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Collaborative Data Integration: Coordinating Efforts within Teams and Beyond

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About the Author

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Executive Summary

Collaboration is a recently arrived requirement for data integration.

TDWI Research defines collaborative data integration as a collection of user best practices and software tool functions that foster collaboration among the growing number of technical and business people involved in data integration projects and initiatives. Two thirds of organizations surveyed by TDWI report that collaboration is an issue for data integration, proving that it's real.

The need for collaboration around data integration has increased recently. On the technology side, data integration specialists are growing in number, data integration work is increasingly dispersed geographically, and data integration is more tightly coordinated with other data management practices (especially data quality and master data management). On the business side, business people have long taken an interest in data integration related to business intelligence and mergers, but they now need direct involvement due to new requirements for compliance and governance.

Collaborative data integration supports governance and stewardship, and it fosters reuse and remote management for distributed development teams.

The leading business benefits of collaborative data integration are that it supports governance and gives business people self-service visibility into the details and progress of data integration projects. Technology benefits include the reuse of development objects and more options for IT management to manage geographically dispersed teams. A benefit for all team members is the "big picture"—the ability to see beyond individual pieces to a broader understanding of the total project, which fosters better and more holistic decisions throughout the project lifecycle.

Collaboration requires structure to get everyone organized, and certain organizational units can provide that structure for data integration. These organizational structures can be technology focused (like data management groups), business driven (like data stewardship programs and governance boards), or a hybrid of the two (like BI teams and competency centers).

Collaboration needs the support of an organizational structure.

Collaboration around data integration is like any kind of collaboration: it's mostly about establishing or following policies, procedures, and standards for data integration. And most of these concern some kind of change management. After all, few projects are "greenfield," and most involve changing pre-existing business processes or IT systems. With data integration, changes range from small updates to older integration routines to a series of projects to support large programs for system consolidation, merger, or business transformation.

Although a lot of collaboration is verbal and organizational, some aspects of it can be automated with software tools for data integration. In particular, most collaborative features in a data integration tool today are for the technical implementation team to do source code management, including features like check in/out and versioning for development artifacts.

Some data integration tools have collaborative features for both technical and business users.

Some data integration tools also include collaborative features specifically for business users. For example, an area within the tool enables a data steward or business person to actively do some hands-on work, like select data structures (that need quality or integration attention), design a rudimentary data flow (which a technical worker will flesh out later), or annotate development artifacts (e.g., with descriptions of what the data represents to the business). A tool may also support views of data integration artifacts that are meaningful to business people, like business-friendly descriptions of semantic layers and data flows. And some tools allow you to manage project documents that describe requirements, staffing, or change management proposals.

All collaborative features—whether for technical or business users—are enabled by the data integration tool's repository, which manages metadata, development projects, and collaborative documents. With all features enabled by a single, central repository, all features are available to all users. And the repository serves as a hub for broad collaboration among all members of the extended data integration team.

Defining Collaborative Data Integration

Collaboration requirements for data integration projects have intensified greatly in this decade, largely due to the increasing number of data integration specialists within organizations, the geographic dispersion of data integration teams, and the need for business people to perform stewardship for data integration. Organizations experiencing these trends need to build teams, best practices, and infrastructure for the emerging practice known as *collaborative data integration.*

TDWI Research defines collaborative data integration as:

> *A collection of user best practices, software tool functions, and cross-functional project workflows that foster collaboration among the growing number of technical and business people involved in data integration projects and initiatives.*

SURVEY SAYS:
64% of organizations surveyed said that collaboration for data integration is an issue.

In May 2007, TDWI asked conference attendees a few questions about collaborative data integration to test whether they are aware of it and to quantify a few aspects of its practice. Judging by survey responses, data management professionals of different types are clearly aware of the practice. In fact, almost two-thirds of survey respondents reported that collaboration is an issue for data integration in their organizations. (See Figure 1.)

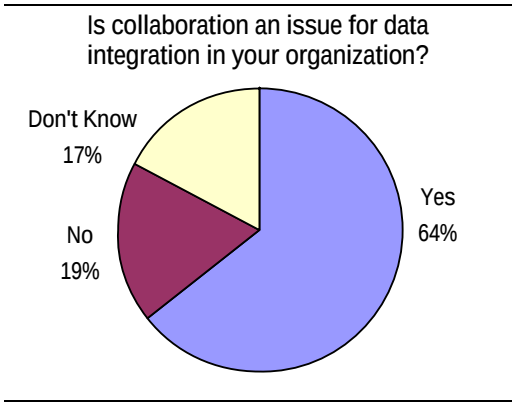

Figure 1. 151 respondents, May 2007.

