

# **Information Lifecycle Management: An Analysis of End User Perspectives**

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## ***Abstract***

Driven by new government regulations in disclosure, records retention and security, Information Lifecycle Management (ILM) became a storage industry buzzword in 2004. An approach to information management that seeks to take into account information's changing value, ILM is a process for managing information through its lifecycle. This study reports findings from an exploratory survey undertaken by ISIC to explore the views of senior technology managers in addressing ILM. Twelve semi-structured interviews with Chief Information and Chief Technology Officers (CIOs, CTOs) in nine organizations were completed. These interviews sought to understand how IT executives view ILM, its business drivers, and its ultimate business value. Key findings include: ILM initiatives are many, varied, and focused at three levels: storage and IT infrastructure; compliance, audit and records management; and data warehousing and business intelligence. Key value objectives identified included: supporting the business in improving performance; better alignment of data and information services with business needs; and strengthening the company's foundation (people, processes, systems) for ensuring compliance.

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# **Information Lifecycle Management: An Analysis of End User Perspectives**

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## **1.0 Introduction**

Reacting to the passage of new governmental regulations in compliance, records retention and security, Information Lifecycle Management (ILM) became a storage industry buzzword in 2004. ILM is a catch-all concept, an approach to information management that seeks to take into account the ways in which information changes over time, as well as the degree to which automation is required to manage, retain and migrate information across the enterprise as its value changes. ILM has been much trumpeted and criticized, yet the elements of ILM - structured data, backup and recovery, tiered-storage, robust archival policies, hierarchical data management, data warehousing and business intelligence applications - are essential building blocks in every IT architecture and data center operation. Moreover, whether called ILM or not, it directly affected industry verticals such as healthcare, telecommunications, financial services and retailing for example, HIPAA, Sarbannes-Oxley, and the Patriot Act are driving numerous, large-scale, costly compliance and related efforts.

This paper presents preliminary findings of an exploratory study to explain the views and plans undertaken by senior IT management in addressing ILM in their IT and business organizations. Twelve semi-structured interviews in 9 organizations were completed to explore how senior IT and technology managers view ILM, the relationship of ILM to other key IT initiatives including reducing IT complexity, distributed data management, data warehousing and business intelligence, and how, ultimately, these senior executives see ILM and its IT complements delivering business value.

The results of these interviews are discussed and summarized in a framework which identifies three levels of management and operational focus: an IT infrastructure or utility level, underscoring a technical approach to distributed data, database applications, and storage management; a records and information governance level, underscoring an approach focused on organizational responsibilities for data, including content and records management, data ownership, access and security; and thirdly, a data warehouse and business intelligence level, underscoring an approach focused on the storage and management of large volumes of data, the delivery of business intelligence information to users, and support for personalized customer experiences in linking warehouse data with customer relationship tools and analytics. It is evident that none of the levels by itself provides an adequate way to partition ILM; however, taken together, the framework addresses information infrastructure, ownership and analytics. A description of the framework and excerpts and analysis of executive interviews are presented below.

## **2.0 ILM and Its Complements: Definition and Literature Review**

### **2.1 Working Definition**

According to the Storage Networking Industry Association's (SNIA) Data Management Forum, Information Lifecycle Management is an end to end concept, comprised of the practices, policies, processes and tools used to align the business value of information, with the most cost effective and flexible IT infrastructure needed to provide it<sup>1</sup>. In essence, the promise of ILM is seamless information access and storage, where storage efficiency and cost effectiveness are driven by the value of the information stored. That at least is the concept. Implementing ILM certainly is, and will be, a complicated exercise. Most storage management implementations, as well as those beyond storage (examples: corporate records management, data warehouses, etc.) could potentially fit under an ILM banner. Consequently, while ILM "specific" purchasing plans may be limited, companies are implementing elements of what could be seen as ILM without necessarily having a budget or project plan tied to ILM. For example, data protection could be viewed as part of ILM - hence implementations of backup systems might be viewed as partial implementations of ILM.

ILM in short, is an umbrella concept or process, with technical, records management and business intelligence applications in practice. As a measure of user take-up, a December 2004 Gartner poll of 95 companies found 12% had an active ILM project underway. A third of the companies responded that they planned to initiate an

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<sup>1</sup> SNIA Data Management Forum (2005). "Information Lifecycle Management: A Vision for the Future."

ILM effort in 2005, and another 20% responded that they had plans to initiate an ILM effort in 2006. Vendor product ranges and sales also continue to grow – the proliferation of ILM strategies from EMC, IBM , Veritas, Hitachi Data Systems and HP can be directly attributed to the explosion in data growth and the impact of record retention rules from the government, such as Sarbanes-Oxley, SEC 17a-4 and HIPAA.

## **2.2 Literature Review**

The importance of data and information management, the precursors to ILM and its complements, has been long been recognized by IT researchers. Early work blended technical discussions (data definitions and data hierarchies, database systems) with work on administrative policies and organizational/administrative functions responsible for managing the firm’s data. In summarizing much of the early work, Goodhue, Quillard and Rockart developed a contingency perspective for understanding data management in a sample of twenty companies studied.<sup>2</sup> They found that effective data management followed no clear pattern; rather, management policies depended heavily on organizational factors such as business objective, project scope, and the use of data planning methods, in explaining successful data management practices.

