

By linking metrics and conversion ratios to key business processes, the intranet efficiency and effectiveness model helps corporations design better software for intranet portals.

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Intranet Portal Model and Metrics

A Strategic Management Perspective

Although many corporations store a great deal of information in their corporate intranets, few have a reliable means of measuring the effectiveness of their intranet portals to use this information to meet specific business needs. Turning information into knowledge capital that corporations can leverage quickly for competitive advantage requires a model and supporting metrics. Most intranet portal measurements are based almost exclusively on usage statistics—with little or no thought given to design or user experience—and corporations apply them in a nonstandardized manner, providing no meaningful insight into how well intranets help corporations achieve their strategic objectives.

What has been missing is a comprehensive model and methodology to base measurements

on logically related groups of metrics, which, when measured periodically, provide actionable steps to optimize the efficiency and effectiveness of intranet portals.

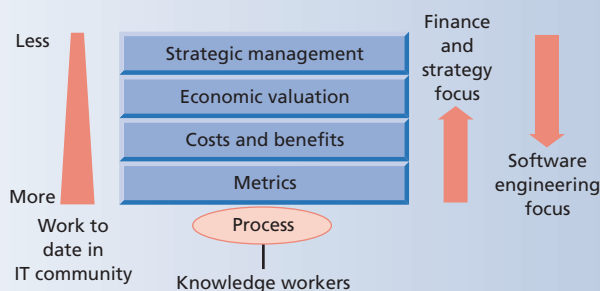
INTRANET EFFICIENCY AND EFFECTIVENESS MODEL

A fundamental shortcoming in efforts to get more value from corporate intranets is the lack of comprehensive and credible means for measuring the portals' ability to meet employee (knowledge worker) and other audience demands. As Figure 1 illustrates, few approaches to metrics begin from a strategic management viewpoint, which lets organizations prioritize critical business requirements essential for value creation. Far more work in the IT community focuses on applying metrics to knowledge worker processes as they impact immediate costs and benefits, and this work fails to recognize longer-term payback as these processes relate to company competitiveness (for example, processes that sustain key business activities that support value creation).

Designing better software for intranet portals and effectively measuring the portals' performance requires linking value to critical business requirements with the proper balance of metrics that help corporations derive more meaningful return-on-investment (ROI) estimates. In effect, this focus would close the gap of understanding between knowledge workers, IT professionals, and business decision makers.

The intranet efficiency and effectiveness model (IEEM) is the first theoretical model for viewing and measuring intranet activity while accounting

Figure 1. Software engineering approach to metrics.



(Modified from "Managing Requirements for Business Value," John Favaro, *IEEE Software*, Mar. 2002, pp. 15-17.)

Requisites for Portal Design

Portals aim to help knowledge workers to discover the information they need to do their jobs better. For information to be easy to find and useful, portal design must



- provide a reasonable amount of information and meta-information;
- reflect designers' understanding of information seeking and user behavior;
- group information logically to facilitate navigation;
- inspire confidence in the quality of information and meta-information; and
- be relevant to the knowledge worker.

Portals should thus contain the 13 constituents of discovering information that collectively sustain these requisites. For simplicity and logic, we've grouped six of these constituents into the back-end domain and seven into the front-end domain. IEEM back-end constituents include

- **Content properties**—the characteristics of a content item, such as author, length, and name, represented with a schema and supported by vocabularies of meta-data.
- **Domain information infrastructure**—the sum and organization of all of a corporation's data, taxonomies, tools, and products. The portal should include only the elements from these groups that it can further develop and integrate to improve content and context control.
- **Domain integration framework**—the virtual representation of the relationships between a design's key elements, which shows how these elements interact and transfer information.
- **Information life cycle**—the events that recur frequently in maintaining the relevance and accessibility of content in an information system.

- **Search**—an application that knowledge workers use to find through direct surfacing or through surfacing an obvious navigational path.
- **User data**—the facts and figures a knowledge worker maintains private access to for knowledge retention and expansion (also referred to as *personalization*).

