Implementing Data Warehousing Methodology:
Guidelines for Success

by Dr. James Thomann and David L. Wells

INTRODUCTION

This is the final article of a three part series. The first, *Evaluating Data Warehousing Methodologies: Objectives and Criteria*, discusses the value of a formal data warehousing process – a consistent, repeatable, teachable process by which warehouses are developed and sustained. That article associates methodology (“a detailed set of steps or procedures to accomplish a defined goal” [Thomann 1974]) with business process (“a series of activities that receives inputs and produces a product that has value to a customer” [Hammer & Champy, 1993]). The first article asserts that “methodologies are the business processes of IT,” and sets forth criteria by which data warehousing methodologies may be evaluated.

The second article of the series, *Evaluating Data Warehousing Methodologies: An Evaluation Process*, describes a process that uses the evaluation criteria to refine the set of possible warehousing methodologies to a short list – a subset of candidate methods that is best matched to organizational culture and needs. This article also clarified and expanded upon the association of methodology with IT business processes, stating that

> “Methodologies are the foundation upon which IT business processes are based. Implementing a business process for data warehousing is demanding. It requires systematic evaluation of methodologies, careful selection of a single method, and managed implementation of that method as a business process in practice.”

This provides the context for this third and final article – responding to the outstanding questions:

- How to select a single methodology from a short list of candidates?
- How to implement a methodology and put it into practice as a data warehousing business process?

The first of these questions – how to select from the short list – needs to be addressed from a process perspective. Selection is a natural extension of evaluation, and best performed as a seamless continuation of that process. Yet, it is difficult in a general discussion of the topic to be precise about the selection process. A prescriptive process that is well fitted to one organization will be exactly the wrong thing to do in another. For this reason, we approach the topic with a discussion of broad categories of results, activities, and roles in the selection process. Each organization will need to adapt these concepts, tailoring a selection process specific to their individual environment and culture. (Note the similarity with the need to adapt methodology to become an organization specific warehousing process.)

The second question – how to implement methodology as a warehousing process – is discussed from a different perspective. Implementation and practice of a warehousing process is demanding. It is much more than selection of a methodology and declaration of a standard. Selection is typically a one-time event; practice is an ongoing activity that affects many people and many jobs. Implementation is a sequence of activities through which practice is achieved. Successful implementation and practice are results of careful attention to human factors, more than they are results of attention to implementation steps. We discuss implementation and practice from this human perspective. Focusing on issues of human, organizational, and cultural change, we seek to provide understanding of the issues, and to offer a few guidelines and techniques for addressing those issues.
SELECTING A METHODOLOGY TO IMPLEMENT

The previous article describes an evaluation process that produces three significant results – a short list of candidate methodologies, selection criteria to guide the choice of a single method, and knowledge of the candidate methodologies. Selection is a process that uses these evaluation results as input, and produces a single output – a selected method to be implemented. Figure 1 illustrates the flow of results from evaluation to selection.

The ultimate goal is to have a data warehousing process that is successfully practiced, and that produces good, useful, predictable results. The result of selection is much less than that – simply knowledge of the method upon which the warehousing process will be based. Thus, selection is the starting point for process implementation – the beginning of the transition from methodology to IT business process. Significant time and effort has been invested to identify and evaluate methodologies. Yet, much work remains to get from a selected methodology to a practiced data warehousing process. Methodology selection, then, should be quick and decisive. It should not become an obstacle, bottleneck, or delay to achieving the ultimate goal.

The selection process, at an abstract level, involves three major activities, as illustrated in Figure 2. Each of these activities is discussed briefly below. Selection activities are described only in terms of purpose and general guidelines. We have specifically avoided discussion about how each activity is performed. The manner by which each step is executed must be tailored to fit the unique environment and culture of the organization.

![Figure 1 - Implementing a Data Warehousing Business Process](image-url)
Identify the Decision-Makers

Knowing who will make the decision is an essential first step of methodology selection. The result of this activity is a list of one or more decision-makers that will choose a single methodology to be implemented. In some cultures, one decision-maker – typically a manager or executive – is the norm. In other environments, consensus decision by a group is more common. Whatever the culture, each participant in the decision making process, and their roles in that process, need to be identified and communicated.