Galliers located the concept of data warehousing in both information architecture and data resource management (DRM) in his review of information systems research issues in 1993.<sup>3</sup> Indeed, information architecture and DRM were ranked the first and second “key information systems management issues” in the U.S. at that time. As distinct from an operational database, a data warehouse is data managed outside the firm’s operational systems (Gupta, 1997), abstracting, storing and organizing data for

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<sup>2</sup> Goodhue, D.L., Quillard, J.A. & J.F. Rockart (1987).

informational and analytical processing over a long time period.<sup>4</sup> Data warehouses are intended primarily for analytical applications such as decision support systems and executive information systems (Gallagher), as the warehouse contains historical data to supply time-related analyses (e.g. analysis of trends).<sup>5</sup> Research shows that implementation of data warehouses is on the increase: Wixom, Gray and Watson have reviewed trends in recent years and reported that an estimated 95% of Fortune 1000 companies either have a data warehouse in place or plans to develop one.<sup>6</sup>

An important issue in data warehousing is ensuring data quality and consistency. In essence, data quality refers to how relevant, precise, useful and timely data is, subject to data inconsistencies when entities appear in multiple systems or there are multiple records of the same entities.<sup>7</sup> Madnick et al has found that a significant challenge to data quality is heterogeneous system integration and incomplete (or inaccurate) management policies for ensuring data integrity.<sup>8</sup> In echoing these findings, Rudra and Yeo found in their work on data warehousing among large organizations in Australia, that data quality problems included heterogeneous systems, lack of policy, planning and ownership of data from management, and data never fully captured (example: incomplete migration of data from operational systems to the warehouse).<sup>9</sup>

In summarizing current trends in data warehousing and business intelligence, Wixom and Watson note that firms are “demanding business intelligence strategies that include efficiently sourcing and storing data, and then making that data available to

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<sup>3</sup> Galliers, R.D. (1993).

<sup>4</sup> Gupta, V.R. (1997).

<sup>5</sup> Gallagher, S. (1995).

<sup>6</sup> Wixom, B.H., Gray, P. & H.J. Watson (2002).

<sup>7</sup> Winter, R. (2001).

<sup>8</sup> Madnick, S.E., Wang, R.Y. & X. Xian (2004).

<sup>9</sup> Rudra, A. & Yeo, E. (1999).

business processes in ways to improve performance and reduce costs”.<sup>10</sup> The import of their analysis suggests that researchers and practitioners together need to understand both facets of data warehousing, that is, getting data in (extracting, transforming and storing data), and getting access to stored data quickly, efficiently, and at minimal cost. In this emphasis they echo a key promise of ILM, that of organizing the storage function efficiently in order to manage storage resources by the value of information stored.

### **3.0 Research Framework**

The relative lack of research studies on ILM presents a number of research opportunities and suggests the need for an exploratory focus. This section discusses the preliminary research questions, field methodology, and IT problem domain. As stated previously, preliminary findings based on an initial sample of senior IT and technology management is reported here. The project is continuing to interview senior IT, technology and storage management, and a follow up paper reporting findings for a larger sample will be completed shortly.

#### **3.1 Research Questions**

The primary goal of this phase of the project is to categorize and document senior managements’ views of the scope, utility and business value of ILM. The questions listed below were developed for this exploratory study. They cover the respondent’s working definition of ILM, future plans, initial experiences with implementation, and business value.

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<sup>10</sup> Wixom, B.H. & Watson, H.J. (2001).

- Q1. What does ILM mean to you? How have you approached it in your organization? Have you viewed it as a separate IT activity, or one in concert with others? If so, what are the other activities?
- Q2. What are your ILM plans for 2006?
- Q3. How have you implemented ILM? What have been the challenges? What are the benefits and risks?
- Q4. How have you worked with the business to implement ILM?
- Q5. How are you measuring the success of your ILM activities?
- Q6. What do you see is the business value of ILM?

### ***3.2 Research Method***

A field interview approach leading to a comparative, case study analysis was selected for the project, based on the project's initial, descriptive goals, the exploratory nature of the research questions, and the complex IT activity being studied. IT researchers have argued that case studies are useful when the goal of the work is descriptive or one that involves classification, and the focus of inquiry is most appropriately studied in its natural setting.<sup>11</sup> A multi-site approach was undertaken to allow limited generalizability of the results. As the project moves forward, the research approach will evolve to a multi-method, comparative case study design, allowing for greater generalizability of results.

In this initial phase, Chief Information Officers (CIO), Chief Technology Officers (CTOs), Chief Executive Officers (CEOs), and Executive Vice Presidents (EVPs) with IT responsibilities were interviewed in nine participating firms. The nine

companies were selected based on the industries represented, access to multiple levels of IT management (including ILM project managers where appropriate), and different phases of ILM adoption (ranging from firms evaluating ILM to those who have completed one or more ILM projects). There were 12 interviewees in total. Data collection for the study included interviews, reports and presentation materials where appropriate, and secondary data.

Face-to-face and telephone interviews were completed over the period from September to December 2005. Due to the competitive sensitivity of the data collected, the identity of the companies participating will remain confidential, and results generalized to the group. In this preliminary reporting of results, analysis of respondent interviews and an interpretive framework is presented.

## **4.0 Preliminary Results**

Responses to the six initial research questions were developed from the interviews, observations, and supplementary data obtained from the interviewees and firms participating. A limitation of the approach in generating and pooling interview responses is the inability to control the variables of interest, as observations are taken directly from the field setting as it presents itself. The limitations to note are that the field setting may change in some way, potentially altering the accuracy of interview data collected prior to the change; and second, changes in the field setting may affect the design and efficacy of the research approach and exploratory questions. No such threats to the original design were observed in the initial field research time period; however, as the project evolves this contingency needs to be monitored.