Why You Should Care about Collaborative Data Integration

Several trends are driving up the requirements for collaboration in data integration projects.

Data integration specialists are growing in number. Collaboration requirements intensify as the number of data integration specialists increases. Many organizations have moved from one or two data integration specialists on a data warehouse team a few years ago to five or more today.

Data integration specialists are expanding their work beyond data warehousing. Analytic data integration focuses mainly on data warehousing and similar practices like customer data integration (CDI). This established practiced is now joined by operational data integration, which focuses on the migration, consolidation, and upgrade of operational databases. Both practices are growing and thereby increasing personnel.

Data integration is now practiced by more people, in more locales.

Data integration work is increasingly dispersed geographically. Projects that involve data integration are progressively outsourced, which demands procedures and infrastructure for communication among internal resources and external consultants. Even when the entire project team works for the same organization, employees may work from home, from various offices, or while traveling.

Data integration is now better coordinated with other data management disciplines. Data integration specialists must coordinate efforts with specialists for data quality, metadata management, data warehousing, master data management, operational applications, database administration, and so on. All these specialists experience moments where they must work together or simply have a read-only view of data integration project artifacts. Related to this,

multidiscipline data management is coordinated more and more by a central enterprise data architect, who authorizes the design of and enforces standards for data integration work.

Business involvement with data integration is now more hands-on.

More business people are getting their hands on data integration. Stewardship for data quality has set a successful precedence. Inspired by that model, a few bold business folks are browsing the repositories of data integration tools to identify data that needs integration and to track the progress of integration work that they've commissioned or sponsored. This form of collaboration ensures that data integration truly supports the needs of a business.

Data governance and other forms of oversight touch data integration. Data is so central to many compliance requirements that governing bodies need to literally look into data integration projects to understand whether they are compliant. For example, one of the typical responsibilities of a data governance committee is to ensure that data for regulatory reports is drawn from the best sources and documented with an auditable paper trail. Goals like this are achieved faster and more accurately when supported by the "big picture" that collaborative data integration provides.

In summary, the number and diversity of people involved in data integration planning and execution are increasing, thus demanding better practices and software tools for collaboration.

Collaborative Data Integration has Cross-Functional Benefits

Given that the scope of collaboration reaches across business and technical people, it follows that the benefits of collaborative data integration reach across these, too.

SURVEY SAYS: Leading benefits are governance, business visibility, and reuse in development.

- **Governance Benefits.** Seventy-one percent of survey respondents report that collaborative data integration supports governance and stewardship. (See Figure 2.) Data integration deserves governance to control data use and stewardship to ensure data improvement—just as other data management practices do—and these cross-functional tasks involve collaboration.
- **Business Benefits.** Business sponsors can collaborate with other team members to help define data integration requirements, keep them focused on business needs, and assure that business and compliance requirements are met as development progresses.
- **Technical Team Benefits.** Reuse for projects and objects is the leading technical benefit (42% in Figure 2). Other benefits include team member specialization, geographic dispersal, and larger team size.
- **IT Management Benefits.** Collaborative data integration gives IT management visibility into the progress of projects and developers, which is key for geographically dispersed teams.

