

# The Information Lifecycle Management Maturity Model

## Presentation Guide

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# The Information Lifecycle Management Maturity Model

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# Table of Contents

## Contents

**Executive Summary** ..... 1

**How Do You Use This ILM Maturity Model?** ..... 1

**Major Assessment Areas** ..... 1

    Business Integration ..... 1

    Application and Information Alignment..... 1

    Data Management..... 2

    Infrastructure and Service Management..... 2

**Introducing the ILM Maturity Model**..... 2

**About the SNIA**..... 26

## List of Tables

Table 1. Business Integration Definitions ..... 15

Table 2. Application and Information Alignment Definitions ..... 16

Table 3. Data Management Definitions ..... 19

Table 4. Infrastructure and Service Management Definitions..... 21

## List of Figures

Figure 1. Title Page..... 2

Figure 2. Contributors to the ILM Maturity Model ..... 3

Figure 3. Session Abstract ..... 3

Figure 4. Agenda ..... 4

Figure 5. Information Lifecycle Management..... 4

Figure 6. Service Management for Information Management ..... 5

# The Information Lifecycle Management Maturity Model

- Figure 7. ILM 2.0 - The Next Phase..... 6
- Figure 8. SNIA Expands its Focus to "Information" ..... 7
- Figure 9. ILM Maturity Model Purpose..... 8
- Figure 10. Value Proposition for ILM..... 9
- Figure 11. Maturity Model Measurement Areas..... 10
- Figure 12. Measurement Area Descriptions..... 11
- Figure 13. Using the Maturity Model..... 12
- Figure 14. Measuring Business Integration..... 13
- Figure 15. Measuring Application and Information Alignment ..... 15
- Figure 16. Measuring Data Management ..... 17
- Figure 17. Measuring Infrastructure and Service Management..... 19
- Figure 18. ILM Service ..... 21
- Figure 19. Usage Example ..... 22
- Figure 20. Usage Example (cont'd) ..... 23
- Figure 21. Observations ..... 23
- Figure 22. Sample Maturity Model ..... 24
- Figure 23. Maturity Model Dashboard..... 25
- Figure 24. What Next? ..... 26

# The Information Lifecycle Management Maturity Model



### Executive Summary

In early 2008 the Data Management Forum's Information Lifecycle Management Initiative (ILMI) and the SNIA End-User Community (EUC) began a joint effort to develop a Maturity Model patterned on the Capability Maturity Model Integration (CMMI) from the Software Engineering Institute at Carnegie Mellon University. The Model provides a standardized tool for consistent point-in-time assessment of the maturity of overall ILM capabilities within an organization. There were three reasons for commissioning this work effort:

- Provide a standardized tool to allow organizations to determine where they stand relative to best practices in managing their information.
- Help organizations improve their ILM practices to balance their information technology service levels and lower costs.
- Help organizations prioritize their IT investments, better aligning their costs with the value of their data as this changes over time.

### How Do You Use This ILM Maturity Model?

Review the ILM Framework and ILM Maturity Model spreadsheet.

The spreadsheet includes a series of questions that can be used to develop an interview template. Identify the ILM stakeholders (Records Information Managers (RIM), Compliance, Legal, Security, Applications, and Business Owners). Conduct interviews with stakeholders (using separate interview sheets for each interview and note who was interviewed). Establish a score for each area (Business, Application/Information Alignment, Data Management, Infrastructure). Sum the area scores on a final scorecard for an overall summary of ILM Maturity Levels in your organization.

### Major Assessment Areas

#### ***Business Integration***

The business integration portion of the Maturity Model focuses on the policies, and processes of the business, as well as governance, business process value, and requirements. The initial stage depicts a reactive (not pro-active) environment in which the ILM team is unaware of business and data governance policies, or the linkage to business process value.

#### ***Application and Information Alignment***

The alignment of applications and information moves the analysis of policies, processes, governance, and value deeper into IT by studying the ownership of information, the duplication and dissemination of information, and data models. Service quality, security, and data protection all factor into how applications and information are aligned.



### ***Data Management***

The data management category continues to delve into the management techniques of the enterprise. The creation and maintenance of metadata appears at this stage of the model. Metadata is the basis for decision-making ; at the initial stage, there is no concerted retention of metadata, and at the opposite end (Optimizing) metadata are automatically maintained as the environment changes and matures.

Data management processes build on the metadata inventory to define a continuum ranging from anecdotal knowledge data and location to fully automated policy-based management.

Metrics introduce the concept of key performance indicators (KPIs) that lead to a common taxonomy, and automated reporting of data quality.

### ***Infrastructure and Service Management***

The final category of infrastructure and service management focuses on very detailed criteria such as data protection, connectivity, security, and data migration.

## Introducing the ILM Maturity Model

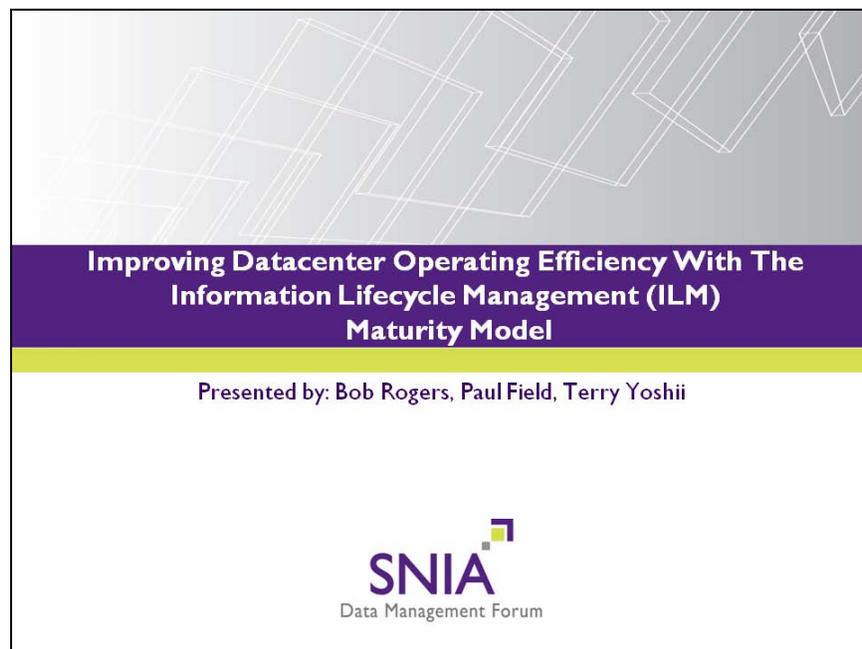


Figure 1. Title Page



Name	Role	Company
Dale Duckwitz	End User	Hanover Insurance Group
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Data Management Forum 2