Front-end constituents include:

- **Accessibility**—the information's availability, reachability, and understandability (that is, how the information is packaged and presented to make it easier for knowledge workers to understand).
- **Communication of authoritativeness and importance**—proof of the credibility of information within an information system that inspires confidence and trust.
- **Communication of understanding search**—demonstration of the information's meaning and significance by keeping it consistent to ensure acceptance and engagement.
- **Information grouping and segmentation**—the logical collection of relevant and similar information and the extraction of only the relevant parts of a document, respectively.
- **Navigation**—a method of moving through the domain framework using visual presentation and consistent choices. Navigation can be local (vertical) or global (horizontal).
- **Personalization**—a method of contextualizing information for a knowledge worker based on what is known about that worker.
- **User assistance**—help available to the knowledge worker while using an information system, including guidance on how to use the system or find particular information.

Because the majority of constituents are in the front-end domain, organizations must take front-end metrics into account. Failing to do so could mean that their actions to increase value will have less impact.

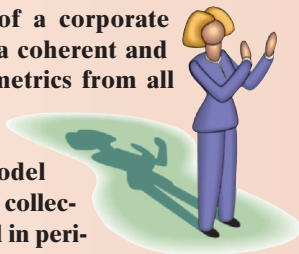
for a corporation's overall critical business requirements. It provides a needed framework for the "family of measures" approach by graphically depicting multiple indicators that derive the unique contributions of IT at the process level. It further provides derivations for common units of analysis (time and money) by linking sets of metrics and conversion ratios to business processes as they relate to knowledge workers, IT managers, and business decision makers seeking to increase value.

Modeling approach

Information technology does not just contribute data; it impacts many business processes that produce results required to sustain value. Analyzing processes within the IEEM can help corporations to better understand which processes are critical to sustaining productivity. One measure of intranet effectiveness is how well the company's portals support its business requirements. Research on the IEEM can help identify metrics and conversion ratios that

Metric Types

Measuring the efficacy of a corporate intranet's portals requires a coherent and balanced combination of metrics from all intranet segments as defined by the intranet efficiency and effectiveness model (see the main article). When collectively and uniformly applied in periodic measurements, these metrics can indicate tractable improvements over time. To do this, we group the metrics into categories that support business requirements:



- You can objectively measure *hard* metrics by directly interpreting server log-file data, server requests, number of visitors over a given period of time, and so on.
- *Soft* metrics involve many subjective and qualitative

aspects (surveys, visual analysis, and usability, for example) that provide a frame of reference for interpreting the results.

- *Derived* metrics include hard and soft metrics from various business and knowledge data and an educated assumption to draw conclusions. Examples include estimates of speed to market, loyalty, and reach.

Many derived metrics can become hard metrics as analysts identify the perceived and measured physical and software interaction between key elements within the constituents. Examples within the cross-portal reference and shared topography constituents are the ability to capture all unique visitors and information maps (akin to server topography), respectively. To eliminate subjectivity, Web analysts strive to find viable ways to make all metrics quantifiable (hard) metrics.

corporations can apply to their portals to determine where they need to focus efforts on meeting strategic business requirements. By dividing an intranet into segments, the IEEM helps corporations define, apply, and refine a balanced baseline of metrics for measuring what is important, instead of what is available.

To better appreciate the purpose of portals and reasons for their occasional redesign, it is important to understand the domains supporting information management as they relate to finding and understanding information, the domains' constituents, and how segmenting these constituents facilitates highlighting and focusing on key business requirements. Three domains the IEEM identifies are

- front end, which addresses user-based factors, such as accessibility and site navigation;
- back end, which addresses site-based factors, such as personalization, taxonomy, and information search; and
- people, processes, and technology, which addresses knowledge-worker-based factors, such as their vision, purpose, and products or service—in short, how well these factors support business requirements that promote productivity.

Constituents represent the data necessary in the front-and back-end domains to find information supporting the people, processes, and technology domain (see the “Requisites for Portal Design” sidebar).

After identifying the requisites and their constituents, we used a series of model or diagram procedures to illustrate and analyze the composition of an intranet, and used

this information to determine the IEEM and its fundamental baseline of metrics. To determine associations between metrics groups and critical business requirements, we used an affinity diagram procedure to create a conceptual model separating the intranet into distinct segments that underlie each domain: content, business requirements, design, domain infrastructure, usage, and user experience. This provided us with greater resolution to map out the problem and solution space. On top of this diagram, we identified the various users and their roles within each segment. Next, we placed an interrelationship diagram on top of the affinity diagram to highlight pertinent metrics (such as relevance, ease of navigation, and user satisfaction surveys) and their logical relationships between related users and their roles.