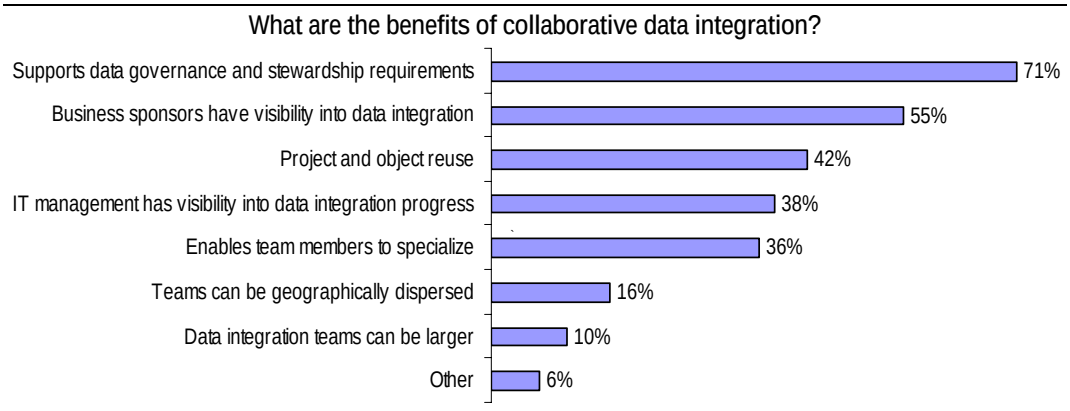

Figure 2. Based on 382 responses from 139 respondents in May 2007.

USER STORY:
Data integration work is increasing for both analytic and operational data integration.

"On the analytic side, our data integration work for data warehousing is rising, because we add several new sources and revise the warehouse data model at least once a quarter," said the BI director at a regional bank in the southern U.S. "On the operational side, we recently started a database consolidation and migration initiative, which is mostly data integration work. As if that weren't enough, the bank occasionally acquires another bank, and data integration is part of the unpredictable fire drill of every merger. We're currently planning a data integration competency center with at least five data integration specialists—plus management, project, and support personnel—which will centralize services for both analytic and operational data integration."

Organizational Issues with Collaborative Data Integration

Due to the changing number and mix of people involved, data integration is facing changes in the organizational structures that own, sponsor, manage, and staff it.

The Scope of Collaboration for Data Integration

With data integration initiatives, the scope of collaboration varies, depending on the variety of organizational units involved.

Sometimes collaboration focuses narrowly on technical people who develop data integration implementations. But it may also include people from IT management who oversee data integration work, like a BI director or enterprise data architect. When data integration work is outsourced, communication between the client company and consultants is another form of collaborative data integration. With analytic data integration, the data integration team must collaborate with business analysts and report producers to ensure they have the data they need. Of special note, the scope of collaboration is progressively extending to business people whose success relies on integrated data, ranging from the chief financial officer to line-of-business managers.

All these folks together constitute an extended, cross-functional team of broad scope, held together by common goals, like compliance, quality decision making, customer service, information improvement, or leveraging data as an enterprise asset. This diverse team needs a centralized organizational structure and technology infrastructure through which every team member can contribute to the business alignment, initial planning, tactical management, and project implementation of initiatives for data integration and related data management techniques.

Organizational Structures That Make Data Integration Collaborative

Different organizational units provide a structure in which data integration can be collaborative.

- **Technology-focused organizational structures.** Data integration—especially when it's for operational purposes, not analytic ones—is sometimes executed by a data management group. The focus is on technology implementations and administration, though with guidance from business sponsors. More and more, data integration is being commissioned by an enterprise data architecture group, which TDWI sees as a new evolution beyond data management groups. In these cases, the scope of collaboration is mostly among technical workers.

- **Business-driven organizational structures.** At the other end of the spectrum, people focused on business opportunities determine where data integration and related techniques (like data quality, master data management, metadata management, and so on) can serve grander business goals. Examples include data stewardship programs (especially when they expand beyond data quality to encompass data integration), data governance committees (which govern many data management techniques, not just data integration), and steering committees

(although these tend to be temporary). The scope of collaboration is very broad, covering business people (who initiate data integration projects, based on enterprise needs), technical people (who design and execute implementations), and stewards and project managers (who are hybrid liaisons).

- **Hybrid structures.** Some organizations align business and technology by nature, and hence are hybrids. For example, the average BI or data warehousing team seems focused on technology, due to the technical rigor required for data integration, warehouse modeling, report design, and so on. Yet most team members communicate regularly with sponsors, report consumers, and other business people to assure that information delivery and business analysis requirements are met. Since most data integration competency centers are spawned from data warehousing teams, they too are usually hybrids. In these cases, the scope of collaboration reaches across business and IT people, who work on fairly equal ground.

A number of trends and consequences follow from the above bulleted points.

All the organization structures mentioned here are hybrids, to some degree. Even when technology is the apparent focus, its use is guided remotely or governed directly by representatives of a business—as it should be, to assure that the goals of the enterprise are served. Meeting these goals, however, requires intense cross-functional collaboration.