Figure 2. Contributors to the ILM Maturity Model

**Session Abstract**

- ◆ The ILM Maturity Model provides both a self-assessment method and a roadmap, outlining the steps that organizations have taken, or need to take, to achieve a self-regulating, optimized, policy-based information management practice. Join us and learn for example, how the latest computing craze — “Cloud computing” — is a natural extension of data center services rooted in sound ILM principles.
- ◆ SNIA’s End-User Community contributed in this joint effort with the Data Management Forum’s ILM Initiative to develop this self-assessment model of ILM maturity that you can use today. The presenters and co-authors will discuss the model, how to perform an assessment, and how to interpret and use the results. The session will also describe how two companies used the model to identify investment opportunities.

Data Management Forum 3

Figure 3. Session Abstract



**Agenda**

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- ◆ Introduction to Information Lifecycle Management (ILM)
- ◆ Purpose of the ILM Maturity Model
- ◆ ILM Maturity Model Overview
- ◆ ILM Maturity Model Details
- ◆ ILM Maturity Model Usage Example
- ◆ What Next?
- ◆ Discussion/Questions

Data Management Forum 4

**Figure 4. Agenda**

**Information Lifecycle Management**

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- ◆ Information Lifecycle Management (ILM)
  - The policies, processes, practices, services and tools used to align the business value of information with the most appropriate and cost-effective infrastructure from the time information is created through its final disposition.
  - Information is aligned with business requirements through management policies and service levels associated with applications, metadata and data.

*Source: The SNIA Dictionary, January 17, 2008*

Data Management Forum 5

**Figure 5. Information Lifecycle Management**

ILM is not a piece of hardware or software.

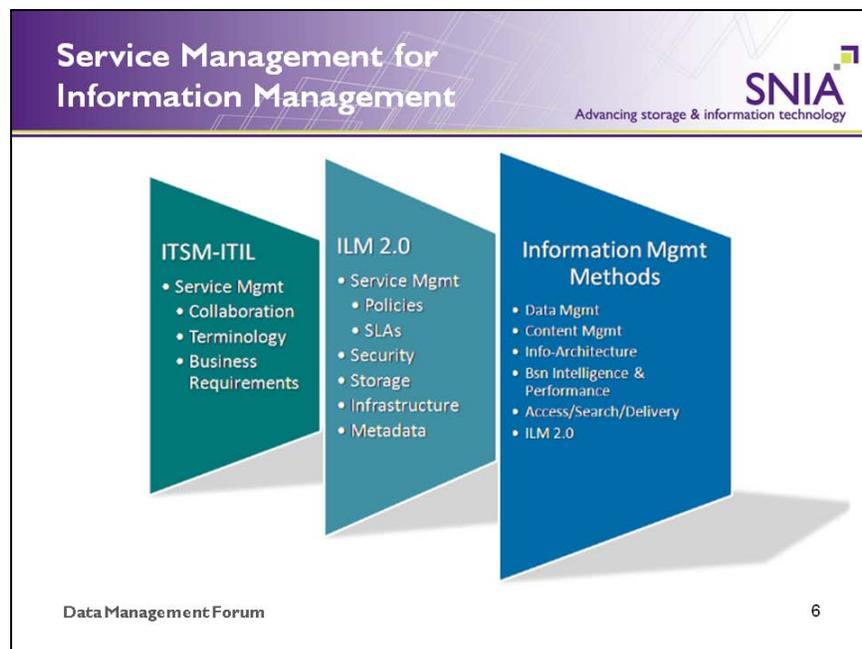
As a matter of fact, in the SNIA definition you don't even see the word "storage" anywhere.



Instead, information lifecycle management is a philosophy and way of life. That's part of why people have had difficulty embracing ILM. It takes some work. Do you have the policies, processes, and practices? Think about the slide we just talked about.... Service management is a major element, if not THE central focus of an ILM strategy.

...and there is nothing wrong with a service management strategy that says that some information never expires. The question is how do you expect to work with this type of information? What type of service does it need? Maybe some thought needs to go into a "special" process that confirms that the information can still be read; just think about the turnover in applications in the data center in the last few years.

In other words, what you want to consider is the holistic approach to information management so that five years, ten years, or whatever number of years from now the information continues to be usable. That's just one example of looking at the information lifecycle, there is also the need to understand data protection needs, in terms of recovery time and recovery point objectives. As you communicate with others in the collaboration process we talked about earlier you will discover what types of services the information needs.



**Figure 6. Service Management for Information Management**

Information Lifecycle Management (ILM) depends on a service management strategy to be meaningful. In that middle layer, you see service management policies and service level agreements. Think of it; what do you want to keep and what is chaff that simply clogs up your storage? You are literally forced to retain everything if you don't know. And that is the issue in many data centers; because without the



initial step of collaborating with the business process owners, and others who are stakeholders in the information management process there is no way to know the value of the information, what its needs are, or how it should be managed. We have to begin the process of building an ILM strategy by working with all of the stakeholders.

By the way, sometimes it is not so simple figuring out who the stakeholders are. If you are the storage guy, and you inherited the job of implementing an ILM program, your first objective ought to be to seek out an executive; somebody fairly high up in your organization who can choose where to start, and has the visibility of all the potential users of the affected information. This collaboration will probably expose some interesting things. Frequently the various people who are participants in this type of process use the same set of words to mean entirely different things. Developing a common terminology is important. The second thing is that although Service Level Agreements probably exist, it is uncommon for such SLA's to include information about how information should be managed. This is often a learning experience for everyone involved.

Finally, once the service management policies and procedures have been developed, things start to get much easier. Information classification becomes a (relatively) simple process of applying rules to information objects so that you can start to see how to do data management, content management, and build a long-lasting information architecture.



Figure 7. ILM 2.0 - The Next Phase

The point of this slide is that information lifecycle management is part of the solution. Your company depends on information strategy, architectures, and governance that feed into how information is managed. Your legal department and others need to be able to find information quickly without



stopping the whole business. In other words, there are many different objectives in terms of enterprise information management and you need to be prepared to handle the job of ensuring that the information that the company needs is there when and where it is needed.

