NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

DISSERTATION

A METRIC MODEL FOR INTRANET PORTAL BUSINESS REQUIREMENTS

by

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December 2003

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REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.			
1. AGENCY USE ONLY *(Leave blank)*	**2.REPORT DATE** December 2003	**3.REPORT TYPE AND DATES COVERED** Dissertation	
4. TITLE AND SUBTITLE: A Metric Model for Intranet Portal Business Requirements			**5. FUNDING NUMBERS**
6. AUTHOR(S) Jacoby, Grant A.			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			**8. PERFORMING ORGANIZATION REPORT NUMBER**
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			**10. SPONSORING / MONITORING AGENCY REPORT NUMBER**
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approval for public release pending; distribution is limited.			**12b. DISTRIBUTION CODE**

ABSTRACT ***(maximum 200 words)***

This research provides the first theoretical model -- the *Intranet Efficiency and Effectiveness Model* (IEEM) -- for the *Family of Measures* approach to measure Web activity as well as a holistic framework and multi-disciplinary quality paradigm approach not previously derived in viewing and measuring *intranet* contributions in the context of a corporation's overall critical business requirements. This is accomplished by applying a *balanced* baseline set of metrics and conversion rations linked to business *processes* as they relate to knowledge workers, IT managers and business decision makers seeking to increase value. It also outlines who should conduct these measurements and how in the form of a business intelligence team and provides a means in which to calculate return on intranet metrics investment (ROIMI) with a common unit of analysis for both aggregate and sub-corporate levels through forms of the Knowledge Value Added (KVA) and Activity Based Costing (ABC) methodologies.

14. SUBJECT TERMS Portal**,** Formal Models, Software Estimation Models, Software Metrics, Project Management.			**15. NUMBER OF PAGES** 193
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	**18. SECURITY LASSIFICATION OF THIS PAGE** Unclassified	**19. SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	**20. LIMITATION OF ABSTRACT** UL

NSN 7540-01-280-5500 Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

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A METRIC MODEL FOR INTRANET PORTAL BUSINESS REQUIREMENTS

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ABSTRACT

This research provides the first theoretical model -- the Intranet Efficiency and Effectiveness Model (IEEM) -- for the Family of Measures approach to measure Web activity as well as a holistic framework and multi-disciplinary quality paradigm approach not previously derived in viewing and measuring intranet contributions in the context of a corporation's overall critical business requirements. This is accomplished by applying a balanced baseline set of metrics and conversion ratios linked to business processes as they relate to knowledge workers, IT managers and business decision makers seeking to increase value. It also outlines who should conduct these measurements and how in the form of a business intelligence team and provides a means in which to calculate return on intranet metrics investment (ROIMI) with a common unit of analysis for both aggregate and sub-corporate levels through forms of the Knowledge Value Added (KVA) and Activity Based Costing (ABC) methodologies.

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ACKNOWLEDGMENTS

I wish to express my sincere appreciation to Professor Luqi for her confidence, trust and support in this endeavor and Professor Thomas Housel for his insights and contribution. I would also like to thank my friends at Microsoft, particularly Mary Lee Kennedy, for allowing me the opportunity to pursue this work and their enthusiastic support of it. Lastly, I wish to thank my family without whose love and support this work would not have been possible.

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EXECUTIVE SUMMARY

Under current and projected growth rates of information stored in corporate intranets and the increasing need to determine how valuable new portals are in collecting and applying information contained to meet specific business needs, employing a method to holistically, uniformly and regularly measure improvement and take related actions to effectively optimize these portals is of mounting importance. As IT professionals and business decision makers seek ways to forge their information into knowledge capital that can be leveraged quickly for competitive advantage, they require a model and supporting metrics to do so. Across any give corporation today, most intranet portal measurements are based almost exclusively on *usage* statistics – with little or no thought given to *design* and *user experience* factors – and are applied in a freelance and non-standardized 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 from logically related groups of metrics which, when measured periodically, provide actionable steps to optimize efficiency and effectiveness of intranet portals to better bolster key business requirements in pursuit of value. This research provides the first theoretical model for the *Family of Measures* approach to measure Web activity as well as a holistic framework and multi-disciplinary quality paradigm approach not previously derived in viewing and measuring *intranet* contributions in the context of a corporation's overall critical business requirements. This is accomplished by applying a *balanced* baseline set of metrics and conversion ratios linked to business *processes* as they relate to knowledge workers, IT managers and business decision makers seeking to increase value. It also outlines who should conduct these measurements and how in the form of a business intelligence team and provides a means in which to calculate return on intranet metrics investment (ROIMI) with a common unit of analysis for both aggregate and sub-corporate levels through forms of the Knowledge Value Added (KVA) and Activity Based Costing (ABC) methodologies. Corporations that use the holistic six segment perspectives outlined in the *Intranet Efficiency and Effectiveness Model* (IEEM) to define, apply and refine a balanced set of metrics and conversion rates will measure and take action on what is important, instead of what is available.

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I. INTRODUCTION

> Much relevant work in other disciplines such as finance, economics and decision theory are seldom encountered by the typical software engineer. An interdisciplinary approach that integrates such work with traditional software engineering theory and practice promises real advantages. The purpose of software design, as for any design activity, is to create added value. Yet, current theories, concepts, tools and methods are not clearly based on modern models of value and value creation…
>
> Manifesto, Economics Driven Software Engineering Research (EDSER)

A. BACKGROUND

The corporate portal is one of the earliest broad applications of information technology (IT) to immediately impact knowledge management practice. Corporate portals have a purpose that is similar to, but fundamentally distinct from, Internet portals that have become the popular interface for searching and traversing the World Wide Web. Corporate portals provide an architecture and set of technologies with which to build a single point of access across a wide variety of applications, repositories, processes, and functions that have proliferated in the corporate information environment. The portal market can be divided into four broad categories: business to employee, business to consumer, business to supplier, and personalized Web front-ends, like Yahoo. This paper focuses on portals designed for business to employee, known as *intranets*.

Most enterprises today find themselves poorly positioned to take competitive advantage of the recent proliferation of corporate information sources resulting from the advent of the intranet. A fundamental shortcoming in doing this is due to a lack of comprehensive and credible means in which to measure how effective the portals meet the demands of their employees (also known as *knowledge workers*) and other intended audiences in pursuit of carrying out business objectives.

Intranets exist to fulfill different purposes for different constituencies than does the Internet. The key difference lies in the underlying mission of the portal itself: on the Internet, the portal sites' business model is based on attracting a portion of the advertising

budgets of corporations that might otherwise advertise in other media (print, TV, radio, etc.). Thus, the general purpose of the public portals is to attract large numbers of repeat visitors, to build online audiences with the inclination to buy what the portal advertisers have to sell. These portals have essentially settled into a one-directional relationship with their viewers.

Inside the organization, the portal takes on an entirely different character. It takes its purpose from the overall mission of the organization: to add sufficient value for its customers to create a sustainable business model. It takes its features and functionality from the mandate to operate at world-class efficiency and effectiveness in order to remain competitive. Achieving this competitiveness requires a bi-directional model that can support the knowledge workers' increasingly sensitive needs for pertinent, helpful, timely content and interactive information management tools.

The primary functionality of a portal is in its ability to select, filter, expose, and deliver with a significant degree of precision the information that knowledge workers within an organization require to pursue core business processes and competencies in support of strategic business requirements. Unlike publication portals or commercial portals which serve essentially as one way bulleting boards, the corporate portal has its information context predetermined by the information requirements and applications already in place in the organization. In this respect, corporate portals share some of the built-in context which gives distinctive shape to departmental and group portals supporting knowledge workers within or partners outside who share similar job functions and objectives. The opportunity for corporate portal developers is to identify and tap into the underlying organization in disparate corporate information, which, if correctly exploited, can yield significant benefits for knowledge workers who are tasked with navigating the myriad internal and external sources of connections among people, processes, and the information sources. As organizations realize their customer data and the intellect of their knowledge workers are their greatest assets, intranets will grow and

their portals will be better interconnected through increased emphasis on taxonomy and tagging management in support of more relative and faster search and navigational finds. The goal is to provide virtually all the information knowledge workers need at their fingertips to be highly productive and to sustain competitiveness.

Portals will become a competitive necessity in many sectors without which a corporation would be at a serious disadvantage. Content which once was lost in a sea of intranet websites, obsolete navigation hierarchies, or legacy data stores will one day be integrated into a single and more personalized experience -- dramatically increasing the quality of results made and thereby improving the odds that more can be accomplished with them. This, by inference, leads to increases in productivity and greater value. Corporate intranets built today will eventually be logically brought together, optimized and deployed correctly making them, in effect, the backbone of the knowledge portals of tomorrow.

B. MOTIVATION

As organizations continue to consume massive amounts of data, the number of portals deployed gradually increases to personalize and meet the needs of specific groups. In fact, the primary impetus behind portal adoption is deep user dissatisfaction with a one-size-fits-all Internet as well as unwieldy intranets. Usually the larger an intranet grows the inherently more inefficient and ineffective it becomes, further inhibiting information from becoming knowledge. Nevertheless, there is great potential to transform large intranets into productivity applications in their own right and a growing number of corporations are using portals to begin turning this into a reality. As a result, the critical work of software engineering in applying data abstraction as well as software architecture design and support required to build efficient and effective intranets is playing an incontrovertible and significant role.

The primary objective of creating Intranet portals is to create value through quality improvements in productivity and customer satisfaction by the exchange of desirable business related knowledge. Recent interest in the software engineering community in portal processes to leverage knowledge reflects this aspect of the quality paradigm. One fundamentally unique way of seeing and solving problems in the quality paradigm is to focus on processes rather than products, services, mistakes, errors, or traffic volume. Work in the quality paradigm deals with recognizing, defining, measuring, analyzing and improving processes. A central value of the quality paradigm is that processes must not merely be improved but they must be continually improved. The same holds true in measuring and improving value created by intranet portals. Only those organizations that continue to refine and measure the subsequent impacts of their portals will realize greater value gains.

The value portals apparently already bring to enterprises is strongly evidenced by the recent surge in portal investments[1]. Corporations of all kinds expect big benefits such as better access to information -- but large majorities of them say they do not measure intranet benefits because they are too abstract and don't convey the impact that their portals have on overall corporate performance. Nevertheless, knowing how intangible assets affect performance can mean the difference between growth and erosion of value. Intranet analytics is not an oxymoron as perceived by many, but it can be counter-intuitive and more research should be devoted to this area to lead the way in how to seize considerable new opportunities.

Presently, most IT organizations today do not have clear ways to calculate and communicate the direct benefits produced. Similarly, the software engineer community lacks deep theoretical understanding of the means by which core concepts of their field are linked to value creation, e.g., modularity in design (architecture), iterative

[1] According to one research firm, 60 percent of Global 2000 companies will have at least a first-generation employee portal this year and most of these portals will be designed primarily for employees' use (Anderson, pp. 43-57).

development methods, testing, etc. Thus, the current conceptual state of the art in software design and engineering is not clearly optimal for value. To the extent that it is not, society is not getting its money's worth from its software engineers. The emerging area of strategic analysis, software and domain design, undertaken in this research, takes the value-based view as a premise and seeks to develop and enhance fundamental software architecture and design theories, tools and methods by basing them on emerging models of value and value creation which are supported by both quantitative and qualitative metrics groupings.

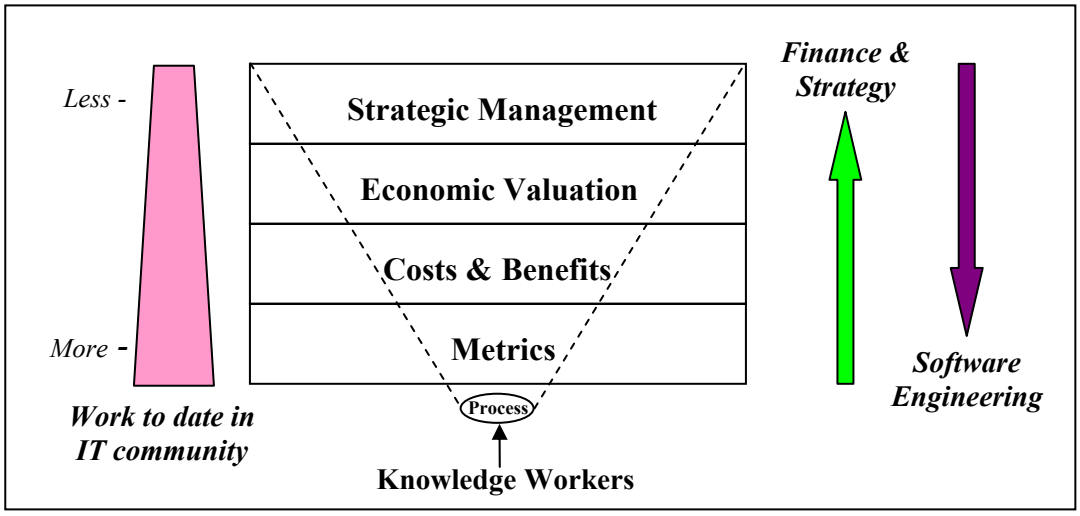

Figure 1. Software Engineering Approach to Metrics

Information technology contributes more than data; it impacts a wide range of business processes that produce the required results to sustain value. It is in the analysis of these processes that answers to productivity can be derived. However, in most corporations there is no consistent, visible and uniform way to measure, manage and maximize the effectiveness of IT-enabled business processes of intranets. The motivation for this research is to provide a model, (*Intranet Efficiency and Effectiveness Model*, IEEM), and means of measuring the effectiveness of a processes integrated approach to quality through the establishment and recommended application of a baseline set of metrics and their conversions ratios that collectively and logically relate to key strategic

business requirements that drive value. Hypothetically, incremental results are achievable. This paper further outlines *who* should do the analytics *and how* in order for corporations to move forward with a continuous optimization process.

C. CONCEPTUAL SCOPE OF RESEARCH

Taking an interdisciplinary approach to this matter reveals the underlying segments that constitute an intranet and their dependencies. This can then be delineated, resulting in logical constituents that can be measured with groups of related metrics using multiple tools and techniques. The supposition is derived metrics that indicate effectiveness of a corporation's intranet portals are achievable and can be presented to provide meaningful feedback as well as actionable steps to further improve portal operations by taking into account and uniformly applying across all portals, a more holistic and coherent combination of metrics from *all* intranet segments. The end result and goal is to drive more value back into an intranet than would be garnered otherwise through more precision tuning of portals in support of business requirements based on audience needs and behavior as well as usage traffic figures and conversion rates.

D. RESEARCH CONTRIBUTION

Although most intranet portal owners agree in principle that measurement is important for success, many fail to properly implement a portal management effort unless budget justifications are required. Indeed, research indicates that 76% of Global 2000 firms do not conduct benchmarking even once a year.

- only 19% of Global 2000 firms conduct it annually.
- just 14% continually refresh benchmarks and use the results regularly in performance reporting (Roth, 2002).

There is a woeful lack of forethought in selecting metrics for intranets, soliciting focused and "impactful" surveys for feedback or how to do appropriate analysis with it to provide actionable steps to improve portal effectiveness. Across any given corporation, most intranet portal measurements today are based almost exclusively on *usage* statistics –

with little or no thought given to *design* and *user experience* factors – and are applied in a freelance and non-standardized manner. While these metrics provide a basis to benchmark against competitors or other departments/groups within the organization, they provide no meaningful insight into how well businesses are achieving their strategic objectives.

As more and more portal mangers seek a means to ensure portals are being properly deployed and modified in support of their employees, their sponsoring business decision makers (BDMs) will search for a strategy to prove its success, and not one based strictly on conventional return on investment (ROI). Portal costs are akin to sunk costs and the actual costs to improve them usually only require analytical capabilities supported by minor and affordable modifications to the system and not costly, major hardware and software developments that require long stretches of time.

The most meaningful way to measure an intranet is by the effectiveness of its collective portals in support of business requirements. The delineation between costs and revenue versus effectiveness and productivity -- along with the lack of any straightforward model-based method to indicate the increase in the potentiality of events that lead to productivity gains -- is the reason why measuring intranets are often overlooked and misunderstood. The research surrounding the Intranet Efficiency and Effectiveness Model contributes to the methodology and analytic basis needed to select a baseline group of metrics and conversion ratios that help to logically and holistically prove out and optimize effectiveness of intranet portals as they relate to and bolster strategic business requirements which steer the productivity factors. An intention being corporations can use the six segment perspectives outlined in the IEEM to define, apply and refine a balanced set of metrics to begin measuring what is important, instead of what is available.

Though credit is due other perspectives, meeting the business requirements is the bottom line to measuring the effectiveness of any website. Within the total set of metrics, there needs to be some monetary business-based metrics, such as ROI, customer lifetime value, customer *recency*, conversion rates, and cross-portal referrals — depending naturally on the specific business objectives of the corporation's overall customer relationship and management strategy. To calculate these metrics, corporations need to integrate data from many sources, possibly spanning the complete enterprise. This can be quite challenging, but in the end organizations need these metrics as tangible feedback for their efforts in creating, maintaining and managing their Web portals, particularly if they are required to present IT-related initiatives in financial terms for return on investment analysis.

To this end, this research provides the first theoretical model for the *Family of Measures* approach to measure Web activity (Section II.B: *Review of Current IT Analysis Approaches*) as well as a holistic framework and multi-disciplinary approach not previously derived in viewing and measuring intranet contributions in the context of a corporation's overall critical business requirements by applying a balanced baseline set of metrics and conversion rations -- which merge website traffic data as well as user behavior – that are linked to business processes as they relate to knowledge workers, IT portal managers and BDMs. It also outlines *who* should do this *and how* in the form of a business intelligence team and further provides a means in which to calculate ROI for the metrics investment with a common unit of analysis for both aggregate and sub-corporate levels through a form of the Knowledge Value Added (KVA) and Activity Based Costing (ABC) methodologies.

E. WAY AHEAD

The following chapters address in sequence related work and their gaps, the conceptual framework of the Intranet Efficiency and Effectiveness Model introduced, how the IEEM is related and applied to strategic business requirements, followed by how

a return on investment can be calculated and by whom, before concluding with a summary and a recommendation for future related work.

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II. ASSESSMENT OF RELATED WORK

> The software development process must incorporate more and more strategic aspects. Project success is more about whether the software delivers value that's greater than the cost of the resources put into it - but that's very tricky to measure.
>
> Martin Fowler, Enterprise Software Consultant

A. CURRENT APPROACHES TO WEB MEASUREMENTS

The primary reason for most investments in information technology is to improve business processes. The problem becomes one of discerning how much value the IT will add to the processes. One way to answer to this question would be to determine how much return the IT provides at the aggregate (referred to hereafter as corporate) and sub-corporate levels. There have been numerous approaches to assessing the impact of IT on company economic performance at the corporate level of aggregation and sub-corporate levels (Brynjolfsson and Yang, 1996). The IEEM is the first theoretical framework that can comprehensively unify analysis to address this problem, regardless of level of aggregation.

Although a great deal has been written on how to calculate return of investments for the Internet, there is an appreciable lack of data on how to measure the effectiveness of an intranet. Current IT measurements either focus predominantly on online volume traffic or its ROI based on some monetary cost allocation calculation. The following table, taken from Models for Measuring the Return on Information Technology by Dr. Thomas Housel (Housel et al., 2001, p. 4), provides a snapshot of some of the predominant, current approaches. This proposal, A Metric Model for Intranet Portal Business Requirements, is appended at the end to provide a basis of comparison and to highlight its strengths over the other methodologies presented. A review of these approaches follows which identifies a number of problematic issues and limitations of each.

Approach	Focus	Example	Level of Analysis	Key Assumption	Key Advantage	Limitation
Process Of Elimination	Treats effect of IT on ROI as a residual after accounting for other more easily measurable capital investment	Knowledge Capital (Strassmann 2000a, b)	Aggregate corporate -level only	ROI on IT difficult to measure directly	Uses commonly accepted financial analysis techniques and existing accounting data	Cannot drill down to effects of specific IT initiatives
Production Theory	Determines the effects of IT through input output analysis using regression modeling techniques	Brynjolfsson & Hitt (1996)	Aggregate Corporate - level only	Economic Production Function Links IT Investment Input To Productivity Output	Uses Econo-metric Analysis on Large Data Sets to Shows Contributions of IT at the Firm Level	"Black-Box" approach with no intermediate mapping of IT's contributions to outputs
Resource-Based View	Linking Firm Core capabilities with competitiveness	Jarvenpaa & Leidner (1998)	Aggregate Corporate - level only	Uniqueness of IT Resource = Competitive Advantage	Strategic advantage approach to IT impacts	Causal mapping between IT investment and Firm Competi-tive Advantage difficult to establish
Option Pricing Model	Determines the best point at which to exercise an option to invest in IT	Benaroch & Kauffman (1999)	Corporate/Sub-corporate	Timing Exercise Option = Value	Predicting The Future Value of An IT Investment	No Surrogate For Revenue At Sub Corporate Level
Family of Measures	Measure multiple indicators to derive the unique contributions of information technology at the subcorporate level	Balanced Score-Card (Kaplan and Norton, 1996)	Sub-corporate	Need Multiple Indicators to Measure Performance	Captures Complexity of Corporate Performance	No Common Unit of Analysis, No Theoretical Framework
Cost-Based	Use cost to determine the value of information technology	Activity-based Costing Johnson & Kaplan (1987)	Sub-corporate	Derivations of Cost ≈ Value	Captures Accurate Cost of IT	No Surrogate For Revenue At Sub Corporate Level, No Ratio Analysis
Intranet Efficiency and Effective-ness Model	*Use hard and soft combinations of metrics from each segment of intranet*	*Business Requirement to Audience Metrics (Jacoby 2002)*	*Corporate/Sub-corporate*	*Multiple groups of logical metrics associated to key business requirements of productivity*	*ProvidesTheore tical ramework and Surrogate for Revenue At Corporate and Sub Corporate Levels*	*Not all subjectivity in analysis is completely eliminated*

TABLE 1. COMMON APPROACHES TO MEASURE THE RETURN ON IT

B. REVIEW OF CURRENT IT ANALYSIS APPROACHES

Research on the problem of estimating the value added by IT can be categorized at two levels of analysis: corporate and sub-corporate. At the corporate level existing approaches can be categorized as: Process of Elimination, Production Theory, and Resource-based View. Two of the prominent sub-corporate approaches can be categorized as: Family of Measures and Cost-Based. The Options Pricing Model and IEEM span both levels in that they can be used to assess corporate level IT investments or individual IT initiatives.

1. Corporate Analysis

The corporate level approaches are largely designed to help investors understand the contribution of corporate assets such as knowledge and technology (e.g., see Brynjolfsson and Hitt 1996, Brynjolfsson and Yang 1996, Im, Dow, and Grover 2001, Strassman 1997) to a firm's or industry sector's performance.

a. Process of Elimination

In the "process of elimination" approaches, the various costs for capital (e.g., equipment, real estate, raw materials) are removed leaving the cost of technology. Once the costs for capital are accounted for and income proportionately reduced, the residual is asserted to be revenue attributable to knowledge capital and/or information technology. Following this approach, all costs attributable to all cost categories, except IT, would reduce the income proportionately leaving the income attributable to the IT.

The limitation of these approaches to measuring the value added by IT to core processes is that they only pertain to the aggregate view. It is unlikely that such aggregated views would allow precise inferences about performance improvements derived from IT initiatives at the process level (Birchard and Nyberg 2001).

b. Production Theory

Others have used economic-based production theory to determine the various contributions of inputs to the firm's output. Hitt and Brynjolfsson (1995) measured the value of IT in terms of productivity, profit, and consumer welfare. Extending this research, Brynjolfsson and Yang (1996) report comprehensively on IT's effect on overall company performance. The resulting "production function" (Brynjolfsson and Hitt 1996, p. 545) can be modeled using economic theory to determine the unique contributions of IT with computer capital, non-computer capital, information systems staff labor and other labor expenses as the inputs (which represent all spending by the organization as well as all capitalized investment) and output in terms of dollars or physical units. This neoclassical economic theory of production treats firms as "black boxes" (Brynjolfsson and Hitt 1996, p. 544) and attempts to deduce the relationship between inputs and outputs without reference to activities within the company.

The strength of such approaches derives from their reliance on commonly accepted financial-economic theories and the use of existing accounting data. This makes them transparent for review and comparison. However, various criticisms have been leveled at these approaches including that the research using these approaches does not "adequately control for other factors [i.e., other than information technology] that drive firm profits" (Bharadwaj 2000, p. 170). Along the same lines, Im et al. (2001, p. 104) stated, "Because many factors influence firm performance, it is difficult to establish causality between IT investments and firm-level output performance." This lack of intermediate mapping of IT impacts on processes makes this class of approaches problematic for providing the kinds of feedback necessary to help management determine whether their IT initiatives are really paying off.

c. Resource-Based View

Researchers using the resource-based view attempt to overcome the shortcomings of the prior methodologies for estimating the value added by IT by

reformulating the problem. They attempt to link a firm's performance to IT resources that are firm-specific such as knowledge, capabilities and unique core processes (Bharadwaj 2000, Jarvenpaa and Leidner 1998) . The assumption is that these unique resources and capabilities are difficult, and very expensive, to copy and therefore provide competitive advantages leading to superior economic returns.

A limitation of this view for tracking the specific value-added contributions of IT is that it does not posit a common, granular unit of analysis that would allow an unambiguous linkage or mapping between a firm's use of IT and the resulting cost-benefits performance. Using this approach, it would be difficult to unambiguously determine the specific contribution of a given IT initiative.

d. Option Pricing Models

The application of option pricing models (OPM) to IT investment has attracted increasing attention (cf. Benaroch and Kauffman, 1999). Basically, the OPM approach in evaluating IT initiatives determines the best point at which to exercise an option to invest. Applied in the context of real options investments, there are six variables used to make the decision: The current value of the underlying asset.

- The time to the decision date.
- The investment cost or exercise price (also called the strike price).
- The risk-free rate of interest.
- The volatility of the underlying asset, which is often the only estimated output.
- Cash payouts or non-capital gains returns to holding the underlying assets. (Amram and Kulatilaka 1999, 37).

The OPM approach has some implicit assumptions that are potentially limiting. For example, net present value is used in the calculation of risk and requires an assumption about projected cash flow. However, there is no cash flow directly

attributable to most corporate processes. This is because the outputs of those processes are not salable to end customers without the outputs of all the other processes, limiting the applicability of this approach at the sub-corporate level.

2. Sub-Corporate Analysis

The current aggregate level approaches do not appear to resolve the problem of determining the IT impacts on process performance (sub-corporate level) with enough precision to benefit managers who must implement changes at the process level. Hence, other approaches for addressing problems of measuring the impact of IT have focused at the sub-corporate level.

a. Family of Measures

The family-of-measures approaches, Balanced Scorecard and Intellectual Capital Navigator advocate the need to measure multiple indicators to derive the unique contributions of information technology at the sub-corporate level. The "Balanced Scorecard" provides typically from four to five key performance indicators selected by management to determine the success of a given strategic organizational thrust (Kaplan and Norton 1996). In the case of an IT initiative, the organization's management team might select this initiative for assessment via a set of key performance indicators, for example including level of customer satisfaction, financial performance, employee satisfaction and core process performance. Edvinsson and Malone's (1997) Intellectual Capital Navigator allows a firm to identify up to 140 variables that account for the performance of its intangible assets including IT (i.e., a subset of its infrastructure assets). Examples of these measures would include: laptops/employee, IT expense/employee, IT staff/staff total, IT literacy of employees, and so on (Edvinsson and Malone's 1997, p. 109).

b. Cost-Based

Many of the cost-based approaches use underlying replacement cost (e.g., transfer pricing, internal markets, outsourcing) to determine the value of information technology (Housel and Bell 2001). These approaches assume that the cost of IT is in some way proportionate to its value. For example, the cost to replace or outsource IT is presumed to be proportionate to the value it adds to process performance. Other approaches assume that by introducing a market mechanism where corporate managers submit bids for IT services, the resulting market price is representative of the IT's underlying value (Ba, Stallaert and Whinston 2001).

C. HOW THE IEEM APPROACH WOULD DIFFER AND COMPLIMENT

The Intranet Efficiency and Effectiveness Model views intranet portal-related initiatives and application of its associated metrics baseline and conversion ratios in the context of the organization's overall strategy by linking metrics groups to critical business requirements and how they effect and are affected by knowledge workers, portal managers and business decision makers. Along these lines, the framework of IEEM actually complements and provides the first theoretical model based on all segments of the intranet processes for the Family of Measures concept. In addition, the metrics baseline is similar to that of the Balanced Scorecard but extends it by providing context linked to strategic business requirements. The ROI for IEEM (see section V.E: Objective of ROIMI) is similar to Cost-Based in that it is founded on cost-benefit analysis with time being the common unit of analysis which can be used at both the corporate and sub-corporate levels, a faculty lacking in the other analysis approaches.

The main assumption when a corporation assumes the IEEM's supporting metrics to serve as a baseline to perform analytics is that it already has an intranet (i.e., sunk cost as a part of doing business) and believes there is room for continuous optimization in it to increase its net value. The ROI conjectured is essentially a cost-benefit between the time needed to invest in applying and acting upon the results of the metric analytics and the

results in time reductions due to subsequent changes introduced by this analysis process, i.e., shorter completion time of a series of business related tasks (sub-corporate level) and speed to market or completion of a project (corporate level).

1. Family of Measures Similarities and Differences

The two of the sub-corporate approaches similar to IEEM are Family of Measures and Cost-Based. The premise of the Family of Measures, like that of IEEM, is that no single performance measure can encompass the range of work undertaken by most business processes. A range of measures, therefore, must be used which reflects the main inputs and outputs of the department. A "family" of measures attempts to measure as low as possible to reflect the work of a department in a way no single measure can. For example, the key performance measures chosen for a management accounts department might be:

- Reports with errors / Total Errors
- Actual cost / Forecast Cost
- Average Report Production Time
- Reports late / Total Reports
- Number of reports / Number of staff
- Average Cost of Reports

These measures should encompass the range of inputs used: labor, materials, capital and equipment, and the measures should encompass the factors of quantity, quality, timeliness and cost. A Family of Measures such as these, related to the real objectives of a department, allows the level of performance to be measured and monitored over time to establish whether it is stagnating, declining or improving. It allows the effect of productivity initiatives to be established and focuses managers' attention on the need to improve productivity -- a true and proven way to improve a company's competitive position.

Unlike the IEEM and its supporting baseline of metrics and conversion ratios, the limitation of these Family of Measures approaches is that they do not provide a common theoretical framework and consequent common unit of analysis that would tie investments in IT unambiguously to a firm's economic performance (Bharadwaj 2000). The lack of a common theoretical framework leads to an inherent problem of subjectivity. Though subjectivity is not completely eliminated in the IEEM, analysts and researchers of the current Family of Measures approaches are left to develop subjective assessments of how the variables relate to each other rather than the guidance of a formal framework or mathematical model. In most cases, simple normalization to an interval scale is used along with an assumption of linearity of the relationship among the variables with weightings provided by the subjective judgments of management about the importance of the various measures (Housel et al., 2001, p.9).

2. Cost-Based Similarities and Differences

Although there is also a cost-benefit analysis involved in the metrics supporting the IEEM, the generally accepted conceptual limitation of the cost-based approaches to generating a return on investment-type performance ratio is that they do not have a surrogate for revenue (Johnson 1992). The problem of using this method for evaluating the value added by IT, is the fact that if cost (or any of its derivatives) is used as a surrogate for value, then all the information is contained in one term of the ratio, i.e., the denominator. The data source for value should come from the revenue side of the firm's performance (i.e., numerator) and the data source for cost (i.e., cost) should come from the cost to produce the firm's outputs (Housel et al., 2001, p.10). The applicability of one popular cost-based technique, known as Activity Based Costing (ABC), to determne ROI for the IEEM and its baseline of metrics and conversion rations is examined and explained in greater detail in Section V.F.2: *Surrogate for Value*.

D. SUMMARY

Intranet portals are evolving out of necessity to better manage data and more fully meet the needs of its audience: the enterprise BDMs, portal owners and managers and knowledge workers. Intranets are built to promote effectiveness and productivity that indirectly generate more precision and revenue. Modifications to intranet portals and how to measure their efficacy are not exclusively about the immediate and direct return of dollars in and of themselves as many ROIs imply. The key is to optimize the portal infrastructure that already exists and the processes that take place therein with minimal costs. The following IEEM and supporting metrics provide the holistic framework and means in which to achieve greater optimization through comprehensive and logically model-based quantitative and qualitative cost-benefits analyses which facilitate seeking, interpreting and gaining additional value..

III. CONCEPTUAL FRAMEWORK

> Everything should be made as simple as possible, but not simpler.
> Albert Einstein

A. GENERAL OUTLINE OF APPROACH

To better appreciate why portals exist and are occasionally re-designed, one should first understand the different domains that support the management of making information findable and understandable, their distinct *constituents* and how these are segmented to sustain key business requirements. The IEEM and its underlying baseline of metrics were determined by a series of model/diagram procedures that were used to break down the composition of an intranet. In order to reveal an abstract *domain analysis*[2] view and the association therein linking metrics groups to critical business requirements, an *affinity diagram* is used to create the conceptual model which separates the intranet into distinct and unique segments in order to help map out the problem/solution space analysis (see Figure 2, *Intranet Domains and Segments*). On top of this diagram the various users and their roles are identified within each segment (see Figure 3, *Constituent Distribution in Segments and Teams Responsible*). Then an *interrelationship diagram* is substituted on top of the affinity diagram to highlight where pertinent metrics and their logical relationship between related users and their roles exist (see Figure 4, *IEEM Outline of Metric Types and Examples in Each Segment*). These metrics are further broken down into hard, soft and derived forms and are also outlined on the diagrams as well as put into a *cause and effect tree* table (see Figure 7, *Ranking of Key Intranet Metrics by Segment*) which shows the impact of these metrics to users as well as strategic business values. Lastly, the table is put into a *prioritization matrix* (see Table 2, *Example of One Metric Breakdown*, and for a fuller breakdown Appendix D,

[2] Domain analysis is a systems analysis for multiple related systems. There is no standard definition of domain analysis; several domain analysis methods exist. Common themes among the methods include:

- mechanisms to define the basic concepts (boundary, scope, and vocabulary) of the domain that can be used to generate a domain architecture to describe the data (e.g., variables, constants) that support the functions and state of the system or family of systems.
- identify relationships and constraints among the concepts, data, and functions within the domain identify, evaluate, and select assets for (re-)use develop adaptable architectures.

Intranet Portal Metric Breakdown) to illustrate levels of importance and to establish a baseline of metrics in which to commence with measurements. Appendix D is the current proposed baseline set of metrics and conversion ratios that result from high-level analysis of intranet efficiency and effectiveness factors that gauge and achieve greater value and value-creating benefits.

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* that has been missing in which to measure all important facets of intranet processes critical to assessing value. Nevertheless, its holistic approach does not eliminate subjectivity altogether as it accounts for critical qualitative factors which are often, if not entirely, overlooked in other commonly used measuring techniques which concentrate on usage statistics, such as traffic volume. In short, as a result of being a more comprehensive model some soft metrics must be taken into account which are not strictly quantitative or without human interpretation or assumption. Nevertheless, when parties agree upon a relatively well-defined set of performance metrics, it is possible to have a relatively unambiguous collaborative interpretation of the phenomenon (Baskerville, 1999, pp. 12). In addition, many of these soft metrics can be interpreted quantifiably (see Section IV.B.2: *Periodic Soft Metrics*).

Invariably, numerical constructs and identifying assumptions regarding cost savings or capital investment and revenue generation are problematic. There is no hard and fast rule for defining these assumptions; however, a comprehensive model that stresses strategic, functional and technical fit, and seeks to identify opportunities for process improvements, is more likely to result in top management support because it is based on their direction for the organization, not merely the merits of a particular technology. Along these lines, IEEM is particularly well suited to concurrence because it systematically takes into account user behavior and feedback which are critical facets to understanding and optimizing processes which propel intranet utility.

1. Domains and Segments Underlying the Intranets

The segments outlined below represent six perspectives of intranet effectiveness measurement, all of which have an underlying dependency on each other. Efficiency and routing provide the basics that must be maximized before content and design can become effective. Content and design may then contribute to overall channel effectiveness which, in combination with other channels, provides a healthy bottom line: meeting the business requirements. Corporations should take the underlying dependency into account, to make sure there is an effective growing path as they phase in their intranet analytics.