Data integration is commissioned by business people more and more. Even so, the commission is usually indirect, when it comes from the business side. For example, upper management mandates a change in business process, which requires changes in IT systems, which in turn requires data integration to implement system changes. In other cases, business people take more of a direct, hands-on approach by specifically identifying systems and data for integration. And, of course, there's a long-standing tradition of business analysts and report producers commissioning data integration work to populate their analyses and reports.

Coordination between data integration and other data management techniques is tightening. In other words, instead of the silos typical of a few years ago, data integration is progressively being designed and deployed as part of a larger solution that coordinates multiple data management disciplines. This adds yet another dimension to collaborative data integration.

The data integration competency center is becoming a common structure for collaboration. The older paradigm of staffing multiple teams with their own data integration specialists is giving way to the data integration competency center, which staffs data integration services from a central group that collaborates with various technology groups and business units.

Collaboration needs structure to succeed. The collaboration tasks alluded to here are done on an ad hoc basis in most organizations today and are therefore prone to miscommunication. Organizational structures give collaborative data integration a structure that enables more people to add value with an auditable progress trail that fosters accurate communication.

USER STORY:
Dual chairmanship is a success factor for data governance and other collaborative organizations.

In recent years, TDWI has seen its Members and others embrace data governance aggressively. People report that data governance gives them the executive mandate, change management mechanisms, and business-to-IT collaborative structure they need to achieve new requirements for compliance, data improvement, information sharing, and business transformation. A success factor in these data governance committees is dual chairmanship—where the committee is managed by two chairmen who represent the business and IT. This helps balance concerns on both sides of the fence, although the business chair tends to lead, supported by the IT chair. TDWI has also seen

this in a few BI teams, stewardship programs, steering committees, and so on, suggesting that dual chairmanship is useful for a variety of cross-functional collaborative organizations.

Best Practices for Collaborative Data Integration

Much of the collaboration around data integration is purely about policies, procedures, and other best practices established by an organizational unit. This collaboration can be enabled by software tools to a degree, as the next section of this TDWI Monograph explains. But it's mostly a matter of verbal communication and documentation among parties.

Change Management

Change management (sometimes called change control) is a major component of collaboration, regardless of the mix of people, process, and technology involved. After all, few projects are truly "greenfield," and most are changes to existing business processes or IT systems. The size and scope of change varies, as in these examples:

- **Small change.** Many data warehouse teams update their warehouse model, data integration routines, and reports quarterly. The substance of such updates is driven by collaboration with business sponsors and report consumers.
- **Mid-size change.** One business unit may propose changes to an IT system owned by another unit for the sake of improving the quality of data integrated between the two. Defining and approving the proposed change involves collaboration among managers and IT people responsible for the involved business units and IT systems.
- **Large-scale change.** A "business transformation" is an extreme example, where a sweeping change (like process reengineering or reorganization) is mandated top-down from the highest levels of management. The scope of collaboration is very broad, and the changes that must be managed can number in the hundreds or even thousands.

On the technology side, change management usually involves a collaborative review process to approve designs of new work, approve proposed revisions of older work, allocate personnel for approved work, test and release technical implementations, and so on. On the business side, cross-functional impacts must be studied and business rules enforced. In fact, an IT director at a healthcare insurer recently described his data governance program as "a workflow-driven change management process in which business units and IT collaborate to harmonize, cleanse, publish, and protect common information assets that must be shared across the enterprise." In some cases, the change management review process may take more man hours than the technical implementation associated with it. Given the complexities of change, it's no surprise that many users turn to one of the organizational structures discussed earlier to organize the change process and give it clout.

The Role of Business People in Collaborative Data Integration

Too often, we think of business people's involvement with IT initiatives as a matter of sponsorship and occasional review. But there's more to it.

In the realm of analytic data integration, collaboration is often a subtle trickle of conversations among business people, report producers, credit scoring and forecast modelers, and data integration developers, as they agree on requirements, work through corrections and changes, and then finish up with user acceptance testing. If asked, some business users may not perceive

themselves as collaborators in the data integration implementation, although they are present at the beginning, middle, and end.

The situation is similar with operational data integration, in that business people initiate data integration projects (directly or indirectly) based on business requirements or opportunities they encounter. The most dramatic examples of how business change indirectly commissions data integration involve business transformation. A common transformation is to change data ownership to be a communal asset, which may require data integration to synchronize data across multiple systems. Another is to transform into a more customer-centric process, which often involves customer data integration. Centralization is another transformation, which may involve consolidating IT systems, which in turn requires operational data integration. Note that all these business changes trickle down and affect data integration, which in turn must collaborate upward to ensure that all business requirements are met.