By the way, you are in good company; this diagram originated with a group of people who have the same goal. Take a look at “MIKE2” – “Method for Integrated Knowledge Environment.”

The slide features a purple header with the title and the SNIA logo. The main content is a bulleted list of points. To the right of the list is a small image of a network diagram with blue and green nodes and white connecting lines. The footer of the slide reads 'Data Management Forum'.

**SNIA Expands its Focus to “Information”**

Advancing storage & information technology

- ◆ Focusing on “Storage” or “Storage Networking” per se is no longer sufficient
  - Transition started in 2004/2005
- ◆ Technology alone is too abstract to map business drivers
  - Storage / Information
    - Information has business value that changes over time
    - Information needs a managed life cycle
  - Server / Application
    - Why is the information important?
    - How is the information used?
  - Network / Infrastructure
    - including mobile resources
  - And add the Users!
    - Who uses the information?
    - When and where do they need access?

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**Figure 8. SNIA Expands its Focus to "Information"**

If you are an IT guy prepare to be surprised; this information is what the stakeholders live and breathe; it’s not just “1’s and 0’s” to them.

Information has value, and that value changes. Don’t be lulled into thinking that older means lower value either; in many places, as the age of some information increases, its value climbs. The one thing that is likely though is that there is a life cycle; some information only needs to exist for a short period of time and some has to be retained for a long, long, time.

Think of why you are doing the things you are doing... How is the information used? Why is the information important? Ok, what did you do with the file containing the instructions for shutting down the nuclear reactor?

Information is everywhere nowadays, is it important to ensure that mobile resources are managed as effectively as the glasshouse? In many cases the information generated by people out in the field is even more important because it is irreplaceable. Preservation begins with the creation of information.

Life was so much easier when the job was to just provision more disk, but that’s only a small fraction of what is expected today.



**ILM Maturity Model Purpose**

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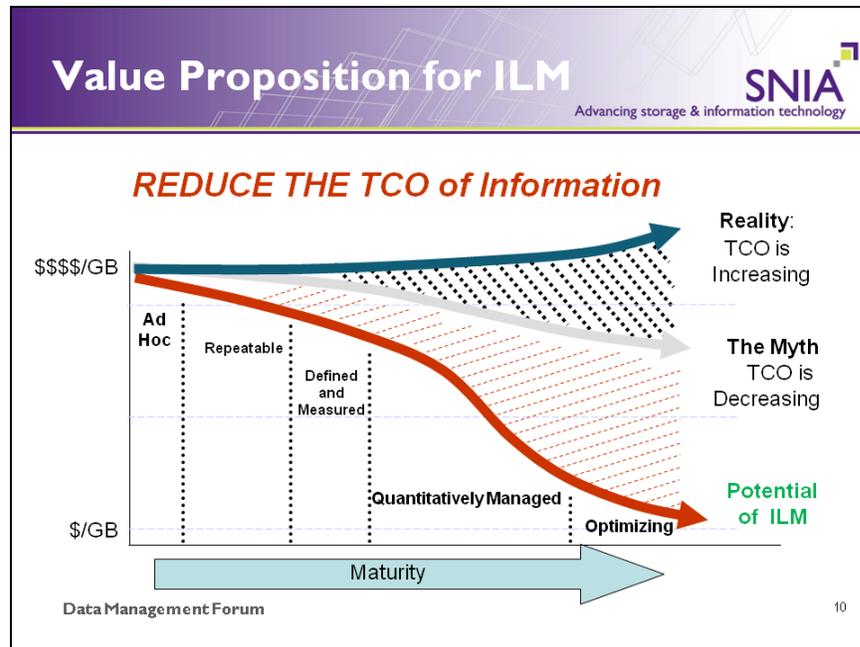
- ▶ Provide a standardized tool to allow organizations to determine where they stand relative to best practices in managing their information
- ▶ Help organizations improve their ILM practices in order to balance their information technology service levels and to lower costs
- ▶ Help organizations prioritize their IT investments, better aligning their costs with the value of their data as this changes over time

Data Management Forum 10

**Figure 9. ILM Maturity Model Purpose**

Now that we have defined ILM, the next step is to introduce the ILM maturity model. First, we discuss why we should have and use a maturity model.

- First, it defines a common framework and language for discussing ILM maturity. Then it enables a relative comparison for how far along an organization is in terms of implementing good ILM practices. This allows an organization to see how they compare to best practices and to other organizations.
- Second, it provides information to organizations about ILM best practices that allows them to improve their ILM implementations. In some cases it may provide a basis for an organization to start an ILM implementation. This allows organizations to provide storage service levels appropriate to the value of their information. Often this will reduce costs as organizations start to feel comfortable with providing lower cost service levels for lower value data.

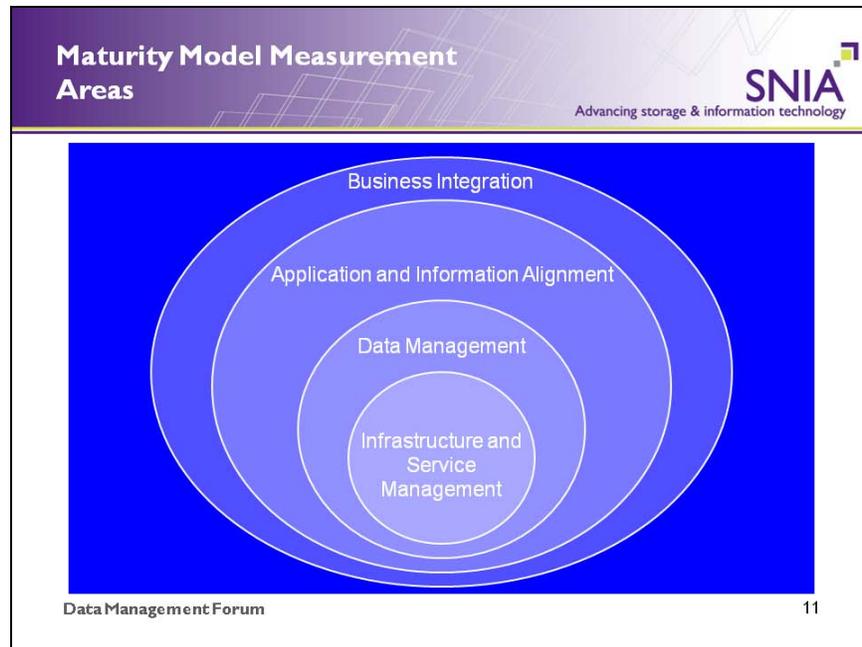


**Figure 10. Value Proposition for ILM**

The rate of change in the cost of managing storage has slowed due to overwhelming complexity and is beginning to head back up due to external factors such as compliance and the barrier that complexity creates. – ILM represents the best new opportunity to get back on the curve and to keep driving cost out.