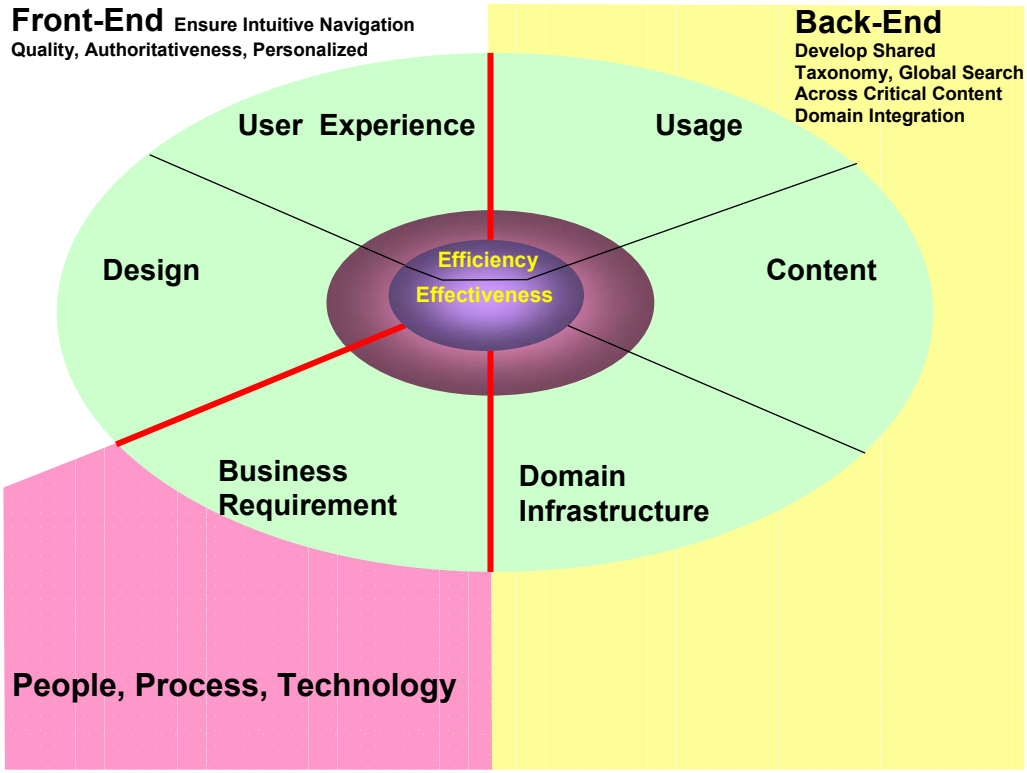

Figure 2. Intranet Domains and Segments [3]

[3] The reason for the delineation and the difference between efficiency and effectiveness shown above is addressed at the end of Section III.B, *Hard, Soft and Derived Metrics for the Intranet*, and again in context to Return on Investment considerations in section V.D.2.a, *Quantitative and Qualitative.*

Web analytics are a vital part of managing any Web portal, but the terminology, the technology and its use are far from being mature. A major obstacle that inhibits enterprise-level valuations of virtually any kind is the lack of consistent data definitions across different portals/groups. Consequently, the IEEM provides a comprehensive reference of this sort to alleviate uncertainty and facilitate concurrence (see Appendix F, *Glossary,* for a comprehensive and analytical set of terms oriented for an intranet). Similarly, this section following explains the model parts illustrated in Figure 2 above:

a. Domains

Segments and constituents of the intranet fall into one of three domains: Front-end, Back-end and People, Process and Technology:

(1) Front-End. Front-end is the processes in which a knowledge worker has a more direct interface, i.e., user experience and design or presentation of content.

(2) Back-End. Back-end is the processes that take place that a knowledge worker does not see, but can be objectively measured, i.e., by directly interpreting server log-file data, packets or server requests.

(3) People Process and Technology. This domain is where challenges of people, processes and technology meet. For an enterprise intranet its purpose is to develop an improved information finding capability by providing an intranet environment that consistently supports both browse and search so that knowledge workers can confidently and seamlessly find the technical information they need to work effectively and efficiently, thereby increasing value.

b. Front-End Segments

The Front-end domain can be further segmented into two underlying areas that knowledge workers directly encounter:

(1) Design - Editorial Programming. The editor's experience should be a straightforward and consistent use of accepted best practices and best tools

available (approved by the company) to organize, access and re-use information in a desired manner to produce a desired outcome.

(2) User Experience. The relationship and cognitive connection knowledge worker has with the intranet and the information provided.

c. Back-End Segments

The Back-end domain can be further segmented into three underlying areas that knowledge workers don't directly come across while using an intranet:

(1) Usage. Technical information that relates to or specializes in techniques or subjects of applied science. Examples of this include numbers, time and duration along with *userID* and other work related information, i.e., department, location and position.

(2) Content. All documents -- help text, search results, forms, or application information -- that is delivered to a knowledge worker via a website, or application. It is both subject and specific information. For example, "People" is a subject and a person by name is specific information. Content is organized and found depending on its properties and associations. Being a subjective or soft metric measurement, the effectiveness of content is not something that can be evaluated using straightforward clickstream analysis (number of clicks to discovering information sought). It is not directly quantifiable and requires deeper insight into how the content of the website is perceived, for example, through the use of surveys.

(3) Domain Infrastructure. This is both the physical and software interaction representation of the relationships between the key elements within a design. It shows how these elements interact and must "transfer" information, so that the architect can build the environment. Examples are information maps (document elements), server topography, scope of services, permissions (ownership).

d. Business Requirements Segment

The focus of this segment is on the outcome of processes which enable value. IEEM regards process as the most critical enabler as improvements to it harness the merits of technology and provide back the greatest ROI and benefits to people.

(1) Business Requirements. The over-arching goal of grouping metrics within and across segments is to track how well business requirements are being supported which promote productivity. Although it is in a separate domain, all segments and their constituents from the Front and Back-end domains are designed to support critical business requirements (these requirements are outlined in section III.E, *Critical Business Requirements*).

2. Constituents

Constituents represent the data necessary in the Front and Back-end domains to find information in support of the third domain of People, Process, and Technology, specifically those requirements outlined in section III.E, *Critical Business Requirements*. The problem portals try to overcome is the same as the main reason they are created: to facilitate knowledge workers' discovery of all the information they need to do their jobs better. This then begs the question of: "What makes information more discoverable?" In order for information to be found and useful, portal design must sustain the following five vital *requisites*:

- Amount of information and meta-information (accessibility & manageability)
- Understanding information seeking and use behavior
- Navigation system design used to expose information (logically grouped)
- Confidence in quality of information and meta-information
- Relevancy to knowledge worker

Thus any portal desiring to be part of the information system should contain the following 13 constituents of discovering information that collectively sustain the requisites above. For the sake of simplicity and logic, six of these constituents are grouped below into the *Back-end* as are the remaining seven into the *Front-End* domains

(examples and a fuller explanation of each constituent can be found in Appendix A, *Constituents to Finding Intranet Information*):

a. Back-End Constituents

(1) Content Properties. An integral connection to content is its content properties. How content is described in order to affect the associations made in information retrieval and presentation is done through the content properties tagged to it. The characteristics of a content item make up its properties (a.k.a. attributes), such as author, length, name, etc., can be represented with a schema and supported by vocabularies of metadata (see Appendix A).

(2) Domain Information Infrastructure. The domain information infrastructure (DII) of a corporation is the sum and organization of all its data, taxonomies, tools and products. DII for Web analytics needs to encompass not all the information architecture that is available but only the best elements of these groups that can be further developed and integrated to improve control of content and context to meet knowledge workers needs and to exceed their expectations as well

(3) Domain Integration Framework. This framework is the virtual representation of the relationships/structure between the key elements within a design. It shows how these elements interact and must "transfer" information, so that the architect can build the environment. Examples are information maps (document elements), server topography, scope of services, permissions (ownership).

(4) Information Life Cycle. This cycle refers to events often repeated again and again in maintaining the relevance and accessibility of content in an information system. These events include updating, versioning, archiving and, when necessary, deleting.

(5) Search. Contrary to other common notions of search, within the IEEM it refers to an *application* employed by knowledge workers as a tool to find through direct surfacing or through surfacing an obvious navigational path.

(6) User Data. Data comprised of facts and figures a knowledge worker maintains private access to for knowledge retention and expansion. This is also referred to as "personalization".

b. Front-End Constituents

(1) Accessibility. Information is considered accessible when it is available, reachable, and understandable. (Assuming the information exists, ideally availability could occur from any *point of access* of and *point of entry* to the information system. Although how reachable information is depends on a number of factors; in this context the more information is compatible with a shared *Information Architecture,* the easier it is to retrieve. How this information is then packaged and presented in a fashion that can be understood by the knowledge worker is the last stage of accessibility.)

(2) Communication of Authoritativeness and Importance. Communication of authoritativeness and importance is achieved by communicating to the knowledge worker the credibility of an information system within that system to ensure confidence and trust in it, i.e., by showing that information comes from a respected and newsworthy source within the organization or outside, such as indicating that the article is from the Human Resource Department or from a well known national syndicate news organization. Another example of this is an organization intranet devoted strictly to business related websites.

(3) Communication of Understanding Search. Communication of understanding search is achieved by communicating to the knowledge worker meaning and significance of the information they are viewing by keeping it consistent to ensure acceptance and engagement, which further increases the audience's propensity to act on information in a common way, i.e., a *Glossary of Terms and Definitions*, Mouse-over, and best practices that are consistently applied to all intranet websites.

(4) Information Grouping and Segmentation. Information grouping is the logical collection of relevant and similar information, such as Content Nuggets and Categories respectively. Another aspect of this is information segmenting in

which only the relevant parts of a document, i.e. a paragraph or two are extracted and placed into fragmented groupings instead of the entire document. For example, first 200 words of a document returned as part of a search result.

(5) Navigation – Local and Global. Navigation is a method of moving through the domain framework by way visual presentation and consistent choices. Navigation has 2 basic types: local (also known as vertical) and global (also known as horizontal):

- *Local navigation* presents choices leading to subtopics or sub-areas of a site, usually defined by one of its main menu subjects (often referred to as a "drill down").
- *Global navigation* presents choices leading to other main areas of a site, i.e. Home; Search; About. Global navigation is consistent throughout an information system which allows knowledge workers to go across portals with a sense of familiarity.

(6) Personalization. A method of contextualizing information for a knowledge worker based on what is known about the knowledge worker. A site can use personalization to alter navigation and content presented according to the perceived needs of the knowledge worker. Examples include content filtering based on role; authentication based on name or status as a manager.

(7) User Assistance. Help made available to the knowledge worker while using an information system. User assistance provides guidance on how to use the system or additional help in finding information sought. Examples are help in context, feedback, Dialog boxes, and training, real time assistance from a human intermediary via a live chat.

The significance in Figure 3 below is the majority of constituents (seven) required in sustaining the five vital requisites to find useful information fall into the *Front-end* domain. This is crucial in understanding that the metrics taken from this end of the intranet must be taken into consideration if portals are to be measured more completely with better balance than they are today. Failure to do this results in less "impactful" actions taken to increase value.

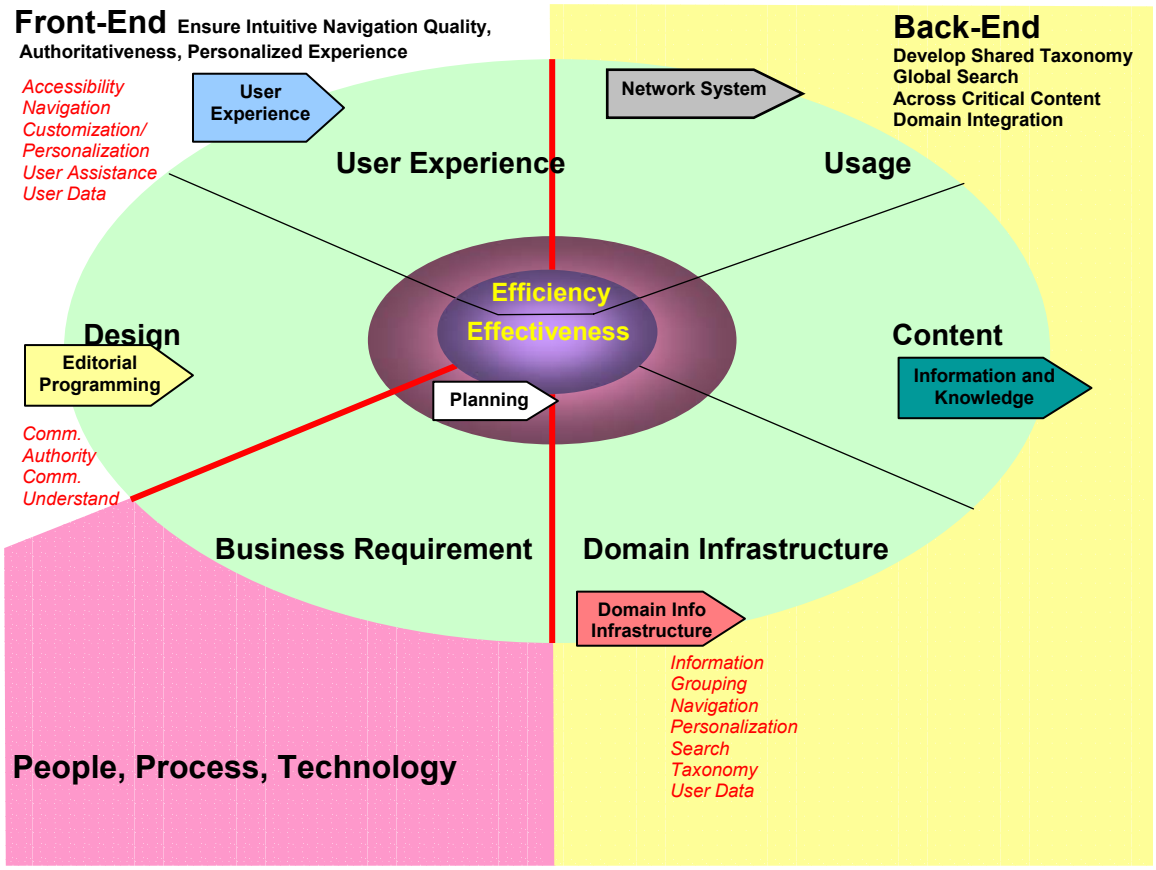

Figure 3. Constituents Distribution in Segments and Teams Responsible

B. HARD, SOFT AND DERIVED METRICS FOR THE INTRANET

To measure efficacy of a corporate intranet's portals requires a coherent and balanced combination of metrics taken from all segments. When these metrics are collectively and uniformly applied in periodic measurements, they can indicate tractable improvements over time. In order to do this, these metrics should be grouped into metric categories that support business requirements (see Appendix C, *Example of Metrics to Measure Intranet Performance*, and Appendix D, *Intranet Portal Metric Breakdown*). To this end, there are essentially three types of metrics: hard, soft and derived.

- *Hard metrics* can be objectively measured, i.e., by directly interpreting server log-file data, server requests, number of visitors over a given period of time, etc.

- *Soft metrics* involve many subjective and qualitative aspects that provide a frame of reference to interpret the results, i.e., survey results, visual analysis and usability.
- *Derived metrics* consist of hard and soft metrics from a variety of business and knowledge data involved and a subsequent educated assumption to draw conclusions, i.e., estimates of speed to market, value, loyalty and reach.

With respect to the preceding discussion and the introduction of these metric types, a theoretical model (see below Figure 4, *IEEM Outline of Metric Types and Examples in Each Segment*) can be created illustrating the placement of domains, segments, constituents as well as a sampling of metric groups that lead to deriving the successfulness of portals in supporting business requirements. A distinction can now also be made that separates efficiency from effectiveness: efficiency is measured with predominantly quantifiable or hard metrics, i.e., numbers and durations of time or both; effectiveness is this and more as it takes into account qualitative factors.

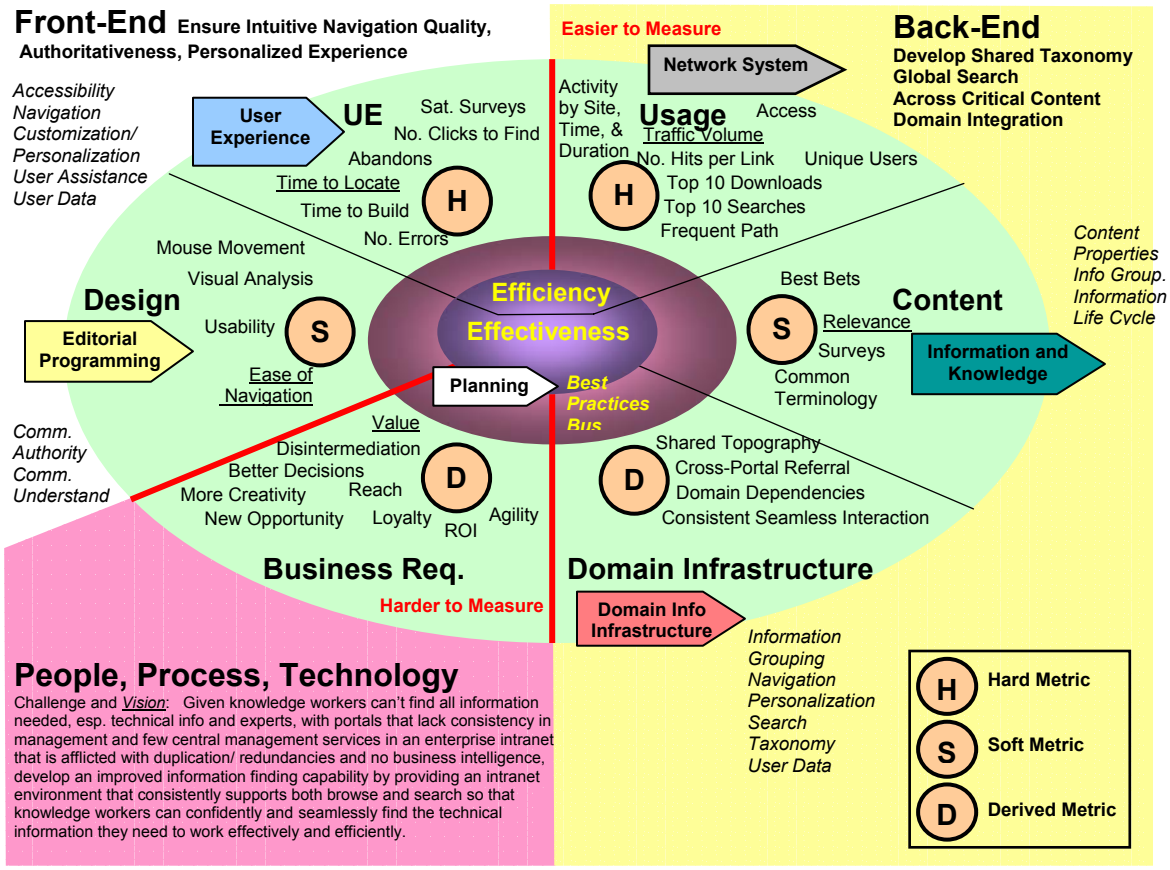

Figure 4. IEEM Outline of Metric Types and Examples in Each Segment

C. AUDIENCES

An intranet services three distinct audiences: *Enterprise* business decision makers, *Portal* owners and managers, and *Users* (or knowledge workers). The interests of all three of these audiences must be taken into account and distinguished as much as possible to better organize, prioritize and conduct metrics to measure effectiveness of an intranet. If people are to be given benefits from enhancements to the enabler of process, then it is essential to understand who and where they are as well as the roles they play in fulfilling business requirements.

1. Enterprise BDMs

Enterprise is the entire operation of a commercially organized company whose business activities are aimed specifically at growth and profit through the making of

products, buying and selling of goods, and/or providing services. The decisions made by high level executives based off what they or their staffs discover in the intranet can have a far reaching effect on the other divisions and departments throughout the organization. Enterprise BDMs are inevitably responsible for ensuring the company meets its business requirements, therefore providing insightful measurements to how the intranet is driving value back into the company is a litmus test of great importance to them.

2. Enterprise Portal Owners and Managers

Portals are a means into an information system, such as a corporate intranet, established over a coherent body of information or community of interest (a.k.a. a site) to provide more personalized and relevant information to its users. Examples in an organization are a Finance website or HR/Personnel website. Portal owners are usually the same as the director or general manager of a large group who directs the creation of the group's own portal to better support its own operations as well as service others. The more the information in their portal is leveraged by other portals and users, the more valuable their portal becomes to the company – a distinction for which owners strive. Portal managers maintain the portals and are responsible for helping the business owner meet business requirements through the optimization of the portal itself. Measuring how the portal is used in order to improve its performance in this vane is of peak interest to both groups of managers, with the preponderance of technical work left to the "hands-on" portal manager.

3. User or Knowledge Worker

A user is one who gathers, analyzes, adds value and communicates information to empower decision-making. The nature of 'k-work' is ad hoc, demand-driven and creative, both in the ability to create new knowledge greater than the sum of its parts and in the ability to present the knowledge in a highly communicative ways (Mattews, 2000, p. 39). A critical and mostly overlooked aspect in deriving and prioritizing more comprehensive sets of metrics needed to gauge effectiveness is a deeper study of the user experience along with more emphasis on specifically what users need in order to do their

jobs better, i.e., do users seek technical information — and if so — is it code or white papers, etc. In this way, portal optimization will gradually provide knowledge workers what they need as well as eventually giving them what they didn't know they needed (as content management and personalization techniques mature and become more sophisticated).

D. RELATIONSHIPS OF DOMAINS, SEGMENTS, AUDIENCES & METRICS

When the model is viewed to see how the domains break out with respect to audiences and metrics, the following conclusions stand to reason: Where users interact with metrics directly occurs in the Front-end. The majority of these metrics are "soft" in nature. Examples of popular soft metrics in the Design segment of the Front-end include visual analysis, usability and ease of navigation. However, there are a number of hard metrics which can be derived to better account for the User Experience segment, such as number of mouse clicks to find, time to locate information sought and page abandons. Where portal owners are most interested in and what portal managers most interact with are metrics in the back-end domain. The majority of these metrics are "hard" in nature. Examples of popular hard metrics include top downloads, unique users and duration on site. However, there are a number of soft-related metrics in this domain, particularly in the Content segment, such as surveys and best bets. Enterprise BDMs have a keen interest in the remaining segment, Business Requirements. These requirements are vital to the productivity of the company and are what all other segments from inception are designed to support and, by extension, what the metrics associated to them as a result of the IEEM should ultimately gauge, i.e., reach, loyalty and value. Figure 5 below highlights which metrics groups and types fall under each audience as well as how and where each corresponds to the Intranet Efficiency and Effectiveness Model.

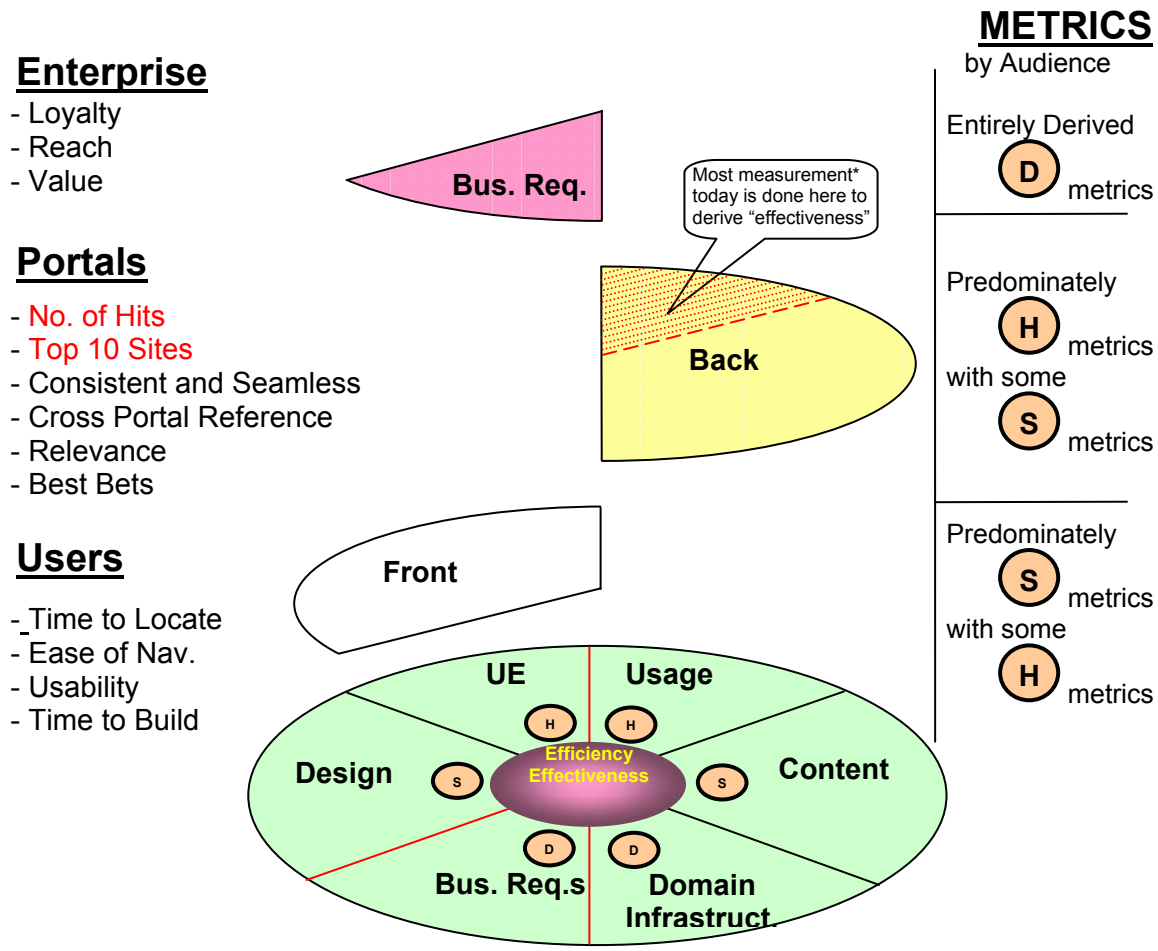

Figure 5. Overlay of Domains, Audiences and Metrics to Segments
* *Usage* segment metrics represent majority metrics used to determine portal performance.

After the variety of Web metrics are tabulated (see Appendix C: *Metrics to Measure Intranet Performance*), there are approximately 30 times as many metrics in the *Usage* segment as there are in the other segments. Moreover, these metrics are all hard metrics. The fact that engineers or people with technical backgrounds, who generally conduct metrics in organizations in the first place, tend to favor quantifiable metrics along with their simplicity and availability often results in an unbalanced approach to measurement, i.e., not taking in periodic and systematic soft metrics, particularly those that most impact users from the users perspective. Figure 6 below illustrates the relative number of metrics commonly used within each segment.

IEEM Metric Proposition:
Given there are few metrics available in other segments outside *Usage* and given that part of the premise of IEEM success is that finding information is more effective when *Font-end* factors are better accounted, then a more coherent selection of metrics from *Usage* AND from other segments needs to be created which take into fuller account user behavior and are delineated between efficiency and effectiveness for each audience (enterprise, portal and user) to provide more consistent and meaningful measurements that indicate improvement gain quantifiably, qualitatively and anecdotally.

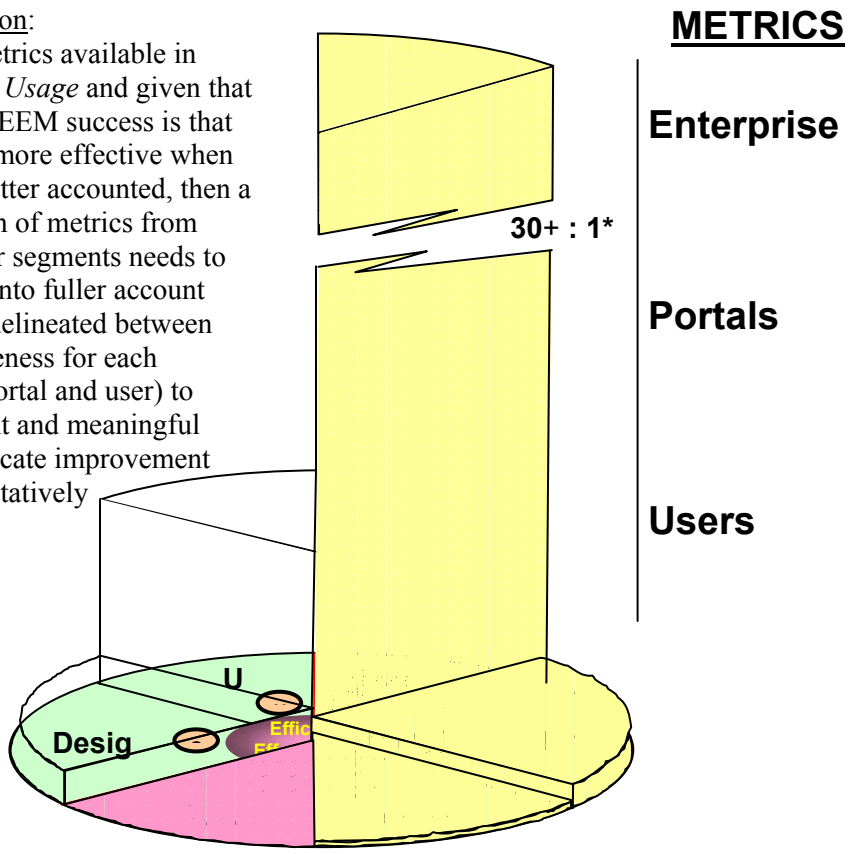

Figure 6. Intranet Segment Metrics Number Comparison
*Ratio of *Usage* metrics is 30+ to 1 over all other metrics from all other segment areas.

Many corporations today 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 (such as banner advertising, search engines and direct links). These metrics are popular and have been created in far greater numbers because they address the issues many departments and groups are facing today, namely accessibility and visibility of their website. These usage-related metrics are also popular because they can be done quickly and are more mathematically straightforward, favoring the proclivity of technically oriented workers who usually do the measuring, than the more time consuming soft metrics concerned with such things as user behavior and experience in the Front-end. In addition, routing metrics are relatively simple to understand at the

business level and the data is relatively easy to collect using the Web server log files. In fact, most Web analytics packages provide many routing metrics as pre-packaged reports, so it is natural to defer to these "out-of-the-box" tools. Unfortunately, since they are often used for Internet websites they are mistakenly applied in like fashion to corporate intranets and in a lopsided manner.

The two audiences with different needs that are driving portal software development are the portal managers who want a centralized framework for integrating and exposing line-of-business applications, and BDMs who want to make their knowledge workers more productive at sharing information and working together. In short, IT wants plumbing and BDMs want productivity. However, simple statistics alone on plumbing are not going to provide BDMs with all feedback needed to track improvements towards productivity. Oddly enough the audience most overlooked in ascertaining intranet performance is the user, despite the fact that many of the constituents necessary to sustain the requisites of finding information are found in the *Front-end* domain where the knowledge worker resides. Consequently, when selecting metrics to measure intranet effectiveness, due consideration needs to be given to metrics in the *Design* and *User Experience* segments.

E. CRITICAL BUSINESS REQUIREMENTS

By determining from *all* segments which complementary metrics can be coupled together in groups and which groups collectively best indicate how well a portal supports a business requirement, efficacy indications are attained. It is through the refinement of these combinations and groupings of metrics (each organization is unique and therefore should take steps to refine their metrics after periodic measurements) from all segments of the Intranet that leads to improvement in critical business requirements. The creation of these metrics requires a multidisciplinary approach and overview. A good baseline for these metrics and their conversion ratios is outlined in Appendix D, *Intranet Portal Metric Breakdown*, and the composition and manner a multidisciplinary team should administer and steward these metrics is presented in Chapter VI, *The Business*

Intelligence Team. To this end, the following critical business requirement terms are defined with regard to the quality paradigm's pursuit for greater value and within the context of what enterprises strive for to be productive:

1. Agility

Agility is the ability both physical and mental to react nimbly and deftly to change, i.e., alert combination of speed, skill and intelligence of work and business transactions to maintain a competitive edge. Examples of this include the ability to adjust to the information needs of a specific audience in order to provide them more personalized and relevant data in short order. This can be presented by how well portal managers analyze user behavior data taken during visits to sites and then optimize the sub-sites, pages and links accordingly.

2. Disintermediation

Disintermediation is the removal of parties normally involved in a process, i.e., a business transaction between producers and consumers. Examples of this are cross portal referrals that allow users to link where they need to be with not having to rely on others or begin making phone calls.

3. Loyalty

Loyalty is feeling and acting upon a sense of duty out of an attachment to something beneficial, i.e., devotion to a particular site that provides useful information to get a job done correctly and quickly. This can be indicated, for example, by the number of return users and growth of new users.

4. Opportunity

Opportunity is an advantageous chance: a chance brought about by coincidence or by design through a combination of favorable circumstances. For example, modifying

the type and number of links on what is determined to be the most visited page should present an opportunity for more traffic to links that were less exposed and frequented.

5. Reach

Reach is to extend the range of influence as far as a particular technology and service allows in order to impact on people or on a group, i.e., a portal to schedule and promote training wishes to touch as many potential customers within a company as possible. This can be determined in part by monitoring the number of new and unique users from different organizations and roles.

6. Return on Investment

ROI is a financial ratio measuring the cash return from an investment relative to its cost. Revenue is normally recorded when the product or service is delivered or ownership of it changes to the customer. Although costs can be associated to nearly every business function (i.e., budgets), costs associated with portals is less clear cut as well as the revenue it generates. Therefore, Intranet ROI should be gauged through indicators of effectiveness that support the business requirements designed to increase productivity. Measuring ROI within the context of this framework is derived from analysis taken from and qualified by all metric sub-groups within each portal and aggregately across the enterprise (see Chapter V, *Return on Intranet Metrics Investment*).

7. Value

Value in this context is an adequate or satisfactory return on or recompense for something of worth, importance and usefulness, i.e., how valuable is the functionality and performance of a portal. Although portals impact matters of monetary worth, their value expressed in terms of money is of lesser consideration compared to the value they return to an enterprise in managing knowledge and facilitating productivity. Similar to ROI, value can be derived by reduced time constraints and increased growth in current and new audiences.

8. Creativity

Creativity is the ability to use the imagination to develop new and original ideas or things, i.e., a new product line or approach to solve a problem. An example could be more cross portal referrals in which users of one portal are now directed to more relevant sources of information in other portals not previously known, thereby increasing their chances to be creative with this wider variety of data along with the subsequent and synergistic cognitive connections they will make between them.

9. Better Decisions

Better Decisions are all about all corporate employees making better informed decisions after considering all pertinent information and choices possible. This metric is certainly derived and anecdotal and is essentially a consideration process of a combination and culmination of derived metrics which gauge the direction of business requirement factors (see Figure 10, *Improving and Reducing the Decision Points*).

F. SUMMARY

In effect, the inter-disciplinary derivation of the IEEM represents a form of data abstraction at multiple levels, making it an *art* as well as a science. It is representative of why software engineers who are tasked to do this type of work benefit significantly more from multi-disciplinary experiences than they would from predominately one background. This holistic approach is essential to determining all segments and their role in the *human* information processes within an intranet. For example, defining a business by the number of "customers" it possesses is meaningless because loyalty continues to elude many sites. Thus, businesses must evaluate themselves with metrics that provide meaningful insight into how well they execute their critical business requirements, not merely how well they are able to drive visitors and elicit sporadic transactions. The IEEM framework helps fulfill this need. Although no single tool addresses all perspectives equally well in an efficient manner, corporations need to realize that

measuring the effectiveness of activity on intranet portals requires periodic application of multiple tools and techniques. How to apply the IEEM in light of this is addressed next in Chapter IV, *Applying the IEEM Framework to Key Business Requirements*.

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IV. APPLYING IEEM FRAMEWORK TO KEY BUSINESS REQUIREMENTS

> Most of our intranet is about top-line growth, not the cost reduction associated with ROI. Intranet applications often provide new ways of working – and how do you measure that?
>
> Martin Armitage, Director of Global Infrastructure, Unilever Corp.

A. OUTLINE OF APPROACH

To date, there has not been a successful demonstration of the methods or strategy necessary to successfully implement a measurement technique that can indicate the effectiveness of an intranet. By soliciting the three audiences to determine which metric area is of greatest impact on their performance and satisfaction (these results can be ascertained or confirmed through analysis of *personas*)[4], metric areas from each segment can then be prioritized, logically grouped and then sub-grouped with specific hard and soft metrics supporting each group. All of which are related back to critical business requirements and divided among the audience most affected.

1. Matrix for Metrics and Prioritization

Figure 7 below shows an initial baseline estimation of the top several metric areas, which 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. The distribution of metrics is of additional interest from a theoretical standpoint because at least one metric area originates from every segment. This substantiates the assertion that more metrics need to be taken from more than the *Usage* segment if accurate and comprehensive measurements of effectiveness are to be indicated. Nevertheless, it is best to limit the number of metrics (the baseline focuses on seven) to include only those that directly correlate to a business benefit or else the analysis may become overly complicated, risking confusion, implementation and, therefore, credibility.

[4] If a business fails to understand its users, then it will probably create a poor product or service. Personas (or *User Archetypes*) are a way of depicting users of products, such as user behavior while visiting portal sites. Using personas allows development teams to focus more on design and apply appropriate effort.

Pri.	Type	Metric	Segment	Constituent	Business Requirement
1	S	Relevance	Content	Content Properties, Search	New Opportunity, More Creativity, Better Decisions, Value
2	H	Traffic Volume	Usage		Reach, ROI, Loyalty
3	H	UniqueUsers	Usage		Reach, ROI, Loyalty
4	D ->H*	Cross Portal Referral	Domain Infrastructure	Domain Information Infrastructure	Reach, Opportunity, Creativity, Disintermediation, Value
5	S	Ease of Navigation	Design	Navigation, Comm. of Understanding	Value, Loyalty
6	H	Top Downloads	Usage		Optimization, Value
7	S	Sat. Surveys	User Experience		Value, Loyalty, Reach, (Productivity)
*	H	Time to Locate	User Experience	Navigation	Value, Loyalty, (Productivity)
Must	S	Common Terminology	Content, Domain Infrastructure	Taxonomy	Value, Reach
Must	D ->H*	Shared Topography		Domain Information Infrastructure	Reach, Opportunity, Creativity, Disintermediation
(Business Rules)					
?	H	Access	User Experience	Accessibility	Value, Reach, More Creativity, (Productivity), New Opportunity (confidential info. handled correctly)

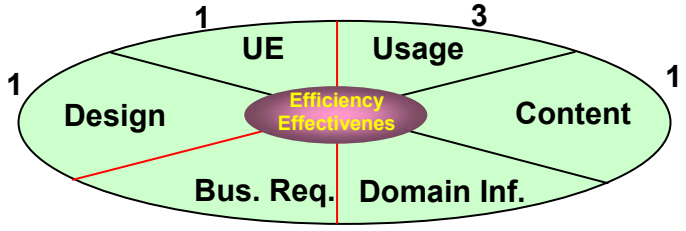


Figure 7. Ranking of Key Intranet Metrics by Segment [5]

2. Methods to Substantiate Measurements and Theoretical Analysis

There are three advantages to specifying down to single metrics logically grouped (see Table 2, *Example of One Metric Breakdown*, below for an example and Appendix D, *Intranet Portal Metric Breakdown*, for a far more complete breakdown):

- When the group consists of hard metrics, the data can be pulled automatically and routinely over time, i.e., create, query and retrieve server log files supporting metrics.