USER STORY: Business transformation indirectly initiates collaborative data integration.

A regional bank in the American Midwest recently realized that it needed to undergo a complete business transformation. The problem was that they were still focused on products like loans and checking accounts, whereas their industry had become more customer-centric. As a starting point for the transformation, they reengineered sales and account management processes to unify the customer experience, which required that they consolidate numerous sales force automation systems, which in turn required data integration to enable technical consolidations and data governance to assure that compliance and other business goals were met. Hence, business personnel conceived of a sweeping change, and executing the change indirectly commissioned data integration implementations as part of the collaborative cross-functional solution.

Software Tools for Collaborative Data Integration

Although much of the collaboration around data integration consists of verbal communication, software tools for data integration include functions that automate some aspects of collaboration. Tools increasingly providing functions through which nontechnical and mildly technical people can collaborate (as described later). However, software tool automation today mostly enables collaboration among data integration specialists who design, develop, deploy, and administer data integration implementations. The focus on collaborative implementation is natural, since it's driven by the need to support the large data integration teams that evolved early this decade.

SURVEY SAYS: 27% of organizations surveyed have five or more data integration specialists.

Corporations and other user organizations have hired more in-house data integration specialists in response to an increase in the amount of data warehousing work and operational data integration work outside of warehousing. In the "old days," an organization had one, maybe two data integration specialists in-house, whereas today's average is closer to three or four. In fact, roughly a quarter of respondents to a TDWI survey reported five or more, while another quarter reported three or four. (See Figure 3.)

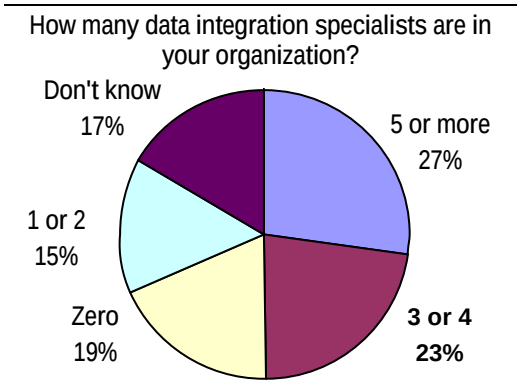

Figure 3. 151 respondents in May 2007.

Data Integration Implementation Team Composition and Collaboration

As the size of data integration teams has increased in recent years, specialization within teams has increased. In other words, instead of generic data integration specialists, multiple roles have emerged in large teams. For example, a large team may be led by a designer or integration architect who designs integration solutions or reviews designs of others. Once a design (or revision of a design) is approved, data integration developers step in and build it. After that, the new data integration work may pass through the hands of specialists for quality assurance (or testing), deployment (which includes scheduling and details of data access), and administration (which involves performance optimization and recovery from failure).

Note that the composition of a large data integration team resembles that of operational application development teams, which, due to their large size, for decades have included specialists for design, development, quality assurance, deployment, and administration. Another way to put it is that data integration teams, as they have grown in size, have adopted the best practices of other application teams. This user-driven trend is mirrored in trends for data integration tools, which themselves have evolved to include many of the collaborative functions seen for years in application development tools intended for large multiple-developer teams.

When it comes to business participation in analytic data integration, the precedence was set years ago by the business analyst, who is a liaison between the business and data-oriented technical teams. Business analysts translate business requirements to technical requirements—essentially mapping business rules and metadata to technical metadata. Hence, they are key collaborators with data integration, business intelligence, and data warehouse modeling teams.

In recent years, more aspects of collaborative data integration have come from data quality and stewardship tools and best practices. After all, a data steward is a hybrid who straddles both IT and business, much like a business analyst does. And data quality and data integration are today often designed and executed by the same team or closely related teams, so cross fertilization is natural. In fact, some data integration teams have stewards. A speaker at a recent TDWI conference explained that his team includes a data steward (for quality issues), a metadata and master data steward (semantics), and an administrative steward (data integration and access).