When identifying decision-makers, consider the value of participation (and the cost of non-participation) from each of (1) the sponsor, (2) IT managers, (3) data warehousing practitioners, and (4) business people who use the warehouse. Balance the value of participation with optimum size of a decision-making group in your environment. Also, consider these factors when identifying decision-makers:

- The decision-making group must include someone that clearly has authority to choose a methodology.
- The sponsor must have some role in the process. Sponsor participation may be provided in any of several ways. Some of the possibilities include deciding how the decision will be made, approving the decision-making process, delegating decision authority, making the decision, and approving the final decision.

Finally consider the impact that identification of decision-makers may have on acceptance of the method during implementation and practice. One of the common questions is “who chose this methodology?”

Determine the Decision-Making Process

Once the decision-makers are identified, the process by which they will reach a conclusion needs to be defined. The result of this activity is an understanding of how to arrive at a decision. An ideal decision making process, of course, uses all of the available inputs – the methodology short-list, the selection
criteria, and the knowledge of each methodology that is gained through evaluation. Particular attention should be given to those selection criteria that are identified as critical success factors.

As with the previous step, the specifics of this activity depend on environment and culture. Clearly, a decision by group needs a more carefully defined process than does an individual decision. If the decision-making body consists of more than one person, then the role of the group needs to be understood:

- Is it a decision-making group or an advisory group? If advisory, how will advice be provided? And to whom?
- If decision-making, will a decision be made by voting? Or by consensus? With or without facilitation?

While these questions may be quick to answer, they will not be answered unless asked. Knowledge of the answers may prove to be an important acceptance factor during implementation. Among the common questions is “how was this methodology chosen?”

**Choose One Methodology**

This is where the “rubber meets the road.” The preliminaries are over, and it is time to make a decision. Using whatever process has been defined, the decision-makers must come to a conclusion. The result of this activity is the final decision to implement a specific methodology. We recommend approaching this as a one-time opportunity, and considering the decision to be irreversible. While it may be possible to discard one methodology and select another, the cost of lost of time and credibility are likely to be prohibitive. Choosing to “try out” a methodology is the same as choosing not to implement one.

The real goal of this activity is not simply a decision, but an informed decision in which you have a high degree of confidence. Such a decision can’t be made without reviewing all of the data that is input to the selection process. Decision-makers will need to know:

- Which candidate methodologies are on the short-list?
- What are the comparative strengths and weaknesses of those methods?
- What selection criteria were determined to be important for the organization?
- How does each methodology perform against the selection criteria?
- Which selection criteria are identified as critical success factors?
- How, and how well, does each method respond to the critical success factors?

Answers to each of these questions should provide a relatively straightforward path to a conclusion. Give special attention to critical success factors, realizing that any method that fails to satisfy them is unlikely to succeed as a data warehousing business process.

Consider documenting the reasons why a specific method is chosen, and reasons why others on the short-list are not chosen. This documentation may prove to be a valuable acceptance tool during implementation. Among the common questions are “Why was this methodology chosen?” and “Why didn’t we pick this one instead?”
IMPLEMENTING A DATA WAREHOUSING METHODOLOGY

Selection of a methodology may be the end of an evaluation and selection process. Yet, it is really more a beginning than an ending. Once a method has been selected, it must be implemented to have value. Implementation is the means by which a methodology is adopted, adapted, and evolved until it is fully assimilated into an organization as the routine data warehousing business process. Where selection can be accomplished by study, review, and evaluation; implementation is best achieved through experience, use, and evolution.

Getting Started

We recommend starting small. Don’t immediately attempt to roll out the selected methodology to every data warehousing project and team in the enterprise. Carefully select one project, and one project team, to begin exercising the methodology. Practice the methodology, experiencing its strengths and weaknesses in a real project setting. Have a base of experience from a first project before adjusting the methodology to fit the organization as a whole. Select the first project and team with these objectives in mind:

- Building a group of people who are the methodology “experts.”
- Developing process mentors for future projects and teams.
- Producing a demonstrable case study of warehousing process deliverables.
- Developing enough experience to begin to adapt the methodology.
- Developing enough experience to define some initial standards.

A good first project is a result of careful selection. It needs to be small enough to be executed quickly – generally in twelve to sixteen weeks– yet robust enough to exercise a broad range of methodology features. The team for the first project should be selected with equal care. Give special attention to the project objectives itemized above, and work to assemble a small team of people who are quick learners, innovative, resilient to change, and able to be learn and to produce results at the same time.

A planned approach to training throughout the first project will prove to have lasting value. One proven method is “just-in-time training.” With this approach, small segments of highly focused training are delivered at strategic points throughout the project. Each training event seeks to teach a concept or skill, using the project as an example and focus for learning. The training is immediately followed by experience, where the learned concepts and skills are applied to accomplish necessary project work. This is a particularly effective way to master and retain new skills. It facilitates team learning, helps to build experts and mentors; and it produces demonstrable results simultaneously – and all while developing warehousing deliverables with business value.

