

An Executive Overview

Killer Business Scorecards

"New thinking, spurring a new conventional wisdom, is needed to displace and replace that which is now in existence. No longer is competitive calibration positioned through simple ratios. No longer can value be judged through old "scorecard" measures of financial performance, customer satisfaction, internal process efficiency, and inside-company knowledge accumulation. The new IT economy is one of the network and the network age." - Howard Rubin, editor Cutter Information Corporation.

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Background: Successful Metrics - Measures that Kill!

Metric investigations originally pursued at Texas Instruments (Operations Research Group) during the late 1960's (Thoreson/Blankenship) were reactivated during the period 1987 - 1997. To our knowledge the recent work constitutes the largest and most comprehensive corporate investigation ever undertaken for the purpose of implementing business metrics and measures necessary and sufficient to genuinely optimize a business enterprise. The extent of the analysis included approximately two hundred thousand (200,000) corporations spread over one hundred countries. Particular emphasis was placed on "information technologies" and their proper measurement. Information technologies include, but are not limited to, information systems, learning systems, knowledge systems, core competencies, intellectual capital, best practices, innovation, reengineering, competitive edges and winning strategies. Early in the effort "VALUE OF" was added as a priority of highest degree. Thus, the value generating capability and actual measure of value was added as a qualifier to each of each of the entities in the previous sentence. Teams of various size and composition were engaged. Co-author Brett Patterson was a consistent member during the period 1990-1997. J Thoreson and Dr. John Blankenship have published ^(Ref. 1,3) the more complete results.

*"Until one is committed, there is hesitancy, the chance to draw back-- Concerning all acts of initiative (and creation), there is one elementary truth that ignorance of which kills countless ideas and splendid plans: that the moment one definitely commits oneself, then Providence moves too. All sorts of things occur to help one that would never otherwise have occurred. A whole stream of events issues from the decision, **raising in one's favor** all manner of unforeseen incidents and meetings and material assistance, which no man could have dreamed would have come his way. Whatever you can do, or dream you can do, **begin it. Boldness has genius, power, and magic in it. Begin it now.**"*

Johann Wolfgang von Goethe

Result: Success Beyond Belief

The project was successful to literally frightening proportions. The contribution to business success of previously fuzzy concepts and/or previously impossible measures (above list) is found to be both possible and economical. Accurate business measures for such entities as corporate knowledge can be readily achieved with a measurement method named Information (Info Edges) Technique for Optimum Performance (ITOP®). Part of the comprehensive scope is a result of redundant terms (synonyms) that have crept into the language due to the lack of previous standard measure and other reasons not pertinent here. For example, practices and processes are synonyms. Best practices are best processes because all practices are composed of processes and visa versa. Knowledge and competencies are synonyms. To measure one is to measure the other. However, the unit of measure is consistent - **uncertainty**. One hundred percent certainty is full knowledge and maximum competency. The measured diagrams herein are a very small subset of what is now commonly possible.

Talk versus Measure

"History unfortunately is a study in how professional philosophers and the scientific 'priesthood' lose contact with reality. Each generation has idea peddlers and professional talkers. Some of this yields good, but largely it is corrosive. The problem is determining the difference.-(Ref. 1)"

The difference is in the ability for the "talkers" to quantify/measure what they espouse. The collection of scorecard measures here accomplishes definitive scaling for most of the prominent management philosophies. Our findings show that most management science doctrine is unfulfilled due to the inability to measure the value derived from use.

Similarity in Measures - Proportionality

In temperature measure the centigrade thermometer is like the Fahrenheit and similar again to Kelvin. All measure the same entity, heat or lack of it. The scales are the major difference. Each is convertible from one to the other. Such a thing has happened often when multiple groups successfully accomplish an important or useful measure. The creation of the "standard" is a separate issue from the measure itself. A standard implies agreement to use one of a set of alternatives.

There is a "standard" articulated measure for information oriented objects. The measure is uncertainty as mentioned previously. What has been missing is the "instrument" for determining the number of "units of uncertainty" attributed to an object intended for measurement. The value of an information object is able to be determined by the number of units of uncertainty that is reduced by having it as opposed to not having it. Knowledge differentials, competency differentials, intellectual asset differentials, and information system differentials are calculated as the difference in units of uncertainty times the value per unit. That is commonly accepted measurement practice and valuation practice.