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Goldstein, D., & M. Meade (1987).

**Q1, Q2.** *What does ILM mean to you? How have you approached it in your organization? What are your ILM plans for 2006?*

In the views of senior management interviewed, ILM is an important, even critical concept, but one that in its current form is very limited. In the words of one CIO, “ILM refers to about 10% of what we do in managing company information and data... ILM products are organized according to vertical applications (for example, email, word processing documents, spreadsheets, etc.), but our information issues are with record keeping across an integrated system – paper records, verbal communications, and electronic data and messages to name a few.” A second interviewee, a Chief Information Officer (CIO) in a major financial services firm, drew a sharp distinction between the media formats typical in long-term records and information storage in financial services – “if an auditor arrived on our doorstep they would go first to our paper records,” and customer experience information, stored in a data warehouse, and used for product development and customer relationships. “Our focus with the business on this kind of thing is with the customer experience and our products, we are investing in data warehousing and business intelligence tools to support (partner with) the business on this... we also have some other work underway in the compliance area on the infrastructure side.”

A third area of commentary and response to the questions was noting the sheer volume of data involved, where in the company data resided, on what storage media / device, in what application, and how, when and where data was used. According to another CIO, “we have several hundred applications and tens and more terabytes of data

sitting on different storage networks and systems across the company... our focus going forward is with data warehousing and BI applications (business intelligence), and working with (educating) the business to help with more understanding and discipline on the applications and data side.” Another respondent concurred, “we (in the corporate IT function) have been responding to more frequent questions from the business on what ILM packages they should consider as part of divisional / business unit IT operations and investment. We’re undertaking education and planning initiatives with the business to address the questions, with the objective of a more cohesive response.”

Taken together, the key themes arising in responses to Q1-Q2 were in how ILM was being viewed and implemented in the companies represented, and what projects were anticipated or in place for 2006. Firms / respondents fell into one (or more) of three general categories of response: a technical, “storage-centric” (utility) view of ILM implementation and practice; a compliance-driven, records management and data archiving view of ILM; and third, a customer-focused, business-intelligence view of ILM, where improved practice / policies in information management were seen as necessary pre-requisites to effective data warehousing and business intelligence applications.

*(a) A “storage centric” view of ILM (technical focus)*

Companies see part of the ILM exercise as improved technical management of the company’s storage (utility) network, where a key challenge is effectively utilizing improvements in storage hardware, storage applications, and storage architectures. Storage industry innovations include, for example, tiered storage, hierarchical storage

management, storage area networks, network-attached storage, storage resource management and advanced software tools supporting virtualization and automated data management (ADM) of enterprise information. The business problem of note here is business policies which either directly or indirectly treat all data the same, regardless of its value. Industry surveys typically report that when IT managers are polled on how much of their primary disk storage has gone untouched within the last 6 months, many don't know, and those who do know generally report that about 40% to 50% of their primary (tier 1) disk storage is being taken up by infrequently accessed data. The implication of this is two; storage costs are increased as firms must buy incremental capacity for new data, and IT is wasting resources by repeatedly backing up static data. Moreover, the alternative of manually relocating less-frequently accessed data from primary to secondary storage is considered prohibitively labor-intensive and error-prone.

Respondents noted that the costs inherent in inefficient storage of digital data were of growing concern, given the rate of increase of corporate data being collected and used by the business, often resulting in requests by the business units for increased IT support in data and storage management. However, senior IT managers also expressed concern that current industry tools and approaches were “vertically focused” (product / application focused – example, email), and targeted at the company's structured, transactional data (that is, the most directly classified data, subject to volume, in the firm). Executives voiced concern that the problem of mixed media storage of business records and the applications that created them were difficult and potentially very costly for archiving purposes. Hence, there was interest in improving the technically-focused storage of corporate level data, and in balancing the “infrastructure view” of ILM with

one focused on the customer experience side of the equation, specifically data warehousing and tools for business intelligence focused on improving customer experience.

With respect to the infrastructure, in the words of one senior IT executive now engaged in defining and implementing several ILM-related projects, “we are working to develop a strategy and projects that embrace diverse but interdependent needs, connectivities and business unit and product interdependence. We have found it necessary to start at the beginning, with the basic fundamentals - content management, document management, records management, forms management, archival policies, storage vendor relationships, and so on. We see a blurring of terms, the boundaries are becoming less clear, although vendor products operate as one kind of boundary. We are working internally on projects and externally, on rallying the business to help with setting scope and compliance issues.”

As noted by this and other respondents, the underlying management question for the IT organization is how extensive a portfolio of services will corporate IT adopt in addressing enterprise information? And how will these activities be organized and funded by the business? Several, initial projects were being funded by IT; however, decisions on larger-scale funding were yet to be made as pilot projects evolved.

*(b) A “records management” view of ILM (administrative compliance focus)*

Companies in industries most directly affected by rapidly evolving security and compliance regulations understandably view improved security compliance and records management as critical administrative complements of ILM. Financial institutions and

healthcare companies are the industries most directly affected. As one financial services executive noted, “post 9/11 compliance regulations, principally related to the Patriot Act, are becoming a very labor intensive, expensive activity for banks, involving training, record keeping, monitoring, and accountability, especially as regards non-US companies and individuals.” A key element of the steadily evolving compliance regime for banks is personal accountability of bank officials for, for example, monitoring and reporting of any kind of suspicious activity involving funds transfer or inter-company transactions. Security and compliance regulations, in this sense, are driving key changes in the role(s) banks must play in obtaining information on their customers, and evaluating, monitoring and storing it.