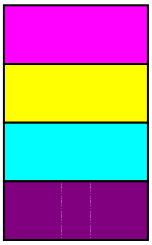
[5] A derived metric (denoted in the table by " * ") can become a hard metric within the Domain Infrastructure segment as the *perceived* physical and software interaction between key elements within the constituent of DII becomes concretely known and measured with precision, examples within Cross-Portal Reference and Shared Topography above are the ability to capture all unique visitors and information maps (akin to server topography) respectively.

- Qualitative data can be derived from logically grouped quantifiable data, for example, *loyalty*.
- When metrics are closely associated to user behavior and business requirements, analysis of the results lead to precision and powerful modifications which optimize the portal more in line with what needs to be done to improve its effectiveness.

Table 2, *Example of One Metric Breakdown*, on the next page presents an example of the thought process, reasoning behind it and how to interpret the results. Upper portion provides the what, where, who, why and how:

- *What* is the metric grouping that has been prioritized to most facilitate improvement in critical business requirements.
- *Where* locates at the level or segment this metric is most appropriate, for example it may apply to the entire enterprise or to mangers of a portal or to user.
- *Who* refers to audience(s) most impacted and interested in these results
- *Why* outlines the business process and is further delineated into three sub-categories of Business Issue, Business Question and Business Significance:
    - *Business Issue* refers directly to the critical business requirement and the supporting derived metrics.
    - *Business Question* relates the main concern from the perspective of either or combination of the business decision maker, portal manager or technical analyst.
    - *Business Significance* is the explanation to *Business Questions.*
- *How* is the best practice of applying the combination of metrics, providing a meaningful name for it and then calling out specifically each metric in that group

In addition, the table is color coded to match the model. 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 *What* category. For example, the color pink is used for all metric areas and metrics that relate to business requirements or are derived, yellow for Back-end and hard metrics, blue for Front-end or soft metrics and purple for best bets or practices.



-Business Req. or Derived Metric
-Back End or Hard Metric
-Front End or Soft Metric
-Best Bet or Practice

WHAT: UNIQUE USERS (Priority No. 3)
WHERE: Enterprise
WHO: Portal Owners and Managers

WHY HOW
<----------BUSINESS PROCESS----------><-----BEST PRACTICES-->

Business Issue: *- Metric Area*	**Business Question of Web Site Activity**	**Business Significance of Web Site Report Solution**	**Specific Metric Area** *- Specific Metric*
Retention: - *Loyalty* - *Value*	How effectively am I building loyalty with my visitors?	Determine how quickly you are building your user base to gage site audience enlargement and shrinkage over time and *vis a vis* other sites.	**Return Visitor Rate** - *Top Visitors (authenticated)* - *Visitors by Number of Visits* - *Visitors Over Time* - *Top Visitors by Hits (Leads)* - *Top Visitors by Hits Over Time* - *Top Visitors by Leads Completed* - *Visits by Length of Visits* * *All of the above for Returning Visitors* - *New vs. Returning Visitors*
Optimization: - *Loyalty* - *Value* - *Agility* - *Optimization*	What do my visitors come back for?	Analyze the most popular content for my return visitors in order to load and associate related information to meet demand.	**Return Visitor Target Pages** (correlate return visits with content): - *Top Returning Visitors by Hits* - *Top Returning Visitors by Hits Over Time* - *Top Returning Visitors by Leads Completed* - *Returning Visitor Visits by Length of Visits* - *Returning Visitor Page Views Over Time* - *Top Document and Content Group for Returning Visitors Over Time* **Survey** - *Internal Returning Visitor Session Activity*
Targeted: - *Reach* - *Loyalty* - *Value* - *Disintermediation* - *Access*	Where do my visitors come from (specifically, which regions, organizations, groups, roles)?	Identify where users originate and how your website is searched and browsed to understand what content areas are most effective to improve overall productivity for a particular region organization, group and/or role).	**Users by Region** - *Most Active by Visits* - *Most Active by Hits* - *Most Returning Visitors* **Users by Group** - *Most Active by Visits* - *Most Active by Hits* - *Most Returning Visitors* **Users by Role** - *Most Active by Visits* - *Most Active by Hits* - *Most Returning Visitors* **Usability Study** - *Internal Visitor Session Activity* - *Usability*

TABLE 2. EXAMPLE OF ONE METRIC BREAKDOWN (TAKEN FROM APPENDIX D)

In addition to being grounded in a theoretical framework, this approach can be applied practically to obtain estimates based in many common units which can be traced directly back to specific pages, links, design, etc. in a portal. Thus, how to go about deriving effectiveness of portals can be *operationalized* in relatively practical ways. Moreover, this approach is not reliant on any particular software, so it can be applied to any network regardless of its network operation system without additional costs to hardware or software, except saving space on a server to store queries of log files. Additional costs will be incurred however in the time charged by an analyst to conduct the metrics or, in the case of a larger corporation, the hiring of a full time project manager to do this work (the extent to which these costs impact ROI is addressed in Chapter V, *Return on Intranet Metrics Investments* and the composition and manner of the analyst(s) to do this work is addressed in Chapter VI, *Business Intelligence Team*).

B. BRINGING IT TOGETHER

However, setting a script to cull data periodically according to a baseline of metrics is not sufficient by itself. Four critical aspects are required to refine this approach:

1. Analysis of User Behavior

Analysis of user behavior patterns within portals on different sub-sites and pages is both informed by the results of metrics used and focused surveys, which in turn informs and refines subsequent metrics and surveys administered. For example, after observing that there is a high number of visitors abandoning a particularly important site, user behavior must be taken into account via a focused survey as well as direct observation and analysis of other metrics used at this site to ascertain the reason why this is occurring. In other words, until sound, lower-level algorithms are written to explain this behavior, analytical skills will be required by a knowledgeable "person in the loop" analyst (see Section VI.B.1: *Analyst*).

Segmentation provided by IEEM along with the attributes that are linked to a user's *loginID* add to the value of all intranet portal site metrics because it enables an organization to track disparate behavior in different segment areas by different audiences or customer groups. For example, determining how first-time users perform differently from repeat users is an important indication of how successful trial efforts will be at engendering long-term loyalty. Conversion rates and average orders will be lower than repeat customers, but narrower gaps will be easier to bridge. Useful comparisons that can be made which take into account the combination of user behavior with usage statistics are:

- Percentage of traffic and page views from new vs. repeat visitors
- Average browse from new vs. repeat customers
- Conversion rate for first-time visitors and download or browse time
- Conversion rate for repeat visitors and download or browse time
- Page views for new vs. repeat customers and visitors

The end result of analysis may dictate page re-design (i.e., content the portal owner wants users to see or believes they need is not being found because it is a few layers deep) or new content added (i.e., creating new links or placing content in a more visible location). Modifications are then followed by the same set of metrics to see if there is an appreciable change in patterns, for instance; more files are downloaded or users are staying at the site for longer periods of time than before.

The metrics must remain consistent or the same between at least two periodic measurements to accurately monitor the impact of the process changes made as a result of changes to sites. The fewer the changes, the more likely the cause and effect impact can be narrowly isolated and tracked. On the other hand, the greater the number of changes, the less likely all impacts can be accurately ascertained to the extent tractable value can be confidently traced to specific modifications. The application of metrics is a balancing act that should lend itself to fewer changes needing to be made over time as the portal becomes increasingly optimized. Figure 8 below, *Balancing changes with Cause and*

Effect, illustrates this point, showing the optimum range of changes that would normally occur when first applied to a newer portal and then over time as the same portal becomes more optimized.

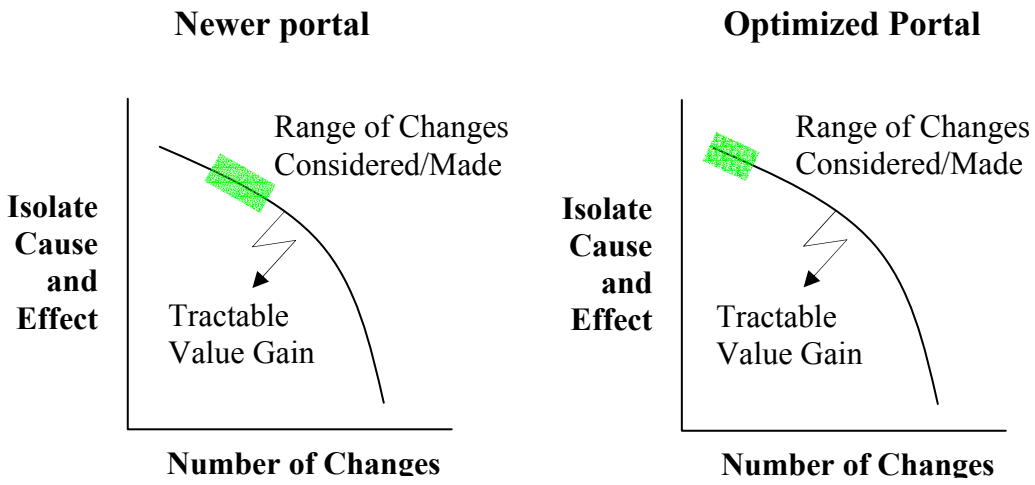


Figure 8. Balancing Changes with Cause and Effect

Taken a step further after modifications are made, if the metrics indicate users are staying at the same site for much greater lengths of time and in greater numbers, either additional surveys or metrics may be called for to determine what files are being opened and downloaded to better understand and react to what users want. This may be further substantiated with *clickstream* data collection in some instances to observe behavior. Although monitoring the every move of an employee may not be desirable, it is certainly legal and implications thereof are not as serious when it is administered to employees using company portal resources. Once compiled, the results from these metrics could affect caching of files and load balance of servers if the demand or user behavior is great enough to indicate the server is not configured properly for the type of load it is receiving due to (metrics related analysis) enhancements. Alternatively, it could simply mean that the site where this behavior is observed in large numbers, needs to be updated and/or

optimized to accommodate demand. All in all, the cycle is one of continued refinement of portals via metric and survey analysis to meet user behavior, expectations and needs.

2. Periodic Soft Metrics

Periodic soft metrics will be required to substantiate and confirm what groups of harder metrics indicate. From time to time, *Front-end* metrics need to be applied, i.e., usability studies and surveys from the *Design* and *User Experience* segments respectively. As suggested in the analysis of user behavior above, surveys can be more focused when based on patterns mapped by hard metrics. Surveys based off analysis of hard metrics are more succinct and provide desired feedback, increasing the likelihood more users will take time to complete them and with less frustration.

a. Surveys

A metrics and communication program is critical to both the communications process and to the development of a feedback loop so that IT can learn which initiatives provide the best business value. If the portal is 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 - and not solely with usage statistics. For example, the portal learning loop in Figure 9 below differs from other architectural elements in that it is not concerned with a specific aspect of information management, but in the ongoing effectiveness of the portal itself. It enables the portal to adjust heuristically to changes in the organizational work and information environment.

Surveys provide an excellent means to both inform and be informed by the learning loop. For example, raw visitors' metrics might indicate that an infrequently visited research page should be archived or discarded, when in fact a single recent access may have been the critical piece in securing a major new contract/revenue stream for the organization. Benefits from surveys are wide spread and may include other obvious but overlooked additions such as providing an online employee manual equipped with a

search engine, thereby reducing the amount of time people spend looking for the manual and information within the manual (see Appendix B, *Online E-Survey Example*, for a general semi-quantifiable online intranet user e-survey).

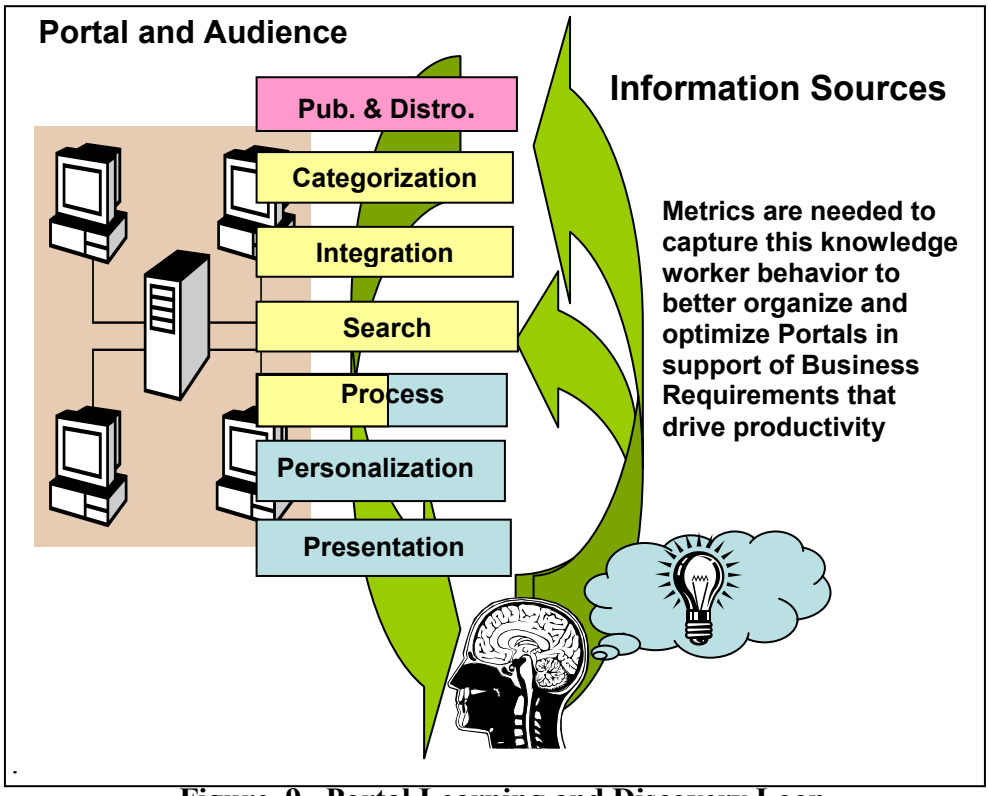


Figure 9. Portal Learning and Discovery Loop

Surveys can be administered dynamically and automatically online or the old fashioned way with pen and paper. The advantages of conducting surveys online are speed and convenience for all parties involved. Provided it is informed and succinct, knowledge workers will learn to accept them if they perceive it helps to meet their information needs. Surveys that warrant user clarification are far more practical when based in conjunction with results from a baseline set of metrics and conversion rations that are uniformly applied. Examples include interviewing some users and asking them to describe the products (getting their descriptive words) and then observing them complete their tasks on the site. Sometimes a survey may ask knowledge workers to

name the categories in which they expect to find the products. At other times a survey will look at the pages found at the next level down in the hierarchy to look for potential trigger words. These words can then be used to create a multi-level category lists and associate them to expand the current taxonomy for broader relevance (within portal context) as well as for tagging and storing *new* corporate information and data formats.

3. Capture and Apply Lessons Learned

Lessons learned need to be captured for submission as business rules or best practices when methods are proven which optimize portal performance. Optimization examples of this kind include:

- Identifying efficient navigational paths
- Pinpointing frequently visited areas of the site as potential high payoff areas
- Planting appropriate keywords within key pages to enhance placement within search engines
- Identifying which referring sites are most effective

Best practices that result in new policies, regulations and business rules need to be supported at the business owner level and higher to ensure recommendations are enforced and employed enterprise-wide with a smoother finding experience for knowledge workers (see section VI.A, *Role of Business Intelligence Team*).

4. A Single Reporting Service

A single reporting service needs to assist portal managers in administering and interpreting the results from the metrics baseline. This could be done by the creation of a product manager position (the person-in-the-loop) responsible for driving value back into the corporate intranet by maintaining and refining the metrics baseline through analysis and regular interaction with both users and portal managers. Without this entity, the execution of metrics for the intranet will most likely return to haphazard and freelance use of *usage* metrics focusing on peaks of volume traffic, much like it always has been.

To continue measuring intranet performance through sporadic and often ill-conceived groupings of metrics — taken almost exclusively from hard metrics in the *Usage* segment — will do little to drive value back into intranets or provide an accurate indication of the performance and effectiveness of portals in support of business requirements. In short, it would be near failure to continue the status quo in how intranets are measured today. A single repository service, based on a practicable model, would provide an improvement to current measurement taking techniques and shed light on a greater awareness of the importance and role of all segments underlying an intranet. Some of the benefits that should be achievable at minimal cost due to this centralization and tighter coordination are:

- Domain owners experience increased traffic by target audiences and higher levels of satisfaction with their domain.
- Domain owners and managers are more efficient with their own resources resulting in a whole that is more efficient than the sum of the parts, i.e., load balance, optimization of most frequently requested pages, downloads, etc. and more effective editorial modifications.
- Domain owners actively participate in the development and adoption of standards and best-practices, and are rewarded and recognized for their work.
- Enterprise experiences increase efficiencies (cost savings) due to elimination of redundancies and increased use of shared services, e.g. people databases and prescriptive architectural guidance.
- Increased employee satisfaction with search and navigation.

One other significant impact to a corporation of a single collection and reporting source is the benefit of being able to directly develop and refine its own model and database from immediate access to data. The hypothesis is that predictors (the metrics used) get better with practice and local data provides the best predictive base because it is

easier to filter out extraneous variables and to focus on key variables. The issues and benefits of a single reporting service are addressed in greater detail in Chapter VI, *Business Intelligence Team*.

C. PERIODIC REVIEW

Hard and soft metrics taken together with consideration given to their strengths and weaknesses allows an enterprise to make informed decision on the investment in, or the ongoing value of its data warehouse and portal system. Achieving success through the use of any performance metric will depend as much on *how well* it is applied as it does on *when* it is used. Studies based on samples and averages over time can make for easier and more credible comparisons. Hence, continuous benchmarking should be instantiated to confirm and correct baseline measurements and conversion rations through periodic (i.e., monthly, quarterly, annually) portal status reviews that measure progress against previous baseline results. For these reviews, portal owners should use the metrics to determine which roles and content are being underserved by the portal and which processes could correct this and better leverage the portals capabilities.

Three different scenarios would likely play out when an accepted baseline of metrics is applied to an enterprise: introductory, intermediate and developed implementation. The parties involved (see Chapter 6, *Business Intelligence Team*) determine all relevant metrics possible within the areas that make up effectiveness and then prioritize them in importance with regard to relevance, balance, accuracy and audience. For example, this work is based in part from data collected from Site Audit and Technical User Information Surveys applied against a baseline set of metrics and conversion ratios, such as those of IEEM (see Appendix D, *Intranet Portal Metric Breakdown*).

In the introductory scenario pre and post-pilot tests to measure underlying areas of effectiveness using the prioritized, combination of metrics based on lessons learned and results from surveys are scheduled to be conducted to find the right fit and rhythm in

metrics selected, i.e., how and when they can be most conveniently and operationally applied. Afterwards, there needs to be a confirmation meeting with Portal Manager and at least one *champion* BDM to establish agreement with the measurement approach and analysis to be conducted as well as to coordinate resources in order to conduct measurements and collect/compile data.. After the first pilot is administered to a selected group of portals (it may not be wise to apply the pilot to the entire enterprise until unforeseen kinks are worked out), data is collected as much by automation as possible and then compiled and collated for analysis. Based on the analysis, a few tractable changes to processes within the portals are made for further observation with the intent to improve productivity.

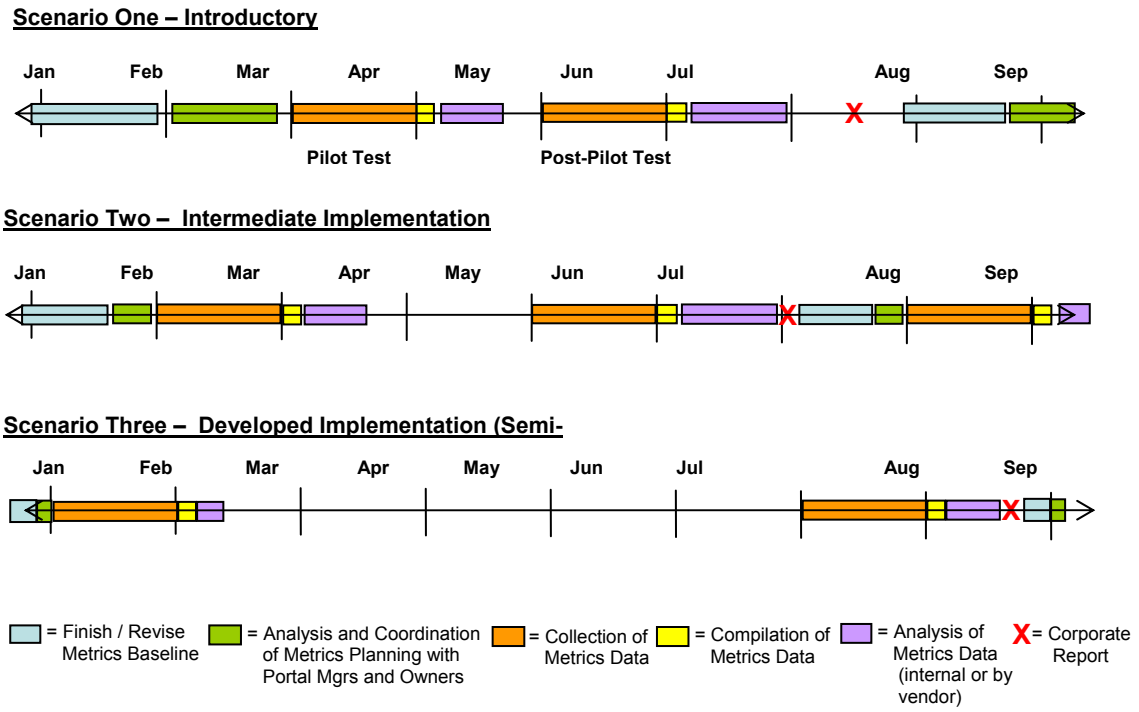


Figure 10. Implementation Scenarios for Applying a Baseline Metrics

The second post-pilot collection of data then takes place over the same time period, usually 30 days, with the same set of metrics and conditions as before, with exception of the process modification(s) made. After these results are processed, the

analysis may take longer to determine the impact of the changes and the extent to which they improved the odds to increase value. In some cases, this analysis may need to be facilitated by vendor support until the company is able and willing to do this nature of work by itself. Following the analysis period, the results need to be present by the analysis or business intelligence team to all the portal managers and owners of the portals monitored as well as their adjunct BDMs if possible to provide executive level reaction and feedback. At the end of this meeting, there should be a wider and better understanding of the necessity and impact of a baseline set of metrics and corresponding conversion ratios grounded in the IEEM.

Subsequent measurements need to be taken periodically and preparations for improved and expanded runs of the metrics program may eventually become a regular job for selected employees at different levels. Over time, less frequent measurements are needed as the implementation reaches the developed scenario, whereby measurements are taken semi-annually (see Figure 10 above, *Implementation Scenarios for Applying a Baseline Set of Metrics*). Providing managers at multiple levels with a practical, valid and reliable way to monitor portal activity and affects on its processes is only part of the battle that needs to be waged by the business intelligence team. Ultimately such methodologies must pass muster with the accounting and financial communities and those agencies that regulate them (Baskerville, 1999, pp. 46-47). An IEEM baseline metric approach would allow collaboration among all concerned parties such that interventions based on the use of this methodology could be tracked over time as the parties attempt to reach consensus on the meaning of the outputs of such analysis. It is only then that such metrics will have a lasting impact. This is precisely why a business intelligence team needs to be formed and is discussed at greater length in Chapter VI.

D. SUMMARY

The intranet is the most measurable medium ever. With respect to legal issues and the compliances more easily demanded within the internal operations for any

organization, it is more measurable than the Internet. Yet organizations of all sizes and types fail to measure its full impact because it is considered either too hard or not a priority. To date, there has not been a successful demonstration of the methods or strategy necessary to successfully implement a measurement technique that can indicate the effectiveness of an intranet. By soliciting the three audiences to determine which metric area is of greatest impact on their performance and satisfaction, metric areas from each segment can then be prioritized, logically grouped and then sub-grouped with specific hard and soft metrics supporting each group. All of which are related back to critical business requirements and divided among the audience most affected.

As the intellectual capital builds in corporate portals, more investments will be made to enhance them and make them greater enablers. Executives will demand from their IT that they implement a program of metrics where each major initiative has defined goals and metrics to indicate whether or not these goals have been obtained. To translate these metrics into financial terms using standard conversion factors, such as the cost to the company of each employee saved, the value of time saved, increased revenue per customer or transaction, or the savings in time and money from fewer defects will require far greater appreciation of intranets and the metrics needed to measure them than is exercised in public and private sectors today. Moreover, IT will be required to communicate these financially oriented results on a regular basis, something many IT professionals today are not versed at doing. The next two chapters on ROI and business intelligence teams focus on how to do this and by whom, respectively.

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V. RETURN ON INTRANET METRICS INVESTMENT

> Return on investment should not be the key benchmark in deciding on a company's IT spending.
>
> Douglas Busch, Chief Information officer, Intel

A. BACKGROUND

ROI has become a big buzzword in IT, yet few companies are tracking ROI in a consistent and standard manner. Enterprises are increasingly scrutinizing their IT spending and proponents of e-business projects must go to much greater lengths to justify any spending than they were required to do during the *dotcom* boom. As a standard fallback, companies rely on traditional return on investment (ROI) metrics to make e-Business funding decisions. Evaluating the potential return on an IT investment can be fairly straightforward--at least in theory. In financial terms, ROI means profit divided by investment, expressed as a percentage (King, 2002, p.41). But within that definition, there is a lot of room for interpretation and pitfalls:

- Does the initiative fit strategically?
- Does the initiative support functional objectives?
- Does the initiative incorporate opportunities for process improvement?
- Does the underlying technology fit the infrastructure?
- Are ROI numbers based on reasonable assumptions?

By focusing solely on what is quantifiable in terms of dollars and cents to answer these types of questions, companies risk being precisely wrong instead of being approximately right. The problem being that it is difficult to translate many benefits into hard cash equivalents. This applies equally to IT investment in a business context. The tendency is to apply a strictly quantitative ROI when in fact true ROI is both quantitative and qualitative. Nevertheless, corporate managers, who subscribe to the mantra, "If you can't measure it, you can't manage it", want quantifiable statistics to more concretely demonstrate that their departmental effort is pulling and financing its share of the weight in the corporation.

Return on investment is popular because it is a simple concept that everyone can understand. ROI and its cousins, Net Present Value, Internal Rate of Return, Payback Period, and Economic Value Added are concepts that executives have traditionally used to measure performance (see Appendix E, *Common Approaches to IT ROI*, for advantages and disadvantages to these and other techniques *de jo*ur in calculating ROI for IT). These metrics are certainly useful but they fall short of providing a complete financial picture for business planning. With Intranet ROI seen as a metric that ranks a technology investment in relation to other company investments, attempts are made to evaluate intranet expenses in terms of cost savings that are attributable to investments in business process automation. ROI therefore would seem like a logical way to assess intranet related payoffs. In practice however, traditional ROI metrics fail to measure the value created by intranets -- forcing business managers at multiple levels to make e-Business funding decisions based on gut feelings, rather than tracking ROI in a consistent and standard manner with the aid of Web metrics within a business value framework.

Despite having high expectations for portals, only a minority of firms report having formal metrics for documenting portal benefits – and virtually all of these are for Internet and not intranet portals. Astoundingly, 51% percent of firms don't have any metrics to prove portal benefits and another 20% don't know if they have any ROI related metrics at all for portals (Gillet, 2001, p. 6). In addition, approximately 66% of IT managers believe ROI is an appropriate metric only "sometimes" for an IT site (Upton, 2001), see Figure 9, *ROI Measured on IT*. Moreover, these opinions on the usefulness of ROI for IT are based largely on Internet e-Commerce sites, not in relation to intranets which are perceived more as "sunk costs" of doing business. All the same, the difficulty of determining valid ROI for Internet e-Commerce sites is another reason why IT professionals and BDMs often avoid applying ROI to their intranet portals.

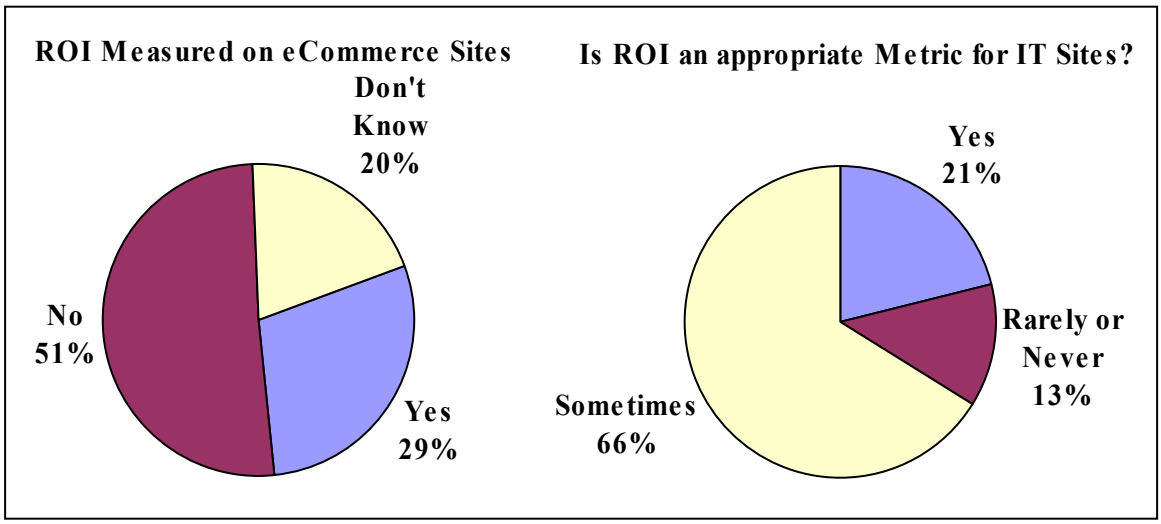

Figure 11. ROI Measured on IT

1. Intranet Measurement Misconceptions

If enterprises are to better realize more productivity from their portals, they need to understand why it is a fallacy to believe measuring portal value is either undesirable or undoable. There are several reasons that perpetuate this false perception:

- Cost cutting is so much easier to understand and measure than effectiveness that it almost always tends to gain prominence, despite a firm's original best intentions.
- A belief that the accuracy of data in many ROI models is so limited there is no point in calculating them. For example, if one is making up numbers to begin with, it's not really going to help decide whether an IT project makes sense.
- Many applications are so inexpensive to develop and deploy that companies often assume they'll get a return on their investments or they justify these relatively small investments by pointing to intangibles, such as improved employee morale from having easy access to their human resources and 401(k) records and better workforce collaboration, resulting in quicker time to market.
- Managers of intranet portals and their bosses generally believe they don't need anyone to convince them of its business value. Managers and their knowledge workers know that the communities build loyalty, give valuable feedback, and contribute to

increased sales. Thus, IT project teams shouldn't jump through financial hoops trying to cost justify essential investments that are "no-brainers."

- Depending on the size of the company, it is not worth the cost or time to determine the ROI for an intranet upgrade or enhancement (effectively conducting an ROI on the ROI). Though ROI calculations are different for different industries and companies, as a general rule it is not always cost effective for small companies to conduct ROI on modest modifications to their intranet portals. Many IT organizations go to the trouble of doing the ROI math only for expensive projects.

Enterprises lack a business strategic model, an affiliated metrics baseline and a Business Intelligence Team (BIT) to conduct the necessary metrics analysis to better discern and balance appropriate quantitative and qualitative metrics. As a backdrop to the above, IT initiatives are increasingly becoming so important that companies are either not evaluating ROI or they are realizing the need to develop new ways to measure ROI to take into account a project's strategic value, i.e., enhancements to their intranet portals and the metrics needed to prove and disprove improvement.

In essence, strategic IT investments that improve the overall efficiency of the enterprise will make the business more productive, saving money and improving the responsiveness of the whole company. Thus, improving the performance of an enterprise's intranet portals is of great significance because the greatest impact of portals is improved productivity. Consequently, companies are going to have to start believing in -- and doing -- this hard work of determining productivity benefits because productivity is the most important piece of ROI analysis (Koch, 2002, p. 3).[6] Because it is hard to quantify all intranet-related investment benefits and savings to the business, these important factors get short shrift, even though they can result in big savings that can have a direct impact on the profitability and overall effectiveness of a business. Though traditional accounting methods make it awkward to absolutely quantify IT's value, this

[6] In a Darwin survey of 75 CEOs from a broad range of companies, increased productivity was cited as by far the most important factor (87 percent, far ahead of the next highest factor, customer satisfaction) they use to determine if IT is delivering full value for the money spent.

doesn't mean the issue of an IT's value should be ignored. Business owners and finance executives alike need to be mindful that ROI methodologies tend to focus on short term quantifiable justifications, while ignoring the strategic role IT plays driving new opportunities for the business.

2. Qualitative Inputs and Raw Benefits

The nature of these metrics-related challenges with respect to value should force business owners to find credible ways to rely more on qualitative inputs. As the role of IT becomes increasingly strategic to the success of a corporation, a new set of metrics needs to be applied to investments that attempt to measure IT's ability to enable increased revenue or faster growth for the business. For instance, if an investment improves the time to market for a critical new product or service, it could be said to have added revenue to the firm. In many situations getting to market early results in a big advantage both in terms of more overall revenue in the life of the product or service and in a period of higher margins before competitors create downward pressure on prices. In effect, portals help meet new challenges to compete on the basis of time -- not for the sake of speed for its own sake, but because profitability in markets is increasingly available only to early entrants who can forge brand and business dominance (a parallel could also be made for a government or military in reducing their decision time cycles).

Return on intranet metric investment (ROIMI) has more credibility and is clearer when it's stated in raw benefits, which are sometimes non-quantifiable, rather than translated into short-term return dollars. The numbers tell the story, but not the whole story: Some benefits may not be quantifiable today in terms of dollars, for example ease of use, competitive advantage, customer loyalty, etc. These benefits are worth including in the value story, despite the risk of companies still ending up with ROI results that are not 100% quantifiable. The challenge is to prevent the translation from becoming fuzzy and losing some audiences.

Calculating ROI requires a considerable amount of data, consistent standards, baselines within a company, and at least some financial expertise. Even with such input, the end results are approximate and can be manipulated. Moreover, intranet ROIs from different companies are unique and returns may differ because they reflect rapid changes in technology and knowledge worker behavior which varies from company to company as do their expertise levels and fields. Even with these restrictions, the procedure of pursuing ROI, in whatever format, forces a company to think about the best ways to measure success – specifically, the hard, soft and derived metrics that matter most in measuring the extent to which business values are supported and achieved.

B. AXIOMS AND DRAWBACKS

Despite best intensions, ROI can be misleading and its limitations need to be recognized and addressed. Recognizing these, a deeper analysis of the IT portfolio can find truly significant contributions to the corporate health and well-being that should be calculated and communicated. In the past, IT organizations used to be viewed as a necessary expense for a business. Today, however, they are often viewed as an important strategic asset to a company's future success. While many businesses are focused on cost control, IT groups are often focusing on how to generate growth for their business by funding projects to help their company reach new customers and work more efficiently with its existing partners. Perhaps not so surprisingly, only about 8.33 percent of IT spending is perceived in some circles to provide incremental benefit to the organization (Gliedman, 2000, p. 2).