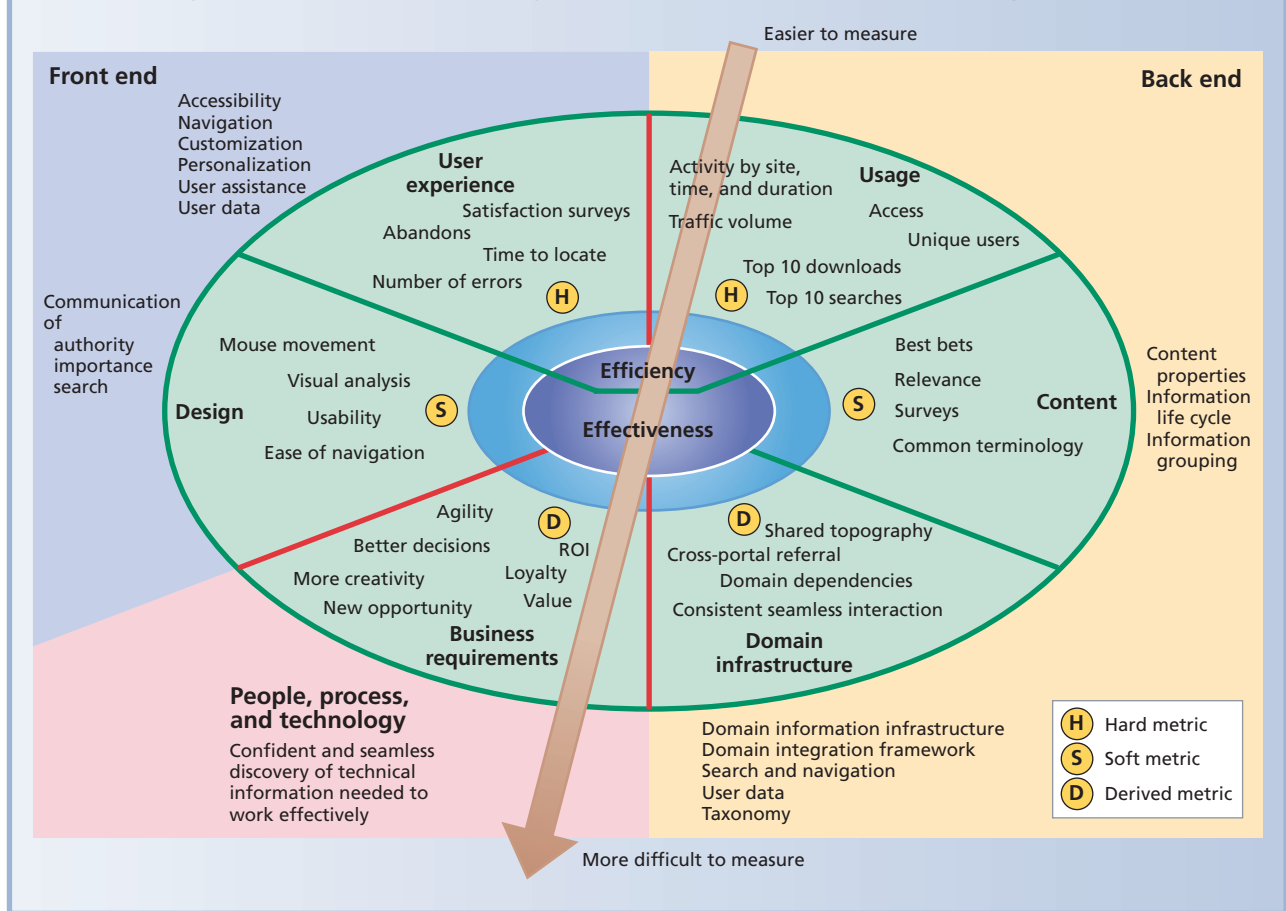
We further classified these metrics into hard, soft, and derived forms (see the “Metric Types” sidebar), outlined them on the diagrams, and put them into a cause-and-effect tree table after consulting with a variety of business decision makers and knowledge workers.