Respondents noted that their IT organizations have been asked to provide responses to compliance, legal and/or regulatory requests involving electronic records. While responsibility for implementing records control is delegated several levels below that of the CIO, ultimately oversight, costs and responsibility often end up with IT management.<sup>12</sup> Conventionally, the distinction between records management (RM) and ILM is that the latter matches storage media with information activity (age, frequency of access, storage media, etc.), and records management is focused on information (administrative) policy, irrespective of how the records are stored. However, as ILM’s footprint extends into records and content management, the appropriate policy infrastructure is a key management concern. This would include corporate policies, retention rules, defined information procedures, audit capability and employee training. Further, firms generally will attempt to promulgate control policies centrally, and implement locally, raising the host of management issues long associated with

centralization – decentralization. Kaarst-Brown and Kelly (2005) have addressed the potential impacts of Sarbannes-Oxley on IT governance, budgets, and relationships with vendors and outsourcers, in an early analysis of the practical impacts of compliance.<sup>13</sup> They found important, potential implications included the creation of new IT oversight roles, changes in senior IT and CFO reporting relationships, and new roles for senior IT management.

In the content management / technical area, there is also increased attention in the firm's document management environment, or Electronic Content Management (ECM) systems. Heretofore a tactical systems environment – ECM systems have been deployed to address specific, business unit problems, such as the submission of a drug for government testing and evaluation, or for the publication and management of technical manuals in software, or in advertising, for managing the dissemination of content associated with an advertising campaign, ECM has been extended into areas such as e-mail archiving and departmental records management. The business problems of note here are data ownership and organizational issues affecting data management implementation, specifically infrastructure, content and delivery. Whether by force (addressing compliance) or the needs of the business, ECM systems are being deployed as decisions on infrastructure and records / content management converge. An example is the convergence of e-mail archiving applications and storage, seen by respondents and industry observers as an evolving trend.

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<sup>12</sup> ARMA International (2005); Gable, J. (2005).

<sup>13</sup> Kaarst-Brown, M.L. & S. Kelly (2005).

*(c) A data warehousing – business intelligence view of ILM (business development)*

A third area of senior management interest is positioning ILM within the higher value activities of partnering with the business to support improved customer experience and innovative products. Several CIOs and CTOs referred to the importance of supporting business initiatives in improving customer relationships, specifically through the development of data warehouses and business intelligence tools and analytics. As one executive noted, “this area has been gaining significant attention in the company, as one where we can partner with the sources of demand (for better information and analytics), and one where we can get the attention and focus of top business management. As we get going on this in a bigger way, we need to know where the pain is coming from, and who will work with us to help solve it.” This and other companies in the preliminary survey have committed to large-scale business intelligence (BI) efforts.

Wixom and Watson have noted this shift in the area of data warehousing, whereby organizations are increasingly focused on actionable business information that can be derived from integrated data: “Organizations are demanding business intelligence strategies that include efficiently sourcing and storing data, and then making that data available to business processes in ways to improve performance and reduce costs.”<sup>14</sup> They note that many of the traditional problems with data warehousing still exist (eg data quality, performance, cost management), but that new issues, such as process integration and information latency, associated with BI/data mining, are accompanying the growing interest in trends including performance management and tactical (local business) support.

In explaining the role of data warehousing in corporate application architecture, Winter has noted that data warehousing has established a new middleware layer, necessary because the direct, individual access of decision support applications to operational data from transaction-oriented applications has proven technically or economically infeasible.<sup>15</sup> Winter's research has found that data quality problems and complex integration (and interoperability) requirements have made it usually impractical to supply consistent, integrated real-time data to decision support applications. Even where technically feasible, or required because of specialized business needs, for example in financial exchanges and/or trading rooms, in most business organizations the development and maintenance of interfaces across multiple decision support and transactional data applications is not economically advantageous.<sup>16</sup> Rather, decoupling decision support from transaction (operational) applications, the key to the data warehouse concept, allows for the reuse of integration techniques, derived data and supports maintenance focused on a few, well-defined interfaces. These expected benefits have spurred dramatic growth in the data warehousing market, which as of 2003 was growing 43% annually and reached approximately \$150 billion in sales.

Respondents in the interview sample were either engaged in current initiatives in data warehousing and BI, or planning for future efforts. In their analysis of best practices in data warehousing in a large US retailing firm, Lawyer and Chowdhury contrasted two different approaches to data warehouse implementation – “top-down” (Inmon style) and “bottom-up” (Kimball style) – which have different implications for technical

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<sup>14</sup> Wixom, B.H. & Watson, H.J. (2001).

<sup>15</sup> Winter, R. (2001).

<sup>16</sup> Winter, R. (2001).

architecture and organizational implementation.<sup>17</sup> According to Lawyer and Chowdhury, the retailer selected a top-down approach due to business demands for highly-detailed, transaction level data, and technical and cost considerations in defining the warehouse architecture to provide it efficiently.<sup>18</sup> Their analysis of best practices yielded management and operational considerations. On the management side, three were essential:

- Data warehouse sponsorship. “Data owners and data stewards are indispensable when negotiating and standardizing multi-user differing views of the same data.”
- Data warehouse growth, expertise. Data warehousing was “best seen as a journey,” not an end, and the importance of expertise was key given the technical and organizational challenges to achieve success.
- Data warehouse education and support. The authors stressed the importance of the requirements for continuing support of the warehousing environment, and therefore the need for regular, targeted education to ensure this support.

