"Management Metrics"

A Way To Measure Global ESCO Effectiveness

Michael Bobker
Director of Strategic Development
Association for Energy Affordability

ABSTRACT

In the de-regulated energy industry, energy service companies have become utility marketing subsidiaries, invading new markets, creating brand recognition, and transferring technology packages tailored to customer needs. They have been at the center of a kind of innovation which is new to the utility Industry: developing end-use "knowledge solutions," or "Management Metrics." As the utility industry moves towards business models built around information technology, knowledge management, and customer-focus at the same time as "going global," conceptualizing and measuring progress in new markets is needed.

"Metric Management Measurement Sets" are suggested, based on business data and geared to the process of innovation diffusion. From a technology platform this management information is readily disseminated throughout a globally networked firm, to improve innovation, technology transfer, corporate performance, and, ultimately, change in the global energy system.

"If it can't be measured, it can't be managed."

Management metrics are a management tool to enable measurement of progress towards goals. Without the ability to measure, management is, at best, intuitive. But, like the serpent devouring its tail, establishing metrics also shapes and defines goals and communicates them

throughout the organization. What is measured tells people what they should seek to accomplish. Structured data spread throughout an organization shows what can be accomplished. So it is of utmost importance that data captured and structured into management information be well aligned with mission and strategy. To keep track of its effectiveness globally, a utility or its ESCO subsidiary must have a good idea of what it seeks to accomplish—at specific times and places—and how this is indicated in business data. Such micro-level managerial devices support the macro-dynamics of change in corporations and, cumulatively, in global systems.

Balance sheets, financial reporting and ratio analyses provide the traditional set of metrics. They overlook non financial characteristics which may give better indication of business trajectories. The concept of "intellectual capital" has spawned a recent literature which includes attempts to quantify what does not show up in normal accounting statements.[1] The claim is even made that this quantification can account for the difference between a firm's book value and its market value. The idea of creating metrics is drawn from this literature. Attention is re-directed from immediate financial results to physical performance characteristics which are relevant to the firm's success in the future.

I have argued elsewhere[2] that competitive advantage is gained by having an information system at the center of one's ESCO business model. The information system combines knowledge databases, telecommunicated interactivity, monitoring and data warehousing to enable leverage, not of finance but of knowledge. Leveraging **knowledge** has become a truism in the world and the theory of e-business. Here I will develop a different but related aspect of the argument: *that the information system can capture, structure, and distribute data as feedbacks throughout an organization, necessary for a new business model in a competitive and globalized market*.

Quantification allows local operations to be managed as a global network through which resources are shared for optimal overall returns. In his book *The Digital Nervous System*, Bill Gates discusses how Microsoft makes marketing decisions based on structured comparisons of regional markets because it has ready database access to a wealth of detail, readily manipulated, from and about local distributors and sales activity. Information technology, properly structured, enables the real-time development and accessibility of information from all levels. Metrics provide a way of examining and summarizing

such information flows so that they can be made "actionable."[3] A manager or executive should be quickly able to assess where action is warranted, what actions are possible, and what impacts way be.

INNOVATION IN THE UTILITY INDUSTRY

This is something of a new world for utilities. Rather than speed and globalization, utility culture has emphasized conservative engineering within a restricted and protected market.[4] Management and engineering has traditionally focused on internal production and distribution processes. The industry, which emerged at the start of the twentieth century as a radical break-out technology, has since evolved through incremental technology improvements and economies of scale.[5] Regulated monopoly status has meant minimal requirements for marketing. An executive is recently cited as saying "we thought we were selling electricity but really we have been distributing it."

Continuing to apply the "throughput-based" utility model in the wake of deregulation has led to mergers and acquisitions—seeking strength through volume and market share, with horizontal replacing vertical integration. Such consolidation along side new competition is typical of deregulating industries, for example airlines and telecommunications, where similar patterns of restructuring can be seen. M&A activity quickly moves to a global scope. Utilities entering new foreign markets have extended the acquisition strategy. Each new locale requires repetition of essentially the same investment in local assets. Large capital commitments financed by increasingly leveraged corporate finance, entail significant risk exposures. But although the markets are new, management accounting for such familiar physical assets is well understood. This is not the case for the deployment of knowledge-based assets to which we will now turn.

