WHITE PAPER
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Information lifecycle management maturity model

ABSTRACT

Information lifecycle management (ILM) has been widely hyped in the storage industry without a clearly understood vision or a defined approach to implementation. Information lifecycle management's stated value is compelling, but clear steps toward implementation are required. Our proposed information lifecycle management maturity model defines an achievable roadmap to the information lifecycle management vision.

Executive summary

Information lifecycle management (ILM) is a sustainable storage strategy that balances the cost of storing and managing information with its changing business value. A well-executed ILM strategy will result in a more agile organization, reduce business risk and drive down both storage unit and storage management costs. Ultimately, organizations gain solid and immediate business benefit from information lifecycle management by better controlling information assets for competitive advantage.

In this paper we present a model describing five states of maturity for information lifecycle management. Our purpose is to present a vision and practical advice for organizations that are deploying an information lifecycle management strategy. Although we believe that our vision for information lifecycle management is not fully attainable in the market today, we also believe that solid business benefit from information lifecycle management is attainable today. Our objective here is to help reduce risk by providing that the information lifecycle management foundation is built today with a view toward attaining that vision in the future.

The five stages of maturity comprise the first axis of the two-dimensional model. The five stages range from a base state (chaotic) through stages denoted as reactive, proactive, optimized and, finally, self-aware. Generally, the maturity stages are characterized by increasing levels of automation and integration, and the depth of alignment between business processes and information lifecycle management.

There are unique values associated with moving up the maturity stages. The early stages offer increased control of the storage environment and cost savings via optimization and better utilization. The latter stages provide substantial reductions in human resources required to manage and administer storage.

On the other axis of the model, we have defined a set of elements that provide linkage between business intent and storage management reality. The elements are structured into five layers:

- The business interface defining the relationship of IT and business processes
- A business value integration layer providing the linkage between business processes and storage management, tying business processes to policy, data classification and security
- A storage management integration layer linking intended actions and the actual outcomes of storage management actions
- An information placement layer involving activities that optimize data location, including data protection, retention management and optimization processes and tools
- The physical infrastructure consisting of the physical hardware and software used to store data, interconnect storage and servers, move information, and monitor and manage storage

The information lifecycle maturity model will provide a roadmap and an assessment approach to provide that current efforts will build a solid foundation for the future, and help to optimize current investment. Achieving the long-term benefits of a fully mature information lifecycle management strategy is dependent on taking the right foundational steps, and many organizations are making those decisions in the term. The information lifecycle management maturity model will help organizations avoid the pitfalls that generally accompany new technology implementations.

Information lifecycle management *(ILM) is a sustainable storage strategy that balances the cost of storing and managing information with its changing business value. Information lifecycle management provides a practical methodology for aligning storage costs with business priorities.*

ILM maturity model — highlights

- *Five stages of maturity described*
- *Intended to provide insight and direction*
- *Later stages not currently attainable and in some (perhaps many) organizations, not worth attaining*

Introduction

The concept of information lifecycle management (ILM) has received a great deal of attention, but has not lived up to the hype. Perhaps we have progressed through the "peak of raised expectations," and into the "trough of disillusionment" and have not yet begun to realize the "slope of enlightenment."[1]

Our objective is to advance information lifecycle management more rapidly into productive results. The basic concept of information lifecycle management is sound. Simply put, placing information on the most cost-effective platform available, while meeting business needs, is a sensible objective and difficult to refute as good policy.

We'd like to help IT organizations avoid the extended "hype cycle" syndrome, and rapidly deploy the elements of the strategy that are mature enough, when they deliver business benefit and are foundational to future steps. To that purpose, a roadmap is needed.

Thus we have developed a "maturity model" for information lifecycle management. The model is intended to provide insight and guidance into what we perceive as the stages of evolution of information lifecycle management.

It's worth noting that a truly advanced state of information lifecycle management is currently impossible. The advanced state we will describe will require the convergence of some current technologies, and the emergence of other technologies. It will also require some hard work for IT organizations and their business counterparts.

There is clear benefit in moving up the maturity model from a low level of information lifecycle management maturity (which we will call chaotic) to a reactive and then proactive stage. We expect (as is typical of maturity models — e.g. software development SEI/CMM and CMMI) that the advanced stages of maturity will have positive but diminishing returns. Further, it will not make business sense for all organizations to attempt to achieve those advanced stages.