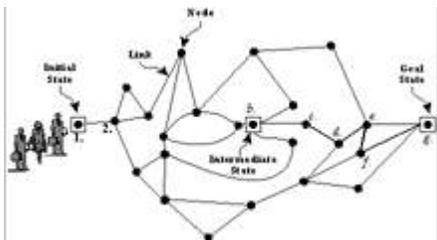
Why Care?

Consider the core basis of competition. COMPETITION arises at EVERY instance where two or more parties target the same open goal (to win something contended). "Open" means that the future outcome (the winner) is not preordained. Who exactly, what team, what company, what product, and what technology will be the winner is uncertain. The fact that each outcome of each competitive activity is not predestined guarantees each future win/loss outcome to be positioned squarely in a situation of risk, uncertainty and doubt - **imperfect information**. The ONLY enemy of risk and uncertainty in the universe is information in some form (stored information is knowledge and intellectual capital). Thus, all aspects of business performance, winning and productivity are information based. Every competitive advantage in business is directly an information asset advantage and only that.

Business SCORECARDS are navigation instruments that both depict previous choices and compel future actions. If any PRIMARY value creating entity in an enterprise is MISSING from the scorecard then the entire enterprise is blinded! Blind navigation increases the odds of poor path choice and minimizes success path odds. A maxim from operations research/management science doctrine follows.

Cause and Consequence

The sole determination of sustained business success and the singular cause of business failure is knowledge and/or information content based. Business optimization has proven to be possible only from a basis of "informed choice" and economic knowledge differentials. Richard Bellman, a noted Operations Research pioneer, described the superior policy as one which causes the critical choices to be made consistent with optimizing goal gains. The policy - *"An optimal policy has the property that whatever the initial state and initial choices are, the remaining (future) choices must constitute an optimal policy with respect to the state resulting from the first choices."*

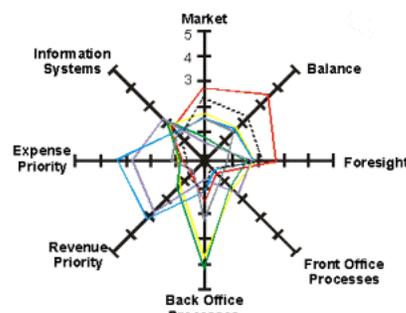


The good news in this statement is the attribute that actual achievement of goal is open to all starting points or current states. Learning happens as explained by Dr. Peter Senge (organizational learning) and Dr. Gary Hamel (core competencies). The bad news is the absolute requirement to correctly measure the actual current "state" of the success ingredients. The success ingredients are information differentials. Information content (knowledge) creates measurable bias toward "best" choices. John von Neumann, an early cyberspace economist^(Ref 5) explains that capturing or achieving an economic utility function requires that the goal be able to be practically measured. A metric guidance system

(Scorecard) is absolutely required for optimizing the corporation.

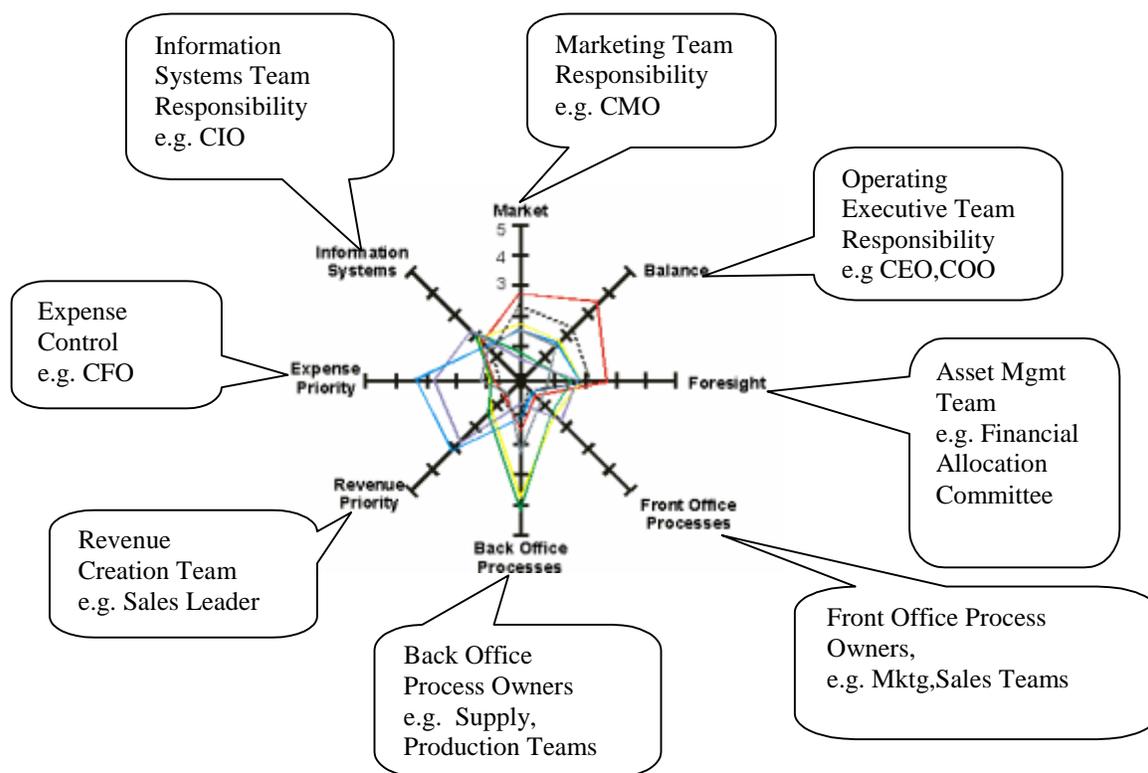
The proper scorecard measures the extent of the value creating goal components so that the weak components can be improved/replaced and the strong components reinforced. The management and strategy issue then becomes one of determining which are the weak and strong components with sufficient confidence and clarity to launch action.