Until recently change and innovation in utilities has remained distinct from the radical break experienced by competitive industries entering the information age/knowledge economy. That is changing quickly now. Gas and electric markets are being made electronically via bulletin boards and trading floors. Having lagged far behind other technology sectors, returning less than 1% annually over the last ten years, some analysts see the industry as now ripe to become "the next hot thing."[6] An industry participant recently pointed out that

> *"for those leading-edge financial services heavily leveraged through the use of the Internet or the e-domain, they are spending upwards of 20 to 30 percent in investments, when expressed as a percentage of total revenue, on information technology infrastructure and application… the average natural gas or electric-combination utilities spends… somewhere in the neighborhood between 2.5 and 3. 5 percent."*[7]

Some substantial capital investments have been recently undertaken to develop enterprise information systems. Enron is reported to have spent some $250 million on its on-line trading system and Reliance Energy almost $200 million in implementing SAP as its integration solution.[8] These systems relate to the movement of commodity and to the streamlining of internal process, especially for meter reading, billing, and reconciliation. The beginning of a new business model is suggested—that utilities will compete successfully through knowledge-intensive software applications. The industry will see a new emphasis on developing platforms, enterprise architecture, software applications, and, based on these, new products and offerings beyond "plain vanilla" electricity.[9]

There is as yet no consensus or standard on what such new "products" might be.[10] New ideas and concepts proliferate as competitive offers. With the idea of information systems as a central enabling technology and the basis of competitive success, an R&D approach will crystallize, albeit still retaining a substantial element of market-like chaos with emphasis on speed-to-market for trials and feedback. In the current world of software-based innovation, R&D is not linear but more like "fermentation vats, termite nests, stew pots, or self-learning object-oriented software systems."[11] The overall concept will be implemented in many small and interlocking initiatives, conducted by separate small groups, deployed in phases, accepting feedbacks, and in an incremental, piecemeal manner building up to a total system. Enterprise software architecture and standards for interoperability become key to coordinating the hopefully interlocking piece of such a puzzle.

The unusual economic characteristic of "knowledge-based" assets, as compared to physical assets, is that their marginal cost is small—each additional use requires little additional investment or variable (operating) cost and the usefulness of the network increases as it gains more users, driving so-called "increasing returns."[12] This is the power of widely accepted software. While the industry will continue to have the bulk of its capital invested in and bulk of its revenue generated by central plants and

wires, it is in this new, non-commodity arena where differentiation can be created and long-term customer loyalty locked-in. In environments where customers are not guaranteed, their needs not well known, and market conditions are volatile, informational and knowledge assets can mitigate the risk incurred by large investments in physical assets.

But gaining an edge in commodity trading or in internal business process efficiency while necessary will probably not be sufficient to "delight (and lock-in) customers." To do so will require focus on the energy value chain beyond the meter. The resource of customer information possessed by the utilities is generally under-utilized. Not having a tradition and well-honed skills in customer focus is a handicap, especially with the emergence of power marketing and Internet retailing.[13] Discovering the need for customer based marketing leads back to ESCO and DSM practices: business models focused at the customer/end-use level, offering services such as distributed generation, energy efficiency bundled with commodity supply, load profiling and demand control, strategic purchasing and risk management. Rather than producing a commodity for the anonymous market, this new form of innovation makes the utility a provider of "knowledge solutions" customized to end-users. And if the medium for kWh is wires, it is rapidly being accepted that the medium for knowledge is the Internet.