Lastly, using the resulting IEEM diagram and prioritization table, we put all of these factors into a prioritization matrix to illustrate levels of importance and to establish a metric baseline from which to begin measurement (*A Metric Model for Intranet Portal Business Requirements*, Grant Jacoby, PhD dissertation, Dept. of Computer Science, Naval Postgraduate School, Dec. 2003).

Theoretical framework

The resulting theoretical model illustrates the placement of the underlying and interdependent domains, segments, and constituents, as well as the consequential and logical

Figure 2. IEEM metric types and examples for all segments.



metric groupings supporting business requirements. Figure 2 is a simplified version of this model. It shows where the segments fit into the three domains. We've made the segments green to reflect the mix of front-end (blue) and back-end (yellow) factors. We've offset the inner core of the IEEM in purple (the darker shade of the people, process, and technology domain of derived metrics) to represent the efficacy of relevant metrics.

Figure 2 further separates efficiency from effectiveness. Efficiency measures are predominantly quantifiable (or hard) metrics, that is, numbers and durations of time or both. They comprise the usage and user experience segments. Effectiveness measures include efficiency measures but also take into account qualitative factors (soft and derived metrics). These measures make up the design, business requirements, domain infrastructure, and content segments. Analysts need to distinguish and appreciate the difference between metrics (hard, soft, and derived) in each segment to attain the best practice of them.

The IEEM includes an intranet's three corresponding audiences: corporation business decision makers, portal owners and managers, and users. Efforts to organize, prior-

itize, and apply metrics for measuring an intranet's effectiveness must consider all three audiences. For people within these audiences to benefit from enhancements suggested by IEEM analysis, business decision makers must know who and where these individuals are within the corporation as well as their roles in fulfilling business requirements.

The IEEM focuses on strategic fit, functional objectives, and the opportunity or necessity for making process improvements as the keys to success. In addition, the IEEM introduces a common theoretical framework for measuring all facets of intranet processes critical to assessing value. Its holistic approach, however, does not eliminate subjectivity altogether. The IEEM accounts for critical qualitative factors that other commonly used measuring techniques (which concentrate on usage statistics, such as traffic volume) often overlook. In short, to be more comprehensive, the model must account for some soft metrics that are neither strictly quantitative nor free of human interpretation or assumption. Nevertheless, when parties agree on a relatively well-defined set of performance metrics, a relatively unambiguous collaborative interpretation is possible ("Investigating Information Systems with

Table 1. Ranking of key intranet metrics by segment.

Priority	Metric	Type	Segment	Business requirements
1	Relevance	Soft	Content	Opportunity, creativity, better decisions
2	Traffic volume	Hard	Usage	Reach, ROI, loyalty
3	Unique users	Hard	Usage	Reach, ROI, loyalty
4	Domain infrastructure	Derived/hard	Domain infrastructure	Reach, opportunity, creativity
5	Ease of navigation	Soft	Design	Value, loyalty
6	Top downloads	Hard	Usage	Optimization, value
7	Satisfaction surveys	Soft	User experience	Value, loyalty, reach

Action Research,” Richard L. Baskerville, *Comm. Assoc. for Information Systems*, vol. 2, no. 4, article 2, 1999).

MATRIX FOR METRICS AND PRIORITIZATION

Table 1 shows an actual baseline estimation determined by business decision makers and IT professionals of the top several metric areas, the segment they come from, and some of the business requirements they sustain. The prioritization of these metrics is based on the metric groups most impactful on overall value from a business management perspective. For example, business decision makers and IT workers might rate “relevance” (a soft metric from the “content” segment) as a first-priority metric because of its effect on new opportunities for business, increased creativity, and better decisions. A hard metric, “traffic volume” (from the “usage” segment) might earn a priority-two rating for its impact on reach, ROI, and user loyalty.