The reality is the benefits often far exceed this perception; otherwise continued large investments into it would not be made. Like metrics for intranets, intranet ROI can also be counter intuitive. The following table outlines seven shortcomings that companies tend not to take into account when calculating ROI on IT and its impact:

Axiom	Drawback	Impact
1. ROI must capture all costs, direct and indirect, associated with the project/technology, including products and services devoted to direct support.	•One size doesn't fit all. •Applying ROI to every activity won't work. •The human factor of computer-assisted work is neglected by the ROI model. •One metric can't characterize the entire IT value.	ROI is useless when it comes to evaluating risk, flexibility, and intangible benefits-factors that have a critical impact on business and should be factored into spending decisions. In addition, ROI can't calculate valuable, intangible qualities.
2. ROI must be based on quantifiable results. The baseline metric is the dollar, often measured through calculating time saved (time is money).	•ROI is both quantitative and qualitative.	Although ROI numbers may appear concrete, they can be misleading. Unless ROI analysis is applied honestly, there is ample room for delusion. The greatest danger is the "concrete" and "measurable"' driving the significant out of the analysis. Because intranet applications are internally focused, it's difficult to get an ROI and is, therefore, neglected.
3. ROI must be based on observable results. Automation has business value only when we can *see* the results such as faster production or higher quality.	•E-business projects often follow the law of unintended consequences because they cross functional and enterprise boundaries, and may produce payoffs in ways that were hard to imagine at the outset.	Taking an accountant's view of IT priorities could actually be counterproductive, because a spreadsheet doesn't tell the whole story. In fact, some of the IT projects that impact business the most can't be measured easily, if at all, some experts now say. However, the only way to grow the bottom line on a sustainable basis is to grow the top line, which is easy to ignore if every project is measured on tangible ROI.
4. ROI emphasizes tangible payoffs that can be measured in financial terms. Often, the easiest to measure returns are bottom-line improvements rising out of cost reductions.	•ROI is a metric that favors cost-saving projects.	ROI tends to favor projects that result in cost avoidance, at the expense of projects that promise revenue growth. This is particularly acute in ROI for intranet initiatives because they are likely to miss at the outset subsequent, positive impacts.
5. Investments in k-worker and partner-facing initiatives result in more effective collaboration and translate into important productivity benefits for all sides.	•ROI measures only the returns that the company sees within its internal operations.	By ignoring the value created for partners and customers, ROI may be missing the real point of e-Business (and the very idea behind creating a corporate portal in the first place). For example, as a parallel approximately two-thirds of the overall benefit of a retail website cannot be accounted for by online transactions alone.
6. ROI calculations for cost-saving projects are more accurate because the enterprise already has the data needed for the equation.	•When calculating ROI for a revenue-generating project like intranet portals, estimates are often used, which makes the ROI calculation less accurate.	The result is that revenue-generating projects are at a disadvantage if they are competing against cost-savings projects based on ROI. Furthermore, not all data/outputs can be known ahead of time with regard to creativity and the volatility of content in data-warehouses and the impact of knowledge applied to it.
7. Most e-business initiatives take time to get accepted and widely adopted. Declaring failure or success is based on a three or a six-month time period (time is money).	•There can be significant time lags between the benefits that will impact revenue and the revenue metrics themselves. The lag time may be six months or more for larger projects. Therefore, companies examining only the metrics most closely tied to revenue risk cutting off projects for which positive return may be just around the corner. •Not all returns are financial returns in the short run, although they eventually may impact financially.	Most e-business projects result in payoffs on multiple dimensions. It's a tactical approach to ROI. The shorter the study, the shorter the ROI basis, the more isolated it's going to be and the less meaningful it's going to be in the overall strategy. It's significant but it needs to be put into the larger context.

Table 3. Axioms and Drawbacks

In effect, in the rapidly changing world of IT, ROI is ROI -- except when it's not. While CIOs say the payback on most IT projects can be measured in dollars, many utilitarian but necessary efforts, like infrastructure upgrades and installing and supporting collaborative applications, don't translate easily and those projects are not given full credit because of the inability (and in some cases, the non-necessity) to attribute any intellectual gains to new technology. For example, in the real world financial ROI calculations may be 0%, but the overall return of all the measures can easily be well over 100%. Consequently, the ROI model needs to be extended to be more comprehensive and dynamic to take into account *time to value* while factoring traditional return on asset analysis.

Strictly quantitative ROI logic for intranet portals and IT is not sufficient. For example, if every chief financial officer discounted productivity gains, companies would not have PCs on their knowledge workers' desks because they don't have positive ROI without the productivity gains and are too costly to manage relative to the hard savings they provide. Thus, executives should exercise caution when demanding "balance sheet efficiency" on ROI calculations for IT investments.

Though there are many ways to express standard measures of return, when traditional ROI conventions don't tell the whole story, business managers and vendor alike will often place greater emphasis on soft benefits -- like employee satisfaction, improved visibility, improved knowledge transfer, and dozens of other assets that cannot be measured in hard numbers -- plausibly sure, but with no attempt to put a dollar figure on the "smiley faces". Thus, to overcome this weakness when calculating ROI for IT projects, decision makers should consider all techniques available to credibly and better measure the overall impact of the investment; they must look beyond ROI.

C. BEYOND ROI

Even in some of its strictest applications, ROI is far from being a perfect calculation. It is understandable then that an enterprise would be tempted to judge the

success of its intranet portal initiatives on its traffic volume statistics alone; they are the only *value* related indicators that can be exactly quantified that a portal brings to a business, i.e., showing how many knowledge workers visit the site over time and therefore providing some level of value. Because an intranet *does* have a measurable impact on traditional businesses, companies must embrace a set of metrics that gives the portal initiatives credit not only for its online knowledge workers, but also its overall contribution to the corporation at large in improving its competitive advantage.

The key to escaping the ROI trap is to think strategically about the outcomes and the payoffs from intranet portals by focusing more broadly on business value and meeting the needs of knowledge workers. The anchor for any e-business project should be the value created. Focusing on value created for customers as opposed to cost savings for the company by supplementing speculative financial outcomes (some of which are dubiously contrived) and quantitative metrics with qualitative ones that are rationally more strategic in nature (and collectively provide more important leading indicators to gauge the competitiveness of the business) is fundamental in looking beyond ROI. Measures such as customer and partner satisfaction, customer loyalty, response time to competitive actions and improved responsiveness are examples of these soft measures. Subjectivity in these "intangible" measures can actually be quite objective if used consistently over time. For example, customer satisfaction measured consistently on a five-point scale survey can be an objective basis for measuring the performance of customer-facing initiatives (Sawhney, 2002, p. 37), see Appendix B, *Online e-Survey Example*.

A variety of ROI techniques exist for managers to assess the value of intangible benefits. "Business value added" and "intangible value" are both concepts used to describe how IT dollars support key business goals that aren't easily quantified. Similarly, "return on opportunity" helps companies examine top-line growth potential rather than focusing on cost savings. "Return on relationship" acknowledges the intangible nature of an e-business by measuring whether relationships produce direct or

indirect returns to a company, such as speed-to-market. By contrast, strict financial ROI approaches, though straightforward, can easily stifle opportunities to create competitive advantage and ignore the impact of intangible benefits altogether.

Best-practice organizations realize that outcomes are more important than outputs. Tracking the interplay between *pain points in processes* and the subsequent impact of modifications to intranet portals to affect business in them based on metrics that tie back to key business drivers is the most critical yet underused measure to improve performance outcomes. Metrics must tie back to the original business drivers so more credible and comprehensive justifications can be provided when the intranet project is proposed. Consequently, executive-level ROIs should emphasize outcomes rather than hit rates, which is the norm today. New intranet applications often provide new ways of working, and companies should approach ROI in this area with sensible notions of "Does the opportunity justify the investment" or "Is perceived value greater than the cost?" Alternatively, intangible costs and raw benefits can often be quantified by measuring the consequences of *not* making the investment in question: money saved versus the prospects of what is to be gained. Thus, in the final analysis, ROI methodology for intranet initiatives is more a cost-benefits analysis (see SectionV.F.2.b: *Activity Based Costing* for how this can be accomplished in the form of process changes through metrics analysis based on the IEEM).

Standard definitions of ROI today are beginning to stray from their original meaning as input metrics are changing to accommodate increasingly dynamic environments such as intranets. Continuing to focus on cost and savings is an operational management contribution to "business management" but it doesn't give satisfactory, complete answers about the contribution of intranet portals to an enterprise's value. These answers can only be found at higher levels – at the level of the strategic management and economic valuation. Benefits may be expressed in many ways, but the key is to express them in understandable terms that focus on value by matching the

critical business requirement issues to the needs and inputs of knowledge workers and business mangers in the value creation process down to groups of specific metrics that can be linked and measured in support of these issues and needs within a coherent and comprehensive framework. The IEEM and its baseline metrics and conversion ratios are designed to provide this approach to these linkages and to provide insight on how to take corrective action upon them. The choice executives face is not whether an approach like this should be taken, but which groups of metrics to choose and how to proceed applying them (see Section IV.C: *Periodic Review*).

D. APPLYING WEB ANALYTICS

The most important benefit of calculating ROI is that the process helps determine which metrics are most pertinent to a particular business. From the outset, companies need to identify and stick to a good starting point when taking measurements to ensure what is being measured at the beginning is also being measured at the end in a systematic and comprehensive manner. This is particularly true in measuring the performance and impact of intranet portals since so little has been previously researched and practiced in how to measure them. Unfortunately, most organizations do not have good data for their intranet ROI. One of the main reasons is because they don't have an adequate and coherent collection of "before" data from each segment of their intranet operation process. Very few companies take comprehensive snapshots of where they are and equally few take comprehensive snapshots of where they are going with respect to overall strategic and value-based objectives.

When building the ROI justification for intranet investments, specific metrics must be predetermined that can be used to properly analyze and report the necessary information. These metrics will be tracked over time so that they can be mapped to actionable solutions related to bolstering business requirements that will prove out the correctness of the original business justification of the project, initiative, or enhancement as well as the solution itself. In addition, the ROI methodology and set of assumptions must be used in a consistent format to better enable quantification of changes in growth

and usage patterns. Rather than metrics portraying what happened, a *dedicated, collective effort* to gather this information and analyze it helps to determine what to do next to improve performance (see Chapter VI, *Business Intelligence Team*). Thus the process of measuring and fine tuning performance intranet portal impacts caused by actions based on metrics analysis is an economic value creator.

1. Pre-Determined Metrics

Enterprises need to predetermine the metrics they will collect to assess their critical business value objectives, i.e., targeting customer loyalty, partner assessment, content effectiveness, channel efficiency, etc. ROI projections for portal framework deployments, though useful for project approval, do not provide insight into the real and actualized value derived from the portal. As a result, planning the business case for portal investments will require predetermined operational metrics, both quantitative and qualitative, to be tracked over time. Otherwise, these metrics provide no meaningful insight into how well businesses are reaching their strategic objectives.

The introduction of the Intranet Efficiency and Effectiveness Model (IEEM) in this paper outlining how to breakdown, analyze and gauge the impact of changes made in support of critical business requirement issues all the way down to specific groups of metrics makes it possible to measure the effectiveness of an organization's quality drive toward greater value. It accounts for a variety of factors and indicators that avoid the problem associated with isolating the specific impact of any one of those factors on an overall conversion rate. A single indicator does not gauge the dial measuring overall success but a collection of the right groups of indicators and the metrics to measure them can achieve this task over time. These indicators and the metrics all work in concert to drive an accurate conversion rate. The IEEM is appropriately broad based to tractably gauge and subsequently provide enhancements to dozens of Web-related initiatives that have an impact on conversion rate because the constituents in the model take into account, for example, the following factors:

- Navigation
- Site layout
- Site authoritativeness
- Prequalification and disposition of visitors
- Site performance
- Scale
- Speed to fulfillment

In addition, information flood and false alarms are essentially prevented by defining multiple metrics to describe business activities. Consequently, an alert is triggered only if a combination of metrics shows certain behaviors. Even if a single metric tells the whole story, it is better to have two metrics linked to the resultant alert, or another means, such as reviewing earlier analysis, to crosscheck that a problem really exists before alerting anyone.

2. Intranet Analytic Omissions and Susceptibilities

The following analytic pitfalls in conducting Intranet ROI are outlined to highlight the differences and subtleties that need to be accounted for when assessing and measuring the value added from intranet processes.

a. Quantitative and Qualitative

There are some caveats that need to be addressed for both soft and hard metrics with respect to intranets. *Dotcoms* counted the number of "eyeballs" driven to a virtual storefront, but time has shown that the quality of website hits and a site's ability to retain customers, known as stickiness or "recency", is a better measure of ROI and business value than measuring site traffic. Quantitative metrics in and of themselves can be misleading for intranets and therefore should be supplemented with e-surveys to fill in qualitative information that Web logs cannot provide. Because some critical information gleaned from usage data or analysis of intranet Web logs is inadequate for measuring ROI, the quality of the knowledge worker experience can be improved by implementing a feedback loop consisting of regular reviews of quantitative and qualitative metrics. For example, a page can have high traffic because the content is uniquely interesting, it

represents a gateway to other sections, or knowledge workers are stuck in a frustrating circular navigation. Similarly, some desirable attributes, such as ease of navigation, relevance of search results, clarity of content as well as the layout of the site, can only be assessed and disambiguated by users. Thus, quantitative metrics must be correlated with qualitative assessments to formulate a complete picture of the user experience, such focused surveys which can be acted upon, i.e., changes to the layout, links and visibility of data.

b. Hit Counts

Quantitative metrics like popular "hit counts" are most commonly used for intranets today because they are readily available and easier to calculate. Once gleaned from Web logs however, they present a number of challenges to decision makers when used for intranets:

- The number of hits and the level of productivity can be inversely proportional. Organizations moving from a complex static intranet to an employee portal often find that the number of hits goes *down* because less surfing is needed to find relevant information. For example, the portal could do the surfing for the user based on a specific user profile, thereby bringing the information directly to the user via another content provider/department portal.

- When the number of hits is used to justify additional modifications based on traffic volume, a low number can often tell a better story than a high number (e.g., "We need more money or manpower because we're *not* getting hits and therefore need to provide more valuable information."). This can occur as a result of facilitating the delivery of what knowledge workers are seeking through personalization, i.e., placing specifically frequented links on the desktop homepage.

- Intranets and department portals generate a base level of hits even if they are never used, due to auto-starting (with morning boot-up or every time a browser window is launched) and multiple counting (e.g., portals generating multiple hits for each page as "portlets" are rendered). Portal owners should calculate the base level of hits that will be

incurred automatically and subtract this figure from total hits to generate the number of live hits, which is a more useful measure of user involvement.

Hit counts out of context are of limited use. Organizations need to tie hit data back to a role- and process-based context, e.g., matching hits with profiles to determine which roles are not being served by the portal and which functionality is most used for each role, determining how often a particular task is accomplished through the portal.

Without thorough analysis, even the simplest metric indicators, like hit counts, can be misleading. Failure to recognize this will degrade portal performance as wasted time and effort in implementing changes based on incorrect interpretations. It may be something small, such as a navigational loop, but it may be corporate-wide affecting tens of thousands. Thus, even the most straightforward hard metrics should not be taken for granted, but meticulously scrutinized in short order. Using the IEEM approach over time, triggers that alert analysts to these potential pitfalls will be well instated because hit counts will be collected with a variety of other metrics, such as e-surveys, which will aid in identifying pain points. Hard and soft metrics analyzed together with consideration given to their strengths and weaknesses allows analysts to identify incongruent analysis. Thus, achieving success through the use of any performance metric will depend as much as how well it is applied as it does on when it is used (see Chapter VI, *Business Intelligence* Team and Section IV.C: *Periodic Review*, respectively for how to realize this).

c. Conversion Rates

Though counter-intuitive, since so many factors impact on the conversion rate, monitoring a conversion rate does not enable businesses to determine the precise impact of any one factor. Conversion rate measures ostensibly how effective the site is at converting its visitors to browse, download, etc. Hence, it needs to be taken into consideration collectively in a coherent manner that covers a variety of pertinent factors from each process segment, which the IEEM from inception is designed to address.

Essentially, a portal seeking to expand its reach and loyalty should deploy initiatives that convert their base of registered users and first-time visitors into loyal repeat customers: Focus on what drives customer loyalty and higher conversion rates will follow. The opposite is not true despite much attention being devoted to devising new conversion rate techniques to manipulate the numbers rather than what factors can push them upwards.

Although efforts at cost reductions can be fairly easily applied throughout a firm, efforts aimed at increasing effectiveness generally cannot, unless the same model and set of metrics are applied *uniformly* across all key portals in an enterprise. For example, what makes one employee satisfied or productive may not have the same impact on another employee. However with the use of identical metrics complemented with occasional surveys, data anomalies are mitigated with periodic samplings over time because studies from samples and averages based on the same method are easier to compare. In spite of the challenges they may present, it is important to maintain a balanced approach while pursuing soft benefits -- such as customer satisfaction and understanding, market intelligence and knowledge transfer -- because they contribute to middle benefits (derived metrics) -- such as speed-to-market and loyalty conversion ratios -- which directly impact the hard numbers that build a company's bottom line.

d. High-End Knowledge Workers

The best ways to approach this exercise is by letting key knowledge workers express what is useful and believable or not. The payback is great since even a small increase in the effectiveness of a firm's most critical workers can impact the firm's bottom line. One study estimates that improving the performance of general knowledge workers adds about ten times more to the bottom line than facility and IT cost reductions combined (Cantrell, 2001). For a firm's most important, "high-end" knowledge workers, this ratio is bound to be dramatically higher, cases in point being a software firm or research division. Instead of employing a common compromise for all, an enterprise

should consider solutions more oriented toward effectiveness solutions for some, and solutions more oriented toward efficiency solutions for others. Thus, when selecting enhancement solutions, analysts and BDMs alike should bear the following in mind: Effectiveness solutions which tend to be more intangible and soft should focus on high-end knowledge workers (get them involved in the feedback loop) and efficiency solutions should target employees who contribute less to a firm's revenue, such as administrative assistants.

e. Knowledge Workers ROI Fallacy

With regard to different types of enhancements for different levels of knowledge workers, Capers- Jones estimates productivity gains of 50-75% are possible (primarily for software and research firms) by using outstanding programmers and analysts (Casper, 1986). The first measurement of this kind was the Sackman's Experiment in which large individual differences were found to exist between programmers (Sackman 1968). Another study of this kind conducted 20 years later, known as Demarco's Coding Wars, found similar results but not as dramatic (Demarco, 1999, p. 27). Table 4 below shows their research results between more and less proficient programmers in an organization given the same amount of time to program:

Sackman's Results		Demarco's Results
Debug Hours :	18 – 1	Best people will outperform the worst by 10:1.
Code Hours :	15 – 1	Best performer will be 2.5 times better than the median.
Program Size :	6 – 1	The top 1/2 will outperform the bottom 1/2 by 2:1.
Run Time :	13 – 1	

Table 4. Programmer Productivity Results

A cursory conclusion to this is that organizations should focus their portal efforts on accommodating their high-end knowledge workers with all the means necessary to do their jobs better. Although this is not entirely incorrect, it overlooks two important factors with respect to ROI: 1) less skilled programmers do not get paid 10 times less salary; and 2) there are normally fewer high-end programmers than the lower-

end knowledge programmers that work on any given project (due to a variety of circumstances such as promotions over time of the more experienced programmer to management positions). Thus, corporations need to exercise caution when allocating resources and prioritizing portal enhancements. The payback may be greater for features or changes that affect a wider body of knowledge workers and programmers who are considered median or lower-end than for a smaller high-end group. This of course will be decided on a case-by-case, or portal-by-portal basis, and is why dynamically constructed portals designed to meet the needs of like users is a powerful new development in the IT world. All the same, analysts and BDMs must keep in mind knowledge worker economies of scale when parceling resources to enhance productivity.

f. Knowledge Workers and Reuse

The combined and logical approach of model based selected hard and soft metrics can lead to better identifying and understanding what knowledge workers are doing with what they *discover* in intranet portals as well as quantifiable and favorable ROI. For example, as a result of hard and soft metric analysis, ROI may appear in some unexpected places such as reuse of software code. Software reuse is a very measurable and desirable as it allows cost per function delivered to be dramatically reduced. "For instance, a 1,200-member IT team at a Cleveland-based financial firm cut its average project turnaround time by an astonishing 45% after it discovered software in a development team's portal that would suffice for other internal projects. On average, a single software component took 200 hours to design, at a chargeback rate of $74 per hour, or $14,800 per component. When one component was reused in eight different projects, it saved the company more than $100,000" (Frakes, 2003, p. 31). Auditing Web log files alone would not have captured this, portal quality tracking complimented with user feedback resulted in spotting and analyzing ROI returns that would have normally gone unrecognized and unaccounted.

With respect to reuse, a promise of software and intranets is lower costs or at least getting more "bang for the buck". Focusing on code improvement through portal optimization is highly desirable because it can result in both higher reliability and faster time to market. However, software reuse until recently has been noticeably missing. Although there is promise of turning this phenomena around with the advent of C# within .NET and free Linux libraries online, many knowledge workers do not even know the code they are writing has already been written or something very similar to it can be modified in its place – even when it exists on their own intranet. If made an objective, properly configured portals will facilitate software reuse and, more important, *knowledge reuse*, by exposing it and providing such things as references to design documents used to implement the module should it be included in other software design templates. Using the same metrics groups over and over again across the enterprise to gauge performance is itself also a form of reuse provided by IEEM domain analysis and metrics baseline (the key to reusable software is captured in domain analysis in that it stresses the reusability of analysis and design, not code). Collectively, these are example of how a best practice can become a business rule whereby virtually all code *must* be made accessible along with clear understandable documentation. If a business rule is not possible, then an incentive program can be devised to reward and recognize portals whose code or documentation is most widely and highly used by other co-knowledge workers.

E. OBJECTIVE OF ROIMI

Used properly, Web analytics can provide significant returns in optimizing portal configurations and capabilities if based on a model that accounts for critical business requirements, measured consistently and periodically to determine where refinements are needed in order to keep in step with the dynamic needs of users. This is exactly why the IEEM has been created so these refinements can be conducted in a logical and coherent manner as they impact on critical business requirements, namely to increase value. Figure 12 below provides a theoretical illustration why a portal optimized using focused metrics is more effective and inevitably more productive than one that does not.

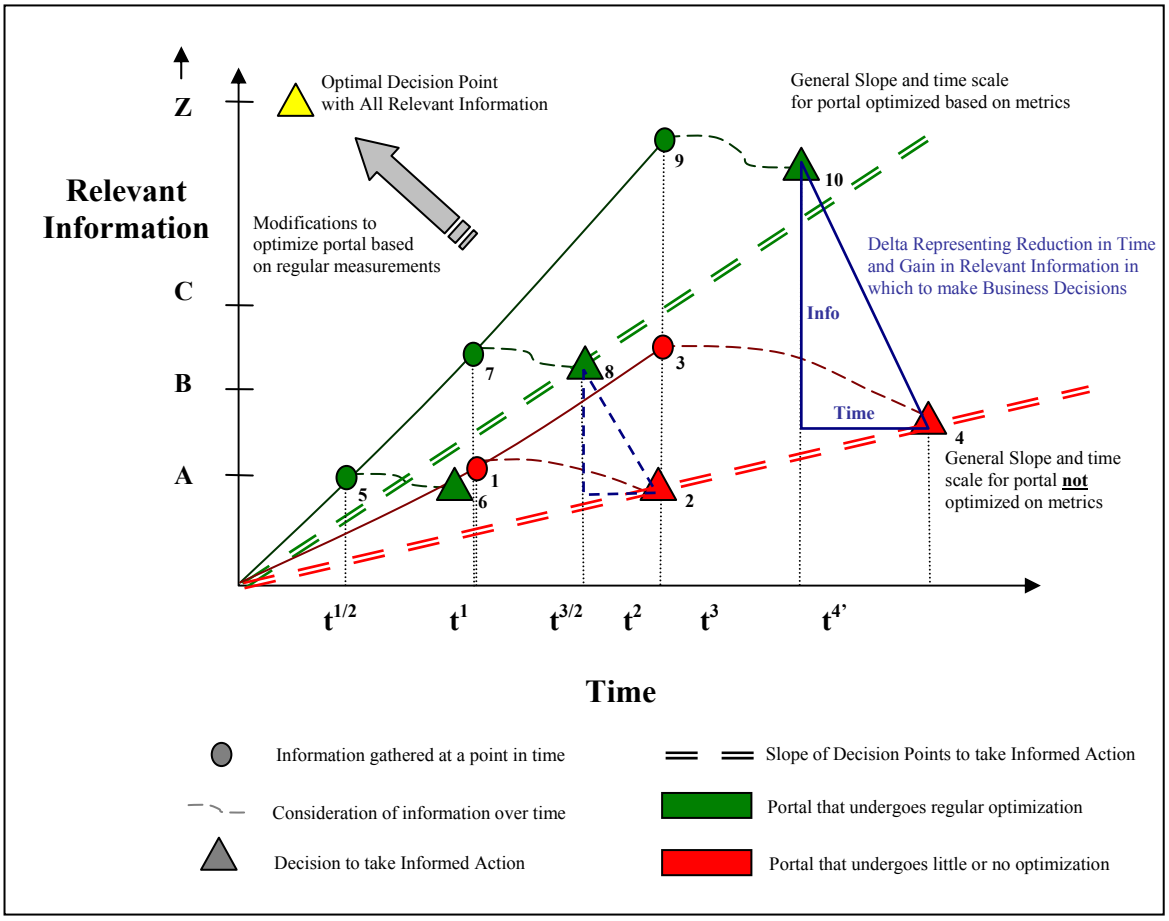

Figure 12. Improving and Reducing the Decision Points

Given the time it takes to find information *A* in time t^1 in an a portal that is not optimized, a portal that is regularly measured to take into account user activity and behavior is more optimized to meet users' needs and, therefore will render more desired relevant information *A+B* in the same time period (point 7 versus point 6). On the other hand, if time is of the essence, information *A* can be found in less time (point 5), thereby allowing the user more time to consider the information or to come to a decision sooner (point 6 versus point 2). Either way the optimized portal will provide as much relevant information in a shorter time period or more information in the same time period. The result is either a business decision sooner or a more informed one respectfully. Another phenomenon is the near exponential affect of this event over time with regard to an

increase in relevant information and the decision process itself. Though time is truncated, it may not always be exponential as the discovery of relevant information can be as a result of better association and placement of documents and information based on user behavior. Moreover, time spent deliberating to reach a decision may also be truncated by a significant margin in some cases since more relevant information is found providing clarity on what courses of actions are more likely than others.

At any given point in time, there will be as more information found in a portal consistently using metric analytics based on the IEEM, resulting in more informed business decisions being reached in less time. In theory, this is how intranet portals facilitate speed to market. Table 5 below, *IEEM Analysis Impact on Time to Reach Decision*, is an extension of Figure 12 above, showing the difference between intranet portals without the guidance of IEEM metrics versus those managed with them:

Best	Portal Type	Time Info Gathered	Amount Info Collected	Time to Reach Informed Decision	PRO / CON
1	Portals using metrics	T1/2	A	≤T1	Best with little time
2	Portals using metrics	T1	A+B	<t2	
3	Portals using metrics	T2	A+B+C+D	<T4 (=t3)	Best with more time
4	Portals **w/no** metrics	T1	A	T2	Worst with little time
5	Portals **w/no** metrics	T2	A+B	T4	

Table 5. IEEM Analysis Impact on Time to Reach Decision

There are many variables that could skew the results for time to reach a business decision to be consistent (i.e., individual skill sets and experience can vary greatly). However, if improvements are made in the other metric areas outlined by the IEEM in Chapter III, *Conceptual Framework*, they will collectively help to minimize the time to

locate desired information and the resulting decision reached. *Time to locate* is a classic example that helps put the figure and table above into perspective. Occasionally, users may find what they are looking for sooner, but will also continue to look for long periods of time (perhaps as much as the approximate 50% of their time as they do now) because they are finding more of what they are seeking. Regardless, the time factor is reduced with respect to finding what is sought or considered desirable: If people still spend 50% of their time looking for information, they should have more pertinent information than before in the same amount of time – which should lead to better decision making and ultimately more effectiveness. Time to locate is an *efficiency* metric that is affected by increases in effectiveness elsewhere. The efficiency metric of time to locate in turn affects effectiveness across the board because users will either have or can do more in less time. Thus, this metric area is an example of how effectiveness affects efficiency and then how this efficiency increase in turn improves effectiveness.

F. DERIVING AND EMPLOYING A COMMON UNIT OF ANALYSIS

Time is money and the unit of analysis most appropriate to measure the ROI impact of the IEEM metrics based analytics is indeed time. Although it may be challenging to put *exact* figures on the impact of every intranet portal project, placing a cost-benefit ROI on the worth of applying the IEEM and metrics baseline analytics across a large enterprise is attainable. The key assumption here is that a corporation would assume the IEEM's supporting metrics to serve as a baseline to perform analytics only when it already has an intranet (i.e., sunk cost as part of doing business) and it believes there is room for continuous optimization in it to increase value. The ROI conducted is essentially a cost-benefit between the time needed to invest in applying and acting upon the results of the analytics (i.e., costs to hire an outside analyst or establish an in-house team to conduct the analyses) and the results in time reductions due to subsequent changes introduced by this analysis process, i.e., shorter completion time of a series of business related tasks (sub-corporate level) and speed to market or completion of a project (corporate level). The increases in quality, creativity and knowledge worker or

customer satisfaction will be strongly implicit but each falls short of readily breaking down into precise units of time, only approximations of it.

Time savings is sought through the optimization of intranet portals which are directly correlated to impacts on both efficiency and effectiveness gains in support of business value objectives. As outlined in Section V.E, *Objective of ROIMI*, this can be accomplished only if the same groups of metrics are applied periodically to obtain before and after results. Otherwise, the comparison between the two sets of data collapses and taking subsequent actions to enhance performance related to the results of specifically crafted groupings of metrics are less certain and valid. The reductions in time must be compared against previous baseline measurements to gauge the extent of performance improvements (see Section IV.C: *Periodic Review* and Figure 10: *Implementation Scenarios for Applying a Baseline Metrics*).

Practitioners who redesign business processes require a method for determining how much their process design decisions will impact performance (El Sawy, 2001). During the lifetime of this approach other combinations of metrics may be applied which are deemed more precise, but these should only take place after at least two to three periodic measurements have already been fully conducted and analyzed to mitigate anomalies and correct errors. This method thereby provides a convenient way to estimate the returns that alternative process design changes can generate. Thus, the IEEM framework portends to resolve the long-standing problem in the IT community of determining the IT initiative impacts on a large number of *processes* at precise enough levels of the entire find experience to benefit managers who must implement changes at the tactical level and still link them to strategic business objectives. The rest of this chapter explains how.

1. Entropy Concept

The credibility and applicability of this conjecture are significantly fortified by associating the metric performance indicators to legitimate and logical granular unit of measurement. The technique which meets the requirement of determining the output of time savings as well as enabling its "operationalization" of this theory is the *Knowledge Value Added* (KVA) theory which offers a practical method for estimating the value added by IT via theories rooted in assumptions derived from entropy in complexity and thermodynamics concepts:

> The changes organizational *processes* make in the structure of inputs to produce outputs can be described in a common way in terms of the entropy concept. The concept of entropy is defined as a measure of the degree of disorder or change in a system. In the context of business processes it can be used as a surrogate for the amount of changes that a process makes to inputs to produce attendant outputs. These process-induced changes can be measured in terms of the equivalent corresponding changes in entropy (Housel and Kanevsky, 1995).

Within the framework of thermodynamics, a fundamental parallelism between transformation of substances and information processing has been established (Li and Vitanyi, 1993). If a substance is transformed from state *a* to state *b*, then the difference of the entropies, i.e., $\Delta E=E(b)-E(a)$, is proportional to the amount of thermodynamic work required for the change (Housel et al., 2001, p. 11). In other words, application of knowledge is determinant of value. A process must enact some change upon inputs to produce an output of value. Therefore, change can create value and knowledge is proportional to value.

> As theorized by Housel, Rodgers, El Sawy and Zhong, by extending this conceptualization of the relationship between complexity and entropy in the organizational context, conditional complexity can be viewed as the shortest description of the process, i.e., effectively, the productivity of the process. Further, a change in entropy when state *a* is transformed into state *b* depends only on *a* and *b* and does not depend on process *P*. This means that, by definition, any process *P* that changes *a* into *b* introduces the same change in entropy or, in an organizational context, adds the same value. It is reasonable then to assume that the minimal set of

> instructions to change *a* into *b*, via process *P* reflects the corresponding change in entropy given the current state of process *P*. In other words, the length of the shortest description of the change provides an acceptable approximation of the change in entropy given the current state of the process. This becomes critical in recognizing that estimations of changes in entropy can only ever be approximations (Housel et al.., 2001, pp. 12-14).

Thus, given that the estimates are derived using the common theoretical framework in IEEM, it follows that a simple correlation between process and outcome leads to reasonable approximation of the reliability of the estimates.

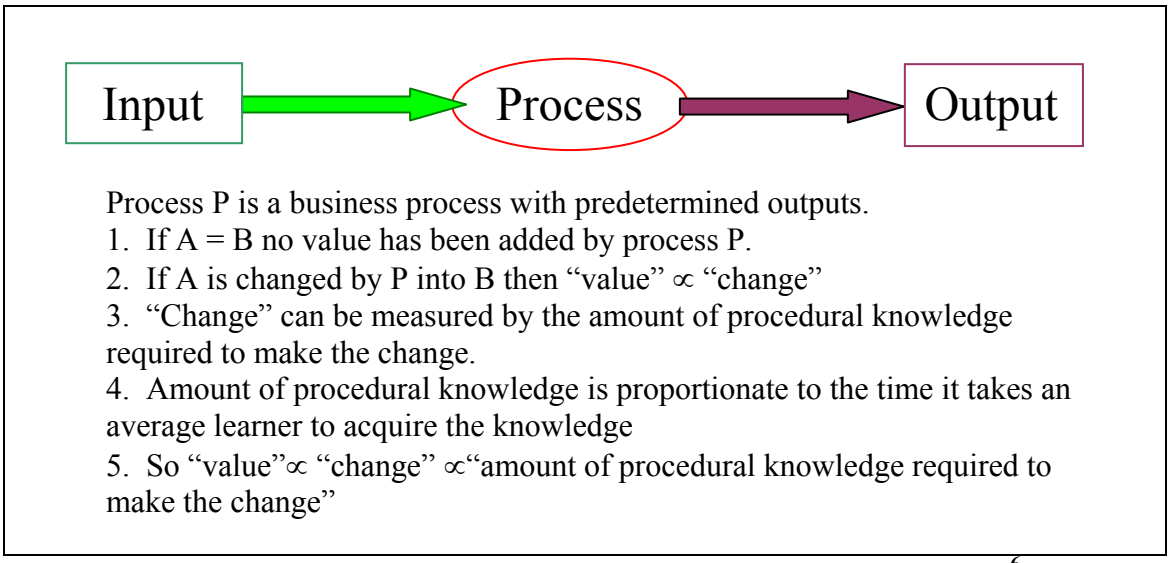

Figure 13. Procedural Knowledge is Proportionate to Change [6]

At a given point in time, a company's total process outputs produce its revenue. It follows that the procedural knowledge required to produce those outputs is a surrogate for the revenue. Further, if this procedural knowledge, which is distributed among people and IT, can be described in common units, then it is possible to allocate corporate revenue to these units of knowledge. This would allow establishment of a common price per unit of procedural knowledge. It follows that price per unit of procedural knowledge is a surrogate for price per unit of common output. This formulation allows a direct

[6] Housel et al., 2001, p. 14.

linkage between corporate revenue and the procedural knowledge distributed among the people and IT used to produce the revenue. Hence it would be possible to allocate the proportionate revenue produced by the procedural knowledge in business processes including the knowledge contained in the supporting IT. This approach establishes the relationship between cost and resulting productivity (Housel et al., 2001, p. 13).

2. Surrogate for Value

The relationship between change in entropy and value added, while fundamental, does not provide a practical way to calculate the value-added by organizational processes, i.e., the entropy increment (Housel et al., 2001, p. 13). The time it takes the average learner to acquire the procedural knowledge required to produce a process output provides one practical surrogate for the corresponding changes in entropy (see Figure 13, *Procedural Knowledge is Proportionate to Change*). This framework can be applied to the context of organizational processes: Processes with predetermined outputs may be described in terms of the amount of time it takes the average knowledge worker to produce those outputs they normally do to complete a business task. It follows, that the procedural knowledge used to produce the attendant outputs may be viewed as a surrogate for the process outputs.

The impact of procedural knowledge can be viewed in two respects in the context of IEEM and portal optimization: one is the reduction of knowledge worker task completion time to exercise the same level of procedural knowledge to create equally if not improved outputs (this respect is how KVA can be applied and is analogous to learning time to conduct a task that has been assigned a percentage of revenue generation for a known outcome whose revenue returned can be estimated); and other is in the context of cost benefit showing how more tasks (ergo more expected outcome) can be accomplished in the same period of time or, alternatively, how the same expected outcome can be achieved in less time (this respect is how Activity Based Costing can be applied, see Section F.2.b: *Activity Based Costing and IEEM*).

In the knowledge worker task completion time approach, the total amount of task completing time required to business-related outputs (i.e., research, code or service) is a surrogate for the revenue derived from a firm's outputs during a given sample period. The outputs of all the company processes used to generate this revenue, at a given point in time, can be described in common units of task completion time. It follows that "price per unit of output," or its surrogate "price per unit of knowledge," (which is derived by dividing company revenue by the total number of units of knowledge) is a constant. However, the cost per unit of knowledge will vary depending on the cost of the knowledge resources (e.g., people and technology) used to produce a process output (Housel et al., 2001, p. 16).

One task for example in which the IEEM can be calculated with KVA is through greater awareness of content which allows for greater opportunities for such things as software reuse or the reduced time to complete any standard business routine. Even more important than reuse or number of lines of reduced code per se is the derived benefits portals provide in improving the chances for faster development and time to market. For example, many additional products are produced as a result of discovering code or useful information that would have been otherwise inconceivable. Thus, the usability of valuable documents and artifacts previously unrecognized creates competitive advantage. *Since the over-arching objective of an intranet is time reduction to complete all tasks, enhancements to process design as a result of IEEM analysis to optimizing portals for knowledge worker productivity needs is therefore the most crucial issue in facilitating and maintaining the highest returns possible for an intranet. The advantages of employing the Knowledge Value Added and Activity Based Costing methodologies in conjunction with IEEM are that, while grounded in a theoretical framework, they can be applied practically to obtain estimates grounded in common units and that these units can be used as a surrogate for value as well as compared to each other to ensure*

opportunities to increase value are not overlooked. How these two approaches to estimating ROI compliment each other are addressed in more detail in the remainder of this section.

a. Knowledge Value Added and IEEM

As changes in process design may be the most crucial issue in predicting and maintaining the highest ROIMI to best leverage knowledge embedded practices within and across intranet portals, good old-fashioned ROI modeling does not permit enough time to develop the business case for either the metrics or the changes suggested by their results. Therefore, calculating returns using the KVA approach in conjunction with the IEEM works like an investment-portfolio approach: the changes made to process are thought to payoff and improve value, but a period of time is needed to collect the data periodically and analyze it before value realizations can occur, generally in the form of recognizing greater savings in time or, conversely, more productivity-related activity in less time as a result of the application of and enhancements to the exercise of procedural knowledge.