Learning and Growth

On conclusion of the first project, much learning will have occurred. Learning alone, however, doesn’t necessarily lead to growth. When the first project is completed, a review is essential. The objectives of the review are to identify and crystallize the learning, and to identify adaptations that begin the evolution from general methodology to organization-specific data warehousing process. At a high-level, the review focuses on these general questions:

- What was done during the project to compensate for problems and meet project needs?
- What changes to the methodology were made? Were they planned changes? Did they work as expected?
- What do you know about the methodology?
- How can you best leverage your knowledge?
- What don’t you know about the methodology?
- How can you fill the knowledge gaps?
What does experience show to be the strengths of the methodology?
How can you leverage the strengths?
What does experience show to be weaknesses of the methodology?
How can you compensate for weaknesses?

More specifically, each of these questions can be applied to each of the evaluation criteria presented in the first article of this series. A review using this approach might produce a framework for action to evolve the warehousing process. Specific needs and actions may be identified to improve the process with regard to completeness, usability, and warehouse enabling, as shown in Figures 3, 4, and 5 respectively. The questions and actions columns illustrate examples of the possibilities. They are not intended to be exhaustive lists.

<table>
<thead>
<tr>
<th>criterion</th>
<th>questions</th>
<th>actions when a strength</th>
<th>actions when a weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td>results oriented</td>
<td>do we produce results? are they complete? are they useful?</td>
<td>use as examples illustrate &amp; demonstrate value</td>
<td>seek to understand don't produce if unknown value add results if needed</td>
</tr>
<tr>
<td>fully described components</td>
<td>are they well described? are descriptions accessible?</td>
<td>use for training &amp; documentation extend the metadata</td>
<td>document from experience provide ready access</td>
</tr>
<tr>
<td>cohesion of results</td>
<td>do the parts fit together? do they fit the environment?</td>
<td>illustrate with deliverables map use for project planning &amp; mgmt.</td>
<td>adapt to fill the gaps adjust to fit the environment</td>
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<tr>
<td>rigor in the process</td>
<td>is the process well disciplined? is it too disciplined?</td>
<td>support discipline with standards</td>
<td>seek the right level of discipline adjust and adapt the process</td>
</tr>
<tr>
<td>appropriate level of detail</td>
<td>is there enough detail? is there too much detail?</td>
<td>illustrate &amp; demonstrate value extend the metadata</td>
<td>seek the right level of detail adjust and adapt the process</td>
</tr>
<tr>
<td>familiarity of techniques</td>
<td>are the techniques familiar? are they valued?</td>
<td>use to bridge from &quot;old&quot; to &quot;new&quot; demonstrate the value</td>
<td>use familiar techniques provide techniques training compare with familiar techniques</td>
</tr>
<tr>
<td>process flexibility</td>
<td>did the process meet dynamic project needs?</td>
<td>record for future reference include in process training</td>
<td>refine and adjust the process manage project dynamics</td>
</tr>
<tr>
<td>project planning usefulness</td>
<td>did the process facilitate project planning?</td>
<td>integrate with planning approach use for project planning &amp; mgmt.</td>
<td>adjust project planning approach support with planning tools</td>
</tr>
<tr>
<td>role/responsibility identification</td>
<td>are roles clearly identified? do they fit the organization?</td>
<td>organize teams by role</td>
<td>describe / adjust the roles adapt the methodology to fit existing, known roles</td>
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Figure 3
A Framework for Process Review and Evolution based upon Process Completeness Criteria

Realize that review of a first project may yield many areas where adjustments are desirable. Don’t become overwhelmed and discouraged. But guard against excessive ambition and undue optimism. Be cautious, and don’t attempt to make too many changes at one time. Agree on a few changes that are of greatest importance and implement them first. Also recognize that one project does not produce the full range of experiences needed to best adapt the process. Understand that as you practice the methodology, it will evolve and grow, as will the people who use it. A small number of adjustments, implemented for and
experienced through a next project is a good evolutionary approach. The review of that next project will lead to further refinement and evolution.

Reviewing the results of a project in this way ensures a detailed and extensive evaluation of the project and its experiences in using the methodology. The goal of the review is an action plan to adjust the methodology, or to adjust your expectations and uses of the methodology, to achieve a best fit into the organization as a data warehousing process.