Next is an actual case example.



For Example - Functional Mapping, Group-Team Specific Mapping

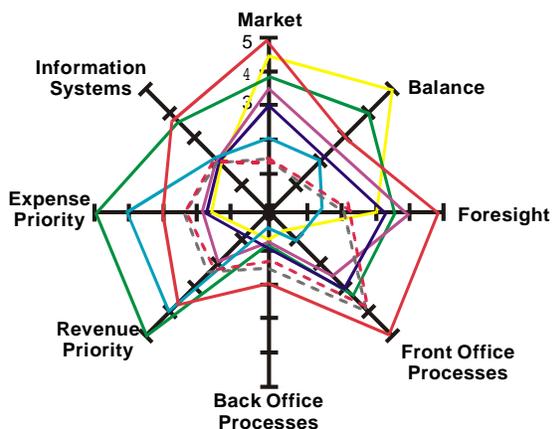
The following are actual scorecards from a subset of thirty-two competing entities in petroleum refining.



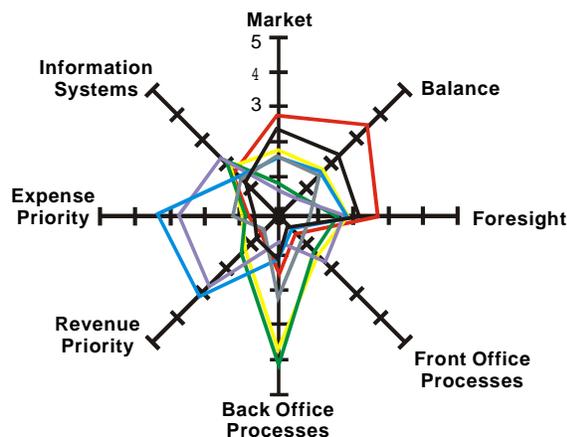
Note: The diagrams in this paper are purposely not current. These are 1995/1996 edge diagrams.

Use for instruction and illustration only. Do not use for action or decisions regarding these corporations. Things have changed since these were first created.





Lyondell Petrochemical
 EI DuPont DeMours
 Mapco Inc
 Amoco Corp (Amoco)
 Holly Corp
 Shell Oil
 Diamond Shamrock Inc
 Tosco



Chevron Corp
 PDV America Inc
 Coastal Corp
 Valero Energy Corp (Valero)
 Ashland Oil Inc
 Amerada Hess Corp
 Phillips Petroleum Co
 Murphy Oil Corp

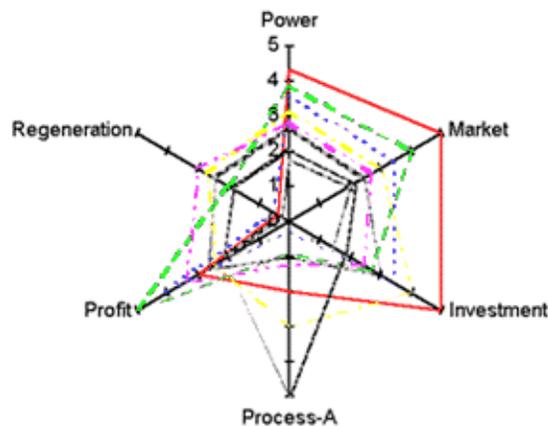
Finding The Leaders - It's Easy

Comparisons between and among the diagrams are sufficiently robust to locate the topic leaders in critical business topic such as those below. Combining all that is shown above means that the specific named person or team is known.