The essence of KVA is that it takes knowledge utilized in corporate core processes and translates it into a numerical form that allows allocation of revenue in proportion to the value-added by the knowledge as well as the cost to use that knowledge (Baskerville, 1999, pp. 20-21). Tracking the conversion of knowledge into value, while measuring its bottom line impacts, enables managers to increase the productivity of these critical assets -- namely in this study, the crucial process activities that take place in portals that drive productivity.

Although the KVA methodology can be applied at any level in a company, it takes on significant value when applied at the enterprise level. A form of the KVA methodology when used within the IEEM framework allows a business intelligence team to iteratively generate estimates of return on portal information system related

initiative/process changes as they test/tweak various process designs modifications within and across a variety of portals. In this manner, competitive advantages of this faculty, i.e., changes brought about by the induction and deduction of metric results based off the IEEM, can be reflected in contributions to the company bottom line over time, not overnight.

ROIMI essentially boils down to a delta in time savings as the time devoted to applying, analyzing and taking subsequent actions based on the IEEM metric conversion rates results in a net gain in time -- or what can be accomplished in that same period of time -- in the work of *all* workers within the enterprise. By extension, this gain in time can be plausibly extrapolated into a gain in value (see Appendix D: *Time to Locate,* for explanation of how this is taken into account by the IEEM). One high level method of expressing the time in terms of savings, which is easier and more justifiable for some parties as opposed to value created, can be done by representing the delta in the time devoted by the small group of people responsible for making all the process changes to portals compared to aggregate statistics at each portal previously and then to the enterprise as a whole prior to the changes taking affect.

For example if *Time* gained (ΔT) as a result of time invested into applying and acting on IEEM metrics, then ΔT equals the amount of time gained by all employees from one measured period of time to the next $\Delta(eT) = eT_1 - eT_2$ minus the total time spent by the business intelligence team (*bitT*) in applying and analyzing a baseline of metrics uniformly across the enterprise, effectively affecting a wide bodies of knowledge workers (as well as others causality speaking). A simple expression of this is $\Delta T = \Delta(eT) - (bitT)$.

An example of how this equation may play out in a large corporation is:

$\Delta T = \Delta(eT) - (bitT)$

$\Delta(eT) = eT_1 - eT_2$

First 30 Period — Second 30 Period

Prior- metric changes — Post- metric changes

eT_1 = *Total No. K-Workers x Total Hours On-Line*

5000 x 4 hr/day x 20 days = 400,000 hours

eT_2 = *Total No. K-Workers x Total Hours On-Line*

5,000 x 3.8 hr/day x 20 days = 380,000 hours

$\Delta(eT)$ = 400,000 - 380,000 hours

= 20,000 hours

$\Delta T = \Delta(eT) - (bitT)$

20,000 hours

$(bitT)$ = *Total No. in BIT x Total Hours Worked*

10 x 4hrs/day x 20 days

= 800 hours

ΔT = 20,000 hours – 800 hours

= **19,200 hours** gained during second period

In this example, there is a 1:24 ratio in time invested by BIT and time saved to other knowledge worker company wide as a result of their process changes. This assumes that all portals are being measured and that most employees use their intranet to conduct business. Although this ratio difference increases with the size of an organization and its intranet, it will, conversely, diminish at some point and go the other directions as these employee numbers and intranet sizes decrease. Even if one quarter of the estimate above is realized during a 30 day period, this enhancement to the exercise of procedural knowledge would still result in a theoretical saving of over 57,000 hours per year (.25 x 19,200 x 12months). It is these kinds of numbers that will get attention and prove why focusing on changes to process is the key to higher returns.

These results can be expressed as magnitude percentage estimates, something mangers at multiple levels may be more willing to share and allow further interventions since specific dollar amounts resulting from the interventions may be

hidden from competitors while being able to share the general results of these interventions. Another tactic in presenting performance metrics and ROI in this case is that it may be wiser to use a range of numbers rather than a single target point. Low-end numbers enable management to make a decision based on conservative projections. High-end numbers dangle the prospect of bigger potential gains in front of them, informing them in any event of the significant scale these changes can make (see Appendix F: *Spreadsheet of ROI Returns* for examples of both ROI magnitude percentage estimates and target range of numbers). A clearer understanding of the potential return should encouraging BDMs to take risks (with such investments of time invested by a few knowledge workers to reduce time on task for many knowledge workers) until they have an accurate way of gauging potential value-creating benefits in harder numbers. In summary, this method provides a means – as well as a rational justification -- in which to calculate ROI for the metrics investment (time saved and better used by enhancements to procedural knowledge within processes) with a common unit of analysis: time to exercise procedural knowledge to produce an expected outcome, which can always be translated into money saved or earned as well as anecdotally accepted as boosting competitive advantage, i.e., time to market.

This example also helps to explain why a form of the KVA methodology can be made to be applicable. For one its basis in entropy concepts takes into account change or the process that enables this and that these changes/outputs are the thing of value since customers pay for the output of the corporation at any given point in time. Simply put, it allows allocation of revenue to the corporate and sub-corporate levels and it allows description of all process outputs in common units. These common units are proportionate to revenue and thus revenue can be allocated to these units allowing the generation of a numerator for an ROI ratio that is not based on any form of cost including, cost savings, cost avoidance, investment cost, etc.[7]

[7] Housel, email to Grant Jacoby on 19 November 2003.

In the case of the example above, KVA could be applied to the IEEM for the time it takes someone to do their job without optimizing changes being made to the process compared to someone who has the same tasks but with the optimized settings. It would be something akin to learning or doing a job and not having to learn or do as much to in order to accomplish the same requirement as a result of the application of knowledge exercised by the analysis team in the form of the changes they make to crucial productivity processes of portal intranets.

In other words, the time to exercise knowledge based off the metrics and applied to impactful productivity process changes of portals can sow even greater knowledge gains into the enterprise at large, i.e., the 1:24 time savings ratio given above. With regard to efficiency and effectiveness, time is saved and value created by virtue of people being able to do more in less time -- again, be it learning or doing. Concomitantly, since these process changes ultimately go across multiple portals there is an effectiveness gain as well, creating value.

b. Activity Based Costing and IEEM

Another and complimenting technique that can be used to measure ROIMI for IEEM based metrics is Activity Based Costing. ABC is a popular cost-based approach because finding the true costs of process activities are clearly useful in evaluating them (Johnson and Kaplan 1987). Despite the fact that the ABC technique appears to be a very suitable managerial tool for e-business, widely–known published reports about its use in intranet or internet-related economies do not currently exist. Nevertheless, applications of ABC to measuring the impacts of IT assume that any cost/time saved or processes simplified (and thus costs or time reduced) by the IT (namely in this case the *corrective* actions taken after analysis of IEEM metrics and conversion rates) are a direct reflection of its value. This assumption holds true in cases where IEEM metrics analysis is applied causing reductions in cost/time while process

outputs remain constant or increase. Thus, the applicability and merits of ABC to IEEM related ROIMI warrants further examination.

Criticisms of ABC need to be kept in mind and overcome if it is to have credibility in assigning value to process changes brought about by analysis of metrics. The conceptual limitation of the cost-based approaches to generating a return on investment-type performance ratio is that they do not have a surrogate for revenue (Johnson 1992). The problem of using this method for evaluating the value added by IT, is the fact that if cost (or any of its derivatives) is used as a surrogate for value, then all the information is contained in one term of the ratio, i.e., the denominator (Housel et al., 2001, p. 10). The data source for value should come from the revenue side of the firm's performance (i.e., numerator) and the data source for cost (i.e., cost) should come from the cost to produce the firm's outputs. In the case of IEEM, a form of ABC provides a numerator of *procedures to accomplish an activity* over the time and cost it takes. This is akin to and borrows from the KVA methodology and presents a method to measure and trace value at the sub-corporate level, ironically unlike ABC's originally intended design (see Section II.C.2: *Cost-Based Similarities and Differences* and Table 1, *Common Approaches to Measuring the Return on IT*). Nevertheless, conventional application of ABC is strictly about cost. This approach to ROI can compliment that of KVA and an illustration of this follows.

ABC is a systematic, cause & effect method of assigning the cost of activities to products, services and customers (*cost objects*). ABC uses a simple principle:

- Products, Services and Customers generate the need for activities.
- Activities consume resources.
- The more varied and diverse the Products, Services and Customers, the more activities are generated and the more resources are needed.

ABC measures the cost and consumption of activities and assigns these costs only to the cost object generating the activity, such as the service provided or the demand of a customer (Roztocki, 2001, p. 2). ABC introduces the concept of *cost drivers*, which are any factor that cause a change in the level of activity. In the case of IEEM metrics analysis and actions, it is the process changes, specifically the procedures removed, modified or introduced. It is the choice and use of cost drivers that enables the analysis team to accurately allocate the indirect and overhead costs to the appropriate cost object. For example, assigning resource costs associated with looking and processing information to do a job (activity) to provide a service (cost object) can be accomplished by using the number of searches, navigational steps, clickstreams, and other metrics outlined by the IEEM metrics baseline and conversion ratios (cost driver). The better the service (be it faster or a *qualifiable* improvement), the less time (resource) is used to run through the steps necessary to provide the service, the less costs are assigned to this service. By focusing on the minimization or optimization of an activity by either reducing the number of procedures or strengthening them to accomplish an activity through crucial process changes of intranet practices, the number of procedures *reduced* provides a means to measure consumption of resources as well as a trace to where value is gained. In addition, the trace on value further informs future decisions regarding where process changes have the greatest impact.

Expenses which can be associated with a particular cost object are considered "direct", i.e., salaries and expenses and those which can *not* be associated with a particular cost object are defined as "overhead", i.e., operational costs. It is these costs that can be traced from activities to cost objects. To systematically relate activities to cost objects, the direct and overhead costs of each cost object are added together as "indirect" costs in order to obtain the product cost. The product cost represents an estimate of the *actual* expenditure on the part of a company to generate a cost object, rather than the cost of that object to a customer. The remaining paragraphs in this section provide an example of how this would work in relation to IEEM.

An example of ABC derived ROIMI for IEEM can be illustrated by a division that runs two sets of procedures: one in a non-optimized portal and the other in an optimized portal essentially using a similar process but with less required procedures. Stepping through any procedures to do nearly any activity takes time and resource. Additionally, process changes that result from actions taken from metrics analysis relate directly to procedures taken and take up time and resources as well which need to be taken into account when seeking a ROI.

For instance, during a 30 day period to accomplish an activity, the direct and overhead cost assigned to a section is $2,400. An optimized portal's cost would need to account for the costs devoted in optimizing the portal for that given period. For instance, the costs could amount to $800 and this cost could be accounted for during the period of just one activity or amortized over a longer period. It would be more realistic however to amortize these costs over the course of at least one year over the same activities that take advantage of the same procedure changes made to facilitate the completion of an activity as a part of doing business, i.e., "time to value".

This activity example would include the following:

- 310 procedures are required to perform an activity in a portal not optimized (links, design, help).
- 285 procedures are required to perform the same activity in an optimized portal.
- Procedures in a non-optimized portal require 125 hours of work to be completed.
- Procedures in an optimized portal require 110 hours of work to be completed.
- The additional cost associated to the optimized portal for this activity is $800.

In total, there are 310 procedures to complete an activity in 125 hours that would normally cost $2,400 in one non-optimized portal versus 285 in 110 hours for an

optimized portal which requires an addition $800 to cover the optimization costs (albeit for one activity or amortized over the course of a year):

To develop this example further, the additional costs imposed by factoring in the costs of metrics analysis and changes are factored two ways in the two complimentary tables below for comparative purposes: in one 30 day activity and then amortized over the course of a year for the same activity conducted multiple times by one knowledge worker.

Indirect cost (time) assigned procedures in non-optimized portal – (310 / 125 hours)	1 procedure per every 24 min. 12 sec
Indirect cost (time) assigned procedures in optimized portal – (285 / 110 hours)	1 procedure per every 23 min. 10 sec
Average indirect cost assigned non-optimized portal over time period to complete the activity (285 / $2,400)	1 procedure per every $7.74
Average indirect cost assigned optimized portal over time period to complete activity (285/ $2,400 x 110hours / 310 hours + $800)	1 procedure per every $10.21
Average indirect cost assigned optimized portal amortized over one year time period to complete the activity (285/ $2,400 x 110hours / 125 hours + $800/12)	1 procedure per every $7.64

Table 6. ABC Costs Assigned to Portals

Variable Calculated	Best Case	Worst Case	Difference
Number of Procedures			
No. procedures required to perform activity in a non-optimized portal	310	310	
No. procedures required to perform activity in an optimized portal	285	300	-15
Number of Hours			
No. hours required to complete activity in a non-optimized portal	125	125	
No. hours required to complete activity in an optimized portal	110	116.5	-6.5
Number of Knowledge Workers that Conduct same Task	500	450	-50
Cost of Activity (direct and Overhead)	2400	2400	
Additional Cost (Associated to the optimized portal for this activity)	800	1100	-300
Indirect Costs for Non-Optimized Portal			
Indirect cost (time in minutes) assigned procedures in non-optimized portal	24.19354839	24.19354839	
Average cost assigned non-optimized portal over period to complete activity	7.741935484	7.741935484	
Indirect Costs for Optimized Portal			
Indirect cost (time in minutes) assigned procedures in optimized portal	23.15789474	23.3	-8.526315789
Average cost assigned optimized portal over time to complete activity	10.21754386	11.12266667	-0.905122807
Amortized Indirect Costs for Optimized Portal			
Average cost assigned optimized portal amortized over one year period	7.644444444	7.761555556	0.117111111
Frequency of Activity (answer only one choice below)	12	12	
Weekly (enter the value of 1 if this applies)			
Bi-Weekly (enter the value of 1 if this applies)			
Monthly (enter the value of 1 if this applies)	1	1	
Bi-Monthly (enter the value of 1 if this applies)			
Quarterly (enter the value of 1 if this applies)			
Semi-Annually (enter the value of 1 if this applies)			
Annually (enter the value of 1 if this applies)			
Procedures Gained in One Activity Period	38.86363636	21.88841202	-16.97522435
Percentage Procedures Gained in One Activity Period	4.472140762	3.834971618	-0.637169144
Procedures Gained in One Year for this Activity	166.3636364	142.6609442	-23.70269216
Percentage Change in Procedure Productivity for Activity in 1 Year (%)	4.472140762	3.834971618	-0.637169144
Total Cost of Procedures for this Activity in One Year	29709.09091	29980.25751	271.1666016
Savings of Procedures for Activity in Optimized Portal over One Year	378.8856305	-75.78568462	-378.8856305
Percentage Savings of Procedures in Optimized Portal over One Year	1.280019022	-0.253463828	-1.53348285
Annual Savings to Enterprise for Activity (if more than one employee)	189442.82	-34103.5581	-223546.3733
Percentage Annual Savings to Enterprise for Activity	1.315502	-0.26312241	-1.578624428
Additional Similar Activities Accomplished across Enterprise	291.8660287	213.9914163	-77.8746124
Percentage Additional Similar Activities Accomplished across Enterprise	4.864433812	3.962804006	-0.901629806
Virtual K-Workers Gained for Activity across Enterprise	24.32216906	17.83261803	-6.489551033
Percentage Virtual K-Workers Gained for Activity across Enterprise	4.864433812	3.962804006	-0.901629806

Table 7. ABC ROI Returns for 30 Day Activities During One Year

If knowledge workers in the optimized portal worked the same number of hours as the non-optimized portal, they would be able accomplish approximately 39 more procedures within the same time period (310 hours / 612 seconds per procedure). Taken a step further if this activity is done 12 time in the course of a year (125 hours is approximately half the number of hours one person works a month, therefore this activity would only account for half of their jobs) and the costs are tabulated using the amortization of the $800 development costs over that period, the total number of additional procedures accomplished would be 166 procedures ([38.86 procedures accomplished in optimized portal/ month x 12 months] – [24.19 procedures accomplished in non-optimized portal/ month x 12 months) and the cost would be $29,709.09 (3886.36 procedures / year x 12 months x $7.64 / 1 procedure).

In summary, the additional 166 procedures gained would cost an additional $378.89 as opposed to $909.09[8], providing a 4.47% increase in procedures accomplished during that month. Taken collectively across the enterprise the percentage increase (or ROI) would continue to gradually climb (albeit slightly in some activities and indistinguishable in others if the process is near fully optimized), moreover the cost savings would be profound. The example given is prepared in the context of what one knowledge worker can accomplish in the average amount of work hours per month. If the savings for this one knowledge worker is nearly $379.89, the savings would be even larger every year when applied to an even greater number of them, i.e., $379.89x 500 workers who must accomplish this same activity equates to $189,442.82 annual savings for this one activity alone. Similarly, an additional 291 activities can be accomplished (166 procedures / year x 500 k-workers = 83,181 procedures / 285 procedures per activity accomplished in an optimized portal): the equivalent of adding 24 knowledge workers (291 activities / 12 activities per k-worker per year) or, alternatively, providing a justification to reduce the size of a knowledge worker pool who completes this activity.

[8] (Total Cost of all procedures completed in optimized portal) versus (Total Cost of procedures in non-optimized portal had it had to produce the same number of procedures as the optimized portal in the same period of time) -($800 Total Cost of activity x 12 months)

Although the percentage improvement appears nearly insignificant for the first activities, the impact of being able to perform more procedures with the same cost or less procedures to accomplish an activity in less time is significant when applied across the enterprise for all knowledge workers (or groups) who perform this same activity over time, as Figure *Productivity Pyramid* below illustrates in purple (color for efficacy gains)

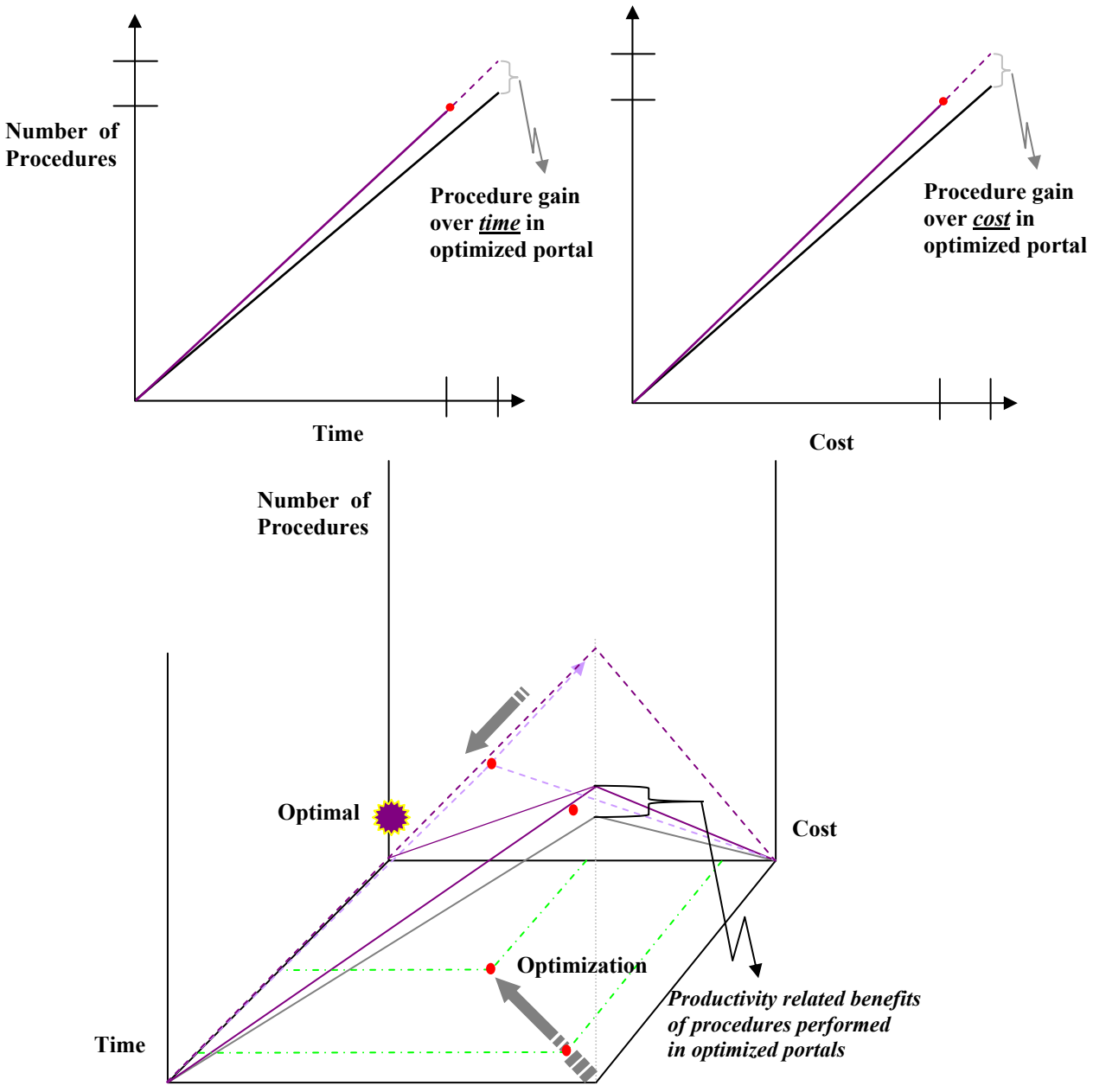

Figure 14. Productivity Pyramid

This type of calculating is conceivable and doable for *standardized* processes of work that can be enhanced by portal changes in information access and discovery. However, it is limited in accounting for *creative* processes since the steps of each procedure cannot be known with certainty ahead of time. It can provide approximate accountability by gauging levels of disintermediation achieved through conversion rates, anecdotal confirmations by the knowledge workers through surveys and more general time estimates derived from shorter development times achieved by in-house research and development efforts or cycles within the R&D department itself.

The example of procedures used above can take on other parallel meanings in terms of value that can be derived. For example, if computer code, i.e., instruction sets (another surrogate for procedures), is discovered as a result of it being more accessible, there would also be significant savings. Using the information provided by ABC as a means to monitor impact of process changes (as a result of IEEM metrics analysis), companies in effect can cut costs, identify opportunities for improvement, and determine a more profitable way of conducting business activities. In addition, the output of the ABC analysis is a good basis for revising tactical-level portal changes/enhancements as well as efficiencies expected of corporate portal strategies (see Appendix F: *Spreadsheet of ABC ROI Return Examples* to see a variety of different activities conducted at varying intervals each year, ie., weekly, bi-weekly, quarterly, etc.). Appendix F also provides worst and best case estimates of process changes to provide BDMs a measure of risk involved with each series of process changes. For example, in the Quarterly Activity estimates, the best case is an annual savings gain of $428,571 but poses a risk of -$35,200 in the worst case. Given this range, the BDMs can better ascertain if the changes are worth the risk.

ONE YEAR RESULTS Variable Calculated	Weekly Best Case	Weekly Worst Case	Bi-Weekly Best Case	Bi-Weekly Worst Case	Monthly Best Case	Monthly Worst Case	Quarterly Best Case	Quarterly Worst Case
Number of Procedures								
No. procedures required to perform activity in a non-optimized portal	50	50	110	110	310	310	1200	1200
No. procedures required to perform activity in an optimized portal	45	48	95	102	285	300	1100	1150
Number of Hours								
No. hours required to complete activity in a non-optimized portal	30	30	68	68	125	125	400	400
No. hours required to complete activity in an optimized portal	26	28.5	57	64	110	116.5	350	375
Number of Knowledge Workers that Conduct same Task	4000	3500	1000	900	500	450	250	220
Cost of Activity (direct and Overhead)	700	700	1200	1200	2400	2400	15000	15000
Additional Cost (Associated to the optimized portal for this activity)	200	300	400	700	800	1100	1000	1400
Frequency of Activity (answer only 1 choice)	48	48	24	24	12	12	4	4
Procedures Gained in One Activity Period	6.923	2.526	18.33	6.375	38.863	21.888	157.142	76.666
Percentage Procedures Gained in One Activity Period	3.846	1.052	3.03	-1.477	4.472	3.834	4.761	2.222
Procedures Gained in One Year for this Activity	92.30	25.26	80	-39	166.363	142.66	228.57	106.667
Percentage Change in Procedure Productivity for Activity in One Year	3.846	1.052	3.03	-1.477	4.472	3.834	4.762	2.222
Total Cost of Procedures for this Activity in One Year	33830.76	33915.78	29277.19	29543.75	29709.09	29980.25	61142.85	61493.333
Savings of Procedures for Activity in Optimized Portal over One Year	1061.538	37.89	395.53	-1169.204	378.885	-75.785	1714.285	-160
Percentage Savings of Procedures in Optimized Portal over One Year	3.140	0.111	1.354	-3.963	1.28	-0.253	2.81	-0.26058
Annual Savings to Enterprise for Activity (if more than one employee)	**4246153**	**132631.57**	**395534.29**	**-1052284.1**	**189442.81**	**-34103.55**	**428571.43**	**-35200**
Percentage Annual Savings to Enterprise for Activity	**3.159**	**0.112**	**1.373**	**-4.059**	**1.315**	**-0.263**	**2.856**	**-0.26663**
Additional Similar Activities Accomplished across Enterprise	8205.128	1842.105	842.105	-344.117	291.866	213.991	51.948	20.4057
Percentage Additional Similar Activities Accomplished across Enterprise	4.273	1.096	3.508	-1.593	4.864	3.9628	5.1948	2.31884
Virtual K-Workers Gained for Activity across Enterprise	170.94	38.37	35.087	-14.338	24.322	17.832	12.987	5.101449
Percentage Virtual K-Workers Gained for Activity across Enterprise	4.273	1.096	3.5087	-1.593	4.864	3.962	5.1948	2.31884
TWO YEAR RESULTS								
Frequency of Activity (answer only one choice below)	96	96	48	48	24	24	8	8
Procedures Gained in One Activity Period	6.923	2.526	18.33	6.375	38.863	21.888	157.142	76.667
Percentage Procedures Gained in One Activity Period	3.846	1.052	3.03	-1.477	4.472	3.834	4.761	2.222
Procedures Gained in One Year for this Activity	184.61	50.52	160	-78	332.727	285.3218	457.142	213.333
Percentage Change in Procedure Productivity for Activity in One Year	3.846	1.052	3.03	-1.477	4.472	3.834	4.761	2.2222
Total Cost of Procedures for this Activity in One Year	67430.76	67515.78	58077.19	58343.75	58509.09	58780.25	121142.8	121493.33
Savings of Procedures for Activity in Optimized Portal over One Year	2353.846	391.5789	1268.261	-1594.659	1666.86	1028.68	4571.428	1173.33
Percentage Savings of Procedures in Optimized Portal over One Year	3.492	0.58	2.186	-2.735	2.8542	1.752	3.778	0.966502
Annual Savings to Enterprise for Activity (if more than one employee)	**9415384.62**	**1370526.31**	**1268261.56**	**-1435193.2**	**833431.08**	**462908.76**	**1142857.1**	**258133.33**
Percentage Annual Savings to Enterprise for Activity	**3.502**	**0.582**	**2.201**	**-2.768**	**2.893**	**1.785**	**3.8093**	**0.97772**
Additional Similar Activities Accomplished across Enterprise	16410.25	3684.210	1684.210	-688.235	583.732	427.982	103.896	40.8115
Percentage Additional Similar Activities Accomplished across Enterprise	4.273	1.096	3.508	-1.593	4.864	3.962	5.1948	2.31884
Virtual K-Workers Gained for Activity across Enterprise	170.94	38.37	35.087	-14.338	24.322	17.832	12.987	5.101449
Percentage Virtual K-Workers Gained for Activity across Enterprise	4.273	1.096	3.5087	-1.593	4.864	3.962	5.194	2.31884

Table 8. One Year vs. Two Year ROI Returns for Different Activities

Despite the promising benefits of this technique based on the IEEM baseline of metrics and conversion rates, it does require time to gauge and calculate, which runs counter-grain to the fast pace nature of internet economies. An illustration of this using the previous 30 day example is depicted in Tables 8 (*One Year versus Two Year ROI Returns for Different Activities*) which illustrates how changes in worst case estimates can go from a negative projection (-$34,103.55 or -0.263% ROI) after one year to a positive return after two years ($462,908.76 or 1.785% ROI). On the contrary, some investments may never – or for an unacceptably long period of time – provide a positive return under worst case estimates, such as the bi-weekly scenario in Table 8 during one and two year returns, providing negative 4.059% and 2.768% ROIs respectively. It is up to the BDMs to decide what is an acceptable risk, but they must first be given the expectations in terms they understand and which can be rationalized by a sound model supported by mathematics (see Appendix F: *Spreadsheet of ROI Returns* for more examples and an explanation of the calculations). Given the time it would take to realize value gains is *affordable*, ABC-like estimates of savings from IEEM metrics, i.e., semi-annual to annual results, appear to be a good managerial tool to gauge time to value for intranets (as well as internets) of large companies involved in e-business.

3. Keys to Measuring Returns on IT

Although they are inter-related, time is the efficiency factor and creating value is the effectiveness factor. A tractable method to prove this with any hard numbers would be similar to the examples above in the form of time reductions in the exercise of procedural knowledge -- much like KVA does in the form of *return on knowledge* in case example it uses showing differences of learning times before and after the application of knowledge (Housel et al. 1999). Consequently, KVA is proposed in this paper as one way to estimate the value-revenue *allocatable* to corporate assets such as people and technology. And ABC is proposed as another means to estimating the return or cost-benefit of ROIMI in a tractable procedure presented in terms of value gain, be it cost, time, activities generated or number of knowledge workers required. In both

methodologies, creating value can be conveyed through the increase of conversion ratios (found in the metrics sub-grouping of Appendix D) that constitute critical business requirements, such as loyalty, reach and disintermediation.

KVA and ABC methods of estimating ROI also compliment each other when used together to estimate the same process. For example, audits that result due to discrepancies can be automated quickly while others are more manual intensive and require time to resolve. In any event, significant cost savings can be made if the number of discrepancies that require audits is lowered. In one study, KVA analysis does not make any recommendations for changes in auditing function because *on paper* it has relatively high ROK (cost to learn how to conduct audits divided into the revenue created by them when factoring associated percentage of costs of audits and the revenue generated back). From an ABC perspective, however, the auditing function comes under scrutiny because of the high cost when a discrepancy has to be researched. Intuitively, auditing does not add value for the customer and, therefore, is a target for re-engineering discovered by ABC (Nomura, 2002). Thus, when using KVA, an analyst must be careful to factor in qualitative measures (i.e., common sense) to ensure a thorough and complete re-engineering effort is made.

On the other hand, ABC has deficiencies when dealing with processes that are complex or involve a large amount of knowledge. In such processes, costs and ROK will not be correlated and, consequently, re-engineering efforts will be focused in different areas. As a result, ABC may misdirect re-engineering efforts. As the economy shifts from a manufacturing to a services emphasis, the value of the KVA methodology increases. Knowledge intensive processes are more prevalent in the services sector and, therefore, will benefit the most from a re-engineering project using the KVA methodology. Thus, while ABC is useful, due to our ascent into the "Information Age", KVA appears to be more relevant for the future (Nomura, 2002).

The advantage of combining IEEM and its associated baseline of metrics which emphasizes surveys and includes the key conversion ratios to estimate the improvement of critical business requirements with ROI estimates from both KVA and ABC is that they collectively overcome a limitation of the KVA and ABC techniques when applied alone, not readily representing to the same extent increases in quality, creativity and knowledge worker satisfaction. However, these factors do impact the bottom line and will eventually find their way into processes with predetermined outputs because the most intangible asset of employee knowledge eventually becomes a tangible asset embedded in company IT. Though it is unlikely that the benefits of these factors will ever be completely quantified, over time this approach does allow for eventual accountability of conversions such as creative outputs into value since they are inevitably embedded into processes with predetermined outputs (Housel et al, 2001). Taken as a whole, conclusions from these approaches should be plausible and provide management with a more comprehensive picture of the value and direction of their *intranet* refinements and initiatives than they currently get from any other means or methodology.

As the academic community points out, there are four key issues that need to be addressed within any framework for measuring the return on IT.

- Unambiguous allocation of value as well as cost of IT initiatives
- Mapping of IT economic impacts at any level of aggregation
- Common unit of measurement
- A supporting theoretical framework

Together the IEEM and its supporting metric conversion ratios and their analysis along with the application of a form of KVA and ABC to determine ROI in measurable common units meet all four of these essential requirements. The collective framework and approach is theoretically-based and "operationalizable". Further, such a framework can prove useful to the practitioners who are struggling to determine which IT process designs will provide the best returns from their intranet portals. In effect, consistent application of the IEEM framework and baseline metrics in combination with KVA and

ABC improves insight into how to increase the value of an enterprise in a rational fashion using common units of measurement when and where necessary.

G. SUMMARY

ROI is one of those things that, in theory, makes perfect sense. The problem with relying solely upon financial techniques such as Net Present Value is that they don't necessarily capture all of the business benefits of an IT investment, nor do they help to evaluate all of the options available (see Appendix E, *Common Approaches to IT ROI*). Nonetheless, a rational and comprehensive pursuit of ROI can lead to the discovery and optimization of proper metrics that can both demonstrate the business value of intranets portals as well as guide efforts toward enhancements to them that will have the greatest ROI.

Although costs vary widely, executives and knowledge workers down the line uniformly expect big benefits from intranet portals. Ironically, however, firms will spend big money but won't measure the results. Sixty-one percent of firms don't have any metrics to prove portal benefits (Gillet, 2001, p. 7). Reasons for the lack of measurement range from not knowing how to do this to taking the easiest, albeit not very insightful, course of action to collect simple metrics such as page hits. Assessing soft and derived benefits for intranets -- such as improved customer service, satisfaction, collaboration, loyalty and quicker time to market -- can be one of the most challenging tasks in determining ROI for intranet portals. Thus, by applying the IEEM metrics baseline, conversion ratios and analysis, an azimuth indicator showing how well a corporation is reaching and supporting its strategic business requirements is possible, provided a reasonable return on intranet metrics investment (ROIMI) of the costs of the analysis process is compared to the time benefits using a form of KVA and ABC. Exactly who should be designated to ensure metric results and analysis produce reasonable estimates of ROIMI is addressed next in Chapter VI, *Business Intelligence Team*.

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VI. BUSINESS INTELLIGENCE TEAM

> IT, in particular, needs to be *managed* as a capital investment opportunity, rather than being merely a money pit of expense.
> John Berry, IT Consultant and Columnist

A. ROLE OF BUSINESS INTELLIGENCE TEAM

Successful IT projects and ROI require collaboration and commitment between business managers and IT professionals. Because analytic skills are extremely scarce, enterprises cannot afford to scatter these experts. Therefore, enterprises should create a Business Intelligence Team (BIT), in which analysts and IT experts work closely together to support business managers in their decision-making tasks. The BIT should be housed where it matters most – not too high disconnected from the real world and not too low losing an over-arching view.

Creation of a BIT is important because IT professionals are increasingly involuntarily and voluntarily involved in the strategic and financial implications of IT. Involuntarily, more and more proposals for IT projects must include economic and strategic justifications and, similarly, more and more software developers/developments are being pressured by customers and managers alike to justify the value of the software and IT enhancements being delivered. Voluntarily, developers of new IT products and processes are now trying to promote them not only with operational justifications (faster, fewer errors, etc.) but with strategic and financial justifications ("this new process will deliver more business value"). Although IT professionals are increasingly involved, two-thirds of companies interviewed by one research group stated funding responsibility lay fully with IT -- or IT had no role at all (Gillet, 2001, p.7). This doesn't match up with the levels and types of responsibilities and expertise required to deduct and calculate IT related ROI.

B. BIT COMPOSITION

Success in applying Web analytics requires collaboration between analysts, portals managers and BDMs. Having the necessary skills in these three fields to collect,

interpret and act on information quickly is a competitive e-business differentiator. Preferably, the people involved in Web analytics should be skilled in more than one discipline. Web analysis is, first of all, an analytics exercise, not an IT project.

1. Analyst

An analyst must be capable of:

- Exploring data and discovering patterns, meaningful relationships, and anomalies.
- Working with the IT department to develop insight into how to identify data from the Web and other sources for a specific analysis.
- Using a palette of techniques, ranging from simple data aggregation, via statistical analysis, to complex data mining.
- Being fluent with analytics tools.
- Distilling the relevant parts and producing sound recommendations, based on the right set of metrics.

2. IT Professional

An IT professional must be capable of:

- Working with a business manager to define the right requirements.
- Implementing the required changes in an efficient way.
- Supporting analysts by advising on the efficient storage of Web site data, integration of data with other sources and how to keep an historic overview of this data.
- Working with analysts to identify the necessary data for a specific analysis and make sure it is accessible and understandable.

3. Business Manager

A business manager, responsible for a portal site, must be capable of:

- Interpreting the results and creating decision alternatives, together with an analyst and IT professional/portal manager.
- Tying analytic results to the corporate objectives to ensure that decisions support the enterprise's business requirements.
- Initiating *process* changes based on changes in portal sites and to follow up on triggers or anomalies reported from the respective intranet portals.