On the technical, data management and data definition side, the authors found eight practices, including warehouse scope, load frequency, the type and use of data modeling tools, metadata definitions, and the need for a defined change management process when management, information or technical considerations required it, as critical to successful implementation. Echoing Lawyer and Chowdhury’s findings, respondents in ILM interviews referred to the importance of business sponsorship, ownership / stewardship of data, and educating the business as key management

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<sup>17</sup> Lawyer, J. & S. Chowdhury (2004); Inmon, W. (1992); and Kimball, R. (1996).

<sup>18</sup> Lawyer, J. & S. Chowdhury (2004).

challenges in initiating data warehousing / BI projects. ILM respondents also noted the importance of completing preliminary assessments of processes that can be automated, of legacy storage systems and interfaces, and of assessing the criticality of applications (e.g., priority) that should be addressed first in a data warehousing / ILM project. Other important considerations noted were the category of information (regulated content, internal, protected or unprotected) and ownership (business or organizational unit, business owner).

It is important to note that business intelligence (BI) as a capability is evolving from the original data-warehousing concept to a focus on actionable information in the hands of business decision makers.<sup>19</sup> This evolution in functionality can be seen as an expansion of scope, and implies that BI is moving beyond the querying and reporting of operational data to individuals and departments, to align itself with the performance goals across business functions and the departments it serves. In short, BI is evolving from providing content to individual functions, to providing services for multi-departmental collaboration. This means, according to Simmers, that BI in corporate practice is moving steadily away from reactive to proactive, and from a focus on integrating transaction silos to corporate level performance support through multi-function team collaboration.<sup>20</sup>

Working backwards, BI and data warehousing depend critically on the cohesiveness and quality of the information infrastructure it is based on - the amalgam of policies, content, applications and storage environments that comprise the foundation on which advanced analytics and performance goals can be built. In this way ILM as an

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<sup>19</sup> Wixom, B. & H.J. Watson (2005).

<sup>20</sup> Simmers, C.A. (2004).

end-to-end concept can be identified as an important building block for effective data warehousing and BI.

**Q3 - Q5, Q6.** *How are you organizing your ILM initiatives? What are the challenges? What do you see as ILM's business value?*

Of the nine organizations participating in the exploratory study, five had active ILM, data warehousing, and business intelligence initiatives underway. Two have started the IT and business strategic planning steps required for an ILM or data warehousing/BI effort, including management education and systems training efforts targeted at business sponsors and IT project team members. All of the firms participating had some form of compliance, data retention and/or security initiative(s) in progress, ranging from major projects underway in financial services and healthcare firms, to smaller scale efforts in other companies focused at the level of business units and/or departmental functions. Typical of the later efforts were those focused on email archiving and customer records management and storage / archiving of customer relationship data.

*(a) ILM and related project organization*

As expected, the organization of ILM projects and related initiatives varied widely according to the goals, level and sponsorship of the effort. As a general observation, multi-function (enterprise level) ILM and data warehousing / BI efforts appear to require relatively large sponsorship networks and executive level commitments of time and stewardship across the full planning and project lifecycle. In

the words of one senior executive, “these projects can be significant and require the active (not passive) support of top management... they (generally) involve customer data and the information necessary to meet functional or personal goals, or they arise out of legal or compliance directives that usually require immediate attention... you don’t want to be starting from scratch on one of these.”

The majority of companies participating in the exploratory study were approaching ILM from a broader focus – for example, locating ILM as a component (complement) within an enterprise information strategy or a data warehouse / BI effort. However, there were localized ILM projects underway in specific function or application environments, such as email archiving, and the organization of the project and key project steps appeared to follow some general guidelines. The initial project step was to define and assess the business processes and information requirements involved in the project scope, and to inventory the storage media, systems and interface environment. A concurrent step was to identify the business priorities and goals set, and to prioritize the information and applications targeted for change.

A second, critical element was to define the business owner of the data / information elements involved, and what business and/or regulatory-driven determinations such as data access, retention, or security needed to be made. These determinations are important – they help in defining the level of service required to support the business. Thirdly, project teams could begin to define processes, their definitions containing at least the following elements: data category, data ownership, determinations as to key use and utility, access and retention requirements, security, archiving and disposal requirements. The scope of these definitions and their

relationship to business requirements is the reason that content (records) management and storage management are two important elements of ILM.

No dedicated Records Information Management (RIM) projects were observed in the exploratory sample. However, all firms had some activity underway in data security and/or compliance, with records management as a key project activity. Electronic records pose a business risk associated with potential exposures in legal discovery, regulatory inspections, industry investigations and privacy rule violations. As Gable has noted, basic records controls are the ability to identify an information record, associate a retention (archival) rule, keep the record unalterable for as long as required, enforce the retention rule through to reliable destruction, or, alternatively, suspend destruction if investigation or litigation is pending or imminent.<sup>21</sup> Managing electronic records requires corporate (administrative) policies, defined data management procedures, employee education and training, and audit capability. As Gable concludes, an expectation of consistency, responsibility and accountability has a greater chance of standing up to outside challenges.<sup>22</sup>

With respect to ILM activities associated with data warehousing and BI project initiatives, Little and Gibson have noted that the concepts of data warehousing and OLAP (On-Line Analytical Processing) for decision support have received widespread exposure in the practitioner community since the early 1990s.<sup>23</sup> The exposure has been diverse, ranging from conceptual discussions to “how-to’s” to vendor product announcements and “success stories.” Data warehousing has been incorporated as a practice area within several, large IT consulting companies, and at least three

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<sup>21</sup> Gable, J. (2005).