Combining ideas about competing through knowledge-based information systems and the need for customer focus gives some clues about the "killer app" for energy services. A killer application is one that becomes the center of how business is done in an industry, like DOS and Windows for PC's, American Airlines' Sabre reservation system, and Netscape's Navigator for the Internet. The ESCO platform must be open to end-users on one end and, on the other, be open to integration and data sharing. For the utility industry development of information-knowledge-Internet business models is just beginning. Examples include wholesale trading (the most advanced area), on-line retail power marketing, automated meter reading and load profiling, multi-site bill aggregation, customer service centers, educational and informational services, collaborative project spaces, and virtual marketplaces ("metamediaries").

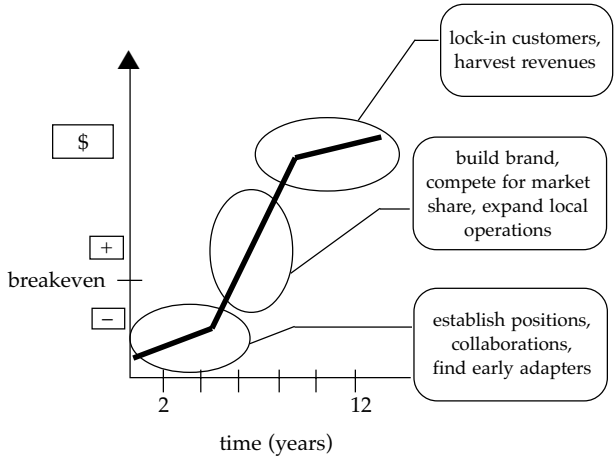
Exploring the potential forms of utility e-business is another paper. The point to be made here is that in the new business models a knowledge-based information system is the key to creating value and as such will be the long-term key to new markets, rather than commodity sale

of kilowatts. The knowledge-based information system provides a platform for the continuous introduction and transfer of new technologies that leads to radical change in the global energy system. At the same time the information system can provide a means of capturing on-going data for management decisionmaking about ventures spread across the globe. But measuring the spread of innovation is not well defined. The next section examines the diffusion process and how business metrics can be fitted to it.

METRICS AS MARKETS EVOLVE

In beginning with new concepts of what a utility does and how it competes, we are talking about customers' unrecognized "latent needs." Such "white spaces" are often considered the key to future firm growth, where the idea is to get beyond what customers presently recognize as their needs.[14] Recognizing latent needs is a process of social communication. Only a small proportion of a population, the most adventurous, the entrepreneurial, perhaps the most educated and outward-looking individual will be "early adopters" of new ways of doing things. Their success influences others and the rate of acceptance accelerates, until the innovation is widespread, the market saturated and the rate of adoption levels off, completing an "S-curve."[15]

S-CURVE OF TECHNOLOGY DIFFUSION



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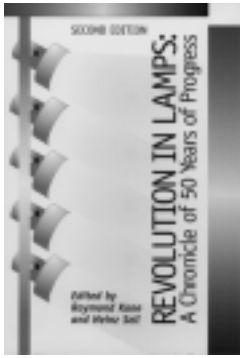

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This pattern can be applied equally at many levels—to the executives shaping the overall mission of utilities, new undertakings by utility staff, learning curves for related technical firms, and conceptual shifts for co-evolving institutions and end-users. Accepting a new utility services model only opens the door to a series of innovations and offerings, so that a family of S-curves, one taking off from the next like a fireworks display, might be a more accurate visualization. Diffusion of the knowledge platform sets the stage for diffusion of new technology packages which are brought to markets faster with the aid of information technology.

Utilities comprise the fundamental institution with respect to energy in modern societies. They have the production and distribution of energy as their mission and control extensive systems to operationalize it. With pressure and incentive to innovate, utilities can be expected to gradually overcome inertial forces resistant to change, promote change among end-users, and, as a result, perhaps play a leading role in the global dissemination of environmentally sustainable technologies.