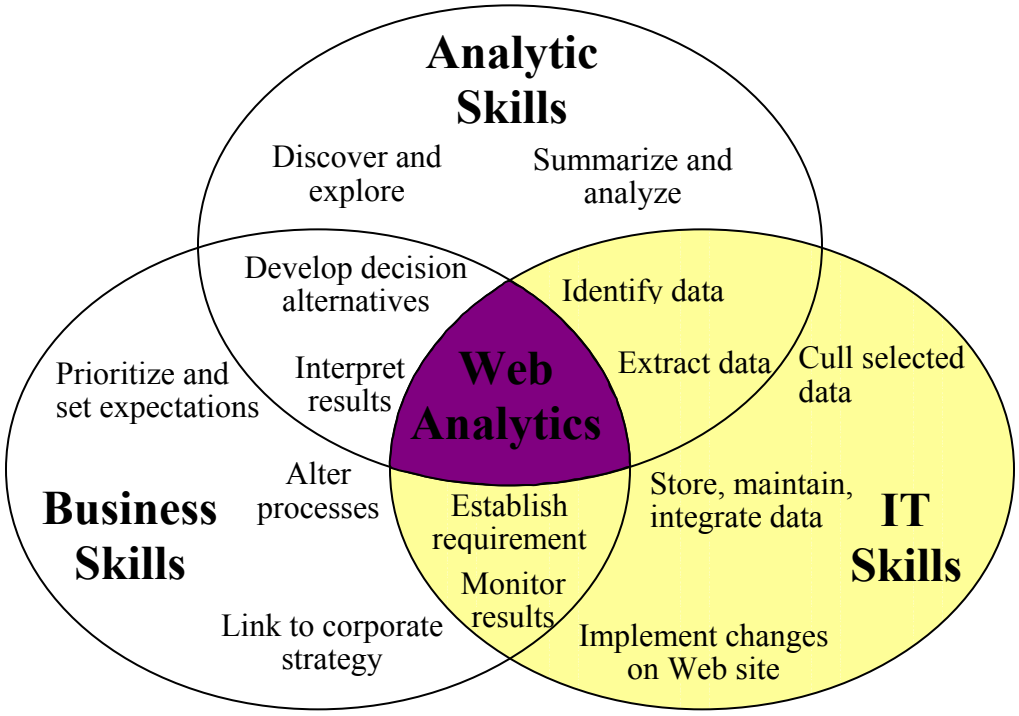

Figure 15. Complimenting Skill Sets and Tasks for BIT [9]

C. BIT ADVANTAGES AND SHORTCOMINGS

While portal managers tend to have a short-range view; the BDMs have a long-range perspective and while portal managers ask how and when; the BDMs ask what and

[9] Buytendijk, 2001, http://www.gl.iit.edu/gartner2/research/97600/97608/97608.html

why? The analyst meanwhile strives to figure out as many answers to these questions as possible. Creation of a multi-disciplinary and perspective BIT produces more advantages than shortfalls, particularly for large intranets, in guiding IT projects and determining their ROI. Advantages include:

- One group to centralize a variety of analytic tasks (see section IV.B.4, *A Single Reporting Service*).
- BDMs are involved up front during ROI benefits analysis and can be held more accountable *along with* IT for achieving the predicted benefits.
- Engenders business acumen of technical workers.
- Incorporates a better mix of common sense, professional judgment, quantitative modeling and strategic perspective.
- More likely to ferret out benefits buried in other lines of business – due, in part, to their collective multi-disciplinary backgrounds.
- Separate software proposals into those that have potential for ROI and those that are simply the cost of doing business (i.e., know when ROI justification is warranted)
- Provides greater validity to ROI analysis, resulting in a wider spread of acceptance.

Disadvantages tend to affect smaller organizations and include:

- The Web exacerbates the advantages of scale: A large enterprise will get far more leverage from its Web investments than a small one (Casser, 2001, p.3).
- Some assets used to compute value-based measures are in the form of intellectual capital, which runs up against a fascinating set of issues in figuring out how to value this talent (Meyers, 1997, p. 47). The result is that value-based performance metrics make little sense for companies without significant hard assets.
- Depending on their levels of experience, some BITs may make the mistake of thinking that measurement of causation is much more prevalent than it really is, particularly if too many modifications are made to portal sites at once (see Figure 8, *Balancing Changes with Cause and Effect*).

- When BITs are replaced with outside vendors/analysts to measure results, their "outsider" replacement may not know the internal culture issues or the nuances of the enterprise, placing it at a disadvantage.
- If consultants are hired, they charge steep fees for this type of service: six figures for larger companies or between $15,000 – 25,000 per month for smaller ones.

Depending on the amount charged, outsourcing may be an acceptable solution for some companies that simply do not have the money and resources to invest in these skills. However the costs associated with this may risk achieving positive ROIMI returns, particularly for smaller companies. In addition, many organizations are uncomfortable with the service provider model because sensitive customer data is handled by a third party. Organizations are also at the mercy of the service provider for report customization and data retention policies. Generally, more money is saved by creating BITs in-house and the *personal investments* are greater and more reliable as well. Thus, corporations should consider seeking out its employees who best meet the BIT-related analytic skills needed (see Figure 14, *Complimenting Skill sets and Tasks for BIT*) for intranet portal analysis during the intermediate and developed terms because the right mix can create a competitive advantage.

Teams selected to analyze Web metrics should try to keep choices tactical in support of strategic objectives, i.e., making changes in which the impact is generally known and can be measured tractably. For example, they must evaluate their success or failure by tracking metrics for each strategic objective, not solely metrics for each tactical initiative. By proceeding in this manner, they can overcome a variety of challenges (see below Figures 13, *Top Challenges in Selecting and e-Business Project*, and 14, *Top Challenges Measuring Success of e-Business Investment*) now confronting commercial and government sectors in trying to measure their intranet portals:

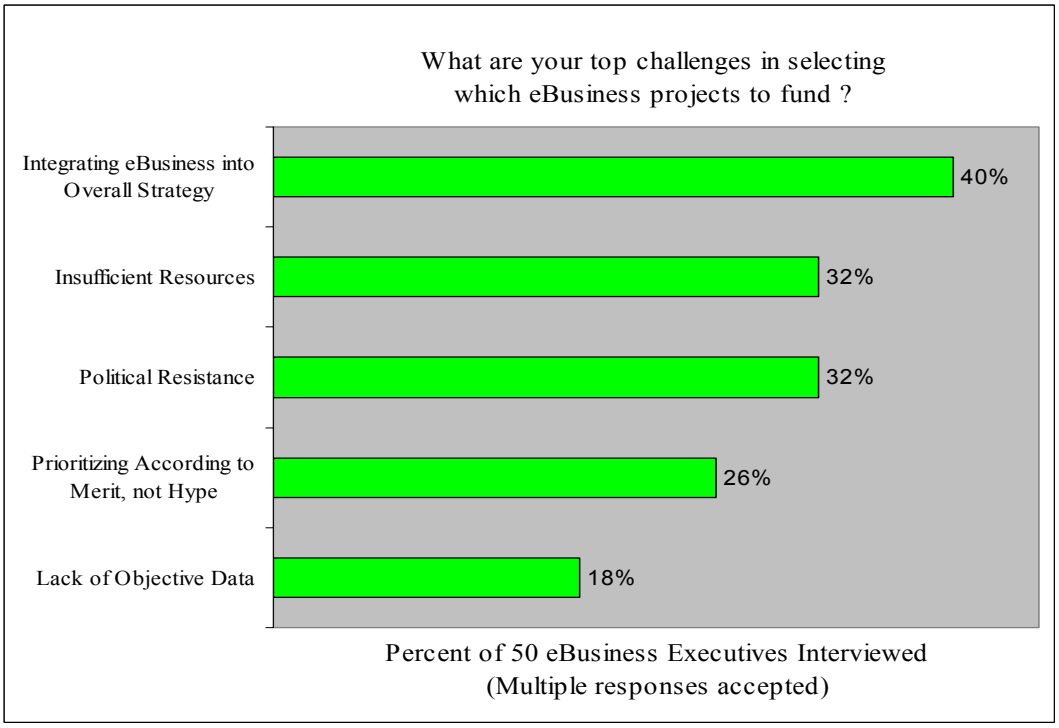

Figure 16. Top Challenges in Selecting and e-Business Project

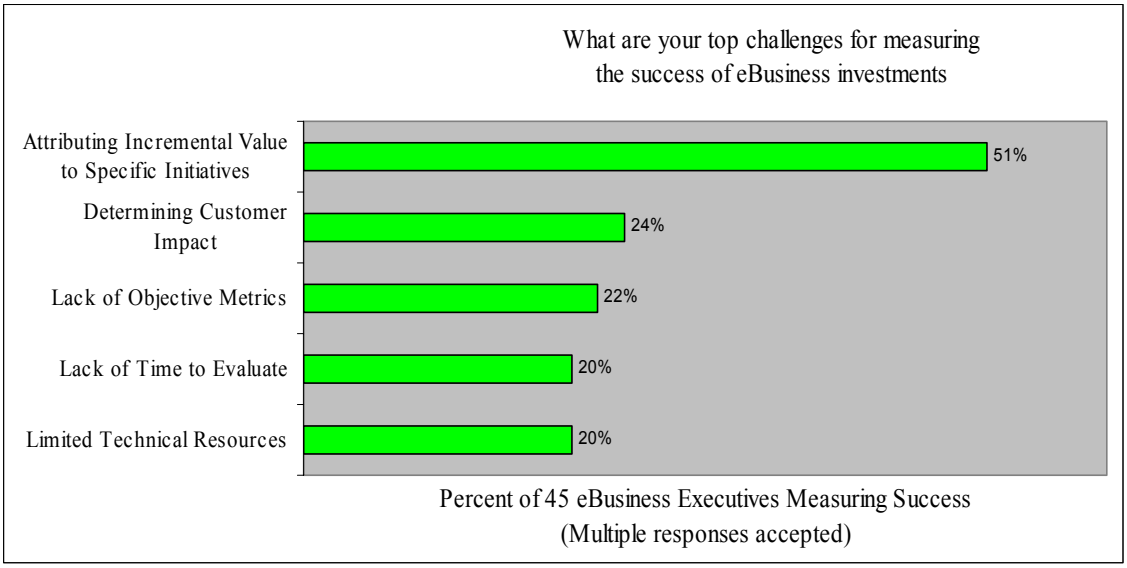

Figure 17. Top Challenges Measuring Success of e-Business Investment [11]

[10] Cameron, 2000, p. 4.

D. DISCOUNTING

BITs can also help separate soft benefits from the hard benefits any given project or enhancement is expected to achieve. In addition, they can discount soft benefits where appropriate. These discounts help to hedge against rosy projections and can be tailored to specific groups. For example, white-collar knowledge workers may have their productivity savings from software discounted by up to 80 percent, while factory workers and salespeople may be discounted by 20 percent. The point being that any soft factor can be given a numerical weight to account for its understood and agreed upon impact with regard to a specific line of work. Thus, while targeting high-end knowledge workers where the gains really matter most (see section V.D.2.d, *High-End Knowledge Workers*), BITs can exercise discretion in not over projecting. However, if they "over-engineer" the process, people may walk away from the results. The predictors and weights used will no doubt become more accurate with practice gradually over time. This phenomenon -- which is unique for every company -- accounts for the lack of *weights* provided in the IEEM set of baseline metrics.

Along these lines, there are a variety of vendors supplying tools that measure metrics in various ways. Unfortunately, few of these metrics are indicators of business performance and, taken out of context, these "standard" metrics can lead to poor conclusions or no conclusions at all. Hence, enterprises need to think hard about how they will apply Web analytics to achieve tangible business results. Creating their own Business Intelligence Team to apply a set of baseline metrics and relevant conversion ratios that account for critical business requirements, like those outlined within the framework of IEEM, is one method to start their measurement process in a standard, uniform manner through a single reporting service.

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[11] Cameron, 2000, p. 5.

E. SUMMARY

In the final analysis, Web analytics are an immature discipline that requires the support and intelligence the human cognitive factors a BIT inherently brings. Within the IEEM framework, BITs can develop business cases that will help senior management better understand the value of a particular IT investment as it supports a variety of business requirements. Their task of tying metrics back to business justification is essential for determining success of intranets portals metrics and communicating the big picture. Naturally, the approach and empowerment (i.e., the extent to which they can recommend and enforce best practices across the enterprise based on their analysis) a BIT is allowed will depend in part on the style of the manager, the culture of the company, and support from top executives. Calculating and communicating their intranet analytic results will:

- Enhance the standing of IT in eyes of business management.
- Cut through culture issues.
- Lead to better choices among potential IT portal initiatives.
- Lead to yet better alignment of IT and business goals.
- Provide feedback so IT can improve itself over time (hence, competitiveness).
- Provide a forum and format that both facilitates and requires managers to detail how process changes will add business value.
- Fosters sponsorship and collaboration among departments and disciplines, preventing blind spots holding more people accountable.

Along with the application of the metrics baseline and conversion rates to begin, adjust and continue measuring performance success, the complimentary skills and empowerment of BIT BDMs, portal managers and analysts ensure the azimuth indicator of IEEM remains pointed toward value: Internal awareness and responsiveness facilitates external awareness and responsiveness.

In short, it's the process, and not technology, that makes for effective IT governance. The BIT works together to better orchestrate the impactful processes of

corporate portals. Before it gets involved in any tools, the BIT ensures processes are in place and understood by a wider audience at many levels, instilling discipline and acceptance. These processes involve inventorying IT resources, including skills, hardware, and software; analyzing their use by business goal, risk, budget, and expected return; and scenario planning. The combination of *process* and *technology* in this manner by these *people* enables all knowledge workers to be more productive.

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VII. CONCLUSION

> The newest innovations, which we label information technologies, have begun to alter the manner in which we do business and create value, often in ways not readily foreseeable even five years ago.
>
> Alan Greenspan, Chairman, US Federal Reserve

A. SUMMARY

The advent of intranet portals creates new opportunities for corporations to make capital investments in their own knowledge and streamlining of working processes at a rate of return far better than keeping the money in the bank. Proper metrics can both demonstrate the business value of intranets and portals as well as guide efforts toward enhancements that will have the greatest ROI. Only firms that holistically consider organizational factors, information technology, and work processes will be able to identify such solutions to act upon. Because the intranet and its applications suites will have a *measurable* impact on traditional businesses, more companies must embrace a set of metrics that gives the IT initiative in this area credit not only for its customers, but also its overall contribution to the corporation at large.

Organizations should predetermine the metrics they will collect, targeting customer loyalty, partner/affiliate assessment, content effectiveness, channel efficiency, etc. Web analytics tools help enterprises jump-start initiatives and provide inspiration, but the results are worthless without context. Along these lines, enterprises must develop a relevant plan of attack for measuring and monitoring their website data. By using the Intranet Efficiency and Effectiveness Model as part of a holistic approach toward a comprehensive appreciation of the interplay between business requirements and underlying intranet segments, constituents and relevant metrics, enterprises will gain valuable insight into how their websites are performing and how their users are interacting with their offerings.

Invariably, a numerical model must be created and the most difficult part of this is identifying assumptions regarding costs and revenue generation. There is no hard and

fast rule for defining these assumptions. However, a comprehensive model that stresses strategic, functional and technical fit, and seeks to identify opportunities for process improvements, is more likely to result in top management support because it is based on their direction for the organization, not merely the merits of a technology or another half-baked technique to manipulate numbers.

The goal is to ensure that any IT investment decision can be shown to be consistent with the organization's business objectives. It may take some experimentation, but eventually a set of metrics measurements can be created that, collectively and associated to the IEEM, describes different facets of how well a corporation is achieving its critical business requirements via its intranet portals initiatives large and small. These measurements should be codified and used consistently within a company; this will ensure that ROI results from different department portals are comparable to each other. Perhaps the most important benefit of applying the IEEM and metrics is that the business intelligence team will learn what they can do to better increase value through leading periodic re-examination of assumptions and results, applying experimentation, rewarding collaboration among IT, finance and business units, and promoting accountability. After all, a group can only improve when it has a chance to lean from both its mistakes and successes. It is the intent of the IEEM and its associated metrics analytics to be just such a starting place.

B. CONTRIBUTION LIMITATIONS AND IMPLICATIONS

This research provides the first theoretical model for the *Family of Measures* approach to measuring Web activity as well as a holistic framework and multi-disciplinary approach not previously derived in viewing and measuring intranet contributions in the context of a corporation's overall strategic business requirements by applying a *balanced* baseline set of metrics and conversion ratios (which merge website traffic data and user behavior) linked to business processes as they relate to knowledge workers, portal managers and business decision makers. It also outlines how this should

be done and by whom in the form of periodic reviews and a business intelligence team respectively. Lastly, it provides a means – as well as a justification -- in which to calculate ROI for the metrics investment (time saved and better used by enhancements to processes) with a common unit of analysis: time, which can always be translated into money saved or earned and competitive advantage.

However there are limitations that need to be taken into account in exercising and improving this model and approach. The IEEM metrics and BITs are intended primarily for large corporations who have multiple portals and a large number of knowledge workers. While the early promise of the Web was as a "great equalizer", the reality is that the Web exacerbates the advantages of scale. Although corporations with smaller intranets should not be dissuaded from using IEEM metrics, those with larger intranets will realize greater returns on the investment made into the metrics. At some point however, applying and realizing IEEM metrics benefits does not make financial sense if the intranet and initiative are small.

Another limitation to this approach is that it takes time in order to measure changes sequentially and incrementally. In addition, if too many changes are made at once, their impact may become too diffuse or complex to estimate and trace credibly and accurately. At a minimum, it would take about 75 days before any comparisons can be made from two 30-day sets of results and preferably longer, one to two quarters with several 30-day result sets for example, before reliable and stable calculations/estimations are filtered and appropriate corrective action is taken (see Section IV.C: *Periodic Review*). The larger the organization, the longer the analysis will take. It would be wise therefore to begin small and incrementally include one or two portals at a time until all portals that need to be measured are. This gradual expansion, however, will require a longer period of time to canvas the corporation. In addition, the number and types of changes must be meticulously recorded and compared to ensure legitimate undesirable patterns are recognized and known remedies are effectively and immediately applied.

There may also be competing departmental portal interest with respect to the time and resources the BIT can apply toward taking corrective action. Such circumstances can become political and the BIT needs to be prepared to list and justify the enhancements they will undertake in both financial and effectiveness priorities (an extension of their own ROIMI and the IEEM metrics prioritization tables in Appendix D, *Intranet Portal Metric Breakdown*). As the number of portals and portal features increase the number of aggregate changes called for may also increase. Another surge in change requirements may be by necessity due to the advent of a new Web technology. Thus, BITs need to be empowered to make best practices that meet the dynamics of change and new business needs into common business rules and policies that can be applied and enforced in short order when and where necessary across the entire enterprise. Lack of this power is a serious limitation and will hinder progress toward achieving greater value.

As portals mature they gradually *borrow* content from other portals and data-warehouses that they may have little control in changing. These sister *content providers* may be tasked to farm out their repositories of information (for example, news, research, archives or Human Resource related data). As a result, some portals owners may consider the IEEM metrics not to be a fair estimate of their value creation because they are getting a large percentage of their content from other internal sources to meet the demands of their knowledge workers. This situation is not necessarily a weakness in the IEEM because the metrics will determine which portals are the most trafficked and trusted and from exactly where and whom. This eventually leads to resource allocations and is why some portal managers fret over the notion that their significance may be diminished by a popular portal that does little else than provide news updates (a loose metaphor being the impact of CNN to syndicate channel ratings). Consequently, all assumptions and calculations along with concerns about comparisons between the participating portals need to be addressed in a reasonable and sensitive manner if the analysis results are to be perceived as valid by the portal players. Keeping all portal managers in the analytics loop is crucial therefore and should be scheduled routinely.

C. FUTURE WORK

Successful Web analytics are more a matter of skills than a matter of technology. Nevertheless, Web logs need to be made as automated and quantitative as possible which presents a number of challenges to decision makers when used for intranet measurements. Understanding cause-and-effect is essential to the development of an accurate appreciation of user behavior, traffic volume statistics and a ROIMI. Many high-end Web analytic features (e.g., session analysis, multiple-site aggregation) offer online analytical processing (OLAP) and data mining functionality via Java-scripted Web pages to collect data. This relatively new technology provides significantly more information and scales better than processing of log files. One obstacle to seeing this through is that Java Server page technology doesn't work (yet) with Active Server Page portlets – that means portal providers or integrators must adapt content to a format the portal understands such HTML, XML or Wireless markup language. Nevertheless, work to see how OLAP related technology can be implemented into the IEEM metrics analysis is highly desirable as it would serve as an enabler to deepen the analysis and shorten decision and corrective action processes.

As the find paradigm of the Web shifts from search to match (intelligent queries on a query so not to be under or over specified), new techniques will be required to ensure the proper metrics are used to monitor which content nuggets are sought from where and to gauge the impacts on the user experience. A promising technique that should be explored to assist in this endeavor is *multivariate clustering*; a statistical technique for dimensionality reduction and cluster analysis applied to develop groups of similar online users based on commonly held value characteristics from among a baseline of value-driven variables/metrics. This technique explores different solutions cluster (and sub-cluster) baseline solutions. It should be further researched to see if it could serve as a viable trial for subsequent change recommendations based on the previous metrics results. This type of research and analysis can present more insightful and

diverse data in a shorter period of time with less disruption to the organization. As a result, the information gathered from this technique may lead to quicker, more accurate adjustments to the value azimuth indicator of IEEM and eventually to complex algorithmic equations needed in the software engineer community which reflect the dynamics of the quality paradigm taking place in all segments and constituents that underscore value in corporate portal processes.

Domain analysis for the Intranet is never completely finished. Product definitions evolve continuously. The development of a particular system that exploits previously accumulated domain knowledge can be the source for new insights about the domain that adds to or refines codified domain knowledge. As the multiple uses of Web analytics become apparent, new correlations will be blended to create unique value for each consumer of the information. There's no one metric that is right for all companies in all circumstances all the time. Inevitably, however, all measurements will continue to strive toward the quantification of benefits wherever possible. The role of software engineers in this endeavor will be to determine how best to ascertain value where it is not visible through domain analysis identification and implementation. IEEM provides a step in this direction as it aligns metrics to business priorities and intranet IT initiatives as well as the most relevant factors within all six underlying segments which have the most impact on deriving, measuring and increasing value. As portals become as ubiquitous in corporations as email is today, more inter-disciplinary research needs to be devoted in this area to help organizations of all types and sizes recognize, measure and capitalize the full potential of their greatest assets: customer data and intellectual knowledge.

APPENDIX A: CONSTITUENTS TO FINDING INTRANET INFORMATION

PROBLEM:
Knowledge workers cannot discover all of the information they need to do their jobs better.

QUESTION:
What makes information more discoverable?

REQUISITES:
- Amount of information and meta-information (accessibility & manageability)
- Understanding information seeking and use behavior
- Navigation system design used to expose information (logically grouped)
- Confidence in quality of information and meta-information
- Relevancy to knowledge worker

CONCEPT:
"Discoverability": - Facilitate information discovery through presentation of relative associations which lead to better decisions, increased productivity and effectiveness that would not have been likely otherwise. Discoverability requires three events to happen: 1) associative connections between content items are created; 2) the information/ knowledge is presented to illustrate relative associations that can be acted upon; and 3) the knowledge worker has the cognitive ability/recognizes there is an action to be taken.

CONSTITUENTS:
Discoverability in an information system such as a corporate intranet is predicated and realizable if usable *relative associations* semantically exist. The term *relative associations* encompasses all types of relationships between items in an information system. These relationships are based on such things as characteristics of the items (properties), knowledge worker tasks and interactions between the items. Once established, these associations can be exposed and leveraged in an information system to enable a knowledge worker to move from concept to concept.

Thus any portal desiring to be part of the information system should contain the following 13 constituents of discovering information that collectively sustain the requisites above and render relative associations useful. These constituents are grouped below into two categories or domains: "Back-end" – the processes that take place that a knowledge worker does not see; and, "Front-End" – the processes in which a knowledge worker has a more direct interface.

CONSTITUENTS	INSTANCES OF	EXPLANATION
BACK-END		
Content and Content Properties	People, Organization, Tools, Application (scope is beyond documents) Covers: Search, Browse & Data Mgmt	Content – All documents -- help text, search results, forms, or application information -- that is delivered to a knowledge worker via a website, or application. It is both subject and specific information. For example, "People" is a subject and a person by name is specific information. Content is organized and found depending on its properties and associations Content Properties – How content is described in order to affect the associations made in information retrieval and presentation. The characteristics of a content item make up its properties, such properties (a.k.a. attributes) include author, length, name, etc. If content is to be discoverable, it requires management of its properties and associations, as well as the tools and applications used to retrieve and present them. How well this is managed affects the overall effectiveness of any method of discovery, such as search and browse.
Domain Integration Framework	Domain Ownerships, Relationships, "Key Sites"	Representation of the relationships/ structure between the key elements within a design. It shows how these elements interact and must "transfer" information, so that the architect can build the environment. Examples are information maps (document elements), server topography, scope of services, permissions (ownership).
Information Life Cycle	Expiring, Adding, Versioning, Retention	The events often repeated again and again in maintaining the relevance and accessibility of content in an information system. These events include updating, versioning, archiving and, when necessary, deleting. (See: Retention in glossary).
Search	UI (Process and Presentation), Crawl	An application employed by knowledge workers as a tool to find through direct surfacing or through surfacing an obvious navigational path.
Taxonomy	Vocabulary, Hierarchy, Meta-Data, Schemas, Heuristics from Longhorn?	The result of identifying, creating and naming relative associations between items in an information system. In turn, the relative associations are grouped or classified into taxonomic structures based on three relationship types: hierarchical, equivalence and associative. Examples are controlled vocabularies; metadata scheme; category labels. (See: Relative Associations in glossary).
User Data	"My Data", "My Profile", Personalization, Segmentation, Metrics, Query Logs	Facts and figures a knowledge worker maintains private access to for knowledge retention and expansion. This is also referred to as "personalization" (see below).

TABLE 9. BACK-END CONSTITUENTS

CONSTITUENT	INSTANCES OF	EXPLANATION
FRONT-END		
Accessibility	Point of Access, Packaging, Formatting, Presentation	Information is considered accessible when it is available, reachable, and understandable. (Assuming the information exists, ideally availability could occur from any *point of access* of and *point of entry* to the information system. Although how reachable information is depends on a number of factors, in this context the more information is compatible with a shared *Information Architecture,* the easier it is to retrieve. How this information is then packaged and presented in a fashion that can be understood by the knowledge worker is the last stage of accessibility.)
Communication of Authoritativeness and Importance	Site Maps, Credibility (Best Bet), Authoritative Flag, Relevancy	Communicating to the knowledge worker the credibility of an information system within that system to ensure confidence and trust. See: Authoritative Flags.
Communication of Understanding	Links, Definitions, Mouse-over, Tool Tips, Contacts, Smart Tags, Context	Communicating to the knowledge worker meaning and significance to ensure acceptance and engagement, which further increases the audience's propensity to act on information in a common way, i.e., the *Glossary of IP Terms and Definitions*, Mouse-over, and best practices.
Information Grouping & Segmenting	Content Nuggets, Categories, Applications	Information grouping is the logical collection of similar and relevant information, such as Content Nuggets and Categories respectively. Another aspect of this is information segmenting in which only the relevant parts of a document, i.e. a paragraph or two are extracted and placed into fragmented groupings instead of the entire document. For example, first 200 words of a document returned as part of a search result.
Navigation - Local - Global	Presentation Consistent Labeling Sources of information, applications	Method of moving through the domain framework by way visual presentation and consistent choices. Navigation has 2 basic types: local (also known as vertical) and global (also known as horizontal). Local navigation presents choices leading to subtopics or sub-areas of a site, usually defined by one of its main menu subjects (often referred to as a "drill down"). Global navigation presents choices leading to other main areas of a site, i.e. Home; Search; About. Global navigation is consistent throughout an information system which allows knowledge workers to go across portals with a sense of familiarity.
Personalization and Customization	Security, Content Filtering, Authentication,	Personalization – A method of contextualizing information for a knowledge worker based on what is known about the knowledge worker. A site can use personalization to alter navigation and content presented according to the perceived needs of the knowledge

		worker. Examples include content filtering based on role; authentication based on name or status as a manager. Customization – Ability for knowledge workers to self-configure the contents/ constituents of their domain site. In essence, individuals are allowed to subscribe to constituents, or sub-constituents of a portal, including navigation, content, search, etc., in order to provide and store information (i.e., like the notion of "my saved searches") most relevant to their interests, position or role.
User Assistance	Help in context, Feedback, Dialog with the knowledge worker, Training	Help made available to the knowledge worker while using an information system. User assistance provides guidance on how to use the system or additional help in finding information sought. Examples are help in context, feedback, Dialog boxes, and training, real time assistance from a human intermediary via a live chat.

TABLE 10. FRONT-END CONSTITUENTS

APPENDIX B: ONLINE E-SURVEY EXAMPLE

Useful *general* e-survey questions about intranets and employee portals include:
One minute of your valuable input will help the company provide you with better intranet service. Please take a moment to complete this automatic survey as part of our on-going effort to optimize out intranet according to *your* needs:

1- means seldom, very little, poor, no
5- means very often, very much, exception, yes

1-2-3-4-5 Is the portal part of your daily routine?
1-2-3-4-5 How would you rate ease of use of the portal?
1-2-3-4-5 How many times per day (or what percentage) do you use the portal?
What is the most useful feature of the portal for you? (To be chosen from provided list of portal features.)
A.)
B.)
C.)
Which of the following processes do you use the portal to accomplish? (To be chosen from provided list of portal processes.)
A.)
B.)
C.)
1-2-3-4-5 How relevant is the information in the portal to your job?
1-2-3-4-5 Which new feature would increase your portal usage the most? (To be chosen from menu of potential new portlets.)
A.)
B.)
C.)
1-2-3-4-5 How critical is the portal to performing your job function?
1-2-3-4-5 How up-to-date is the information in the portal?
1-2-3-4-5 How would you rate the performance of the portal?
1-2-3-4-5 Has the portal met or exceeded your expectations?
How can the portal be improved to enable employees to be more productive?

_____.
_____.

SUBMIT
THANK YOU
(Note: To be useful, the survey must capture timing and demographic information about the respondent (see Figure 2, *Intranet Domains and Segments*). When this information cannot be determined automatically from a respondent's profile, the respondent should be queried directly.)

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APPENDIX C: METRICS TO MEASURE INTRANET PERFORMANCE

The following table lists numerous specific metrics that can be applied to measure a portal site's *activity* – not all of them are needed for an intranet. When a subset of these metrics are further logically represented and grouped in agreement with the segments and constituents that the IEEM outlines in support of assessing critical business requirements, rational subsequent and impactful actions can be taken based off these metric results which lead to coherent and sensible *value* gains (see Appendix D for the baseline approach to do this).

Red -represents a metric category
Grey -represents a useful IEEM metric

Summary
General Statistics
Page Views Over Time
Top Pages by Visits
Advertising Click Through Rate
Hits Over Time
Visitors Over Time
Top Visitors
Top Referring Sites by Visits
Top Browsers by Visits
Commerce Analysis
Summary
Executive Summary
Results Summary
Abandonment Summary
Results by Marketing Campaign
Shoppers
Buyers
Attempted Buyers
Engagement Rate
Conversion Rate
Abandonment Rate
Summary by Marketing Campaigns
Marketing Campaigns Results
Summary
Revenue Forecast
Qualified Revenue
non-Qualified Revenue
Visits
Qualified Visits
non-Qualified Visits
Product Qualifications
Visitor Conversion Ratio
Results by Visitor Qualification
Results by Product Category
Results by Product
Cost
Summary
Per Visit
Per Qualified Visit
Per non-Qualified Visit
Per Product Qualification
ROI
Summary
Per Day
Per Visit
Per Qualified Visit
Per non-Qualified Visit
Per Product Qualification
Projections
Revenue Forecast
ROI
Visit
Qualified Visit
non-Qualified Visits
Product Qualifications
Referrers
Revenue Forecast
Qualified Revenue Forecast
non-Qualified Revenue Forecast
Visits
Qualified Visits
non-Qualified Visits
Product Qualifications
Results by Visitor Qualification
Results by Product Category
Results by Product
Product Categories

Table 9 – Specific Metrics

Revenue Forecast
Product Qualifications
Results by Product
Results by Visitor Qualification
Results by Marketing Campaign
Results by Referrer
Products
Revenue Forecast
Product Qualifications
Results by Visitor Qualification
Results by Marketing Campaign
Results by Referrer
Products Summary
Pages
Top Pages
Top Pages by Visits
Top Pages by Visits Over Time
Top Pages by Views
Top Pages by Views Over Time
Top Documents
Top Documents By Visits
Top Documents By Visits Over Time
Top Documents By Views
Top Documents By Views Over Time
Dynamic Pages & Forms
Dynamic Pages & Forms by Visits
Dynamic Pages & Forms by Visits Over Time
Dynamic Pages & Forms by Hits
Dynamic Pages & Forms by Hits Over Time
Page Views Over Time
Top Content Groups
Top Content Groups by Visits
Top Content Groups by Visits Over Time
Top Content Groups by Hits
Top Content Groups by Hits Over Time
Top Entry Pages
Top Entry Pages by Visits
Top Entry Pages by Visits Over Time
Least Requested Entry Pages
Least Requested Entry Pages by Visits
Least Requested Entry Pages by Visits Over Time
Top Exit Pages
Top Exit Pages by Visits
Top Exit Pages by Visits Over Time
Single Access Pages
Single Access Pages by Visits
Single Access Pages by Visits Over Time
Paths
Top Paths Through Site by Visits
Top Destination Paths Through Site
Files
Hits Over Time
Top Directories
Top Directories by Visits
Top Directories by Visits Over Time
Top Directories by Hits
Top Directories by Hits Over Time
Top Directories by Kbytes Transferred
Most Downloaded Files
Most Downloaded Files
Most Downloaded Files Over Time
Most Downloaded Files by Visits
Most Downloaded Files by Visits Over Time
Most Accessed File Types
Most Accessed File Types
Most Accessed File Types by Kbytes Transferred
Most Uploaded Files
Most Uploaded Files
Most Uploaded Files by Visits
Top Entry Files
Top Entry Files by Visits
Top Entry Files by Visits Over Time
Least Requested Entry Files
Least Requested Entry Files by Visits
Least Requested Entry Files by Visits Over Time
Parameter Analysis
URL 1D Parameter Analysis by Visits
URL 1D Parameter Analysis by Hits
URL 2D Parameter Analysis
Advertising
Advertising Click Through Rate
Ad Visits
Ad Visits
Ad Visits Over Time
Ad Views
Ad Views

Table 9 – Specific Metrics

Ad Views Over Time
Ad Visits With Clicks
Ad Visits With Clicks
Ad Visits With Clicks Over Time
Ad Clicks
Ad Clicks
Ad Clicks Over Time
Visitors
Top Visitors
Top Visitors
Top Visitors Over Time
Top Visitors by Hits
Top Visitors by Hits Over Time
New vs. Returning Visitors
New vs. Returning Visitors
New vs. Returning Visitors Over Time
Top Authenticated Visitors
Top Authenticated Visitors
Top Authenticated Visitors Over Time
Top Authenticated Visitors by Hits
Top Authenticated Visitors by Hits Over Time
Visitors Over Time
Visitors Over Time
Visits Over Time
Visitors by Number of Visits
Demographics
Top Geographic Regions
Most Active Countries
North American States and Provinces
Most Active Cities
Most Active Organizations
Most Active Organizations by Visits
Most Active Organizations by Hits
Top-Level Domains Types
Top-Level Domains Types by Visits
Top-Level Domains Types by Hits
Activity
Summary of Activity for Report Period
Visits by Number of Pages Viewed
Bandwitdh:Kbytes Transferred Over Time
Average Time to Serve Documents
Average Time to Serve Dynamic Pages
Day of Week
Visits by Day of the Week
Hits by Day of the Week
Hour of Day
Visits by Hour of the Day
Hits by Hour of the Day
Length of Visit
Visits by Length of Visit
Page Views by Length of Visit
Server Cluster Load Balance
Server Cluster Load Balance by Hits
Server Cluster Load Balance by Kbytes Transferred
Errors
Technical Statistics and Analysis
Dynamic Pages & Forms Errors
Client Errors
Server Errors
Referers
Top Referring Sites by Visits
Top Referring URLs by Visits
Top Search Engines
Top Search Phrases
Top Search Keywords
Browsers and Systems
Top Browsers
Top Browsers by Visits
Top Browsers by Visits Over Time
Top Browsers by Hits
Top Browsers by Hits Over Time
Microsoft Explorer Browsers
Microsoft Explorer Browsers by Visits
Microsoft Explorer Browsers by Visits Over Time
Microsoft Explorer Browsers by Hits
Microsoft Explorer Browsers by Hits Over Time
Netscape Browsers
Netscape Browsers by Visits
Netscape Browsers by Visits Over Time
Netscape Browsers by Hits
Netscape Browsers by Hits Over Time
Top Platforms
Top Platforms by Visits
Top Platforms by Visits Over Time
Top Platforms by Hits
Top Platforms by Hits Over Time
Help - Debug Statistics

TABLE 11. SPECIFIC METRICS

Table 9 – Specific Metrics

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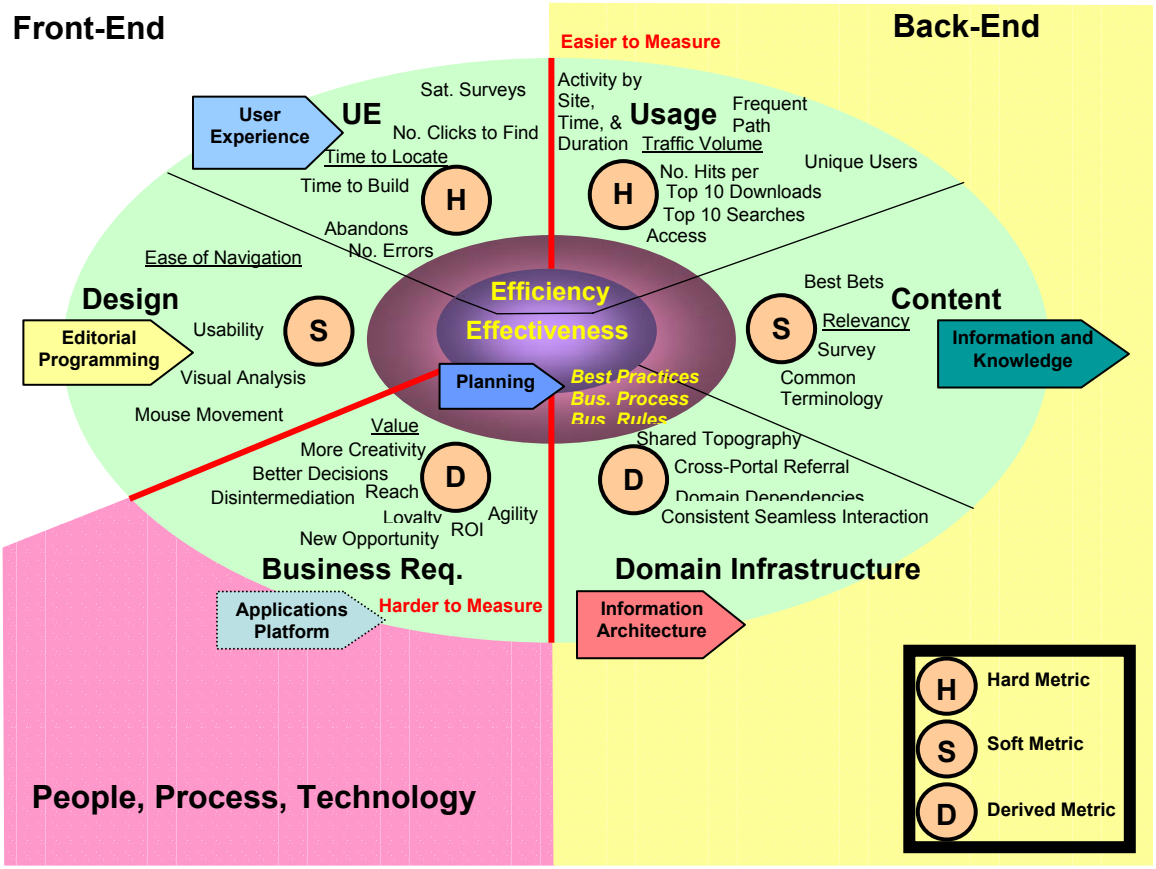
APPENDIX D: INTRANET PORTAL METRIC BREAKDOWN

The ensuing tables of baseline metrics and conversion ratios is color coded in line with the illustration of the model below to highlight from which domain and metric type metrics originate. The model is an approach to determining effectiveness taking into account the pertinent characteristics of intranet domains, segments and constituents with the resulting supposition delivered by a variety of metrics specified in priority and divided into audiences and responsibilities according to business requirements.