<sup>22</sup> Gable, J. (2005).

professional associations, The Data Warehousing Institute, The International Data Warehousing Association, and the OLAP Council, have been established to codify and disseminate best practices and management innovation in establishing and operating data warehouses. And academic research has been spurred by authors including Little and Gibson, Wixom, Gray and Watson, and an annual academic papers track at HICSS (the Hawaii International Conference on System Sciences), chaired by Wixom and Watson.<sup>24</sup>

Empirical investigations of factors affecting data warehousing success have investigated the relative importance of different management and technology factors in implementation. Little and Gibson, for example, surveyed 242 members of data warehousing implementation teams in 41 companies, asking a series of questions ranging from executive sponsorship to use of software engineering design tools.<sup>25</sup> They identified nine factors as the most important, including understanding the organization's external environment, senior management support, having a defined method / capability for implementation and adhering to it, preparing data for the warehouse, and the use of tools (software engineering and query) supporting the implementation. Wixom and Watson found in their cross-sectional survey of 111 organizations that organizational issues that arise during implementation, including resources, user participation, and the skill level of project team members, increase the likelihood that warehousing projects will finish on-time, on-budget, with the right functionality.<sup>26</sup> Conversely, diverse, non-

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<sup>23</sup> Little, R. G. Jr. & Gibson, M.L. (1999).

<sup>24</sup> Wixom, B. & H.J. Watson (2005).

<sup>25</sup> Little, R. G. Jr. & Gibson, M.L. (1999).

<sup>26</sup> Wixom, B.H. & Watson, H.J. (2001).

standardized source systems and poor development functionality increased the technical issues that project teams needed to overcome.

The factors identified in both empirical studies are echoed by responses to questions and commentaries presented by ILM survey participants. In the words of one respondent, currently engaged in a large-scale data warehousing initiative, “the support we have received from the business, discipline about what data we put into the warehouse, and work on the query tools used to access data have been an important parts of the project’s success.”

*(b) Business value*

The principal business value objectives named by respondents in the exploratory study were three - supporting the business in improving performance, especially in customer facing activities and improving customer relationships and interaction; improving performance of IT through better alignment of data and information services with business needs, including lowering costs, improving quality, and improving the performance of data and information access and storage; and third, strengthening the foundation (people, systems, records) for ensuring compliance (“decreasing the business risks and costs of compliance”).

Other important objectives noted included working with the business to achieve a more cohesive (“disciplined”) approach to the use and storage of information and data in the firm, including issues such as

- ownership, application, quality of and patterns of information use

- building consensus and commitment across the business and IT for the investments in time and resources needed to address ILM and its infrastructure drivers including data warehousing and BI
- formulating strategies, management approaches and investment plans that embrace the diverse but interdependent needs driving complex (and costly) information and data management projects

Technology and IT infrastructure objectives included reducing IT complexity in database, decision support, and storage systems; implementing improved business intelligence applications (improved query and search capabilities, improved response); improving cost performance of the information infrastructure; and reducing the information, data management and archiving / storage component of overall IT costs.

## **5.0 Summary of Findings: An Interpretive Framework**

Figure One presents an interpretive framework summarizing the key findings of the exploratory study. The framework has been derived from responses to questions and discussions with senior IT and technology management during the course of the first phase of exploratory research. Respondents anchored ILM initiatives within three levels of management and operational focus: an IT or information infrastructure level, underscoring a technical approach to distributed data, database applications, and storage management; a records and information governance level, underscoring an approach focused on organizational responsibilities for data, including content and records management, data ownership, access and security; and thirdly, a data warehouse and business intelligence level, underscoring an approach focused on the storage and

management of large volumes of data, the delivery of business intelligence information to users, and support for customer-based analytics and data mining. These levels are not mutually exclusive; rather, it would be anticipated that most organizations would have business and IT activities present in all three.

Three points can be made to amplify the levels denoted in the figure. First, the sample of senior management interviewed saw ILM as driven by broader, enterprise wide management and operational objectives, including for example, data warehousing and business intelligence applications supporting improved customer relationships on the one hand, or business compliance and regulatory directives on the other. ILM therefore, was not viewed as an end in and of itself. Second, ILM in its simplest sense, was seen as a “natural” progression of ideas and products coming into the IT marketplace, evolving from early database management and storage systems, to more complex information and storage architectures, including tiered storage, hierarchical storage management (seen as data and transport centered), to ILM and beyond (seen potentially as information centered). And third, ILM was seen by respondents as a process, one where business value would be realized when that process was embedded within enterprise or business unit wide initiatives with goals of contributing to improved business performance, or mitigation of business risk associated with regulation and compliance / security.

**<Figure 1 – Exploratory Framework>**

## **6.0 Conclusions, Policy Implications and Future Research**

Our exploratory analysis suggests there is no single, clear-cut approach to defining the scope, objectives, and implementation practices of ILM. Rather, a range of business objectives can serve as policy and operational drivers for ILM. Three macro drivers emerged from interviews with senior IT and technology management, technical (database management and storage systems technologies); compliance and records management (regulatory directives); and data warehousing and business intelligence (improving customer relationships). These levels were not mutually exclusive; rather, the majority of firms interviewed had activities underway in more than one level.