But the utilities alone will not create this shift. Older institutions "co-evolve" to support and promote innovation in an industry.[16] Some of these, like government regulatory bodies, set rules. Others, like professional societies and trade associations, become allies in promoting new practices. Others will be important in pilot demonstrations and in producing the people who will staff new industry processes. The concept appears in recent utility practice as post-DSM "market transformation" where partnerships are promoted as the way to bring about energy efficiency. We can see at work a process of social learning in the application, adoption and adaptation of new knowledge as technology is transferred.[17] Measuring such institutional and attitudinal change will provide a leading indicator of market take-off for new energy services.

With this perspective it becomes clear that **management metrics** should take into account evolving needs and strategies along the S-curve of innovation diffusion. The following sections provide a trial sampling of metrics, in categories related to stages along the S-curve.

Metrics Set, Phase 1a: Global Scanning to Set the Framework

The framework establishes the size, key characteristics, and potential of various markets against which on-going measurement can be done. It also suggests the level of effort which is justified and the most

important targets for marketing. Statistics are generally available from published sources by region and by nation and less readily at the individual level of the individual utility.

- Energy market size
  kW, kWh, Btu
  % of pop. electrified
- Price
- Reliability, reserve margins, and new capacity planned
- Energy sources, fuel mix
- Use/Distribution
  key sectors/end-use %'s
  energy intensities
  growth rates - population, economic, sectoral
- Utilities & major energy co's
- Regulatory context
- Competitors
- Secondary market opportunity (e.g.—carbon trading)

Energy use in developing markets is a moving target. There is an on-going shift from non-commercial to commercial forms of energy. And energy use is closely related to population and economic growth, both of which are at higher rates than in already industrialized (OECD) countries (Europe, North America, and Japan). Therefore, it is important to periodically update data.

Metrics Set, Phase 1b: Market Entry and Institutional Development

Here we are landing on new shores, both conceptual and geographic. Metrics for this phase seek to measure activity in terms of the number and type of contacts, indications of trial interest, and measured attitudinal change. Time in showing progress along these parameters is a key measurement variable.

- Contacts - 1st, 2nd meetings
- Collaborative events - presentations, seminars, training, publications
- Local partnerships, service and supplier relationships
- Proposals requested

- Pilot programs, demonstrations, commissioned feasibility studies
- Software/Web Site registrations, subscriptions, affiliations
- Sectoral distribution
- Market studies—surveys, focus groups

The last item is a distinct category which initiates an ongoing program of market research among target groups.

Metrics Set, Phase 2: Creating Customer Value and Brand Reputation

With the utility market transforming, emphasis shifts to how effectively the new enterprise can prepare to dominate its market. This phase might perhaps be thought of as filling a new reservoir or priming a pump. Although proposal-making will continue to be important in maintaining business throughout the life cycle, here it is perhaps the single key business process. The proposal's ability to comprehend, capture and perhaps even lead[18] customer need sets the stage, for the creation of "customer-perceived quality." And quality has been identified as the key precursor for market dominance.[19]

- Proposal-making efficiency
  - Development time, average per proposal
  - Proposal size (avg kW, avg $)
  - Preparation cost
  - Proposed cost/kW(h)
  - Rate of acceptance
  - Time to acceptance
- Sectoral distribution of proposals
- Network resources used
- Quality measures—surveys and focus groups

The last item refers to the continuing use of market research to track attitudinal response of customer targets.

Metrics Set, Phase 3: Lock-In and Harvesting

Here the emphasis shifts to actual values realized and costs incurred, more traditional business measures of outputs, revenues, capital costs, and operating costs. Efficiency projects' energy savings—

"negawatts"—are included on an equal footing with kW generated, distributed or otherwise managed, as is suggested by the designation "(n)kW."