TCO is the Total Cost of Ownership and includes acquisition, environment, operations, management, service, upgrade, loss of service, and residual value usually compared over a 3 year period. The above annual cost of operations is based on historical data from Strategic Research Corp and ITCentrix. In 1992, the annual cost of managing storage as originally published by Strategic Research Corp. was \$5,000,000/TB. After 12 years time, 2004, it is now down to \$22,000/TB or \$22/GB but the erosion rate will disappear due to overwhelming complexity unless a new approach it taken.

Unfortunately concepts such as TCO don't take into account contributions to business productivity, flexibility, or competitiveness. We need a new metric to fully express the power of ILM and its potential impact on the business.



**Figure 11. Maturity Model Measurement Areas**

Here we introduce the four major areas of the ILM maturity model.

- At the highest level, ILM practices need to be integrated with how the organization conducts its business. This implies that the knowledge of how the business is run is a key part of an ILM strategy.
- At the next level, ILM practices need to be aligned with the organization's applications and information. This implies an understanding of an organization's applications and information.
- At the next level, ILM policies need to be incorporated in an organization's data management practices. This ties the desired service levels to actual service level implementations.
- Finally, at the physical level, ILM policies need to be reflected in the actual IT infrastructure. There should be higher cost infrastructure that supports the higher service levels, and lower cost infrastructure that supports the lower service levels. And there should be mechanisms in place, manual or automated, that move data between service levels at the appropriate time.



Measurement Areas Descriptions	
<b>Business Integration</b> ♦The extent to which information management is integrated with the organization's policies and processes	<b>Application and Information Alignment</b> ♦The extent to which information management is aligned with the organization's applications
<b>Data Management</b> ♦The extent to which information management policies are reflected in the organization's data management practices	<b>Infrastructure and Service Management</b> ♦The extent to which information management policies are implemented in the organization's storage infrastructure

Data Management Forum 12

**Figure 12. Measurement Area Descriptions**

Here we provide high level summary descriptions of the four major areas of the ILM maturity model. Later in the presentation we will get into these areas in more detail as we dive into the maturity model.



## Using the Maturity Model

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- ◆ Understand the sections and rows of the model (see the descriptions and examples)
- ◆ Map of swim lanes (rows) to stakeholders and set up interviews
- ◆ Identify Stakeholders – business, application groups, data, infrastructure)
- ◆ Use a separate spreadsheet for each interview conducted
- ◆ Determine which level the stakeholder is in for each row of the model (refer to the maturity level assessment questions) and note it on the spreadsheet.
- ◆ Sort the final results into structured/unstructured data (if needed)
- ◆ For overall score ... lowest score for each area is the current state of maturity
- ◆ Areas with the lowest maturity levels indicate where investments should be made

Data Management Forum 13

**Figure 13. Using the Maturity Model**

Know what your objectives are for doing this assessment and review the model thoroughly. Make any changes that you feel are necessary to fit your organization's needs.

At this point, it's critical identify the correct stakeholders to interview. Examples are:

- Line of Business Managers
- Information Security
- Compliance and Risk
- Legal
- Records Managers
- Operations Managers
- Application Owners
- Data users and data owners

Set up and conduct interviews using a separate spreadsheet to record answers and results for each interview.

The questions provided as examples will often prompt a discussion that will allow you to establish the level of maturity for each area (row). The overall rating will be the lowest level scored for of all of the rows in any given swim lane. We'll show you an example later in the presentation.



There may be a need to look at ILM maturity from various perspectives. When all of the interviews have been conducted, it may be worth categorizing the results into structured and unstructured data environments data.

The areas with the lowest levels of maturity often point to opportunities where investments should be made.

Roll up the results into the ILM Maturity Model Dashboard for a high level view of where your organization currently stands. This is a point in time assessment that should be repeated periodically to measure an organization’s progress towards established goals.

Keep in mind that a low maturity level is NOT a “bad” thing. It’s much easier to get funding when you can prove that the areas that you are investing in are the areas that need the most work.

Measuring Business Integration					
	Initial (Ad Hoc)	Repeatable (Documented)	Defined & Measured (Standardized & Correlated)	Quantitatively Managed (Automated ILM)	Optimizing (Continuous Improvement)
<b>Processes/ Policies</b>	Reactive to conflicts with business processes/policies when noticed	Follows business processes/policies inconsistently	Follows business processes and policies consistently.	Automated ILM consistent with business processes/policies	Feedback loop for continuous improvement of ILM alignment with business processes and policies.
<b>Governance (of processes, policies, data)</b>	Unaware of business data governance practices	Aware of business data governance practices but followed inconsistently	Follows business data governance practices consistently	Automated ILM consistent with business data governance practices	Feedback loop for continuous improvement of ILM alignment with business data governance practices
<b>Business Process Value</b>	Not linked explicitly to business process value. No differentiation	Basic linkage with business process value	Consistent linkage with business process importance. Key Business Performance Indicators identified for assessment and ILM process improvement.	Automated ILM consistent with business process importance	Feedback loop for continuous alignment of ILM with business process importance
<b>Requirements</b>	No stated ILM requirements	Documented ILM requirements	Documented and uniform ILM requirements	Automation of documented and uniform ILM requirements	Feedback loop for continuous input of ILM improvements

Data Management Forum 14

**Figure 14. Measuring Business Integration**

Here is our first major section of the ILM Maturity Model – Measuring Business Integration.

Note the columns showing the levels of ILM maturity:

- At the initial, or ad hoc level, there is a very basic implementation of ILM.
- At the repeatable, or documented level, there is starting to be some structure to the ILM implementation, but it still remains fairly reactionary and disconnected.
- At the defined and measured, or standardized and correlated level, there is a basic level of organization and structure to the ILM implementation, with a consistent linkage to the needs of the organization. There is some process improvement.



- At the quantitatively managed, or automated ILM level, the ILM implementation is now automated instead of manual. This increases the efficiency of ILM in the organization.
- At the optimizing, or continuous improvement level, the ILM implementation has achieved the ability to be efficient, and to be able to increase its efficiency, all while meeting and evolving with the needs of the organization.