Corresponding Color Codes on Metric Baseline Tables

- Business Req. or Derived Metric
- Back End or Hard Metric
- Front End or Soft Metric
- Best Bet or Practice

FIGURE 18. IEEM COLOR CODE SUPPORTING METRICS BASELINE TABLES

Intranet Portal Metric Supposition and Breakdown on Measuring Intranet Websites to Indicate and Improve Effectiveness Gains

WHAT: **RELEVANCE (Priority No. 1)**

WHERE: **Enterprise**

WHO: **Portal Owner Related**

WHY: **HOW:**

Business Req. or Derived Metric

Back End or Hard Metric

Front End or Soft Metric

Best Bet or Practice

<----------BUSINESS PROCESS----------><------BEST PRACTICES ------> <-------- IEEM Related -------->

Business Issue: *- Metric Area*	**Business Question of Web Site Activity**	**Business Significance of Web Site Report Solution**	**Specific Sub-Metric Area** *- Specific Metric*	**Who Benefits and Why** (User, Portal, Enterprise)	**IEEM Segment(s):** ***IEEM*** Constituent(s)	**Efficiency (E) or Effectiveness(F)**
Success: - *Best Bet* - *Best Practice* - *ROI* - *Visitors (by Search Engine)* - *Downloads (by Search Engine)*	Which configuration for our search engines should I pay attention to?	How a chosen search engine is configured takes time and money to develop. Configurations must be justifiable in terms of relevant, helpful finds and downloads or takeaways, which lead to better decisions and opportunity, leading ultimately to increased revenue and understanding the ROI. Thus determining which configuration (including *Best Bets* and *Best Practices*) provides the best relevance is critical to enabling users to find the information they need to do their jobs.	**Visitor by Search Eng. Configuration** - *Top Referring Sites by Visits* - *Top Documents By Visits* - *Top Content Groups by Visits* - *Top Entry Pages by Visits* - *Top Directories by Visits* **Downloads by Search Engine** - *Top Documents By Views* - *Top Content Groups by Hits* - *Top Directories by Kbytes Transfer* - *Top Search Engines* **ROI by Search Engine Configuration** - *Best Bet:* Most relevant hits - *Best Practice:* Successful Approach - *User Survey:* User Feedback	**User** – Find more frequently information they need **Portal** – Product Manager provides suggestions (in the form of collective *Best Bets* and *Best Practices*) to search configuration algorithms **Enterprise** – When users and portals benefit from more relevant search hits, so does the enterprise in aggregate	Info. Architecture - *Search*	**F**

TABLE 12. RELEVANCE METRICS TO BUSINESS REQUIREMENTS

Intranet Portal Metric Supposition and Breakdown on Measuring Intranet Websites to Indicate and Improve Effectiveness Gains

WHAT: **TRAFFIC VOLUME (Priority No. 2)**

WHERE: **Enterprise**

WHO: **Portal Owner Related**

WHY: **HOW:**

Business Req. or Derived Metric

Back End or Hard Metric

Front End or Soft Metric

Best Bet or Practice

<----------BUSINESS PROCESS----------><-------BEST PRACTICES ------> <-------- IEEM Related -------->

Business Issue: *- Metric Area*	**Business Question of Web Site Activity**	**Business Significance of Web Site Report Solution**	**Specific Sub-Metric Area** *- Specific Metric*	**Who Benefits and Why** (User, Portal, Enterprise)	**IEEM Segment(s):** *IEEM* Constituent(s)	**Efficiency (E) or Effectiveness(F)**
Usefulness (Leads Commit, and Completed): - *Value* - *ROI* - *Loyalty*	How many visitors is my web site producing? Are we converting visitors to committed leads, i.e., an exchange of information, and completed processes, i.e., downloads?	Identify and track leads by *web browsing behavior* to understand total quantity and quality of leads. Quantify lead to download conversion rates (or length of site visit duration) to understand lead generation effectiveness in order to better understand what adjustments need to be made (i.e., site re-design, elevation of highly sought after pages or click to success and pages to drop).	**Visitors to Leads** - *Top Pages by Views Over Time* - *Top Documents by Views Over Time* - *Page Views by Length of Visit* - *Visits by Length of Visit* - *Top Exit Pages by Visits* **Total Leads** - *Most Accessed File Types* - *Most Uploaded Files* - *Top Directories by Hits Over Time* - *Top Content Groups by Hits Over Time* **Lead to Download Conversion** - *Most Downloaded Files by Visits* - *Most Downloaded Files by Visits Over Time* **Usability Study** - *Usability*	**User** – Exchange information only when necessary and download or view (time duration) what is needed. **Portal** – Managers learn where visitors fail to make leads or where leads fail to complete the process and can make changes accordingly (analysis can be provided by Product Manager) **Enterprise** – When users and portals benefit from visits becoming leads and leads being completed in the form of downloads or views, the enterprise benefits as well by virtue of users making better decisions from finding what they need.	Info Architecture - *Domain Integrated Framework (DIF)* Design - *Usability Study*	**F**

TABLE 13. TRAFFIC VOLUME METRICS TO BUSINESS REQUIREMENTS

Intranet Portal Metric Supposition and Breakdown on Measuring Intranet Websites to Indicate and Improve Effectiveness Gains

WHAT: **UNIQUE USERS (Priority No. 3)**

WHERE: **Enterprise**

WHO: **Portal Owner and Portal Manager Related**

WHY: **HOW:**

Business Req. or Derived Metric

Back End or Hard Metric

Front End or Soft Metric

Best Bet or Practice

<----------BUSINESS PROCESS----------><------BEST PRACTICES ------> <--------- IEEM Related --------->

Business Issue: - *Metric Area*	Business Question of Web Site Activity	Business Significance of Web Site Report Solution	Specific Metric Area - *Specific Metric*	Who Benefits and Why (User, Portal, Enterprise)	IEEM Segment(s): *IEEM* Constituent(s)	Efficiency (E) or Effectiveness(F)
Retention: - *Loyalty* - *Value*	How effectively am I building loyalty with my visitors?	Determine how quickly you are building your user base to gage site audience enlargement and shrinkage over time and *vis a vis* other sites.	**Return Visitor Rate** - *Top Visitors (authenticated)* - *Visitors by Number of Visits* - *Visitors Over Time* - *Top Visitors by Hits (Leads)* - *Top Visitors by Hits Over Time* - *Top Visitors by Leads Completed* - *Visits by Length of Visits* * *All of the above for Returning Visitors* - *New vs. Returning Visitors*	**User** – Gains familiarity to a site which reduces overall frustration. **Portal** – Managers learn where return visitors come from and how many there are, which a partial indication that users find the site helpful. **Enterprise** – When users continue to return to the same site for information, it indicates that they find it helpful and s well as where the sources of richness lie.	Info Architecture.: -*User Data*	**F**
Optimization: - *Loyalty* - *Value* - *Agility* - *Optimization*	What do my visitors come back for?	Analyze the most popular content for my return visitors in order to load and associate related information to meet demand.	**Return Visitor Target Pages** (correlate return visits with content): - *Top Returning Visitors by Hits* - *Top Returning Visitors by Hits Over Time* - *Top Returning Visitors by Leads Completed* - *Returning Visitor Visits by Length of Visits* - *Returning Visitor Page Views Over Time* - *Top Document and Content Group for Returning Visitors Over Time* **Survey** - *Internal Returning Visitor Session Activity*	**User** – Popular downloaded information remains as well as other information like it eventually being posted or better associated. **Portal** – Managers learn which pages are desired and can load related information to meet demand. **Enterprise** – As portals more accurately monitor what information is sought and add additional information that is related, the enterprise is doing a better job meeting the expectations and business needs of its users.	Info. Knowledge - *Survey* Info Architecture - *Info Grouping* - *User Data*	**F**

TABLE 14. UNIQUE USER METRICS TO BUSINESS REQUIREMENTS

Intranet Portal Metric Supposition and Breakdown on Measuring Intranet Websites to Indicate and Improve Effectiveness Gains

Business Req. or Derived Metric
Back End or Hard Metric
Front End or Soft Metric
Best Bet or Practice

WHAT: **UNIQUE USERS (Priority No. 3)**

WHERE: **Enterprise**

WHO: **Portal Owner and Portal Manager Related**

WHY: **HOW:**

<----------BUSINESS PROCESS----------><------BEST PRACTICES ------> <--------- IEEM Related --------->

Business Issue: - *Metric Area*	Business Question of Web Site Activity	Business Significance of Web Site Report Solution	Specific Sub-Metric Area - *Specific Metric*	Who Benefits and Why (User, Portal, Enterprise)	IEEM Segment(s): *IEEM* Constituent(s)	Efficiency (E) or Effectiveness(F)
Targeted: - *Reach* - *Loyalty* - *Value* - *Disintermedi-ation* - *Access*	Where do my visitors come from (specifically, which regions, organizations, groups, roles)?	Identify where users originate and how your web site is searched and browsed to understand what content areas are most effective to improve overall productivity for a particular region organization, group and/or role).	**Users by Region** - *Most Active by Visits* - *Most Active by Hits* - *Most Returning Visitors* **Users by Group** - *Most Active by Visits* - *Most Active by Hits* - *Most Returning Visitors* **Users by Role** - *Most Active by Visits* - *Most Active by Hits* - *Most Returning Visitors* **Usability Study** - *Internal Visitor Session Activity* - *Usability*	**User** – Potentially better *personalized* service **Portal** – Managers learn which pages are desired and most effective by region, organization, group and role and can make enhancements accordingly. **Enterprise** – As portals more accurately monitor what information is sought and add additional information that is related, the enterprise is doing a better job meeting the expectations and business needs of its users, both enterprise and world wide.	Info. Knowledge Info Architecture: -*DIF* -*Taxonomy* -*Content Properties* -*Accessibility* Ed. Programming - *Usability* - *Ease of Navigation*	**F**

TABLE 14. UNIQUE USER METRICS TO BUSINESS REQUIREMENTS

Intranet Portal Metric Supposition and Breakdown on Measuring Intranet Websites to Indicate and Improve Effectiveness Gains

WHAT: **CROSS PORTAL REFERRAL (Priority No. 4)**

WHERE: **Enterprise**

WHO: **Portal Owner Related**

WHY: **HOW:**

Business Req. or Derived Metric

Back End or Hard Metric

Front End or Soft Metric

Best Bet or Practice

<----------BUSINESS PROCESS----------><------BEST PRACTICES ------> <-------- IEEM Related -------->

Business Issue: *- Metric Area*	**Business Question of Web Site Activity**	**Business Significance of Web Site Report Solution**	**Specific Sub-Metric Area** *- Specific Metric*	**Who Benefits and Why** (User, Portal, Enterprise)	**IEEM Segment(s):** ***IEEM*** Constituent(s)	**Efficiency (E) or Effectiveness(F)**
Achievement: - *Value* - *Reach* - *Disintermediation*	Is my web site becoming a more important channel for information?	By measuring customer satisfaction and the visitors (as well as subsequent leads) from others web sites to yours, you will be able to understand your web site's importance and relevance.	**Visitor by Source** (Referral from other Portal) - *Top Referring Sites by Visit* - *Top Referring URLs by Visit* **Leads by Source** (correlate visitor by source referral to lead) - *Top Referring Sites by Visits to Leads* - *Top Referring URLs by Visits to Leads* **Leads Completed by Source** (correlate visitor by source to lead completed) - *Top Referring Sites by Visits to Leads Completed* - *Top Referring URLs by Visits to Leads Completed* **Unique and New Users** - *New vs. Returning Visitors* - *New vs. Returning Visitors Over Time* **Survey** - User Sat.	**User** – Site provides or directs you to a site with the needed information and user has opportunity to express satisfaction. **Portal** – Managers learn which pages are desired and can load related information to meet demand. Mangers learn visitor, lead and lead completed ratios by source to determine most valuable referral sites. **Enterprise** – Ultimately, the more referrals the more information is to be discovered. As portals are monitored for referral by source, the value of a portal takes on an added dimension to overall significance or enhancer to enterprise information discovery (intranet portals will in effect be both a beneficiary and benefactor of referrals).	Info Architecture: -Navigation -Search Info Knowledge User Experience - *Sat. Survey*	**F**

TABLE 15. CROSS PORTAL REFERRAL METRICS TO BUSINESS REQUIREMENTS

(Continued on Next Page)

WHAT: **CROSS PORTAL REFERRAL (Priority No. 4)**

WHERE: **Portal**

WHO: **Portal Manager Related**

WHY: **HOW:**

Business Req. or Derived Metric

Back End or Hard Metric

Front End or Soft Metric

Best Bet or Practice

<----------BUSINESS PROCESS----------><------BEST PRACTICES ------> **<--------- IEEM Related --------->**

Business Issue: *- Metric Area*	**Business Question of Web Site Activity**	**Business Significance of Web Site Report Solution**	**Specific Sub-Metric Area** *- Specific Metric*	**Who Benefits and Why** (User, Portal, Enterprise)	***IEEM*** **Segment(s):** ***IEEM*** Constituent(s)	**Efficiency (E) or Effectiveness(F)**
Optimization: - *Survey*	How can I maximize the effectiveness of my online services offerings?	Measure the visitation to online service resources and inform services people of key areas of concern or need as a mechanism to improve business performance.	**Web Page Most Visited:** - *Top Pages by Views Over Time* - *Top Documents by Views Over Time* - *Page Views by Length of Visit* - *Visits by Length of Visit* - *Top Exit Pages by Visits* - *Most Accessed File Types* - *Most Uploaded Files* - *Top Directories by Hits Over Time* - *Top Content Grps by Hits Over Time* - *Most Downloaded Files by Visits* - *Most Downloaded Files by Visits Over Time* **Load Balance and Caching:** - *Server Cluster Load Balance by Hits* - *Server Cluster Load Balance by Kbytes Transferred* **Survey** - *User Feedback:*	**User** – Sites are proactive in monitoring what your interests are in. **Portal** – Managers learn which pages are desired and can load related information to meet demand. **Enterprise** – More responsive and pro-active in providing overall Intranet support, leading to increased user sat.	Info Knowledge: - *Survey* Info Architecture: - *User Data*	**F**
Usefulness: - *User Sat.* - *More Creativity* - *Better Decision Making* - *Agility*	Which user segments utilize web service pages?	Anticipate possible service issues and recommend solutions based on segmentation of user type and web activity.	**User Segment Usage Rate:** **Users by Group** - *Most Active by Visits* - *Most Active by Hits* - *Most Active by Duration of Visit* - *Most Active by Download* - *Most Returning Visitors*	**User** – Sites are proactive in monitoring what your interests are in (and provide some *personalization)*. **Portal** – Managers learn user behavior and needs and attempt to anticipate what information is desired to the lowest denominator possible. **Enterprise** – More responsive and pro-active in providing overall Intranet support, leading to increased user sat.	Info Architecture: - *User Data*	**F**

TABLE 15. CROSS PORTAL REFERRAL METRICS TO BUSINESS REQUIREMENTS

Intranet Portal Metric Supposition and Breakdown on Measuring Intranet Websites to Indicate and Improve Effectiveness Gains

WHAT: **CROSS PORTAL REFERRAL (Priority No. 4)**

WHERE: **Portal**

WHO: **Portal Manager Related**

WHY: **HOW:**

Business Req. or Derived Metric

Back End or Hard Metric

Front End or Soft Metric

Best Bet or Practice

<----------BUSINESS PROCESS----------><------BEST PRACTICES ------> <--------- IEEM Related --------->

Business Issue: - *Metric Area*	**Business Question of Web Site Activity**	**Business Significance of Web Site Report Solution**	**Specific Sub-Metric Area** - *Specific Metric*	**Who Benefits and Why** (User, Portal, Enterprise)	**IEEM Segment(s):** *IEEM* Constituent(s)	**Efficiency (E) or Effectiveness(F)**
Preservation: - *User Sat.* - *More Creativity* - *Agility* - *Retention* -*Dintermedia-tion*	How do I increase user loyalty by proactively contacting my users?	Deliver personalized services offerings (via UI or email) directed toward identified user needs	**Repeat Visits** - *Top Visitors (authenticated)* - *Visitors by Number of Visits* - *Visitors Over Time* - *Top Visitors by Hits (Leads)* - *Top Visitors by Hits Over Time* - *Top Visitors by Leads Completed* - *Visits by Length of Visits* * *All of the above for Returning Visitors* **Personalization** - Automated and User Determined Personalization **Survey** - *Emails to High Frequency Visitors to Solicit Needs*	**User** – Sites are proactive in monitoring what your interests are in (and provide some *personalization)*. **Portal** – Managers learn user behavior and needs and attempt to anticipate what information is desired to the lowest denominator possible. **Enterprise** – More responsive and pro-active in providing overall Intranet support, leading to increased user sat.	Info Architecture: - *Personalization* - *User Data* User Experience: - *Personalization*	**F**

TABLE 15. CROSS PORTAL REFERRAL METRICS TO BUSINESS REQUIREMENTS

Intranet Portal Metric Supposition and Breakdown on Measuring Intranet Websites to Indicate and Improve Effectiveness Gains

WHAT: CROSS PORTAL REFERRAL (Priority No. 4)

WHERE: Enterprise

WHO: Portal Manager and Editor Related

WHY: **HOW:**

Business Req. or Derived Metric

Back End or Hard Metric

Front End or Soft Metric

Best Bet or Practice

<----------BUSINESS PROCESS----------><------BEST PRACTICES ------> **<--------- IEEM Related --------->**

Business Issue: - *Metric Area*	**Business Question of Web Site Activity**	**Business Significance of Web Site Report Solution**	**Specific Sub-Metric Area** - *Specific Metric*	**Who Benefits and Why** (User, Portal, Enterprise)	***IEEM*** **Segment(s):** ***IEEM*** Constituent(s)	**Efficiency (E) or Effectiveness(F)**
Retention: - *User Sat.* - *Usability* - *Ease of Navigation*	Why are visitors leaving our site, even though they have already selected several items or started a lead session?	Monitor dropped pages and then study them to understand why they were dropped and make modifications (i.e., design change) to improve discovery of information	**Abandons:** - ***Dropped page rate over time*** **User Sat. Survey:** - *Abandonment causes* **Usability Study:** - *Abandonment causes*	**User** – Pages where users have problems will be identified and users may have chance to comment on their modification. **Portal** – Managers learn which pages are desired and can load related information to meet demand. Mangers learn visitor, lead and lead completed ratios by source to determine most valuable referral sites. **Enterprise** – Ultimately, the more referrals the more information is to be discovered. As portals are monitored for referral by source, the value of a portal takes on an added dimension to overall significance or enhancer to enterprise information discovery (intranet portals will in effect be both a beneficiary and benefactor of referrals).	Ed. Programming, User Experience: - *Survey/Feedback*	**F**

TABLE 15. CROSS PORTAL REFERRAL METRICS TO BUSINESS REQUIREMENTS

Intranet Portal Metric Supposition and Breakdown on Measuring Intranet Websites to Indicate and Improve Effectiveness Gains

WHAT: **EASE OF NAVIGATION (Priority No. 5)**

WHERE: **User**

WHO: **Portal Manager and Editor Related**

WHY: **HOW:**

Business Req. or Derived Metric

Back End or Hard Metric

Front End or Soft Metric

Best Bet or Practice

<----------BUSINESS PROCESS----------><------BEST PRACTICES ------> <--------- IEEM Related --------->

Business Issue: *- Metric Area*	**Business Question of Web Site Activity**	**Business Significance of Web Site Report Solution**	**Specific Sub-Metric Area** *- Specific Metric*	**Who Benefits and Why** (User, Portal, Enterprise)	**IEEM Segment(s):** *IEEM* Constituent(s)	**Efficiency (E) or Effectiveness(F)**
Site Design	Is our site navigation effective?	Measure how difficult it is for your visitors to take the desired action.	**Clicks and Duration Measures**: **Usability Study**:	**User** – Pages. **Portal** – Managers learn. **Enterprise** –	Ed. Programming, User Experience: - *Navigation*	**F**
Site Design	How do I know if my site is optimized for my typical web site visitor?	Track which browsers and platforms your visitors use so you can design according to their needs	Web Graphics: Referrers, Browsers used, Search Engines	**User** – Pages. **Portal** – Managers learn. **Enterprise** –	Ed. Programming, User Experience, Info. Architecture - ***Personalization***	**F**
Site Design	How can I make transactions easier for my visitors?	Analyze the seeking processes to determine speed the process to download	**Click to Success Rate**	**User** – Pages. **Portal** – Managers learn. **Enterprise** –	Ed. Programming, User Experience: - *Personalization*	**E(F)**
Site Design	How do I evaluate the success of design tradeoffs and choices?	Continuously measure the effect of each design change on your visitation	**Caching Statistics**	**User** – Pages. **Portal** – Managers learn. **Enterprise** –	User Experience, Ed. Programming: - *Navigation* Info. Knowledge	**F**

TABLE 16. EASE OF NAVIGATION METRICS TO BUSINESS REQUIREMENTS

WHAT: **TOP DOWNLOADS / PAGES (Priority No. 6)**

WHERE: **Portal**

WHO: **Portal Manager Related**

WHY: **HOW:**

Business Req. or Derived Metric

Back End or Hard Metric

Front End or Soft Metric

Best Bet or Practice

<----------BUSINESS PROCESS----------><------BEST PRACTICES ------> <-------- IEEM Related -------->

Business Issue: - *Metric Area*	**Business Question of Web Site Activity**	**Business Significance of Web Site Report Solution**	**Specific Sub-Metric Area** - *Specific Metric*	**Who Benefits and Why** (User, Portal, Enterprise)	***IEEM*** Constituent(s)	**Efficiency (E) or Effectiveness(F)**
Site Design	Are there popular pages that aren't easy to access?	Improve access to popular pages and satisfy your visitors	**Deep Link Correlation** (content group by no referrer)	**User** – Pages. **Portal** – Managers learn. **Enterprise** –	Info Architecture: - ***Info Grouping*** - *Search* - *Content Properties*	**F**
Site Design	What keywords should I use to maximize search engine traffic to my site?	Maximize traffic to your site by understanding what terms your visitors are using to locate your site	(Search engine optimizer)	**User** – Pages. **Portal** – Managers learn. **Enterprise** –	Info Knowledge: - *Content Properties*	**F(E)**

TABLE 17. TOP DOWNLOADS/PAGES METRICS TO BUSINESS REQUIREMENTS

WHAT: **USER SATISFACTION SURVEYS (Priority No. 7)**

WHERE: **Front End**

WHO: **Portal Owner, Manager, Editor and User Related**

WHY: **HOW:**

Business Req. or Derived Metric

Back End or Hard Metric

Front End or Soft Metric

Best Bet or Practice

<----------BUSINESS PROCESS----------><------BEST PRACTICES ------> <-------- IEEM Related -------->

Business Issue: - *Metric Area*	**Business Question of Web Site Activity**	**Business Significance of Web Site Report Solution**	**Specific Sub-Metric Area** - *Specific Metric*	**Who Benefits and Why** (User, Portal, Enterprise)	**IEEM Segment(s):** *IEEM* Constituent(s)	**Efficiency (E) or Effectiveness(F)**
User Experience	Do users prefer and use my site? Why and Why not?	Improve satisfaction of your content delivery to help users do their jobs and make decisions better.	User Sat Survey with a variety of questions related to the business discussion	Customer Portal Enterprise	All Segments - All IEEM Constituents	**F(E)**
Site Design	How can the site (UI) be modified to best meet the demands of users?	Improve satisfaction of your content delivery	User Sat Survey with a variety of questions related to the business discussion	Customer Portal Enterprise	All Segments - All IEEM Constituents	**F(E)**

TABLE 18. USER SATISFACTION SURVEY METRICS TO BUSINESS REQUIREMENTS

WHAT: Time to Locate (Priority No. *)

There are many variables that could skew the results for time to reach a decision to be consistent (i.e., individual skill sets and experience can vary greatly). However, if improvements are made in the other metric areas previously listed, they will collectively help to minimize the time to locate desired information and the resulting decision reached. Nevertheless, from time to time users may find what they are looking for sooner, but will also continue to look for long periods of time (perhaps as much as the approximate 50% of their time as they do now) because they are finding more of what they are seeking. Regardless, the time factor is reduced with respect to finding what is sought or considered desirable: If people still spend 50% of their time looking for information, they should have more pertinent information than before in the same amount of time – which should lead to better decision making and ultimately more effectiveness. "Time to Locate": is an efficiency metric that is affected by increases in effectiveness elsewhere. The *efficiency* metric of Time to Locate in turn affects effectiveness across the board because users will either have or can do more in less time. Thus, this metric area is an example of how effectiveness affects efficiency and then how this efficiency increase in turn improves effectiveness.

Intranet Portal Metric Supposition and Breakdown on Measuring Intranet Websites to Indicate and Improve Effectiveness Gains

WHAT: **Miscellaneous**

WHERE: **Portal**

WHO: **Portal Manager and Editor Related**

WHY: **HOW:**

Business Req. or Derived Metric

Back End or Hard Metric

Front End or Soft Metric

Best Bet or Practice

<----------BUSINESS PROCESS----------><------BEST PRACTICES ------> <--------- IEEM Related --------->

Business Issue: - *Metric Area*	**Business Question of Web Site Activity**	**Business Significance of Web Site Report Solution**	**Specific Sub-Metric Area** - *Specific Metric*	**Who Benefits and Why** (User, Portal, Enterprise)	**IEEM Segment(s):** *IEEM* Constituent(s)	**Efficiency (E) or Effectiveness(F)**
User Experience	How often do people abandon my registration and survey forms?	Monitor incomplete survey and registration forms and analyze why they were abandoned	Registration abandonment rate	Portal User	Info. Knowledge	**E(F)**
User Experience	How often do people bookmark my site?	Understand how important your content is to certain visitors	Bookmark volume trend	Portal User	Info. Knowledge	**F**
Performance	How do I gauge the performance of my caching or load balance?	Analyze and understand what performance benefit caching has for my visitors and make appropriate changes	Caching statistics Load Balance statistics	Enterprise Portal User	Info. Knowledge	**E**
Web Site Performance	How do I know what errors are occurring on the web site?	Control error rates by tracking client, server, and dynamic page/form errors and fixing them	Visitor Error Rate	Portal	Info. Knowledge	**E**

TABLE 19. MISCELLANEOUS METRICS TO BUSINESS REQUIREMENTS

Portal Manager Questions Related to IEEM Buy-in (Miscellaneous)

Business Issue	**User Pain**
Interoperability	Will this solution work with my existing environment? (Databases, applications and hardware platforms)
Data Integration	How do you integrate multiple data sets, on multiple platforms for multiple people?
Productivity	How can I automate the process of distributing the analysis and reports on website activity? (and present them in a format that is understandable and meaningful)
Scalability	Can the system scale to the large amount of Web data we process and provide us with timely reporting?

APPENDIX E: COMMON APPROACHES TO IT ROI

Technique	General Definition	How to Calculate	Advantage	Disadvantage
Return on Investment (ROI)	A catchall phrase commonly used for several ways to measure business value of a project. ROI means profit divided by investment, expressed as a percentage. As the numerator, profit can be replaced by cost reductions or productivity gains derived from the operational improvements an IT project yields	Revenue or cost savings divided by investment	Best applied to projects where all costs that will be incurred or all cost reductions that will be realized are known ahead of time, usually from experience on a similar project.	Difficult to apply to entrepreneurial IT projects that are designed to help launch new products, services or businesses that translate to new sources of revenue and profits. ROI doesn't consider risk, flexibility & intangibles.
Net Present Value (NPV)	Refers to the future net cash flow a project is expected to deliver, minus the investment. It defines the value of a project in "today's dollars." The calculation is based on the company's cost of capital used for assessing proposal alternatives. It returns a nominal amount.	Cash inflow minus cash outflows calculated in today's dollars.	Includes all cash flow related to a project. Considers the time value of money, or the difference in the value of a dollar today and what it might be three years from now.	The highest NPV doesn't always correspond to the most efficient use of a company's capital.
Internal Rate of Return (IRR)	One of several metrics that considers the time value of money, IRR expresses the dollar returns expected from a project as an interest rate. Once the rate is established, it can be compared to rates earned by investing in other projects. More informally, IRR is also known as the "hurdle rate" because it's usually the lowest rate of return that management will accept. Typically, a project must earn an IRR that is several percentage points higher than the cost of borrowing, to compensate the company for its risk exposure and time.	C= all costs associated with the project and call it . R=estimate of all returns resulting from the project. T= how many months or years company will realize returns. i= firm's minimum acceptable rate of return Calculate the interest rate: C=R x T (i). Reference a NPV chart listing the value of a $1 annuity and find the corresponding interest rate. Compare that interest rate to the minimum acceptable rate and determine if project will leap over hurdle rate.	Includes all cash flow related to a project. Considers the time value of money. It enables the comparison of rates of return on alternative investment options. Given two investment alternatives and assuming that both fit strategic objectives of the organization, the investment with higher internal rate of return should be selected. Conceptually it is the easiest method to understand.	Disadvantages: Assumes cash flows are reinvested at the IRR. Cumbersome to calculate interest rate when cash flows vary widely year to year. There is no specific formula that can be used to calculate the IRR; it is found by interpolation.
Payback Period	How long it will take an investment to pay for itself	Initial project investment divided by cash inflows (or cost reductions) per year.	It's simple and understandable.	Time value of money and cash or other benefits received after payback period are not recognized, which determines profit.
Economic Value Added (EVA)	Measures a corporation's true economic profit. The idea is to understand which business units best leverage their assets to generate returns and maximize shareholder value.	Net operating profit minus an appropriate charge for the opportunity cost of all capital invested in an org. – EVA= Net Operating Profit After Taxes (NOPAT) - (Capital x Cost of Capital)	Can more precisely define value in terms specific to an enterprise.	Complex, proprietary (expensive) and not widely used. Metric is extraordin-arily dependent on the size of a business. Big operations/ projects tend to produce big EVAs, while small operations/ projects are much smaller.