[1] *See any one of Gartner's "Hype Cycle" publications — e.g. "Hype Cycle for Storage Technologies," June 2004*

Information lifecycle management (ILM) maturity model stages:

- *Chaotic — Ad hoc storage optimization*
- *Reactive — Uncoordinated process-management driven*
- *Proactive — Standardized tools and process; linkage of storage optimization to service level management*
- *Optimized — Policy-management-driven ILM linked to content management*
- *Self-aware — Predictive policy-based management, linked to information quality and content management; highly adaptive "on-demand" storage infrastructure*

The maturity model

Maturity stages

The information lifecycle management maturity model is intended to provide direction to IT organizations seeking to evolve their information lifecycle management implementation.

We have defined five states of maturity in the model:

- **Chaotic** — Ad hoc approaches to managing storage.
- **Reactive** — Multiple processes/procedures in place for storage management, relying on individuals' knowledge and experience. Data protection (backup/DR) is consolidated.
- **Proactive** — Standardized and documented procedures, generally unsophisticated. Service-level management has resulted in definition of standard service levels which have been translated into information lifecycle management data classes and policies.
- **Optimized** — Policy-based storage management processes are standardized, and compliance is managed. Enterprise content management is linked to storage optimization efforts.
- **Self-aware** — Storage management processes have been elevated to best practices levels; continuous improvement and benchmarking are in place. The IT organization supports rapid adaptation to business changes.

Chaotic	Reactive	Proactive	Optimized	Self-aware
No ILM initiative	Ad hoc management	Standardized	Virtualized	Predictive
Archive and backup fragmented and incomplete	Driven by exception	Process driven	Policy driven	Content driven
One data class	Manual storage management	Standard service levels	Business-driven service levels	On-demand service
Static infrastructure	Backup consolidation	Planning	Integrated planning	Business process alignment
	Archive islands	Consolidation	Application alignment	On-demand infrastructure
		ECM		

Fundamentally, information lifecycle management depends on linking business value to storage management actions. We define "optimized" as "business-value optimized." To attain business-value-based optimization requires linkage between business process requirements (service levels) and use of infrastructure. Information lifecycle management must address issues beyond access frequency as a means to decide where in the infrastructure to place a given data object. Information lifecycle management must deal with data recovery and protection; discovery, retention and disposal; and security.[2] In order to be truly linked to business value, information lifecycle management must be content aware.

[2] *See "Best practices in data classification for information lifecycle management" at www.storagetek/ILM/whitepapers*

Information lifecycle management (ILM) maturity model elements:

.. Business interface

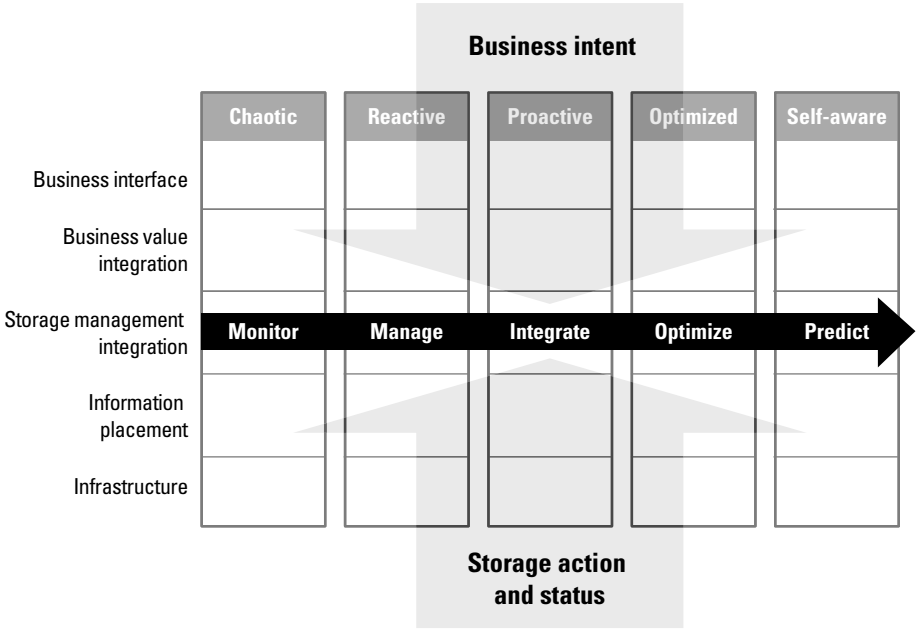
- *Business value integration — includes policy management and data classification processes*
- *Storage monitoring — includes resource management, metadata management and measurement functions*
- *Information placement — includes data protection, archive and optimization processes and tools*
- *Infrastructure — consists of the physical storage layer*

Combined top-down and bottom-up, the elements define a model linking business intent with storage reality.

Elements of the maturity model

The information lifecycle management maturity model is structured to link business intent (plans, requirements and service levels) downward through a layer of integrating processes (policy management and data classification) and into the model "gearbox" of storage management integration. From the bottom up, infrastructure is linked to information placement (data protection, archive and optimization) and into the management integration layer.