Data Integration Tool Requirements for Technical Collaboration

Let’s recall that the mechanics of collaboration involve a lot of change management. It trickles down all the way to data integration development artifacts, like projects, objects, data flows, routines, jobs, and so on. Managing change at this detailed level—especially when multiple developers (whether in-house or outsourced) handle the same development artifacts—demands source code management features in the development environment. Again, these are features long seen in other application development tools, but recently added to data integration tools:

- **Check out and check in.** The tool should support locking for checked-out artifacts and automated versioning for checked-in ones. Role-based security should control both read and write access to artifacts.
- **Versioning.** This should apply to both individual objects and collections of them (i.e., projects). The tool should keep a history of versions, with the ability to roll back to a prior version and to compare versions of the same object. This functionality may be included in the data integration tool or provided by a more advanced third-party version-control system.

- **Nice-to-have source code management features.** Check in/out and versioning are absolute requirements. Optional features include project management, project progress reports, object annotation, and discussion threads.

When a large data integration team has specialized members, it might set up a series of system environments, one each for design, development, testing, deployment, and administration tasks. Having separate systems for each task is desirable, though not always practical due to the resulting complexity, and costs. Therefore, most teams have two environments: one for deployment and administration, another shared by design, development, and testing personnel. Ideally, versioning should be automatic as a project moves through design, development, testing, and deployment phases.

Data Integration Tool Requirements for Business Collaboration

Development aside, a few data integration and data quality tools today support areas within the tools for data stewards or business personnel to use. In such an area, the user may actively do some hands-on work, like select data structures (that need quality or integration attention), design a rudimentary data flow (which a technical worker will flesh out later), or annotate development artifacts (e.g., with descriptions of what the data represents to the business).

However, most collaboration coming from stewards, business analysts, and other business people is more passive. Therefore, some data integration tools provide views of data integration artifacts that are meaningful to these people, like business-friendly descriptions of semantic layers and data flows. Other views may focus on project documents that describe requirements, staffing, or change management proposals. Depending on what's being viewed, the user may be able to annotate objects with questions or comments. Some tools support discussion threads to which any user can contribute.

All these functions are key to extending collaboration beyond the implementation team to other, less technical parties. Equally important, however, is that different tools (or areas within tools) bridge the gaps among diverse business and technical user constituencies. Such bridges are best built via common data integration infrastructure with a shared repository at its heart.

Collaboration via a Tool Depends on a Central Repository

The views just described are enabled by a repository that accompanies the data integration tool. Depending on the tool brand, the repository may be a dedicated metadata or source code repository that has been extended to manage much more than metadata and development artifacts. Or it may be a general database management system. Either way, this kind of repository manages a wide variety of development artifacts, semantic data, project documents, and collaborative views. When analytic data integration is applied to business intelligence and data warehousing, the repository may also manage objects for report, data analyses, and data models. (See Figure 4.)

So that all collaborators can reach it, the repository should be server-based and easily accessed over LAN, WAN, and Internet. Depending upon the user and what he/she needs to do, access may be available via the data integration tool or a Web browser, but with security. A well-developed repository will support views (some read only, others with write access) that are appropriate to various collaborators, including technical implementers, IT management, business people, business analysts, data stewards, BI professionals, and data governance folks. Because the repository manages development artifacts and semantic data, it may also be accessed by the data integration tool as it runs regularly scheduled jobs. Hence, the repository is a kind of hub that

enables both the daily operation of the data integration tool and broad collaboration among all members of the extended data integration team.