The distribution of metrics is of additional interest from a theoretical standpoint because at least one metric area originates from every segment (see the “Segment” column). This supports our assertion that to achieve accurate and comprehensive effectiveness measurements, analysts should take more metrics from segments other than the usage segment. Nevertheless, it’s best to limit the number of critical metrics areas to include only those that directly correlate to a business benefit (although the number can vary for each corporation, the IEEM baseline example here focuses on seven). Otherwise, analysis can become overly complicated, threatening order, implementation, and credibility.

Many corporations focus on routing metrics, such as number of hits per page, top 10 search strings, most popular downloads, and number of referrals from other sources (banner advertising, search engines, and direct links). These metrics exist in far greater number than other metrics because they address the issues many organizations face today—namely, Web site accessibility and visibility.

These usage-related metrics are also popular among the technically oriented workers who usually do the measuring because they require less time and are more mathematically straightforward than the more time-consuming soft metrics that measure user behavior and experience in the IEEM front-end. In addition, routing metrics are relatively easy to understand at the business level, and the data is relatively easy to collect using Web server log files. In fact, most Web analytics packages provide many routing metrics as prepackaged reports, so deferring to these out-of-the-box tools is natural. Unfortunately, corporations often apply these tools to their intranets as they would to their Internet Web sites, but there are fundamental differences between the two, and simple substitutions like this provide an inaccurate assessment of an intranet portal’s performance. Simple statistics on plumbing alone won’t provide business decision makers with all of the feedback necessary to track productivity improvements.

The audience most overlooked in ascertaining intranet performance is the user, even though many of the constituents necessary to sustain effective information finding are in the front-end domain, where the knowledge worker resides. Consequently, when selecting metrics with which to measure their intranet’s effectiveness, corporations must carefully consider metrics from the design and user experience segments.

Metrics and focused surveys inform analyses of user behavior patterns within portals and help corporations refine subsequent metrics and surveys. For example, to ascertain why numerous visitors are abandoning a particularly important site, a corporation should examine user behavior through focused surveys, direct observation, and analysis of other metrics used at the site.

A combined metrics and survey program is also critical to the communications process and development of a feedback loop that helps IT learn which initiatives provide the

best business value. For example, raw visitor metrics might indicate that a corporation should archive or discard an infrequently visited research page, when in fact a single recent access might have been the critical piece in securing a major new revenue stream for the organization. Surveys offer many benefits and can lead to obvious but overlooked additions such as providing an online employee manual equipped with a search engine, reducing the amount of time people spend looking for the manual and the information in it.

User surveys

User surveys can be administered dynamically online or the old-fashioned way with pen and paper. The advantages of conducting surveys online are speed and convenience. Surveys based on previous analysis of hard metric patterns are also more focused, succinct, and provide the desired feedback (not provided by hard metrics), increasing the likelihood that users will take time completing them and have less frustration. Knowledge workers will be more likely to accept a survey if they perceive that it helps meet their information needs. IEEM surveys try to cover what is missing from the hard metrics analysis while keeping the focus on business productivity. Survey questions might include:

- How would you rate ease of use of the portal?
- How relevant is the information in the portal to your job?
- How would you rate the performance of this portal?
- How can the portal be improved to meet your business needs?

Surveys that warrant user clarification are far more practical when combined with results from a baseline set of metrics and conversion ratios that are fundamentally based and uniformly applied. Examples include user interviews in which users describe the products (with their own descriptive words) and observers watch them complete the tasks onsite. A survey might ask knowledge workers to name the categories in which they expect to find the products. Other times, a survey will examine pages at the next level down in the hierarchy for potential trigger words. Survey designers can use these words to create multilevel category lists and associate them to expand the current taxonomy for broader relevance (within the portal's context) as well as for tagging and storing new corporate information and data formats. For the portal to succeed as a new paradigm for professional computing, it must be able to recognize and adjust to ongoing changes in knowledge workers' information needs—it can't do this with usage statistics alone.

Practical application

To further elaborate on the interplay of surveys and metrics, Figure 3 dissects a metric area from Table 1 (unique users) to show the reasoning behind the application of metrics to IEEM domains and audiences. The headings describe the organizations, people, and processes involved. We've color coordinated the matrix to the IEEM to ensure thorough interpretation of the association between the model and metrics, including surveys. All metric areas and specific metrics are colored to represent what they support and where they belong in the IEEM as they are used with that metric priority or category.