The starting point for an ILM implementation is that it must meet the needs of the organization. To do this, it must be able to integrate with the processes and data governance policies of the organization. It also must take into account the varying importance or values of the organization's business processes. To do this, it must have the requirements of the organization's needs.

In this section, for each row, map how well your organization is doing against the requirements for each ILM level. For example, under processes and policies, determine whether your organization has an ILM implementation that is reactive to or conflicting with the needs of the organization, whether ILM is automated with a feedback loop, or something in between. Note where you stand and proceed to the next row.

Processes	<p>These are the processes and policies used by the business for its operations. ILM should be implemented within or complementary to these processes.</p> <p>Example: The business has process/policies where customer information is captured in a Customer Relationship Management application. The ILM policies should include one that is appropriate for the storage needs of this information.</p> <p>Question: How are your business processes/policies aligned and integrated with your ILM policies?</p>
Governance	<p>These are the data governance policies used by the business to set the retention and protection policies of its information. ILM should be implemented to reflect the data governance policies.</p> <p>Example: The business has a Customer Relationship Management application. The data governance policy states that the customer opportunity information that is captured by this application must be kept for three years. This information also must be encrypted. After three years the information must be deleted. The data storage structure for the CRM information should enact this policy.</p> <p>Question: How are your business data governance practices aligned and integrated with your ILM policies?</p>
Business Process Value	<p>This is the importance set by the business for its business processes. ILM should be implemented to reflect the varying levels of importance of the business processes and Key Performance Indicators established to determine effectiveness of ILM.</p> <p>Example: The business has a Customer Relationship Management application. This application is deemed critical to the operational well-being of the business, with minimal downtime allowed. The data storage structure for the CRM information should reflect this availability expectation and this expectation may be a KPI for the business process.</p> <p>Question: How do you align and link your business process values with your ILM policies and what are your key performance indicators?</p>
Requirements	<p>These are the requirements defined by the business for its ILM policies. ILM should be implemented to reflect these requirements.</p>



Example: The business has defined six ILM policies with varying levels of data activity, response time and retention expectations. Each of these policies should be reflected in a permutation of the data storage structure.

Question: How do you determine your ILM requirements and make improvements to your ILM policies?

### Table I. Business Integration Definitions

Once you have mapped each row with its column, proceed to the next section.

Measuring Application and Information Alignment <span style="float: right;">SNIA Advancing storage &amp; information technology</span>					
	Initial (Ad Hoc)	Repeatable (Documented)	Defined & Measured (Standardized & Correlated)	Quantitatively Managed (Automated ILM)	Optimizing (Continuous Improvement)
<b>Processes</b>	Unclear ownership of information	Applications/Groups own information	Business level ownership Linkage to Business Metrics	Enterprise owns information	
<b>Policies</b>	Backup Only	Documented business Requirements	Aligned to service offerings w/static allocation	Automated/dynamic allocation of services	
		Backup as an Archive	Recovery-Based	Electronically-stored Information (ESI) as a resource	Data Preservation
<b>Governance</b>	DB schema	Enterprise Architecture/ Data Model	Enterprise Taxonomy		
<b>Alignment Dynamics</b>	Duplication of information Inconsistent copies of information	Increase in information sharing reduces an extent of duplication/multiplication.	Quality metrics are established	Information stored based on business requirements	Information lifecycle based on changing business values
<b>Value</b>	No information value is determined. All treated the same.	Business value of some part of information is periodically assessed with consistent results in most cases.	Business value of information consistently assessed. Metrics for measuring information business value are defined. Standard processes for measuring information business	Information storage and protection criteria are regularly re-assessed based on the business value.	Continuous assessment of information value with consistent results.
<b>Access/ Availability</b>	Limited sharing Incorrect Security	Information sharing policies are set.	Information sharing with established security controls.	Information sharing policies are regularly reviewed.	Single information copy across enterprise provides information consistency, access control.

**Figure 15. Measuring Application and Information Alignment**

Applications are how businesses automate their business processes and store/retrieve information that is needed. The manner in which applications behave models the processes and policies established by business and other information governance stakeholders. At this layer, Application Owners will need to comprehend a wide range of requirements and understand the value of the information that is being generated, processed, stored, and deleted.

Key points on this slide:

1. Enterprise owns the information
2. Information is stored based on business requirements
3. Business value of information changes over time and value is re-assessed on a regular basis
4. Information storage requirements are understood, communicated and reviewed periodically



Processes	see Business Integration Definitions
Policies	see Business Integration Definitions
Governance	see Business Integration Definitions
Alignment Dynamics	<p>Quality of storage services introduces classes of service allowing customers to align their storage with application requirements based upon Quality-of-Service metrics</p> <p>Example. Quality of Service (QoS) in Fabric Channel switching enables traffic differentiation and prioritization, allowing latency-sensitive applications such as online transaction processing (OLTP) to share storage resources alongside throughput-intensive applications such as data warehousing.</p> <p>Question: To what extent are the classes of services determined by the business data value dynamics?</p>
Value	<p>Value of storage services for business is to provide a combination of processes, tools, methods, and metrics to achieve business goals.</p> <p>Example - Establishing a process for linking business value of the applications with information life management metrics.</p> <p>Question: Do you have a data value re-assessment process to align the storage service level with business values?</p>
Access/Availability	<p>Access control and information availability address data security and include accountability, traceability, risk management, information retention and sanitization.</p> <p>Example: establishing a security policy enforceable with security tools and sanctions.</p> <p>Question: Do you have established authentication, authorization, and accounting policies controlling data access and management?</p>