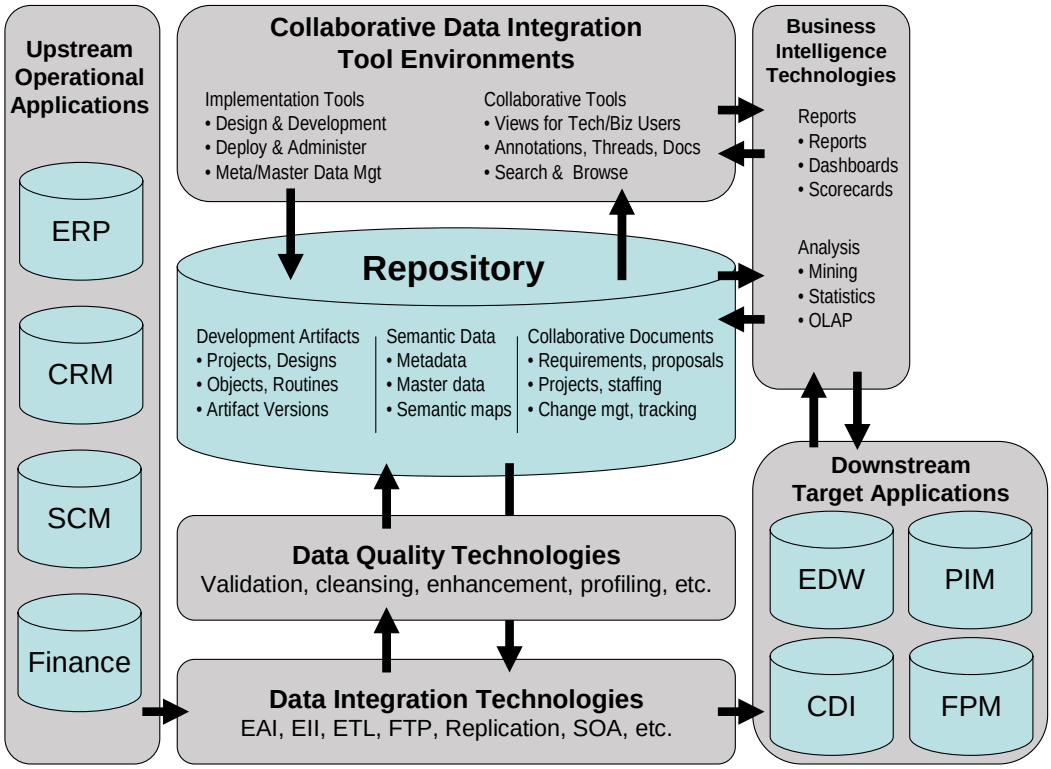

Figure 4. Technology stack for collaborative data integration.

Conclusions and Recommendations

In summary, the emerging practice called collaborative data integration is real. It will become more prominent in cases where data integration demands intense collaboration among large teams of technical staff and where business people must get directly involved to articulate their requirements or to oversee data use for the sake of BI, compliance, governance, or business transformation. Collaborative data integration is inherently cross-functional, in that it involves both policy and process to guide technical and business personnel.

Make data integration collaborative for large, distributed, or cross-functional teams.

- **Recognize that data integration has collaborative requirements.** The greater the number of data integration specialists and people who work closely with them is, the greater the need is for collaboration around data integration. Headcount aside, the need is also driven up by the geographic dispersion of team members, as well as new requirements for regulatory compliance and data governance.
- **Embrace collaboration for its benefits.** The leading benefits of collaborative data integration are its support for governance, business visibility into integration projects, reuse in development, and more options for IT management. Collectively, these benefits enable all team members to see the big picture, instead of just their own individual project pieces.
- **Determine an appropriate scope for collaboration.** At the low end, bug fixes don't merit much collaboration; at the top end, business transformation events require the most.

- **Support collaboration with organizational structures.** These can be technology focused (like data management groups), business driven (data stewardship and governance), or a hybrid of the two (BI teams and competency centers). Organizational units like these are best led by dual chairmen representing IT and the business.

Create policies and processes to govern data integration and to enable its collaboration.

- **Create policies and procedures.** After all, much of the collaboration around data integration consists of policies, procedures, and standards that are communicated verbally or through project documents to people within the scope of collaboration.
- **Focus on change management.** Most of the policies and procedures you'll create will support various forms of change management, ranging from the change proposals typical of data governance to the project updates typical of the daily work of data integration specialists.
- **Encourage business people to play a bigger or more direct role in data integration.** To some extent, this will happen anyway in firms that are stepping up data governance, since this inevitably leads to more oversight for data integration. Stewardship—when borrowed from data quality and applied to data integration—provides a model for a deeper involvement with data integration. Mergers, reorganizations, and transformations offer other opportunities where business people can prioritize data that would yield the greatest return from integration.

Look for data integration tools that support collaborative features for both IT and the business.

- **Select data integration tools that support broad collaboration.** For technical implementers, this means data integration tools with source code management features (especially for versioning). For business collaboration, it means an area within a data integration tool where the user can select data structures and design rudimentary process flows for data integration. Equally important, the tool must bridge the gap, so that planning, documentation, and implementations pass seamlessly between the two constituencies.
- **Demand a central repository.** Both technical and business team members—and their management—benefit from an easily accessed, server-based repository through which everyone can share their thoughts and documents, as well as view project information and semantic data relevant to data integration.