In addition to being grounded in a theoretical framework, the IEEM methodology is practical in that it lets corporations obtain estimates using many common units (the most appropriate for measuring the ROI impact of IEEM metrics-based analytics is time [Jacoby, 2003]) that are directly traceable to specific pages, links, and designs in a portal. Thus, it's possible to derive portal effectiveness in relatively practical ways. Moreover, this approach does not rely on a particular software program, so it can run in any network without additional hardware or software costs, other than the server space necessary to store log file queries.

Figure 3 is one partial example of more than a dozen actual examples of baseline sets of metrics and conversion ratios resulting from high-level analysis of intranet efficiency and effectiveness. The US Navy and a large Seattle-based software company are studying and refining these baselines to determine the best techniques for

- analyzing user behavior;
- using periodic soft metrics (that is, short, focused electronic surveys) to confirm predominately hard metric results related to behavior;
- automating capture of optimum processes for submission as business rules and best practices; and
- creating a single reporting service for comparing portal performances consistently to gauge impact of process changes.

To facilitate decisions on their investment in, or ongoing value of, data warehouse and portal systems, corporations should consider the strengths and weaknesses of the hard and soft metrics used in their analyses. Achieving success through use of any performance metric depends as much on how well you apply it as when you use it. Studies based on samples and averages over time can produce more credible comparisons. Hence, corporations should confirm and correct baseline measurements and conversion ratios through periodic portal status reviews that

The creation of business intelligence teams is one way to combine analytic skills with IT experience.

Figure 3. Example IEEM metric-definition process.

WHAT: Unique users

WHERE: Enterprise

WHO: Portal owner and portal manager

WHY:

HOW:

Business process

Business practices

Audiences

Business requirement (metric area)	Business question and significance	Specific metric area (specific metric)	Who benefits and why
Retention: Loyalty Value	<p>How effectively am I building loyalty with any visitors?</p> <p>Determine site audience growth and shrinkage over time and vis-a-vis other sites.</p>	Return visitor rate Top visitors (authenticated) over time, by number of visits, and by hits (leads) New versus returning visitors.	<p>User gains familiarity to a site, reducing overall frustration.</p> <p>Portal owner/manager learns where return visitors come from and how many there are.</p> <p>Enterprise learns where the sources of richness lie.</p>
Optimization: Loyalty Value Agility Optimization	<p>Why do visitors come back?</p> <p>Analyze the most popular content for return visitors to load and associate related information.</p>	Return visitor target pages Top returning visitors by hits, by hits over time, by leads completed, and by visit length Returning visitor page views over time Survey Internal returning visitor session activity	<p>User continues to find popular information in addition to new related information.</p> <p>Portal owner/manager learns which pages are desired and can load related information to meet demand.</p> <p>Enterprise can gauge how effectively it is meeting its users' expectations and business needs.</p>

measure progress against previous baseline results. For these reviews, portal owners should use metrics to determine which roles and content the portal is under serving and which processes could correct this and better leverage the portal's capabilities.

Determining which complementary metrics can be grouped and which groups best indicate how well a portal supports a business requirement can lead to efficacy indications. Refining these groupings (each organization is unique and therefore should work to refine its metrics after periodic measurements) from all intranet segments helps corporations improve critical business requirements, such as agility, disintermediation (reducing the number of points required by process occurrences), loyalty, opportunity, and reach.

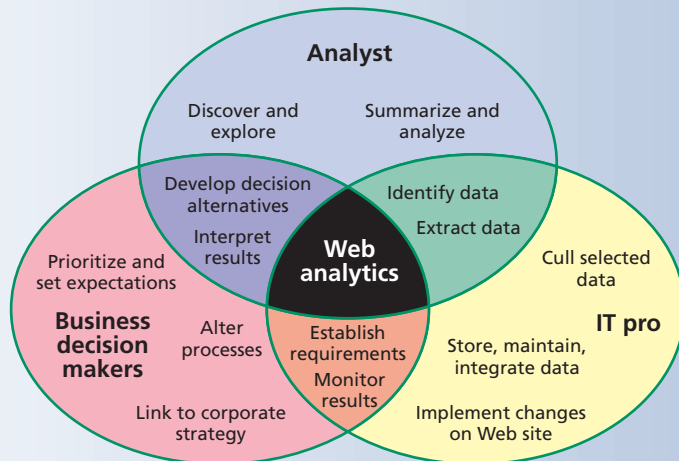
BUSINESS INTELLIGENCE TEAMS

Successful IT projects and ROI require collaboration and commitment between business managers and IT professionals. Corporations must either identify knowledge workers with the required analytic skills or, if affordable, hire someone with them. The creation of business intelli-