<table>
<thead>
<tr>
<th>criterion</th>
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<th>actions when a strength</th>
<th>actions when a weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td>adaptable</td>
<td>did the process fit the project, the team and the organization?</td>
<td>formalize common adjustments and document for reference</td>
<td>adjust the methodology fit projects to the process</td>
</tr>
<tr>
<td>model-based</td>
<td>did the process produce models? do the models add value? is the set of models complete?</td>
<td>illustrate and demonstrate value employ models as metadata</td>
<td>understand the role of models adjust process to include needed and desired models</td>
</tr>
<tr>
<td>goal driven</td>
<td>were process goals clear? was goal attainment measured?</td>
<td>emphasize goal-based projects measure process improvement</td>
<td>understand the process goals align process with project goals</td>
</tr>
<tr>
<td>traceable</td>
<td>were dependencies among deliverables clear?</td>
<td>use to plan &amp; manage projects use for change management</td>
<td>understand deliverables flow develop a dependency map</td>
</tr>
<tr>
<td>teachable</td>
<td>can the people who used the process transfer their knowledge to others?</td>
<td>use project results to produce a case study implement a mentoring program</td>
<td>seek ways to convert individual and team experiences into organizational knowledge</td>
</tr>
<tr>
<td>documented</td>
<td>was the process documentation useful and valuable?</td>
<td>illustrate and demonstrate value use as training supplement</td>
<td>identify documentation gaps and formally document the process</td>
</tr>
<tr>
<td>team enabling</td>
<td>did the process facilitate teamwork through the project?</td>
<td>use process goals to focus teams use process roles to organize teams use deliverables dependencies to drive communication</td>
<td>understand and emphasize process goals understand roles and integrate them into the organization identify communication needs</td>
</tr>
<tr>
<td>referenceable</td>
<td>was the project team able to benefit from experiences of other practitioners?</td>
<td>share experiences of the project have outside practitioners participate in project review</td>
<td>seek a community of practice attend related conferences and events</td>
</tr>
<tr>
<td>measurable</td>
<td>was project progress measured? was product quality measured?</td>
<td>use measures to assert process value and to effect process improvements</td>
<td>identify and implement desired and useful measures</td>
</tr>
<tr>
<td>criterion</td>
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<td>actions when a strength</td>
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<tr>
<td>scaleable</td>
<td>was the process appropriate to the size and scope of the project?</td>
<td>formalize any scaling adjustments that were made and document for reference</td>
<td>identify optional deliverables that may be excluded to scale down</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>identify additional deliverables that may be needed to scale up</td>
</tr>
<tr>
<td>comprehensive</td>
<td>did the process include activities and deliverables to meet every project need?</td>
<td>illustrate and demonstrate value emphasize deliverables-based project planning</td>
<td>identify missing deliverables and/or activities</td>
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<td></td>
<td></td>
<td></td>
<td>extend the process to meet all needs</td>
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<tr>
<td>evolutionary</td>
<td>was the project executed as one step toward larger warehousing goals?</td>
<td>use the process as the basis for program planning as well as project planning</td>
<td>adapt to include project decomposition</td>
</tr>
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<td></td>
<td>did the process support the broader warehousing context?</td>
<td></td>
<td>adjust to include incremental implementation of goals</td>
</tr>
<tr>
<td>business information focused</td>
<td>did the process identify information needs at the beginning?</td>
<td>identify and organize projects based upon related sets of business information needs</td>
<td>extend the process to begin with identification of information needs</td>
</tr>
<tr>
<td></td>
<td>was information needs focus kept throughout the project?</td>
<td></td>
<td>link data and process deliverables to information needs</td>
</tr>
<tr>
<td>data structure independent</td>
<td>did the process support an informed and objective decision between dimensional and relational data structures?</td>
<td>evolve a warehousing environment that includes multiple kinds of data structures to meet diverse needs</td>
<td>extend the process to include data structure independent models, and defined criteria for choosing among data structures</td>
</tr>
<tr>
<td>acquisition method independent</td>
<td>did the process support an informed and objective decision between “push” and “pull” modes of data acquisition</td>
<td>evolve a warehousing environment that acquires its data in varied ways depending on source characteristics</td>
<td>extend the process to include method independent models of data acquisition requirements, and defined criteria for choosing between ‘push’ and ‘pull’ approaches</td>
</tr>
<tr>
<td>vendor and tool independent</td>
<td>did the chosen tools fit well with the methodology?</td>
<td>adapt the methodology to explicitly identify the use of the chosen tools</td>
<td>tailor the methodology to fit the tools and the deliverables they support or choose different tools</td>
</tr>
<tr>
<td></td>
<td>did the tools support the methodology’s deliverables?</td>
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It quickly becomes clear, considering the number of needs that a data warehousing process must ultimately satisfy, that methodology implementation is a complex effort. Implementation is, itself, a process that must occur over an extended time. Methodology implementation is, in fact, primarily a process of managing the changes that must occur in order to evolve from a general warehousing methodology to a tailored data warehousing process that is practiced by an organization. Not only must the methodology be adapted. Organizations, teams, jobs, roles, individuals, standards, long-standing practices, expectations, performance measures, and many other factors may be subject to change.