Some perennial data management issues emerged in our interviews. Lack of data and records standardization remains an underlying problem with data, making it difficult to share or interpret data across application system boundaries. Conversely, enterprise-wide data standardization, an important objective of strategic data planning approaches of the 1980s and 1990s, is not a goal, only the degree of standardization that makes business sense to pay for. Data quality and standardization issues are an operational focus for current data warehousing and business intelligence project implementations.

Too, difficult organizational issues are still present in efforts such as ILM that focus on managing information and data in the firm. The managerial focus on short-term results, the centralizing tendencies of data and records management, the issues of data ownership and stewardship by line managers, all present challenges to well-intentioned efforts to develop a more cohesive and strategic approach to managing information in

the firm. ILM and its business policy and operational drivers are not short-term investments in either time or money; rather, respondent interviews pointed to the time and sustained commitment required to realize business value.

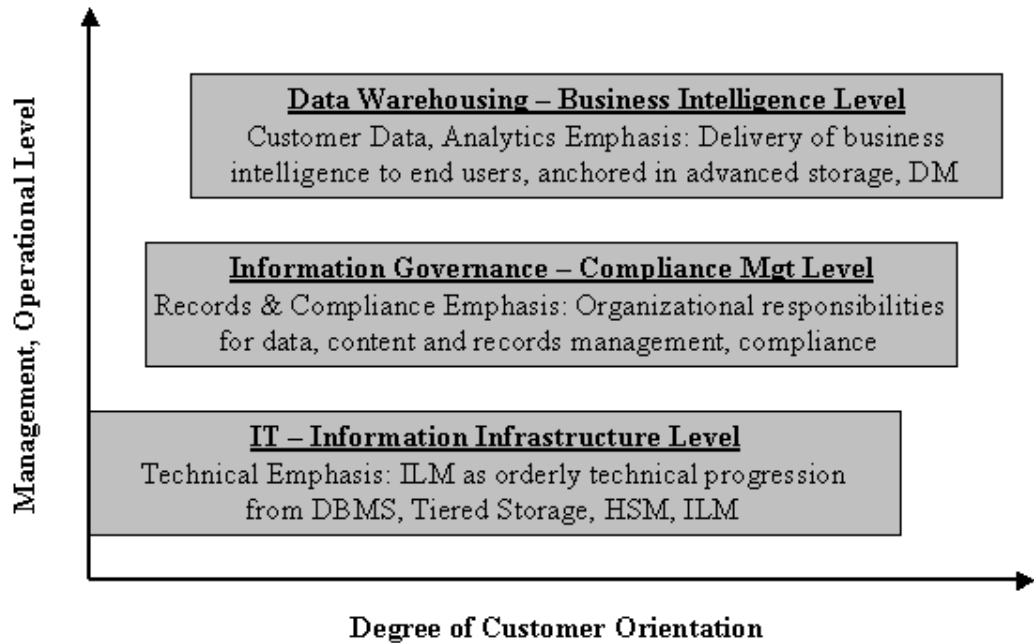
A number of implications and questions emerge for IT, records management, and storage professionals from our exploratory study. For IT management, there is the critical question of how far the IT role will or should expand, either consciously or unconsciously, into enterprise information and such traditionally legal, financial and records management areas as regulatory compliance, archiving and disclosure. The potential implications of such a role expansion are large.

For records managers, dramatically heightened attention to compliance, regulatory directives, and records management has obvious benefits and risks. The benefits are senior management attention and heightened interest in the role and work activities of records managers in the firm. The risks are also in the rapid potential growth of the role, and the very different balance of skills necessary to join systems development efforts on both the back end (storage) and front end (customer information) of the business.

For storage professionals, the challenges may be the most dramatic, in the large, potential expansion of their role, the skills necessary to be successful in any expanded role that emerges, and ultimately, how storage expertise will be valued in the organization of projects, activities and people working on the structure and delivery of enterprise information in the firm. The ILM “footprint” against these issues is limited, but evolving, and research directed towards understanding that evolution is needed.

This paper has reported on preliminary findings from our initial, exploratory study. Work will continue in interviewing a larger sample of senior IT and technology management, and as that phase of the study evolves, detailed studies of project team implementations will be added to the research plan. Updated findings on continuing work will be published periodically.

**Figure 1 - Underlying ILM Drivers: Exploratory Framework**



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## 7.0 References

1. ARMA International (2005). "Information Management: A Business Imperative." Available at [www.arma.org](http://www.arma.org).
2. Ballou, D., Madnick, S.E. & Wang, R.Y. (2004). "Special Section: Assuring Information Quality." *Journal of Management Information Systems*, Vol. 20 No. 3, Winter 2004 pp. 9-11.
3. Benbasat, I., Goldstein, D., & M. Meade (1987). "The Case Research Strategy in Studies of Information Systems." *MIS Quarterly* 11(3): 369-386.
4. Brohman, M.K., Parent, M., Pearce, M.R. & W. Wade (2000). "The Business Intelligence Value Chain: Data-Driven Decision Support in a Data Warehouse Environment: An Exploratory Study." *Proceedings of the 33rd Hawaii International Conference on System Sciences*.
5. Chen, Y. (2005). "Information Valuation for Information Lifecycle Management." *Second International Conference on Autonomic Computing (ICAC)*, IEEE Computer Society, pp. 135-146.
6. Cook, R. (2003). "Here Comes ILM." *SearchStorage.Com*, July 21, 2003. Available at [www.searchstorage.com](http://www.searchstorage.com).
7. Cooper, B., Watson, H., Wixom, B., & D. Goodhue (2000). "Data Warehousing Supports Corporate Strategy at First American Corporation." *MIS Quarterly* 24(4): 547-567.