gence teams is one way to combine analytic skills with IT experience. In a BIT, analysts and IT experts work closely together to support business managers in their decision-making tasks. The BIT's position in the corporation should be close enough to knowledge workers to stay grounded in the real world, yet far enough removed to attain an overarching view of the corporation's needs.

IT professionals are increasingly involved in IT's strategic and financial implications. Successfully applying Web analytics therefore requires collaboration among analysts, portals managers, and business decision makers. Having the necessary skills in these three fields to collect, interpret, and act on information quickly is a competitive e-business differentiator. The people involved in Web analytics should be skilled in more than one discipline: Web analysis is an analytics exercise, not an IT project. Figure 4 shows how the skill sets common in the three fields overlap and complement each other. Whereas portal managers tend to have a short-range view, business decision makers have a long-range perspective. Portal managers ask how and when; business decision makers ask what and why. Meanwhile, analysts strive to answer as many of the questions as possible.

Figure 4. Complementary skill sets and tasks for business intelligence teams.



(Modified from "The Right BAM Metrics Prevent Information Overload," Frank Buytendijk, Gartner advisory, 13 Mar. 2002.)

Creating a multidisciplinary BIT has more advantages than shortfalls, particularly for large intranets, in guiding IT projects and determining their ROI for metrics investment (ROIMI). Advantages of creating a multidisciplinary BIT include the following:

- Various analytic tasks are centered in one group.
- Because business decision makers are involved during ROI benefits analysis, they are more accountable (along with IT) for achieving the predicted benefits.
- The BIT can separate software proposals into those with potential for ROI and those that are simply the cost of doing business.
- The mix of common sense, professional judgment, quantitative modeling, and strategic perspective is more balanced than in groups that include individuals from just one area.
- A BIT is more likely to ferret out benefits buried in other lines of business, partly because of their collective multidisciplinary backgrounds.
- A multidisciplinary group gives greater validity to ROI analysis, resulting in a wider acceptance.

Outsourcing might be an acceptable solution for companies without the money or resources to invest in teaching their IT workers the required skills. However, the costs associated with outsourcing can risk reaching positive ROIMI, particularly for smaller companies. Many organizations are uncomfortable with the service provider model because they don't want a third party handling sensitive customer data. It also puts the organization at the service

provider's mercy for report customization and data retention. Generally, corporations save more money by creating in-house BITs using the best analyst available (the personal investment is also greater and more reliable). Given team members' experience with the organization, in-house BITs do a good job of discounting soft benefits where appropriate. Such discounts help hedge against rosy projections and can be better tailored to specific groups. Thus, for economies of scale, intermediate and developed corporations should consider identifying employees who best meet BIT-related analytic skills because BITs not only provide the right mix but can also create a competitive advantage.

In the final analysis, Web analytics is an immature discipline requiring the human cognitive factors inherent in a BIT. Successful Web analytics are more a matter of skill than of technology. In short, the process, not the technology, makes IT governance effective. Combining process and technology through these teams helps all knowledge workers be more productive. Creating BITs to apply a set of baseline met-

rics and relevant conversion ratios that account for critical business requirements is one way organizations can coherently and uniformly start the measurement process.

Portal managers and business decision makers might consider juxtaposing their current approaches to intranet measurement and ROI on the IEEM, or using the IEEM as a baseline for developing metrics that focus on the critical business requirements that derive competitive advantage and value. Understanding how seemingly intangible assets affect performance can mean the difference between growth and erosion of value. Although intranet analytics can be counterintuitive, from a strategic management perspective, it can also keep the focus on creating value. ■

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An expanded version of this article appears in the proceedings of the 2004 International Multiconference in Computer Science and Computer Engineering.