Achieving organizational change is never easy. Organizations are composed of people; and people quite naturally resist change. At an individual level, change threatens the comfort zone. For the IT professional, that threat often comes in the form of making current skills obsolete, and demanding that new skills are learned. The one-time expert becomes a novice, resulting in fear, discomfort and resistance.

For the business professional, data warehousing process changes are equally dramatic. Team development of warehouses demands business participation at a level not typical of past systems development efforts. Business people assume some of the analyst role. They are expected to describe their responsibilities, articulate their information needs, and understand relationships between data and information. Beyond specification of requirements, accessing and using the warehouse demands that the business people analyze their own information needs. These are substantial changes from the days of asking IT to provide special “one-time” reports. These changes may well be sources of discomfort, and cause for resistance from the business community.

At an organizational level, the challenge is in changing culture. Culture establishes the set of values by which a group thinks, behaves, and acts collectively. Most organization cultures have evolved over time, are neither documented nor fully understood, and are sustained by inertia. Yet, this fuzzy, partially understood force will directly affect an organization’s ability to succeed with a defined, structured business process for data warehousing. Changing organization culture is not an event, but a complex and difficult transition. Successful organizations will employ the same principles that help with all complex undertakings: a planned, systematic approach.

**A Method for Managing Change**

Fundamental to change management is the classic change model shown in figure 6. The change model has three significant parts: The desired state describes what the organization wants to become. The current state objectively assesses where the organization is today. The change process describes how the organization plans to move from current to desired state.

![Figure 6 - The Classic Model for Organizational Change](image-url)
• Be selective about which changes you’ll implement and in what sequence. Create a realistic vision for
the future. Then evolve toward that vision.
• Don’t try to implement all of the changes at once. Focus first on those changes that respond to
identified critical success factors. Move in small steps and reassess your position after each step.
• Implement each change as a project. This implies all that is known about successfully executing
projects - known deliverables, constrained time, committed resources, and active management.

Combining these principles with the classic change model yields an enhanced change model (see figure 7)
to evolve through multiple cycles of change. Each change is executed as a project. Upon completion of a
change project, the former desired state becomes a new current state. Following a project review, the next
change project is planned and executed.

![Cycles of Change](image)

**Change Projects for Data Warehousing Processes**

Desired change must be engineered; it does not just happen. Evolving to data warehousing as a formal
business process involves complex and difficult changes that must be carefully managed. Each change, or
set of related changes, is planned and executed as a project. Completion of the first change project will
produce several important results:

• A new current state which includes initial implementation of a warehousing methodology.
• Understanding of the human and cultural issues.
• Greater knowledge and better understanding of methodology.
• Need and desire for a next change project.

Many kinds of change projects are possible. Consider projects to:
• Adapt the methodology, adjusting deliverables and activities to fit the specific needs and tools of your environment. Deliverables of such a project could include updated standards, adjusted documentation, sample deliverables, and help facilities for methodology practitioners.

• Address deliverables management, with attention to where and in what form deliverables are stored, how versioning is managed, how change history is kept, and how deliverables are integrated with metadata management practices.

• Focus on quality assurance, identifying specific criteria by which deliverables will be examined and tested, and defining the procedures by which those criteria will be applied.

• Support the methodology with tools, through implementation of new tools or changing the way that existing tools are applied.

• Train data warehousing practitioners, with learning options including formal classroom training, mentoring programs, self-study courses, and development projects specifically tailored to provide opportunities to learn new skills.

Each of these examples (and many more) is a significant change project with human, cultural, and technical considerations. Attempting to address everything at one time, in a single large project is a certain path to failure. A collection of multiple projects, each moving a step closer to the desired environment, is the only practical answer to maturing the warehousing process.