- Power Measures
  - (n)kW proposed
  - (n)kW contracted
  - (n)kW generating
- Productivity Measures
  - Contract to billing time
  - Installed cost/(n)kW generating
  - Operational cost/(n)kW generating
  - Average customer size - kW, $
  - Revenue/employee
  - Revenue/expense
  - Net profitability
- Customer Value & Retention
  - Sectoral distribution of customers
  - New proposals to existing customers
  - (n)kW added to original contracts
  - Customer loss
  - Brand recognition and loyalty
  - Customer-perceived value

But what really matters to the "sustainability of the harvest" is that customers be retained. Since sales to existing customers are less expensive than obtaining new customers (first-time sales), expansion of existing contracts with new products and services "turbocharges" business performance in this phase. Here again, ongoing market research is suggested to provide quantified indicators of success levels and trajectories.[20]

CONCLUSION: GLOBAL EFFECTIVENESS

Metrics capture business performance indications that are not caught by typical financial reporting. Current profitability, for example, at an early phase of market transformation will not project possible future market dominance the way various non-financial measures—pro-

posal efficiency and customer value—will. Similarly, the level of interaction through the information system and ability to leverage knowledge across the global network impacts the total system's development but will not be visible in any individual financial results.

In considering how metrics will be used, we can imagine the manager of a utility or ESCO which owns and/or partners with a worldwide network of companies. For this manager it is important to be able to track and make sense of what is going on across the board, to be able to see who is doing what well when. For this manager, business knowledge supports decisions about allocating resources, about new initiatives, and comparing performances. It is even tempting to try to formulate a summary quantification where effectiveness implies a ratio of change created, moving towards a goal, what might be called "progress," in terms of time and expense,

$$\textit{Effectiveness} = \textit{Progress}/(\textit{time})\ (\textit{expense})$$
$$\textit{where Progress} = \textit{realized}/\textit{potential value}$$

and values are obtained from data in the information system, such as for market kWh, universe of customers, etc.

But the use of metrics should not be limited to a centralized head office. The richness of detail and business texture quantified by metrics should not be boiled out in creating some summary abstraction. To do so makes the metrics a tool of management control, an old model of the diversified corporation "managed by the numbers," instead of realizing its organizational learning potential in the context of "the wired corporation."[21] Electronically distributed and accessible, the metrics will provide guidance to local managers about what is valued and expected to bring success. Having results available on the system provides internal benchmarking and a guide to who is expert at particular aspects of the process. Information flows not only "up" but also horizontally throughout the organization, which in turn reinforces the value of capturing business information for those who must do the capturing.

This nexus of business data continuously captured as metrics, a web of electronic interconnections, and informed and interacting managers forms a new and dynamic global business model which can energize change in the conservative institutional care of the global energy system.

Notes

1. Leif Edvinson and Michael Malone, *Intellectual Capital*, Harper 1997 p.23 ff.
2. M. Bobker "ESCO's and Information Technology for New Markets," Strategic Planning for Energy and the Environment, v. 18, no. 3, 1999; and M. Bobker, "Leveraging Knowledge," Proceedings of the World Energy Engineering Conference, 1999.
3. "Actionable information" is a concept pioneered by the organizational research of Christopher Argylis. It becomes especially relevant as more and more information becomes available but is not necessarily readily useful.
4. Richard Hirsh, *Power Loss: the Origin of Deregulation and Restructuring in the American Utility System* MIT 1999 makes this point at greater length, including comment on utility recruitment practices.
5. Utterback, *Mastering the Dynamics of Innovation,* Harvard Business School 1996 provides the most comprehensive recent theory of innovation patterns in industries. Competition between many prototype products is common before an industry paradigm takes hold.
6. Hugh F. Holman, BancBoston Robertson Stephen Inc. (an investment firm) cited in "Is Energy Technology an Oxymoron?" *Public Utilities Fortnightly*, February 15, 2000
7. Thomas Aruffo, NiSource in *Public Utilities Fortnightly*, April 15, 2000, p 28
8. Reliance case cited in Kate Thomas "Strategic IT Applications" *Hart's Energy Markets*, v. 4 no. 10, October 1999. Enron cited in Flowers p. 107
9. This idea is adapted from J.B. Quinn, J. Baruch and K.A. Zien *Innovation Explosion: Using Intellect and Software to Revolutionize Growth Strategies*, 1997. Relevant in the subsequent paragraph is their exploration of software-based development of innovations as well as the development of software-based innovation.
10. There is a thriving literature on Internet-based e-business. P. Seybold *Customers.Com* 1998 provides a good overview of experiments and applications in a wide range of businesses (no utilities). Evan Schwartz *Digital Darwinism* 1999 and L. Downes and C. Mui *Unleashing the Killer App* 1998 provide similar treatments with many examples. Reading this literature stimulates thought

about possibilities and steps.