**Table 2. Application and Information Alignment Definitions**



Measuring Data Management					
	Initial (Ad Hoc)	Repeatable (Documented)	Defined & Measured (Standardized & Correlated)	Quantitatively Managed (Automated ILM)	Optimizing (Continuous Improvement)
<b>Metadata</b>	No Extended Metadata	Multiple Isolated Repositories Inconsistent use of metadata across environments	Multiple Isolated Repository Consistent strategies and data model/architecture defined Self describing data	Federated Metadata Repository Metadata management	Automated change/data mgmt. (changes reflected across metadata repository automatically)
<b>Data Mgmt. Processes</b>	Requires human knowledge of data and location. Management processes are manual	Management processes are Documented & Manual	DM Policies enforced based on correlated metadata Manual processes still required for management of data based on business metrics	Automated Policy Based Mgmt. Manual feedback and correction Data management processes based on storage and business metadata	Automated DM is a closed loop system (no human intervention required)
<b>Data Protection Operational and Disaster Recovery</b>	Recovery timing predictions are not possible or a guess	Standard Tool Set BC Plan Documented Business Impact Analysis Standard back-up and recovery processes applied manually across the organization RTO/RPO can be estimated but may not be accurate, primarily due to lack of testing and repeatability	Standard Service Levels offered Staged DR testing Standard back-up and recovery processes applied automatically based on defined data criteria RTO/RPO easily estimated and reliable, process is tested periodically RTO/RPO Classification	Audited and fully tested recovery plans Standard back-up and recovery processes based on org. policy when allocated RTO/RPO available in real time, processes tested periodically, real-time predictive capabilities highlight when thresholds are exceeded	Automated and dynamic risk mitigation Dynamic backup/recovery processes based on policy and changes to metadata RTO/RPO is managed automatically based on policy
<b>Metrics</b>	No Metrics	Metrics Available – Inconsistent taxonomy across environments DM metrics stored for ad hoc reporting	Common Taxonomy for metrics Collected and maintained DM metrics (tied to KPIs) are collected and maintained, basic automated reporting	Automated reporting Data Quality Metric DM metrics (tied to KPIs) are available in real time, automated reporting of exceptions based on organizational policy	Managed based on Policy Self-describing data DM metrics (tied to KPIs) are automatically based on policy

**Figure 16. Measuring Data Management**

We talked about Business Integration and Application Alignment. Data Management is our next focus area in the Maturity Model. Notice that we start with Metadata as the major element. Without metadata to guide the processes we have no basis for measurement, no information for key performance indicators, and no way to classify information. Metadata is critical to understanding information lifecycle management.

The presence of metadata is not a foregone conclusion: in many cases the metadata that is needed for an ILM project either doesn't exist, or has to be created. What kind of metadata do you need? Think back to what we have discussed already; the value of the information, how to align the information; this is all metadata that needs to be captured and recorded. Your service level objectives are just one of the types of metadata to be gathered.

Think about the data management processes you have in place today. Are they documented? Could someone else come in and take over without assistance? Are those policies automated, and if so, what drives the processes? Is it the metadata that describes your requirements?

You can test out your data management processes with the next category. A good Disaster Recovery exercise is unannounced and requires the local IT staff to watch as the "survivors" follow the recovery procedures.

Finally, think about the metrics for assessing data and service quality. Moreover, is there a common vocabulary so that management, staff, and end-users all have agreement on what constitutes key performance indicators.



## Metadata is

... (from kcoyle.net)  
... constructed ... (Metadata is wholly artificial, created by human beings.)  
... for a purpose ... (There is no universal metadata. For metadata to be useful it has to serve a purpose.)  
... to facilitate an activity ... (There's something that you do with metadata.)

The business has processes that are critical to its operation and existence. The set of rules used to identify those processes and the information used in the execution of those processes would constitute metadata. These metadata rules not only need to be constructed, but are also used for a variety of processes and serves to facilitate the company's operation; as such, these metadata belong in a repository (or repositories), subject to management policies, and used to administer information.

Example: Metadata for unstructured files (.doc) would be the file characteristics such as file size, owner, date of creations, etc. As maturity level increases additional metadata are required to manage information in accordance with the characteristics and ILM policies. Further along in maturity, metadata definitions are further expanded to include other attributes such as retention and expiration, physical data location, etc. Metadata across the enterprise will be consistently defined and retained in a federated repository in the Quantitatively Managed state.

Question: What are the constructs that identify this key information? Constructs might be keywords, process names, department names, etc that can be associated with digital objects within the enterprise. Where is the store of metadata? Is the metadata administered as a corporate resource?

## Processes

A large part of data management is understanding what information assets exist within the enterprise and how this information is integrated into corporate processes. The common term for this is "portfolio management." The level of collaboration necessary to implement a portfolio management program is substantially beyond the scope of storage administration and requires the active participation of executive level management. However, once "C-level" management has participated in this process, Storage Administrators should be able to implement standardized information management policies into automated data management processes.

Question: Does the enterprise have a well-known and understood set of processes, policies and objectives for its business critical applications such that information assets can be identified, located, protected, preserved and deleted?

## Data Protection (DR and OR)

These are the processes and policies set by the business for the protection and continuance of its on-going operations. ILM should be implemented with consideration for these processes and policies. ILM policies define backup data categorization and their retention periods.

### Examples:

- \*\* Data Recovery Processes defined and documented with business priorities and service objectives communicated to storage administrators
- \*\* When data loss occurs where will the required data be ... this should be based on ILM retention and deletion policies that are in effect.
- \*\* Data is deleted in backups based on ILM retention and deletion policies that are in effect.



Question: If a failure occurs within the IT environment, can its effect on the business be assessed and remedied based on recovery time objectives?

## Metrics

Measurement of quality of service in the managed data environment. A common taxonomy is constructed to ensure consistent identification and tracking of information assets across the enterprise regardless of physical location or condition. Storage service level objectives will exist (e.g. 99.999% availability) as part of an overall ITSM plan

Example: OR/DR capability has been defined and implemented at the infrastructure level. Data RTO/RPO are reported consistently and used as KPIs for Storage Services

Question: Do you have consistent metrics established for each class of storage service and how do you measure and report out on these?

**Table 3. Data Management Definitions**

Measuring Infrastructure and Service Management					
	Initial (Ad Hoc)	Repeatable (Documented)	Defined & Measured (Standardized & Correlated)	Quantitatively Managed (Automated ILM)	Optimizing (Continuous Improvement)
<b>Storage Service</b>	No Storage Service Strategy No Service Lifecycle process No Service Levels No Service Metrics	Introduction of Service Design Processes and Functions. Event/Fault Monitoring Configuration Mgmt. is manual (Excel) Some reporting capability	Storage Service Catalog, Service Transition Capacity Management ILM Reporting against KPIs	Storage Service Portfolio and Catalog. Configuration & Asset Management. Tools/Processes/CMDB All Storage CIs CMDB	Highly automated CMDB processes and support
<b>Storage</b>	No Standardized Tiering	Storage tiers defined at basic level	Storage pools established	Shared storage pools	Self-healing
<b>Connectivity</b>	Direct	Networked	Virtualized	Adaptive (internal & cloud?)	
<b>Data Preservation &amp; Retention</b>	Backups only	Data retention based on SLO	Data Retention & Deletion based on SLO aligned to policies	Automated policy application to class of service and audit	Dynamic protection based on evolving business needs
<b>Security</b>	Physical Only	Network/Array/Device Level	Application and LUN Level	Data Encryption	
	User	Network/Array Level (RBAC)	Active Monitoring/Alerting	Audit (external)	
<b>Movement</b>	None	Manual - some documented policies/processes	Policy Based Movement	Automated PBDM	

Data Management Forum 17

**Figure 17. Measuring Infrastructure and Service Management**

Shared storage infrastructures are generally very complex. Establishing a storage service and offering standardized services will greatly simplify service management. At the heart of the storage service is a Storage Service Catalog that provides for better alignment of application/business needs to the information objects being managed at the infrastructure layer. The challenge of providing the appropriate levels of protection and retention continues to rise, driven by increasing in data capacity, regulatory compliance, security, litigation support, and the fact that IT is constantly pressured to do more with a flat or decreasing budget.