Together these elements define a top-down and bottom-up model for information lifecycle management, integrating business intent with storage reality.



The elements of the model are as follows:

- **Business interface** defines the relationship of IT and business processes. Maturity stages map the development and integration of IT infrastructure to business processes.
- **Business value integration** is the linkage between business processes and storage management, tying business processes to policy, data classification and security.
- **Storage management integration** supplies the linkage between intended actions and the actual outcomes of storage administration or management actions. It includes resource management, metadata management and measurement functions. Management integration matures through stages starting with basic monitoring, followed by management, integration, optimization and prediction.
- **Information placement** is the physical management layer in the information lifecycle management maturity model. It involves activities that optimize data location. It includes data protection, retention management and optimization processes and tools.

Information lifecycle management (ILM) maturity

Current state:

- *Majority in reactive stage of maturity*
- *The task at hand for IT organizations: business process alignment*
- *The task at hand for IT suppliers: tools and platforms that provide virtualization, policy management, flexibility and granularity across heterogeneous storage systems*

- **Infrastructure** is the physical hardware used to store data and interconnect storage and servers. Infrastructure also includes the software layers used to move, monitor and manage storage.

Current state: reactive maturity level

At present (Q1 2005) we believe that the majority of organizations are in a reactive state of information lifecycle management maturity. This may have less to do with the organizations themselves than it has to do with the state of available tools and infrastructure solutions. There is one significant hurdle that most organizations will have to clear to get to a proactive or optimized information lifecycle management state: closer business/IT alignment.

About a year ago, Gartner quantified the process maturity of large U.S. data centers.[3] Using a model with some similarity to our information lifecycle management maturity model, Gartner assessed the overall state of IT process maturity. Gartner's results indicate significant improvement from their 1999 estimates. Still, a significant number of organizations (approximately 85 percent) had not reached a state where business process linkage had evolved to the point where it could be relied upon to provide sound input to IT infrastructure decisions. Business/IT alignment is critical to business-value-based information lifecycle management; without it information lifecycle management is merely cross-platform hierarchical storage management (HSM). An organization may achieve some business benefit from implementing heterogeneous HSM, but the broad value that we see from information lifecycle management involves intimacy with business considerations, beyond access history. Advanced information lifecycle management maturity involves making storage management "business process aware." This implies using a broader set of business considerations (such as access performance, retention, disposal, protection, discovery, recovery and security) in applying policy to a set of business objects.

IT suppliers will need to upgrade their portfolios if information lifecycle management is to reach an advanced state of maturity. Tools are needed that improve virtualization, policy management and infrastructure flexibility. These need to be made available across platforms and will likely need to be standards-based. Additionally, they need to provide the ability to integrate file-based management with object- and content-based management. While this is a tall order, our perception is that it is being worked on by most of the information lifecycle management vendors. It's highly likely that the proverbial "perfect storm" for information lifecycle management will really occur.

[3] *Gartner, "Data Center Poll Confirms Improved Process Maturity," April 2004, SPA-22-1694*

Information lifecycle management (ILM) maturity

Future state

- *Business/IT alignment*
- *Pervasive, automated resource management*
- *Self-correcting policy engines*
- *Infinite classes of information optimized automatically across a continuum of storage, based on the business value of the information content*

Required convergence of technology and process

- *Content management and storage optimization*
- *Information science (information quality management, semantic abstraction, information asset management) and ILM*
- *Adaptive storage infrastructure*

Future state: advanced maturity levels

Envision a storage management world where business information objects are automatically managed based on their business value. Where the storage infrastructure not only is business aware, but also is conscious of the content of a business object. Where business decision-makers have specified rules about their information, and the complex service level requirements of a particular information element are consistently and automatically met. Finally, envision a storage management world where the incremental cost of storing information is as low as the cost of incremental capacity. That is our vision of information lifecycle management.

The characteristics of a "self-aware" information lifecycle management implementation include:

- Complete alignment of IT/business processes based on sophisticated service level management processes
- A self-correcting policy engine treating all data as objects, with infinite granularity, and with actions based on business rules
- Transparent, automated resource management, with automated and pervasive discovery, providing a "living" model of the storage infrastructure and its linkages to business processes
- Integration of information quality management, content management, security, data protection, archive and storage optimization
- Virtualized, resilient, self-healing, self-provisioning and self-balancing storage infrastructure; not representing a tiered architecture, but a continuum of performance options available on a "pay per use" basis

A "self-aware" information lifecycle management implementation is dependent on the convergence of several technologies and processes. Perhaps the most significant is the convergence of content management and file-based storage optimization. Today content management vendors are focused on consolidating islands of archive applications into a vertical application (not unlike what backup vendors have been doing for the past decade). This is driven by the need to do discovery across all of an organization's archives, in support of compliance. Generally, content management suppliers haven't even begun to think about infrastructure optimization of the soon-to-be-consolidated archives. After uncoordinated, decentralized archives are consolidated into centralized archive implementations, we expect the next step will be to provide automated, tiered implementations for content. This convergence will eventually make content management an information lifecycle management service.