TABLE 20. COMMON APPROACHES TO IT ROI

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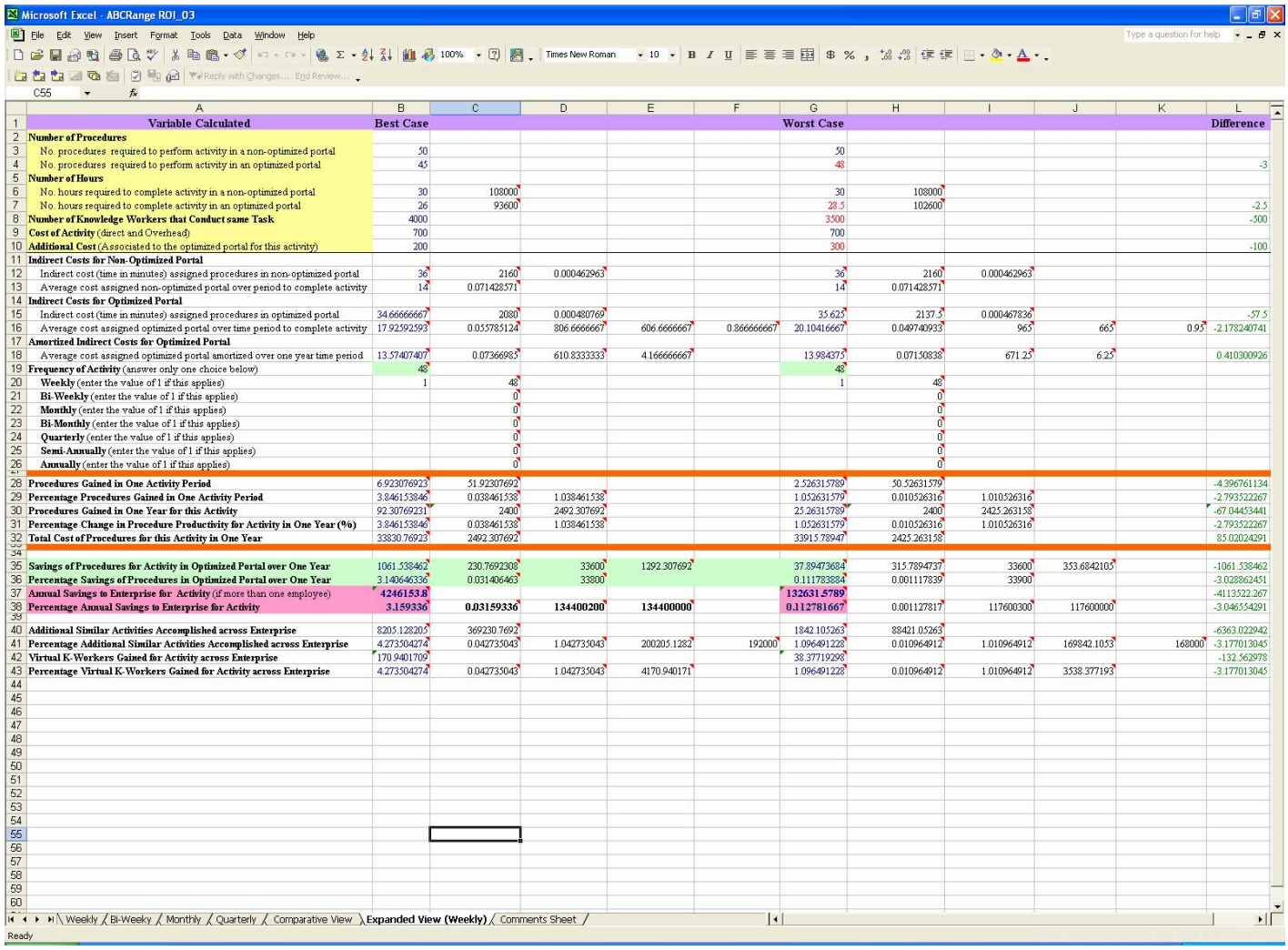
APPENDIX F: SPREADSHEET OF ROI RETURNS

Variable Calculated	Weekly Best Case	Weekly Worst Case	Bi-Weekly Best Case	Bi-Weekly Worst Case	Monthly Best Case	Monthly Worst Case	Quarterly Best Case	Quarterly Worst Case
Number of Procedures								
No. procedures required to perform activity in a non-optimized portal	50	50	110	110	310	310	1200	1200
No. procedures required to perform activity in an optimized portal	45	48	95	102	285	300	1100	1150
Number of Hours								
No. hours required to complete activity in a non-optimized portal	30	30	68	68	125	125	400	400
No. hours required to complete activity in an optimized portal	26	28.5	57	64	110	116.5	350	375
Number of Knowledge Workers that Conduct same Task	4000	3500	1000	900	500	450	250	220
Cost of Activity (direct and Overhead)	700	700	1200	1200	2400	2400	15000	15000
Additional Cost (Associated to the optimized portal for this activity)	200	300	400	700	800	1100	1000	1400
Indirect Costs for Non-Optimized Portal								
Indirect cost (time in minutes) assigned procedures in non-optimized portal	36	36	37.0909	37.09090	24.19354	24.19354	20	20
Average cost assigned non-optimized portal over period to complete activity	14	14	10.90909	10.90909	7.74193	7.74193	12.5	12.5
Indirect Costs for Optimized Portal								
Indirect cost (time in minutes) assigned procedures in optimized portal	34.66666	35.625	36	37.64705	23.15789	23.3	19.09090	19.56521
Average cost assigned optimized portal over time period to complete activity	17.92592	20.10416	14.79876	17.93540	10.21754	11.12266	12.84090	13.44565
Amortized Indirect Costs Optimized Portal								
Average cost assigned optimized portal amortized over one year time period	13.57407	13.98437	10.76367	11.35861	7.64444	7.76155	12.15909	12.53260
Frequency of Activity (answer only one)	48	48	24	24	12	12	4	4
Procedures Gained in One Activity Period	6.923076	2.526315	18.333333	6.375	38.863636	21.88841	157.14285	76.66666
Percentage Procedures Gained in One Activity Period	3.84615	1.052631	3.030303	-1.477272	4.47214	3.83497	4.76190	2.22222
Procedures Gained in One Year for this Activity	92.30769	25.26315	80	-39	166.36363	142.66094	228.5714	106.6666
Percentage Change in Procedure Productivity for Activity in One Year (%)	3.846153	1.052631	3.030303	-1.477272	4.472140	3.834971	4.76190	2.22222
Total Cost of Procedures for this Activity in One Year	33830.76	33915.78	29277.192	29543.75	29709.090	29980.257	61142.857	61493.333
Savings of Procedures for Activity in Optimized Portal over One Year	1061.538	37.89473	395.53429	-1169.204	378.88563	-75.78568	1714.28571	-160
Percentage Savings of Procedures in Optimized Portal over One Year	3.140646	0.111783	1.354569	-3.963405	1.28001	-0.253463	2.810304	-0.260586
Annual Savings to Enterprise for Activity (if more than one employee)	**4246153.85**	**132631.57**	**395534.29**	**-1052284.09**	**189442.81**	**-34103.55**	**428571.43**	**-35200**
Percentage Annual Savings to Enterprise for Activity	**3.15933**	**0.112781**	**1.373363**	**-4.05962**	**1.31550**	**-0.26312**	**2.85695**	**-0.26663839**
Additional Similar Activities Accomplished across Enterprise	8205.128	1842.105	842.1052	-344.11764	291.86602	213.99141	51.94805	20.40579
Percentage Additional Similar Activities Accomplished across Enterprise	4.273504	1.096491	3.50877	-1.5931372	4.86443	3.962804	5.194805	2.318840
Virtual K-Workers Gained for Activity across Enterprise	170.9401	38.37719	35.0877	-14.338235	24.32216	17.83261	12.98701	5.10144
Percentage Virtual K-Workers Gained for Activity across Enterprise	4.273504	1.096491	3.50877	-1.593137	4.86443	3.962804	5.194805	2.318840

TABLE 21. COMPARATIVE ROI RETURNS FOR DIFFERENT ACTIVITIES: ONE YEAR

Variable Calculated	Weekly Best Case	Weekly Worst Case	Bi-Weekly Best Case	Bi-Weekly Worst Case	Monthly Best Case	Monthly Worst Case	Quarterly Best Case	Quarterly Worst Case
Number of Procedures								
No. procedures required to perform activity in a non-optimized portal	50	50	110	110	310	310	1200	1200
No. procedures required to perform activity in an optimized portal	45	48	95	102	285	300	1100	1150
Number of Hours								
No. hours required to complete activity in a non-optimized portal	30	30	68	68	125	125	400	400
No. hours required to complete activity in an optimized portal	26	28.5	57	64	110	116.5	350	375
Number of Knowledge Workers that Conduct same Task	4000	3500	1000	900	500	450	250	220
Cost of Activity (direct and Overhead)	700	700	1200	1200	2400	2400	15000	15000
Additional Cost (Associated to the optimized portal for this activity)	200	300	400	700	800	1100	1000	1400
Indirect Costs for Non-Optimized Portal								
Indirect cost (time in minutes) assigned procedures in non-optimized portal	36	36	37.09090	37.0909	24.19354	24.19354	20	20
Average cost assigned non-optimized portal over period to complete activity	14	14	10.90909	10.9090	7.741935	7.741935	12.5	12.5
Indirect Costs for Optimized Portal								
Indirect cost (time in minutes) assigned procedures in optimized portal	34.66666	35.625	36	37.64705	23.15789	23.3	19.09090	19.5652
Average cost assigned optimized portal over time period to complete activity	17.92592	20.10416	14.79876	17.93540	10.21754	11.12266	12.84090	13.44565
Amortized Indirect Costs for Optimized Portal								
Average cost assigned optimized portal amortized over one year time period	13.52777	13.91927	10.67595	11.21563	7.52748	7.608777	12.04545	12.38043
Frequency of Activity (answer only one choice below)	96	96	48	48	24	24	8	8
Procedures Gained in One Activity Period	6.92307	2.5263	18.3333	6.375	38.8636	21.8884	157.1428	76.6666
Percentage Procedures Gained in One Activity Period	3.84615	1.05263	3.0303	-1.47727	4.47214	3.83497	4.761904	2.2222
Procedures Gained in One Year for this Activity	184.6153	50.5263	160	-78	332.7272	285.321	457.1428	213.33
Percentage Change in Procedure Productivity for Activity in One Year (%)	3.84615	1.05263	3.0303	-1.47727	4.472140	3.83497	4.761904	2.2222
Total Cost of Procedures for this Activity in One Year	67430.76	67515.78	58077.19	58343.75	58509.0909	58780.257	121142.857	121493.33
Savings of Procedures for Activity in Optimized Portal over One Year	2353.846	391.5789	1268.261	-1594.659	1666.862	1028.686	4571.428	1173.333
Percentage Savings of Procedures in Optimized Portal over One Year	3.492353	0.580116	2.186657	-2.735264	2.854216	1.752446	3.77804	0.966501
Annual Savings to Enterprise for Activity (if more than one employee)	**9415384.62**	**1370526.31**	**1268261.563**	**-1435193.18**	**833431.085**	**462908.7637**	**1142857.1**	**258133.333**
Percentage Annual Savings to Enterprise for Activity	**3.50274**	**0.582706024**	**2.201827701**	**-2.76846**	**2.893777**	**1.785837**	**3.8093**	**0.97772**
Additional Similar Activities Accomplished across Enterprise	16410.25	3684.210	1684.210	-688.2352	583.7320	427.9828	103.8961	40.8115
Percentage Additional Similar Activities Accomplished across Enterprise	4.273504	1.096491	3.50877	-1.593137	4.864433	3.962804	5.194805	2.31884
Virtual K-Workers Gained for Activity across Enterprise	170.9401	38.37719	35.0877	-14.33823	24.32216	17.83261	12.98701	5.101449
Percentage Virtual K-Workers Gained for Activity across Enterprise	4.273504	1.096491	3.50877	-1.593137	4.864433	3.962804	5.194805	2.31884

TABLE 22. COMPARATIVE ROI RETURNS FOR DIFFERENT ACTIVITIES: TWO YEARS



Microsoft Excel - ABCRange ROI_03

Variable Calculated	Best Case					Worst Case					Difference
Number of Procedures											
No. procedures required to perform activity in a non-optimized portal	50					50					
No. procedures required to perform activity in an optimized portal	45					48					-3
Number of Hours											
No. hours required to complete activity in a non-optimized portal	30	108000				30	108000				
No. hours required to complete activity in an optimized portal	26	93600				28.5	102600				-2.5
Number of Knowledge Workers that Conduct same Task	4000					3500					-500
Cost of Activity (direct and Overhead)	700					700					
Additional Cost (Associated to the optimized portal for this activity)	200					300					-100
Indirect Costs for Non-Optimized Portal											
Indirect cost (time in minutes) assigned procedures in non-optimized portal	36	2160	0.000462963			36	2160	0.000462963			
Average cost assigned non-optimized portal over period to complete activity	14	0.071428571				14	0.071428571				
Indirect Costs for Optimized Portal											
Indirect cost (time in minutes) assigned procedures in optimized portal	34.66666667	2080	0.000480769			35.625	2137.5	0.000467836			-57.5
Average cost assigned optimized portal over time period to complete activity	17.92592593	0.055785124	806.6666667	606.6666667	0.866666667	20.10416667	0.049740933	965	665	0.95	-2.178240741
Amortized Indirect Costs for Optimized Portal											
Average cost assigned optimized portal amortized over one year time period	13.57407407	0.07366985	610.8333333	4.166666667		13.984375	0.07150838	671.25	6.25		0.410300926
Frequency of Activity (answer only one choice below)	48					48					
Weekly (enter the value of 1 if this applies)	1	48				1	48				
Bi-Weekly (enter the value of 1 if this applies)		0					0				
Monthly (enter the value of 1 if this applies)		0					0				
Bi-Monthly (enter the value of 1 if this applies)		0					0				
Quarterly (enter the value of 1 if this applies)		0					0				
Semi-Annually (enter the value of 1 if this applies)		0					0				
Annually (enter the value of 1 if this applies)		0					0				
Procedures Gained in One Activity Period	6.923076923	51.92307692				2.526315789	50.52631579				-4.396761134
Percentage Procedures Gained in One Activity Period	3.846153846	0.038461538	1.038461538			1.052631579	0.010526316	1.010526316			-2.793522267
Procedures Gained in One Year for this Activity	92.30769231	2400	2492.307692			25.26315789	2400	2425.263158			-67.04453441
Percentage Change in Procedure Productivity for Activity in One Year (%)	3.846153846	0.038461538	1.038461538			1.052631579	0.010526316	1.010526316			-2.793522267
Total Cost of Procedures for this Activity in One Year	33830.76923	2492.307692				33915.78947	2425.263158				85.02024291
Savings of Procedures for Activity in Optimized Portal over One Year	1061.538462	230.7692308	33600	1292.307692		37.89473684	315.7894737	33600	353.6842105		-1061.538462
Percentage Savings of Procedures in Optimized Portal over One Year	3.140646336	0.031406463	33800			0.111783884	0.001117839	33900			-3.028862451
Annual Savings to Enterprise for Activity (if more than one employee)	**4246153.8**					**132631.5789**					-4113522.267
Percentage Annual Savings to Enterprise for Activity	**3.159336**	**0.03159336**	**134400200**	**134400000**		**0.112781667**	0.001127817	117600300	117600000		-3.046554291
Additional Similar Activities Accomplished across Enterprise	8205.128205	369230.7692				1842.105263	88421.05263				-6363.022942
Percentage Additional Similar Activities Accomplished across Enterprise	4.273504274	0.042735043	1.042735043	200205.1282	192000	1.096491228	0.010964912	1.010964912	169842.1053	168000	-3.177013045
Virtual K-Workers Gained for Activity across Enterprise	170.9401709					38.37719298					-132.562978
Percentage Virtual K-Workers Gained for Activity across Enterprise	4.273504274	0.042735043	1.042735043	4170.940171		1.096491228	0.010964912	1.010964912	3538.377193		-3.177013045

Weekly / Bi-Weekly / Monthly / Quarterly / Comparative View / **Expanded View (Weekly)** / Comments Sheet

Ready

TABLE 23. EXPANDED FIELD VIEW OF COMPARATIVE ROI WEEKLY RETURNS

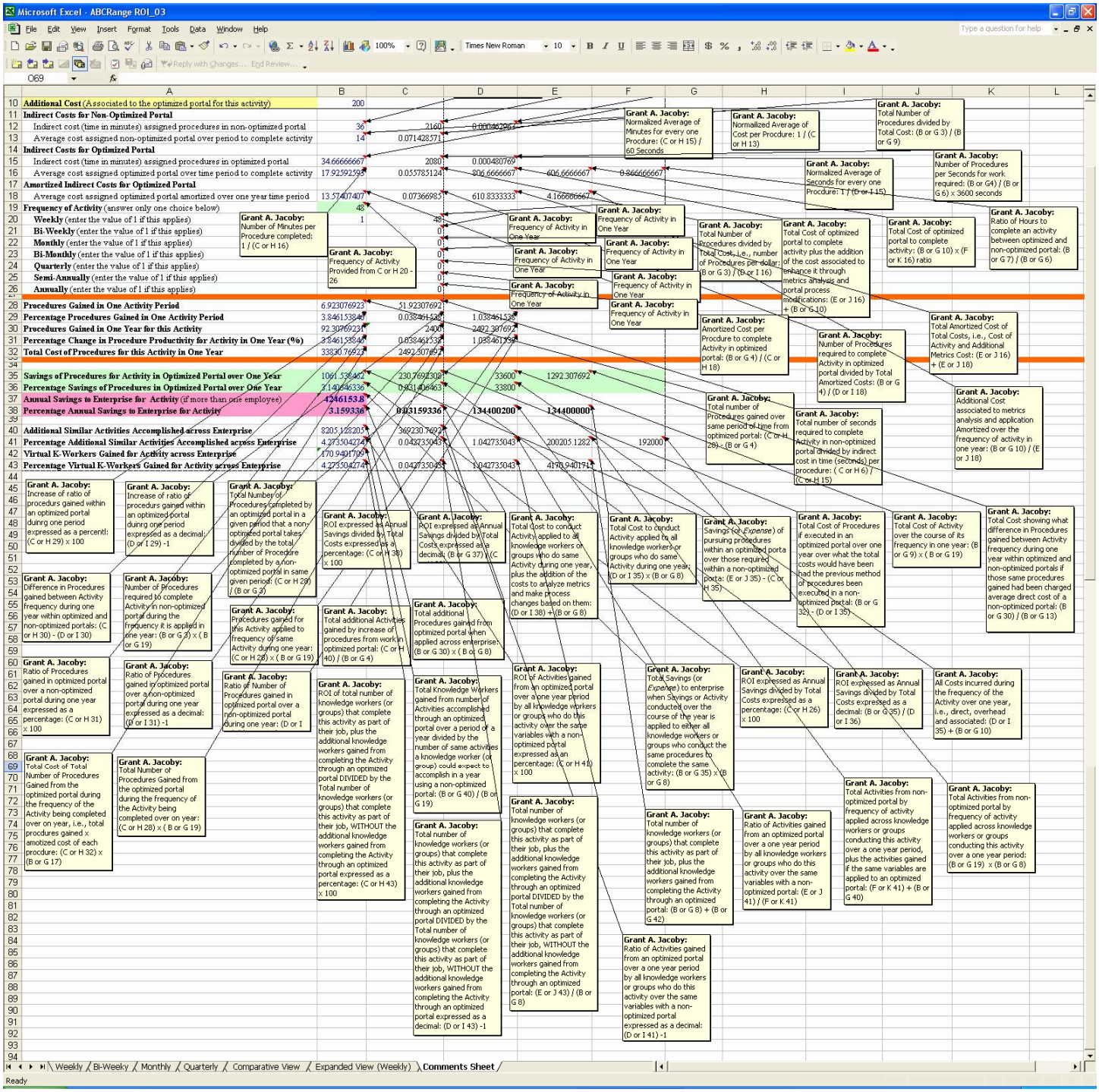


TABLE 24. FIELD COMMENTS EXPLAINING ROI CALCULATIONS

APPENDIX G: GLOSSARY

----- - QUANTITATIVE ------ - QUALITATIVE ------ - BOTH

Accessibility: Information is considered accessible when it is available, reachable, and understandable. (Assuming the information exists, ideally availability could occur from any *point of access* of and *point of entry* to the information system. Although how reachable information is depends on a number of factors, in this context the more information is compatible with a shared *Information Architecture,* the easier it is to retrieve. How this information is then packaged and presented in a fashion that can be understood by the knowledge worker is the last stage of accessibility.)
(Note: Accessibility also has another meaning in terms of access or permissions to get information.)

Additive: The term that is characterized by the addition of independent statistical sums that are representative of the sum of their parts when summed as a whole. For example, when the total page views for each page in a vroot, such as /office, are summed by simple addition that sum correctly represents the total page views for that vroot. Antonym non-additive

Associative relationship: A relationship between items that are closely related conceptually but not hierarchically and are not members of an equivalence set.

Attempted Downloads: The number of attempted downloads as indicated by the HTTP Status for acknowledged page request. See also Successful Downloads.

Average minutes per usage day: The average number of minutes spent on the website, category, channel, or application during the day, per visiting person.

Average minutes per usage month: The average total number of minutes spent on the website, category, channel, or application during the month, per visiting person.

Average minutes spent per unique page: The average number of minutes spent on each unique page during the day.

Average unique pages per visitor in a month: The average number of different pages viewed per day over the course of the month by those persons visiting the domain, global domain, property, or category. A *unique page* is defined as a specific URL that was successfully loaded by the browser at least once in the day. Even if the page was viewed many times, the page is counted only once under the unique page definition. In the case of non-Web content, unique pages are the equivalent of unique window titles, if applicable, or if not, are undefined and set to zero. The multiple URLs displayed within a framed page are not counted as additional unique pages; rather, all credit is given exclusively to the host URL, which does not change as users update constituents of the

page. Therefore, websites utilizing frames may show lower unique page estimates than websites that do not utilize frames.

Average usage days per visitor per month (Frequency): The average number of different days in the month, per person, in which a website, category, channel, or application was visited. A person is defined as a visitor if they access at least one "page" of content within the website, category, channel, or application. A *day* is defined as 12:00 midnight through 11:59:59 PM.

Authoritative Flags: An indication that the information presented has gone through a screening process to discern its credibility, i.e., confirmation that information is timely and trustworthy.

Best Bets: Results from an authoritative Intranet sponsored site maintained by an internal division or group that is regularly updated and contains large amounts of information relevant to the search topic and does not require any special security permission to view it.

Best Practices: Effective means of doing work in a preferred way that takes place and changes over a period of time based originally from guidelines.

Clickstream Analysis: A Web analytics software that tracks and measures all visitor behavior (mouse movement and links invoked) online and offline both quantitatively and qualitatively to assess user behavior patterns.

Cluster: A group of servers. Specifically, a cluster is a group of servers assigned to one sub-domain of an enterprise. Synonym: Domain.

Cognitive Factor: The critical analysis ability of an individual. For example, in Web analytics should attempt to account for the cognitive ability of the knowledge worker to further link associated information and to take into account additional commonalities and solutions that are not readily apparent or realizable by quantitative measurements alone.

Communications: Human and technological systems used for sending and receiving messages. In the case of exercising Web analytics, communications is what supports the engagement of the knowledge worker.

Communication of Authoritativeness and Importance: Communicating to the knowledge worker the credibility of an information system within that system to ensure confidence and trust. See: Authoritative Flags.

Communication of Understanding: Communicating to the knowledge worker meaning and significance to ensure acceptance and engagement, which further increases the audience's propensity to act on information in a common way, i.e., a *Glossary of Terms and Definitions*, Mouse-over, and best practices.

Community: Enterprise communities are based on groups of shared interest. A community can be a group or a task, but they both share a common interest.

Composition: The percentage of a website, category, channel, or application's visitors that belong to a specific demographic grouping.

Content and Content Properties: Content – All documents -- help text, search results, forms, or application information -- that is delivered to an knowledge worker via a website, or application. It is both subject and specific information. For example, "People" is a subject and a person by name is specific information. Content is organized and found depending on its properties and associations
Content Properties – How content is described in order to affect the associations made in information retrieval and presentation. The characteristics of a content item make up its properties, such properties (a.k.a. attributes) include author, length, name, etc.

Contextualization: The process of placing an idea, information item or knowledge worker in a relevant environment to enhance understanding. See: Personalization and Customization.

Customization: Ability for knowledge workers to self-configure the contents/constituents of their domain site. In essence, individuals are allowed to subscribe to constituents, or sub- constituents of a portal, including navigation, content, search, etc., in order to provide and store information (i.e., like the notion of "my saved searches") most relevant to their interests, position or role.

Data: Information, often in the form of facts or figures (for example, numbers, text, images, and sounds) obtained from experiments or surveys, in a form that is suitable for storage in or processing by a computer used as a basis for making calculations or drawing conclusions.

Data Mining: Analysis of data in a database using tools which look for trends or anomalies without knowledge of the meaning of the data.

Data Warehouse: For any Web analytics, the system for storing Web analytic data for the enterprise Web servers.

"Discoverability": - Facilitate information discovery through presentation of relative associations which lead to better decisions, increased productivity and effectiveness that would not have been likely otherwise. Discoverability requires three events to happen: 1) associative connections between content items are created; 2) the information/ knowledge is presented to illustrate relative associations that can be acted upon; and 3) the knowledge worker has the cognitive ability/recognizes there is an action to be taken.

Digital media reach percentage: The percentage of projected individuals who visited a specific website, category, channel, or application among the total number of projected individuals using any digital media during the course of the reporting period.

Domain: This term is used to identify the domain of an enterprise. See also: Sub-domain.

Domain Integration Framework: Representation of the relationships/structure between the key elements within a design. It shows how these elements interact and must "transfer" information, so that the architect can build the environment. Examples are information maps (document elements), server topography, scope of services, permissions (ownership).

Download: Any file that is sent to a client by an HTTP server with selected extension, such as .exe, .doc, .zip, etc.

Drilling: To analyze data in more depth by moving down or up levels within a category or classification, to include date hierarchies. An example would be analyzing page views for June 2000, then "drilling-down" to June 1, 2000.

Editorial Programming: The editor's experience should be a straightforward and consistent use of accepted best practices and best tools available (from within the company) to organize, access and re-use information in a desired manner to produce a desired outcome.

Engagement: The more utility a system provides the more recognized and compelling it becomes. In other words, there is a gradual synergy that manifests from enthusiastic knowledge workers through escalating levels of commitment up to outright ownership as a result of perceived usefulness of a system/service.

Equivalence relationship: A relationship between items that is conceptually equivalent. Ex: ASP = Active Server Pages

External Referrer: In contrast to internal referrer, external referrers are the websites which are not managed by the enterprise, and are therefore generally not tracked. Examples are Yahoo, Lycos, Excite, etc or a business partner domain.

Extranet: An Extranet is somewhat similar to an Intranet. Extranets are designed specifically to give external limited access to certain files using the Internet protocol and the public telecommunication system to securely share part of a business's information or operations with suppliers, vendors, partners, customers, or other businesses.

Finding: This is a process employed by knowledge workers to seek the information they need to do their jobs.

GUID: GUID stands for Global Unique Identifier, a unique 32-character hexadecimal string which is generated for each user who accepts cookies.

GUIDed User: A user assigned a GUID in a cookie. Also referred to as GUIDs and users.

Guideline: Guidance on how to meet established standards. Over time guidelines become best practices.

Hierarchical relationship: A relationship between items based on one item being a part of another, one item being an instance of another, or one item being descended from another. This creates linkages from broader to narrower, generic to specific or parent to child.

Hit: In Web activity, a hit is registered when a file is sent to a client by an HTTP server. This includes graphics, HTML, EXEs, etc.

HTTP Status Codes: The code associated with a page request that is recorded in the IIS log for each HTTP method exchange between client and server. For example, a successful page request results in an HTTP code 200 or OK and can be imported into a log file for the data warehouse. Occasionally there is a 404 page error which occurs when a server has not found anything matching the request URL (no indication is given on duration of condition).

Index: The composition of the website, category, channel, or application compared to the demographic composition of the universe.

Information: The meaning of data as it is intended to be interpreted by people. Data consists of facts, which become information when they are seen in context and convey meaning to people.

Information Architecture: The information architecture (IA) of a corporation is the sum and organization of all its data, taxonomies, tools and products. IA for Web analytics needs to encompass not all the IA that is available but only the best elements of these groups which can be further developed and integrated to improve control of content and context to meet knowledge workers needs and to exceed their expectations as well.

Internet: The Internet is a public cooperative of networks and gateways around the world that uses a portion of the total resources of the currently existing public telecommunication networks that use of a set of protocols called TCP/IP (for Transmission Control Protocol/Internet Protocol. Two recent adaptations of Internet technology, the intranet and the extranet, also make use of the TCP/IP protocol.

Intranet: An Intranet is a private, secured information portal designed specifically for the internal communications of small, medium or large businesses, enterprises, governments, industries or financial institutions of any size or complexity. Intranets can be custom-designed to fit the exact needs of businesses no matter where they are situated. Users, also referred to as knowledge workers, of Intranets consists mainly of company employees and business partners.

Internet Architecture: All constituents used to provide a means of access or transfer to a point of entry.

Information Grouping & Segmenting: Information grouping is the logical collection of similar and relevant information, such as Content Nuggets and Categories respectively. Another aspect of this is information segmenting in which only the relevant parts of a document, i.e. a paragraph or two are extracted and placed into fragmented groupings instead of the entire document. For example, first 200 words of a document returned as part of a search result.

Information Life Cycle: The events often repeated again and again in maintaining the relevance and accessibility of content in an information system. These events include updating, versioning, archiving and, when necessary, deleting. See: Retention

Information System: A procedure that combines and organizes related elements into a complex whole to achieve meaningful representation of data.

Internal Referrer: In contrast to external referrer, internal referrers are the websites managed within an enterprise Intranet.

No Referrer Includes the following ways a user can enter a website:

- favorites or bookmarks
- a manually typed URL
- embedded links in documents or e-mail messages
- default start page of a browser
- use of a browser configured not to pass headers
- server site redirect

Knowledge: Understanding gained through experience or study

Knowledge Worker: One who gathers, analyzes, adds value and communicates information to empower decision-making. (The nature of 'k-work' is ad hoc, demand-driven and creative, both in the ability to create new knowledge greater than the sum of its parts and in the ability to present the knowledge in a highly communicative way).

Log Availability: An indicator as to the whether log files are present and ready for importation by analytics team to be aggregated into the data warehouse. Factor affecting log availability includes network anomalies, server outages, and corrupt disks.

Metadata: Information about a content item derived automatically or by human analysis. Types of metadata include: administrative (managing and administering content), descriptive (describing/identifying) and technical (related to how a system functions of how metadata behaves). Metadata can be expressed in name/value pairs. See: Surrogate

Ex: author : Jane Doe
UID : 7395ZX32Y2001

Metadata Schema: Accumulation of metadata representing classes of information common to all members of a given content sent. Metadata schema is part of an overall schema. See: Schema

Metrics: Though primarily numeric, mainly quantitative and some qualitative facts that are associated with Web usage, such as the count of unique users for a specific page on a given day.

Minutes per Page View: Total minutes visitors spent on the sites divided by total page views.

Mean Time Between Failure (MTBF): MTBF measures how long a server runs before it "fails" or needs to be rebooted.

Navigation: Method of moving through the domain framework by way visual presentation and consistent choices. Navigation has 2 basic types: local (also known as vertical) and global (also known as horizontal).
Local navigation presents choices leading to subtopics or sub-areas of a site, usually defined by one of its main menu subjects (often referred to as a "drill down").
Global navigation presents choices leading to other main areas of a site, i.e. Home; Search; About. Global navigation is consistent throughout an information system which allows knowledge workers to go across portals with a sense of familiarity.

Non-additive: The term that refers to not having a numerical value that is equal to the sum of the parts. In Web analytics, this term is used in application of the summation of unique users and unique pages.

Null User: A user whose browser cannot accept a cookie, or a user who has chosen not to accept a cookie, or a user who has not been to a site on which cookies are issued. We cannot assign a permanent GUID to a null user and therefore cannot track their activity on a site.

Online User: All users who come to an enterprise Intranet. In general, we can tell what type of browser customers are using, where they came from, and what areas of the site they visit.

Page Instrumentation: The concept of adding "trigger" code in the form of scripts to a Web page that is able to relay user interactions to a service that archives the activity for analysis. Synonym: Click Stream Data Collection.

Page Views: Any file sent to a client that provides information, such as http, ASP, Word documents, etc. Depending on the business, the following files may or may not be counted as page views: avi, bmp, cdf, class, css, dat, dll, gif, idq, inc, jpg, js, toc, and wav.

Page Views per User: Page views by GUIDed users divided by the number of unique users (GUIDed). We use this number to indicate how many pages are viewed by a user on average.

Page Views by GUIDed: Users The count of page views by GUIDed users only.

Percentage Page Views by GUIDed: Users Page Views by GUIDed users divided by Total page views. For example, if there are 10,000 pages viewed under a vroot, with 3,000 pages viewed by GUIDed users, this means that GUIDed users account for 30% of the page views, and non-GUIDed account for 70% of the page views.

Persona: If a business fails to understand its users, then it will probably create a poor product or service. Personas (or User Archetypes) are a way of depicting the users of products, such as user behavior while visiting portal sites. Using personas allows development teams to focus more on design and apply appropriate effort on the right set of features to support these users. Named and developed by usability engineers, personas are tools that help make customers very real to the product developers while comprising a rich collection of consumer data, field research and other studies. Key objectives are to ensure products are both *useful*, so they do the things people want them to do, and *usable*, so people can accomplish those things easily. One of the most important functions of usability engineers is to communicate to the development team, as clearly as possible, who the users really are. When designers and developers don't share a distinct image of their user, they carry different interpretations of 'user' around with them. As a result, they are prone to developing a schizophrenic interface or – taken as a whole across a large enterprise – very inconsistent interfaces that leave for a bumpy, if not dissatisfying, surf experience from portal to portal.

Personalization: A method of contextualizing information for a knowledge worker based on what is known about the knowledge worker. A site can use personalization to alter navigation and content presented according to the perceived needs of the knowledge worker. Examples include content filtering based on role; authentication based on name or status as a manager.

Pivot Table: An interactive data report that permits the user to manipulate the hierarchy of data filters as well as the organization of column and row headings. This provides a means to rearrange data for different views during analysis.

Point of Access: Content can be reached through a variety of points of access. These access points reside within the content item itself, i.e. full text, or are associated with the content through its properties and relative associations. (Compare to the use of the term in identifying physical points of access to an information system such as desktop computers, hand-held computers, and wearable computers.)

Point of Entry: Logical and visually identifiable place on an information system where a knowledge worker can begin to seek information. This point of entry is then accountable for the knowledge worker's experience.

Policy: Accepted and codified set of decisions designed to accomplish identified business goals. Any and all Web analytic policies coordinated by a Business Intelligence team should reflect business values.

Portal: A means into an information system, such as a corporate intranet, established over a coherent body of information or community of interest, also known as a site. This (personalized) Website is built on a common set of application services that enables firms to connect employees, customers, partners, and suppliers to all appropriate corporate computing resources from any Internet-capable device.

Productivity: The better knowledge workers apply knowledge, the more productive they are. Therefore, how this knowledge is managed for and by knowledge workers is the most integral, inextricable aspect of improving knowledge worker productivity. Productivity benefits from improved knowledge management include a conservation of resources, maintaining competitive edge and creating new opportunities.

Profiled User: Is a GUIDed user who has submitted profile data through a RegSys application. An un-profiled user is a GUIDed user who has not registered.

Query manipulation: The process of modifying an original query to best match the technology, content and knowledge worker behavior to improve relevancy of information presented. Query manipulation can be done manually by the knowledge worker, interactively with the knowledge worker and the information system working together or automatically by the search technology. Query manipulation includes such things as word breaking and expanding a query term to include all of its synonyms.

Raw Logs: Log files preserved in the state as found on their Web server of origin. An analytics application processes raw logs using a server application, such as Commerce Server 2000 for example, as it ports these logs into the data warehouse.

Reach: Total unique users for a specific cluster or vroot divided by the total number of unique users for the entire enterprise domain.

Redirect: The HTTP action of sending a Web user to another physical URL upon the request of another. Redirects are recorded in the logs by HTTP status codes in the range of 300-399.
Redirects are specific to whether they are client-side or server-side. For example, a client-side redirect results in another 200 status code whereas a server-side redirect results in a 302.

Referrer: Indicates how users get to the pages they are on and which URL a user has come from. See also Referrer type.

Referrer Type: There are at least three types of referrals relevant to Web analytics: external referrer, internal referrer, no referrer

Referring Stats: This is the statistic relating to referrer in the Web analytics program.

Relative Associations: The term relative associations encompasses all types of relationships between items in an information system. These relationships are based on such things as characteristics of the items (properties), knowledge worker tasks and interactions between the items. Once established, these associations can be leveraged or exposed in an information system to enable a knowledge worker to move from concept to concept.

Retention: Percent of GUIDed users who viewed at least one page in a vroot during the previous calendar month and also visited at least one page in the same vroot during the current calendar month. All content items in an information system have value for a certain length of time. Determining this length of time is deciding an item's retention. The length of time an item has value and is retained depends on many factors. An item's retention can be recorded in metadata and made available for information management purposes.

Roll-up: The summary of a path data takes before it resolves as a metric in a report.

Schema: The representation of the tables that depict the logical organization of the database or data warehouse. It is the architecture of an information storage and retrieval system, including the storage structure, taxonomy arrangement, and user-interface design for search and retrieval. Particularly important is the interaction between the various elements. The schema is the design and how the pieces work together. (Schema includes metadata schema.)

Search: An application employed by knowledge workers as a tool to find through direct surfacing or through surfacing an obvious navigational path.

Search Stats: Statistics that are collected specifically on search engines on an enterprise websites that include the search strings entered by users.

(Smart) Tags: Constituents of the schema which identify and label metadata elements. There is a 1:1 relationship between the tags and the elements. Smart Tags attempt to do this process automatically based on intelligence

Standard: The processes, protocols and technologies established or chosen by Business Intelligence team as the models to follow or use to meet policy requirements.

Subdirectory: The collection of zero or more directories or files below a parent directory.

Sub-domain: The term used to represent the breakouts of virtual URL addresses attached to the enterprise domain. Synonym: Cluster.

Subscription: Knowledge worker selected delivery of specific content to their email inbox. This is meant to occur at a specified interval, or as a result of an event. It would include specific content but may also encompass notification following the posting of related information.

Successful Downloads: The number of successful downloads based on the HTTP Status code + the Win32 Code or Unix Code indicating success.

Surrogate: Accumulation of metadata representing classes of information common to all members of a given content sent. Metadata schema is part of an overall schema. See: Schema

Taxonomy: The result of identifying, creating and naming relative associations between items in an information system. In turn, the relative associations are grouped or classified into taxonomic structures based on three relationship types: hierarchical, equivalence and associative. Examples are controlled vocabularies; metadata scheme; category labels. See: Relative Associations.

Technical Information: Relating to or specializing in techniques or subjects of applied science.

Total Estimated Unique Users: Total Estimated Users = Total Page Views / (Page Views by GUIDed Users / Total GUIDed Users). This calculation is made with the assumption that non-GUIDed users view the same number of pages as GUIDed users.

Total Page Views: Aggregated number of page views by all users. This includes GUIDed and non-GUIDed users.

Total usage minutes: The total number of usage minutes spent at the website, category, channel, or application during the course of the reporting period.

Unique GUIDed: User See Unique Users.

Unique Pages: The count of individual pages in a vroot or cluster which have been viewed at least once in the period being measured.

Unique Pages per User: Total unique pages divided by the number of GUIDed users.

Unique Users: The estimated number of different individuals (in thousands) that visited any content of a website, a category, a channel, or an application during the course of the reporting period. Visitors who receive a GUID by way of cookie upon entering portals within the enterprise domain/website enable analytics programs to keep track of actual volume of different visitors to enterprise portals on a daily, monthly, and annual basis. (Generally unique users represent a *non-additive* metric in Web analytic programs, in that if unique users are analyzed through separate queries for each month in a year, the sum of those queries would not be a correct representation of the actual unique users for the year.

The sum of the individual months would be greater than the total unique users for the year.)

Unprofiled User: An unprofiled user is a GUIDed user who has not registered online via a registration application.

URL: A Uniform Resource Locator is an Internet or Intranet address consisting of the Internet protocol name, host name, and other elements, often including directory and file name.

User Assistance: Help made available to the knowledge worker while using an information system. User assistance provides guidance on how to use the system or additional help in finding information sought. Examples are help in context, feedback, Dialog boxes, and training, real time assistance from a human intermediary via a live chat.

User Data: Facts and figures a knowledge worker maintains private access to for knowledge retention and expansion. This is also referred to as "personalization".

User Experience: The relationship a knowledge worker has with the intranet and the information provided.

User Profile: An enterprise profile of a user associated with an enterprise ID system which includes specific data entered by that user. See User Type.

User Type: Of all the Intranet users who visit an enterprise portal, a portion of them go to a registration wizard and accept an ID cookie that is issued to them. These users can now be counted as unique users, although not much is known about them at this point. If the user completes the basic registration form, then system admin has their e-mail name and department. If the user also answers more specific profiling questions on where they use a computer, what their role with computers is, etc., then they can be considered profiled users and can be categorize as a specific type of Business User.

Vroot: Abbreviation for Virtual Root, which is the logical root for a website on the Enterprise domain. Typically the default page for a website will be stored directly under the vroot.

Web Service: A Web Service is a unit of application logic providing data and services to other applications. Applications access Web Services via ubiquitous Web protocols and data formats such as HTTP, XML, and SOAP, without worry about how each Web service is implemented. Web services combine the best aspects of component-based development and the Web.

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