Key points on this slide:

- I. Alignment with IT Service Management framework can be very useful



2. Service Level Objectives are well defined, understood, measured, and reported
3. Automation of routine tasks that are labor intensive will need to be deployed
4. Risk mitigation from a security and compliance perspective cannot be overlooked
5. Managing storage and storage services goes well beyond managing disks and tapes

Storage Service	<p>Describes the availability and capability of the services being delivered by a storage service organization and their alignment with ITIL based service management practices</p> <p>Example: Storage services are offered to customers based on infrastructure capabilities such as Disaster Recovery with RTO and RPO</p> <p>Question: What is the process you use to map customer needs to service capabilities and how do you measure service performance?</p>
Storage	<p>Describes the design and implementation of storage devices in support of efficient storage tiering in an ILM environment</p> <p>Example: Storage "devices" (block and/or file) are implemented and differentiated (tiered) by performance, availability and protection capabilities as well as cost</p> <p>Question: How many tiers of storage have you implemented and describe the capabilities (technologies/automation) of your shared storage resource pools</p>
Connectivity	<p>Describes the efficiency of design and integration across multiple tiers and types of storage within the storage environment</p> <p>Example: The storage to host interconnect type (Local, Direct Attached, Storage Area Network, Network Attached Storage, Virtualized) determines the degree of agility within your storage environment</p> <p>Question: What type(s) of storage and percentage(s) have been deployed within your storage environment? Is it virtualized?</p>
Data Preservation & Retention	<p>Describe the ability to retain, preserve and delete data over its full life cycle.</p> <p>Example: Business requirements define the retention of financial data and the deletion of records that are no longer required. This capability will be provided as a service with specific classes. Retention financial records for 7 years, immutable, with deletion after 7 years.</p> <p>Question: Do you have records management policies that dictate retention and how do they tie into your classes of service?</p>
Security	<p>Describes the method of security implemented to protect information assets within the storage environment</p> <p>Example: Security can range from "none" to password protection on devices to encryption of data at rest or in flight and should be aligned to corporate policies. Includes physical and logical security (AAA)</p> <p>Question: How do you ensure appropriate security within your storage environment?</p>
Movement	<p>Describes the method and degree of consistency and automation/efficiency for movement of data within the storage environment</p> <p>Example: Manual intervention is often required to migrate data when a storage array is decommissioned or when data needs to be placed on less expensive infrastructure.</p>



This process can be automated to limit manual intervention and should be aligned with data migration policies.

Question: What types of data migration do you perform and what is your process and tools for alignment with data movement policies?

**Table 4. Infrastructure and Service Management Definitions**

ILM Service		Initial (Ad Hoc)	Repeatable (Documented)	Defined & Measured (Standardized & Correlated)	Quantitatively Managed (Automated ILM)	Optimizing (Cont. Improvement)
<b>ILM Service Assessment</b>	Spans all domains: Business Application Information Data Storage	No Service Strategy No Service Lifecycle process No Service Levels No Service Metrics	Introduction of Service Design Processes and Functions. Event/Fault Monitoring Configuration Mgmt is manual (Excel) Some reporting capability	Storage Service Catalog, Service Transition Capacity Management ILM Reporting	Storage Service Portfolio and Catalog. Configuration & Asset Management. Tools/Processes/CMDB All Storage Cls CMDB	Highly automated CMDB processes and support
<b>Service Lifecycle</b>		Strategy Defined	Design of Process & Functions	Transition of Services	Service Operation	Full Service Lifecycle with continuous service improvement.

*\* If ILM is being offered as a service, this Maturity Model will help identify the areas of improvement to reach a desired end state*

Data Management Forum 18

**Figure 18. ILM Service**

Implementation of ILM as a service includes development of storage service strategy, service design, service transition, service operation, and continual service improvement. Storage service design provides guidance for storage service catalog and storage service management processes (for example, service level management, storage service capacity management, storage security management). Storage Services Catalog as part of the Service Portfolio will provide alignment of business requirements to the new and existing storage services. The development and evolution of the storage services catalog involves the dynamic alignment of business needs to the provision of storage services. It is a business requirements–driven approach and is not constrained by specific types of hardware or software. The primary purpose of the continual ILM service improvement is to address the maturity of enabling IT processes for continual alignment and realignment of storage service with the current and future business needs.



## Usage Example

Advancing storage & information technology **SNIA**

- ◆ Overview of interview conducted (Data Management)
  - Medium size insurance company
  - Total data ~120TB local , 80TB remotely replicated
  - 60% structured data
  - Employees ~5000
- ◆ Questions asked:
  - What are the constructs that identify this key information? Constructs might be keywords, process names, department names, etc that can be associated with digital objects within the enterprise. Where is the store of metadata? Is the metadata administered as a corporate resource?
  - Does the enterprise have a well-known and understood set of processes, policies and objectives for its business critical applications such that information assets can be identified, located, protected, preserved and deleted?
  - If a failure occurs within the IT environment, can its effect on the business be assessed and remedied based on recovery time objectives?
  - Do you have consistent metrics established for each class of storage service and how do you measure and report out on these

Data Management Forum 19

**Figure 19. Usage Example**

### Observations:

1. Engagement with the appropriate stakeholder is difficult without a major program or initiative to drive it with management support
2. There is a disconnect between written policies and execution. No process to follow through on enforcement or auditing
3. Key business drivers for ILM need to be clear and embraced by management and stakeholders



## Usage Example

Advancing storage & information technology **SNIA**

- ◆ **Overview of interview conducted (Infrastructure)**
  - Large Bank
  - Total data ~1.5PB local
  - 60% structured data
  - Employees ~75K
- ◆ **Questions asked:**
  - What is the process you use to map customer needs to service capabilities and how do you measure service performance?
  - How many tiers of storage have you implemented and describe the capabilities (technologies/automation) of your shared storage resource pools
  - What type(s) of storage and percentage(s) have been deployed within your storage environment? Is it virtualized?
  - Do you have records management policies that dictate retention and how do they tie into your classes of service?
  - How do you ensure appropriate security within your storage environment?
  - What types of data migration do you perform and what is your process and tools for alignment with data movement policies?

