

### (1) Efforts involving organization-wide data integration: benefits, barriers, and lessons

#### Benefits

Organization-wide data integration tends to lead to the following benefits in the context of enterprise-level planning and decision making:

- Improved managerial information for organization-wide communication (Goodhue, et al., 1992)
- Improved operational coordination across sub-units or divisions of an organization (Goodhue, et al., 1992)
- Improved organization-wide strategic planning and decision making

Data integration is necessary for data to serve as a common language for communication within an organization. Without data integration there will be increased processing costs and ambiguity between sub-units or divisions. Without data integration, there will be delays and decreased levels of communication, reductions in the amount of summarization, and greater distortion of meaning (Huber, 1982). Data integration facilitates the collection, comparison, and aggregation of data from various parts of an organization, leading to better understanding (Goodhue, et al., 1992), and improved enterprise-level planning and decision making when there are complex, interdependent problems.

#### Barriers

Data integration can have a positive impact on reducing costs by reducing redundant design efforts (Goodhue, et al., 1992). However, because multiple sub-units or divisions are involved, data integration can also increase costs by increasing the size and complexity of the design problem or increasing the difficulty in getting agreement from all concerned parties. These barriers were summarized by Goodhue et al. (1992) as:

- Compromises in meeting local information needs
- Bureaucratic delays that reduce local flexibility
- Higher up-front costs of information system design and implementation

Organization-wide data integration may result in a loss of local autonomy in the design and use of data. In addition, it may also involve a loss of local effectiveness. Over time, different sub-units may face different task complexity and environmental challenges of unanticipated local events (Sheth and Larson, 1990).

#### Lessons

The following lessons have been derived from the cases of organization-wide data integration (Goodhue, et al., 1992; Sheth and Larson, 1990; Robertson, 1997):

- Choosing the appropriate level of data integration in an organization may require trading off improved organization-wide communication and coordination against decreased local flexibility and effectiveness
- The top management in an organization should allow each division to design and implement its own information systems, based upon best serving its local operational and information needs. "The result might be systems that are locally optimal but not integrated across the divisions, with different definitions, identifiers, and calculations in each division" (Goodhue, et al., 1992, p302)
- A single logical design for use across multiple sub-units can be difficult. The more sub-units involved and the more heterogeneous their needs, the more difficult it will be to develop a single design to meet all needs
- Data integration may change the organizational information flows, and affect individual roles and organizational structure
- The cost of designing and implementing data integration must be also considered, because it might be much higher than expected

### (2) Efforts involving data integration across multiple organizations: benefits, barriers, and lessons

#### Benefits

Like the efforts involved in single organization, the use of multiple data sources provide improved communications and coordination across different organizations, both in the same and different sectors of the economy. In addition, these efforts involved in the cases also tend to lead to the following benefits (Clark County Recorder's Office, 1998; QMAS Report, 1997; SEI's MassCHIP Program):

- Increased customers service quality
- Increased existing personnel efficiency
- Improved information quality, timeliness, and utilization
- Increased accessibility, and analysis of information
- The elimination of redundant data and tasks
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#### Barriers

While there are clearly advantages, using an integrated approach across multiple organizations also presents a number of challenges. For example, obtaining data from other agencies is often difficult, and in many cases will be impossible. Culhane and Metraux (1998) summarized these limitations as:

- Legal restrictions may prevent access to a particular data set
- Difficulty in obtaining the cooperation of agency heads, who will often make data sharing decisions based upon "perceived self-interest for the agency or the current political administration"
- Data sharing often requires compatibility between different computer systems as well as the availability of information system personnel with the requisite time and technical skills
- Integrating data systems frequently requires the concurrence of system administrators, directors of programs, and services consumers

Other barriers are also identified from the cases discussed above (QMAS Report, 1997):

- **Cost** -- Data integration across organizations can cause expenses to multiply. For example, conducting multiple performance evaluations simultaneously may be more expensive than using each tool separately
- **Timing** -- It takes much more time to collect needed data from different sources across organizations. This time lag may cause synchronization problems
- **few data standards** -- This will result in no clear vision of data strategy, and make the information decision support much more complex
- **Information overload** -- Organization staff may be overcome by the volume of information across multiple organizations. They may view this abundance of information as overly complicated, and may choose not to use it

#### Lessons

Based on the experiences in the cases where organizations are either in the same or multiple sectors of the economy, the following important lessons regarding the implementation of a comprehensive data integration project are identified (QMAS Report, 1997):

- The objective of data integration should be defined clearly from the start
- Data integration projects require a significant time commitment
- Barriers to participation must be identified and addressed
- Early financial commitment is a key to ensuring ongoing political commitment
- MIS (management information systems) staff should be involved from the start

In addition, there are some important questions regarding the use of multiple data sources from external organizations (QMAS Report, 1997):

- Are the data current enough to be useful?
- What are the content limitations of the data?
- What are the limitations in terms of available methodologies for analyzing the data?
- What are the technological requirements? What confidentiality issues are relevant?

All these questions should be carefully addressed in the data integration across multiple organizations.

It is worth noting that several cases in this paper are in health care field, it probably indicates that health care is a leader in data integration efforts. It also seems to us that organization-wide data integration is done for operational reasons, while data integration across multiple organizations (at least in the cases) is done for research and evaluation purposes.