A more subtle dependency is the convergence of information lifecycle management and the general group of disciplines we will call "information science." Information science deals with the use and reuse of information, its quality, taxonomy and automated abstraction. Advanced information lifecycle management is closely integrated with such issues, and will help to fulfill the promise of actually managing information as a business asset.

Finally, adaptive storage technology needs to develop further to realize the potential of information lifecycle management. Flexible, adaptive storage is a clear prerequisite of advanced information lifecycle management.

Information lifecycle management (ILM) maturity action plan

- *Complete a self assessment of your organization's information lifecycle management maturity*

Advice for reactive stage organizations:

- *Focus on IT/business alignment — storage resource management is key to building and maintaining a model linking storage infrastructure to business process*
- *Consolidation of archive and content strategies — with a clear vision of future integration with other ILM services*
- *Data protection stability and reliability must be provided*
- *Storage optimization will likely yield significant benefits*

Summary

Action plan

In the near term, depending on where you are in the deployment of an information lifecycle management strategy, there are several actions that will increase your benefit from information lifecycle management. One of the clear conclusions from our initial testing of the information lifecycle management maturity model is that IT/business alignment is the most important indicator of maturity. A first step (and the reason why we are presenting this model) is to complete an initial high-level information lifecycle management assessment. Make sure you have a clear understanding of where you are and where you are going.

We have documented the information lifecycle management maturity model in considerably more detail than is presented in this introductory white paper. We are also working to develop an assessment questionnaire to help organizations self-assess their stage of maturity.

Based on our assumption that the majority of organizations are in a reactive state, we can provide some generic recommendations.

1. Generally, organizations in a reactive state will require a closer linkage between their business and IT processes. Several public resources (ITIL, COBIT, etc.) are available to support IT process development and further this objective. Additionally, several providers of professional services have offerings that are intended to close the IT/business gap.

   A solid alignment depends on a clear understanding of the resources available and their linkage to applications and business processes. This appears close to impossible without a good resource management solution.

2. Archive/retention management is also a probable candidate for focus. Reactive organizations are likely to have begun the consolidation of archives and are likely to be in the midst of evaluating enterprise-wide content management solutions. A key consideration is recognizing that eventually you will want to integrate your content management solutions with your other information lifecycle management services.

3. Clearly, if your data protection strategies do not have consistent results, or if you are not cost-effective in meeting service requirements, a need to focus on solving those problems is obvious. Again, solving them with a view of the future of information lifecycle management will pay off as you begin to integrate data protection with security, retention management and content.

4. Depending on your current infrastructure and storage management tool set, a storage optimization initiative will likely yield significant benefit, and will build a foundation for other information lifecycle management initiatives. Again, look to the future to verify your infrastructure will support deeper integration of data protection, retention management and content.

Information lifecycle management (ILM) maturity model benefits

The information lifecycle management maturity model:

- *Provides a roadmap describing a vision and a path to it, to provide that current initiatives help to build a solid foundation*
- *Provides an assessment model to check the IT investment portfolio and provide that investments are optimized*

Benefits

Our purpose in building the information lifecycle management maturity model is to clarify a roadmap for advancing information lifecycle management. We have hypothesized that a significant number of organizations are in a reactive state and are likely frustrated with the amount of "buzz" surrounding this subject.

While our vision of advanced ILM is currently impossible, the individual steps along the way will yield strong business benefits. Further, we commit to quantifying those benefits as part of the ongoing development of this model.

The information lifecycle management maturity model will provide a roadmap and an assessment approach to help make sure that current efforts build a solid foundation for the future, and help to optimize current investment.

For perspective, one only has to look back a few years and remember the cost and frustration associated with early client/server implementations. Eventually, as an industry we figured out what worked and what didn't, and the tools, processes and technologies matured to the point where we now take client/server for granted.

Achieving the long-term benefits of a fully mature ILM strategy is dependent on taking the right foundational steps in the context of a long-term vision, and many organizations are making those decisions in the near term. The information lifecycle management maturity model will help organizations avoid the pitfalls that generally accompany new technology implementations, and will help organizations to gain solid business benefit from information lifecycle management — today.

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