Data Management Forum 20

**Figure 20. Usage Example (cont'd)**

## Observations

Advancing storage & information technology **SNIA**

- ◆ Mainframe side is more mature than Open Systems
- ◆ Data management policies not implemented or consistently applied company wide ... data centers are better managed than remote offices
- ◆ Structured data scored higher than unstructured ... ownership is not clear for unstructured data
- ◆ Business process value difficult to quantify ... most difficult question. May need additional questions.
- ◆ Is "Optimizing State" a real goal or is this a state of "Enabled Capabilities"? Depends on risks to company
- ◆ Customer could relate to the questions and was very pleased
- ◆ Could be used as a benchmark to understand where we are compared to other companies in the same industry

Data Management Forum 21

**Figure 21. Observations**

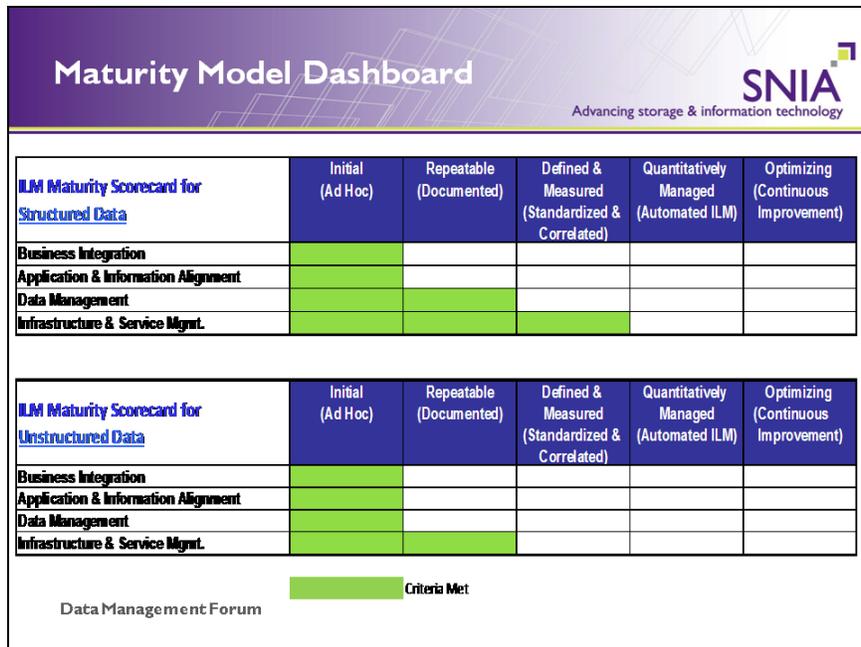


Sample Maturity Model		SNIA Advancing storage & information technology				
		Initial	Repeatable	Defined and Measured	Quantitatively Managed	Optimizing
Business Integration	Processes		X			
	Policies			X		
	Governance	X				
	Process Value		X			
	Requirements		X			
Application and Information Alignment	Processes			X		
	Policies		X			
	Governance		X			
	Alignment			X		
	Value	X				
	Access		X			
Data Management	Metadata			X		
	Processes		X			
	Data Protection		X			
	Metrics		X			
Infrastructure and Service Management	Storage Service			X		
	Storage			X		
	Connectivity			X		
	Security			X		
	Movement			X		

**Figure 22. Sample Maturity Model**

This is a table that can be used to record the results of a specific area and associated set of interviews. An example of specific areas may be email, CRM, engineering, finance, manufacturing, sales and marketing, etc.

In this example, you will see that Infrastructure and Service Management was at a much high level of maturity than Business Integration. You may ask, “well what level of maturity are these folks at then?” Well, note the lowest grade in each swim lane and lets move to the next slide ...



**Figure 23. Maturity Model Dashboard**

Map the lowest grade for all of the spreadsheets onto the ILM Maturity Model Dashboard as we did in the top dashboard for structured data. This provides a quick visualization of the overall maturity level of this given area.

It isn't necessary to break this into different areas or categories but it may help when it's time to identify where investment should be made.

Please keep in mind that these are all templates and each company will probably modify them to meet their specific needs.

It has been suggested that we use different color codes to indicate that some progress is being made specific areas or that investments have already been identified. This is totally acceptable but could get confusing if the dashboard gets too "colorful".



### What Next?

Advancing storage & information technology **SNIA**

- ◆ Now that we have the score, what do we do with it?
  - Gaps Identified/Assessed
  - Cost Justify Investment Areas
  - Focus on Governance
  - Establish ILM as a Service
- ◆ What should you do?
  - Download and try the Model; upload your results and comments to STORTOC.ORG
  - Participate in follow-on efforts to improve the Model

Data Management Forum 24

**Figure 24. What Next?**

We have used the model, computed our score, now what? First, we don't worry too much about where we are; this is not an overnight project. Furthermore, we know that it will take executive commitment and participation to move us up the scale. And we may even decide that where we are is "just fine." ILM is a corporate exercise, it doesn't matter what your storage vendor says, what matters is what type of service and what level of cost is appropriate for your environment.

The good part about this exercise is that Terry's score sheet shows us where we might consider investing. We have identified the gaps and have a pretty good idea of what to do, where to invest, and even what to expect from an investment. That is really good because it helps management understand value, understand governance, and understand how IT can be run as a service.

### About the SNIA

The Storage Networking Industry Association (SNIA) is a not-for-profit global organization, made up of some 400 member companies and 7,000 individuals spanning virtually the entire storage industry. SNIA's mission is to lead the storage industry worldwide in developing and promoting standards, technologies, and educational services to empower organizations in the management of information. To this end, the SNIA is uniquely committed to delivering standards, education, and services that will propel open storage networking solutions into the broader market. For additional information, visit the SNIA web site at [www.snia.org](http://www.snia.org).