Begin the migration by defining the longer-term desired state. Next, partition the set of goals into a set of small projects. Sequence the projects in the way that makes most sense for your organization. Early projects need to produce some significant and meaningful results, leverage strengths, influence skeptics, and offer opportunities to learn and grow. Later projects build upon successes of earlier projects.

Each project must have defined and measurable deliverables. And each project must address human and cultural considerations, as well as warehousing process needs. Ultimately, these projects should produce meaningful and tangible results satisfying the methodology criteria that are important to the organization. The methodology selection criteria, especially those identified as critical success factors, identify the important focus for change projects.

PRACTICING AND SUSTAINING THE WAREHOUSING PROCESS

Implementing a warehousing methodology is not an event, but a process – one whose product is a routinely practiced warehousing business process, and whose activities are directed at managing change and evolving organization and culture. In any evolutionary process, the question “when am I finished?” arises. When implementing a warehouse methodology, more specific and detailed questions include:

• When are you done?
• At what point is the state of “practice” achieved?
• What are the characteristics of a mature warehousing process?
• What are the signs of good practice? Of poor practice?
• What are the signs of a healthy process? Of an ailing process?
• What are the steps to improve poor practice?
• What are the steps to revitalize an ailing process?

While implementing a warehousing methodology is a process of change, completing the implementation does not mean that change will end. For most of the people involved, the transition from implementing to practicing will be seamless. They’ll never realize when one state ends and the next begins. Yet change will
continue, and the process will evolve throughout its entire life span – experiencing varying degrees of effectiveness, and migrating from a newly implemented process to a mature process.

So, when is a state of practice reached? Whenever following the process and producing its defined deliverables is the normal way to conduct data warehousing business; and Whenever doing something other than defined by the process is an exception; Then you have reached a state of practice.

A mature warehousing process is one that is fully integrated into the organization’s culture. When it is not just the normal way of doing warehousing business, but the natural way to conduct that business, then the process is considered to be mature.

Mature processes face a different set of challenges – maintaining the soundness of the process and the merits of its practice. Care must be taken to ensure that the process remains healthy – well aligned with changing organizational, technical, and project needs. Practice without responding to external change leads to entropy and an ailing process. Any process, to remain healthy, requires active measures to sustain the value of the process. And attention is needed to achieve and sustain good practice – with understanding of the reasons for each activity and the value of each deliverable. As a process becomes familiar and comfortable, it is at risk of being practiced by rote – of people doing things simply because “that’s the way we’ve always done it.” Routine practice is in danger of becoming poor practice. When a process is practiced by rote, and without understanding, the quality of results is certain to suffer.

Continuous Process Improvement (CPI) offers a proven set of practices to sustain a business process. CPI employs some of the fundamental principles of quality management to ensure that a process is both healthy and practiced effectively. Through measurement and monitoring, the health of the process and the quality of its results are monitored. Failure to meet targets for any of several monitoring criteria may indicate a need to adjust the process, or to adjust the manner in which the process is practiced.

A popular set of CPI metrics can be taken from the four areas described in The Balanced Scorecard (see references). These areas (with examples of their role in monitoring a warehousing process) are:

- **Financial Measures** – Does the process produce cost-effective results? Is the warehouse worth what it costs to build, operate and maintain?

- **Customer Measures** – Is the process customer focused? Does warehouse development appropriately involve customers and account for their needs? How satisfied are customers with warehouse results?

- **Internal Measures** – Does the process meet internal needs to conduct warehousing business? At which things must we excel – Speed of delivery? Adaptability to change? Business Alignment? Other factors? Do we excel at building and delivering warehousing results? Are critical success factors being met?

- **Innovation and Learning** – Do we continue to improve as a warehousing organization? Are warehousing projects team oriented? Are customers a part of the team?

Employing these, or similar measures helps to monitor the health of the warehousing process and the state of its practice. Whenever problems or deficiencies are detected, corrective action is needed to protect the investment in the process. Seek corrective measures that address the root causes of problems, and avoid the temptation to simply repair symptoms. Sustain the process and its full value through quick, decisive actions.

**CONCLUSIONS**

Evaluating, selecting, and implementing a data warehousing methodology are all challenging tasks. Each of these activities, however, is necessary to attain the goal of warehousing as a business process. Successful
implementation depends upon careful selection, and a sound selection demands systematic evaluation. This series of articles offers thoughts and guidance for each of the three steps. We believe that this guidance – combined with your knowledge, experience, and good judgement – will lead to effective data warehousing practices in a culture of mature warehousing processes.
References