11. Quinn *et al. Op.Cit.* p. 107
12. For one of many recent statements of this principle see C. Shapiro and H. Varian *Information Rules: A Strategic Guide to the Network Economy* Harvard Business School Press 1999. Also see the more theoretical economic work by W. Brian Arthur *Increasing Returns and Path Dependency in the Economy* University of Michigan Press 1994.
13. Vinod Dar, a consultant, for example, suggests that utilities might become fulfillment infrastructure for dot.com's which come to control the customer interface. Cited in Patricia Williams "E-marketing: Is Energy Missing the Net? " *Public Utilities Fortnightly* 3/15/2000. The utilities need to develop marketing and market research capabilities, largely unnecessary under regulated monopoly conditions, is touched on in this paper but deserves separate treatment in its own right. Seminars in marketing strategies and branding for utility executives have become suddenly popular.
14. Quinn *Op. Cit.*, Prahalad and Hamel *Competing for the Future* Harvard Business School Press 1994 and Dorothy Leonard-Barton *The Well-Springs of Knowledge* Harvard Business School 1995 all develop this concept. Prahalad and Hamel emphasize getting ahead of present markets as a key business function. Leonard-Barton introduces the idea of fitting marketing techniques, such as "empathy" and participant-observation to the discovery of unserved markets and latent needs.
15. This is the classic approach developed by Everett Rogers in his book *The Diffusion of Innovation* Free Press 1995 (4th ed).
16. This view is developed briefly by Richard Nelson "The Co-evolution of Technology, Industrial Structure, and Supporting Institutions" in Dosi, G., Teece, D. and Chytry, J. (ed) *Technology Organization and Competitiveness* Oxford 1998.
17. Joseph Stiglitz "Scan Globally, Reinvent Locally: Knowledge Infrastructure and the Localization of Knowledge" keynote address, First Global Development Network Conference, Bonn Germany, December 1999. The idea that technology packages will be transferred by "horizontal linkages" between North and South is suggested by Tim Forsythe *International Investment and Climate Change: Energy Technologies for Developing Countries*, EarthScan

1998.

18. Hamel and Prahalad *Op. Cit* make the business theory argument most forcefully that firms must find their customers' next needs rather than be bound into only satisfying their current needs.
19. See references in note 13 above for anticipating customers' needs. The idea of "market-perceived quality" as leading indicator of market dominance is from Bradley Gayle *Measuring Customer Value* Free Press 1994 p. 167 ff.
20. Gayle, *Op. Cit.*
21. This view is put forward as part of what they see as an emergent new business model by Sumantra Ghoshal and Christopher Bartlett *The Individualized Corporation*, Harper 1997, exemplified in major corporations such as ABB and GE.

ABOUT THE AUTHOR

Michael Bobker, CEM, is the director of Strategic Development for the Association for Energy Affordability and its public interest energy services company, Affordable Energy Solutions, whose mission is to serve low-income communities in New York State. Mr. Bobker has over 20 years of experience in energy services and building engineering, at the community level and in the private sector serving many public agency clients. As chief operating officer of an ESCO and in consulting engineering practice and turnkey construction, he has managed energy audit programs, public facility upgrading projects, and commercial and institutional retrofits. He has particular expertise in boiler plants and micro-cogeneration. Mr. Bobker is a Certified Energy Manager and holds graduate degrees in sociology and international business. He is also presently a research associate at Columbia University's program on information and resources, investigating the potential roles for utilities in transferring climate change abatement technology. He can be reached at *mbobker@aeany.org* or *mbobker@aol.com*.