8. Duplessie, S., Marrone, N. & S. Kenniston (2003). "The New Buzzwords: Information Lifecycle Management." SNW Online, ComputerWorld, March 31, 2003.
9. Gable, J. (2005). "IT Update: What CIOs Should Know About Records." ARMA International ([www.arma.org](http://www.arma.org)).
10. Gallagher, S. (1995). "How to make use of raw data." Government Computer News, Cahners Publishing Associates LP, April 3, 1995, Vol. 14 No. 7, pp. 23(3).
11. Galliers, R.D. (1993). "Research Issues in Information Systems." Journal of Information Technology, Vol. 8 No. (2), pp. 92-98.
12. Goodhue, D.L., Quillard, J.A. & J.F. Rockart (1987). "Managing the Data Resource: A Contingency Perspective." Center for Information Systems Research, Working Paper Number 150, MIT Sloan School of Management.
13. Gupta, V.R. (1997). Introduction to Data Warehousing. System Services Corporation, Chicago, Illinois.
14. Inmon, W. (1992). Building the Data Warehouse. New York, John Wiley & Sons.
15. Kaarst-Brown, M.L. & S. Kelly (2005). "IT Governance and Sarbanes-Oxley: The latest sales pitch or real challenges for the IT Function?" Proceedings of the 38th Hawaii International Conference on System Sciences.
16. Kelly, S. (1997). Data Warehousing in Action. John Wiley and Sons Ltd.
17. Kimball, R. (1996). The Data Warehouse Toolkit – Practical Techniques for Building The Dimensional Data Warehouse. New York, John Wiley & Sons.

18. Komiega, K. (2004). "ILM Standard in the Works." SearchStorage.Com, April 8, 2004. Available at [www.searchstorage.com](http://www.searchstorage.com).
19. Lawyer, J. & S. Chowdhury (2004). "Best Practices in Data Warehousing to Support Business Initiatives and Needs." Proceedings of the 37th Hawaii International Conference on System Sciences.
20. Little, R. G. Jr. & Gibson, M.L. (1999). "Identification of Factors Affecting the Implementation of Data Warehouses." Proceedings of the 32nd Annual Hawaii International Conference on System Sciences.
21. Madnick, S.E., Wang, R.Y. & X. Xian (2004). "The Design and Implementation of a Corporate Householding Knowledge Processor to Improve Data Quality." Journal of Management Information Systems, Vol. 20 No. 3, Winter 2004.
22. O'Hara, M.T. & M.K. Brohman (2002). "Boeing Employees' Credit Union: Leveraging the Data Warehousing Investment." Proceedings of the 35nd Annual Hawaii International Conference on System Sciences.
23. Peterson, M. (2005). "Strategic Profile: Information Lifecycle Management: A Vision for the Future." Storage Networking Industry Association (SNIA), Data Management Forum.
24. Rudra, A. & Yeo, E. (1999). "Key Issues in Achieving Data Quality and Consistency in Data Warehousing among Large Organizations in Australia." Proceedings of the 32nd Annual Hawaii International Conference on System Sciences.
25. Sakaguchi, T. & M. Frolick (1997). "A Review of the Data Warehousing Literature." Journal of Data Warehousing 2(1): 34-54.

26. Senf, D. (2005). "Building Towards An ILM Strategy." International Data Corporation (IDC). Available at [www.idc.com](http://www.idc.com).
27. Simmers, C.A. (2004). "A Stakeholder Model of Business Intelligence." Proceedings of the 37th Hawaii International Conference on System Sciences.
28. SNIA Data Management Forum (2005). "Information Lifecycle Management: A Vision for the Future," Storage Networking Industry Association.
29. Wendt, J.M. (2003). "Starting the ILM Process." Storage Magazine, December 2003. Available at [http://storageMagazine.techtarget.com/magItem/0,291266,sid35\\_gci941220,00.html](http://storageMagazine.techtarget.com/magItem/0,291266,sid35_gci941220,00.html)
30. Winter, R. (2001). "The Current and Future Role of Data Warehousing in Corporate Application Architecture." Proceedings of the 34th Hawaii International Conference on System Sciences.
31. Wixom, B.H., Gray, P. & H.J. Watson (2000). "Introduction to the Minitrack on Data Warehousing." Proceedings of the 33rd Annual Hawaii International Conference on System Sciences.
32. Wixom, B.H. & Watson, H.J. (2001). "An Empirical Investigation of the Factors Affecting Data Warehousing Success." MIS Quarterly 25(1): 1-25.
33. Wixom, B.H., Gray, P. & H.J. Watson (2002). "Introduction to the Minitrack on Data Warehousing." Proceedings of the 35th Annual Hawaii International Conference on System Sciences.
34. Wixom, B. & H.J. Watson (2005). "Introduction to the Minitrack on Data Warehousing and Business Intelligence." Proceedings of the 38th Hawaii International Conference on System Sciences.