- ✓ THE Cost Leader
- ✓ THE Supply Chain Leader
- ✓ THE Process Leader (Best Business Practices)
- ✓ THE Price Leader
- ✓ THE Reengineering Leader
- ✓ THE Edge Leader (Competitive Edges)
- ✓ THE Org Learning Leader
- ✓ THE Information Systems Leader
- ✓ THE Economic Value Creation Leader
- ✓ THE Knowledge Leader
- ✓ THE Intellectual Capital Leader
- ✓ THE Value Delivery Leader

Not all of those named above are immediately available from the diagrams shown here. The collection is more extensive than can be reasonably presented in this briefing.

For example, there are a set of more elevated views. This view accumulates and reduces the set to the fewest recommended. Process re-engineering (**Process-**



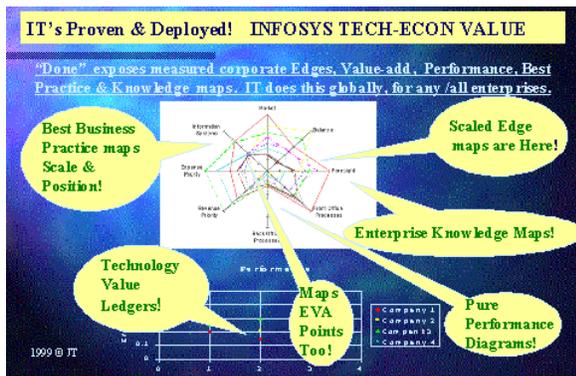
Adaption in the diagram) is a meaningful metric. "Regeneration" is the ITOP metric that measures **organizational learning** and its derivatives including R&D, and innovation.





Business Metrics Scorecard

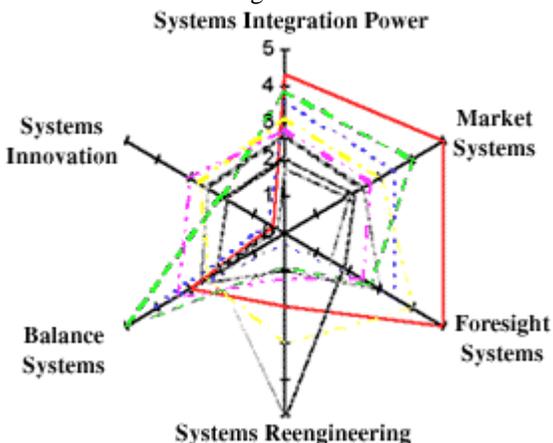
The proper application of Information Economics permits the creation of a value-oriented edge diagram for any or all enterprises. The example shown below was presented at a measurement forum sponsored by the American Management Association. The intellectual capital is "mapped."



The position of the value creating edges, practices, processes and systems are shown. Extensions shown above include reengineering, organizational learning and innovation measures for actual business organizations. Intellectual capital is the common ingredient - applied knowledge.

Other Templates - Wide Possibilities

That shown here in no way exhausts the possibilities but it is thought that the wise will take special note of the power. We would feel remiss not to include one of the most notable "missing" scorecards.

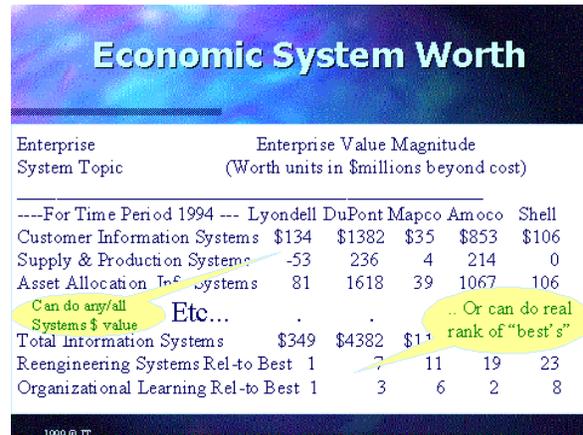


The systems integration scorecard has not been possible until now. Shown is the high level scorecard for systems integration for the same corporations in the example.

Because all winning tactics (edges) in competitive situations are information edges, it follows that the



high value investments will always fall into the class of information improvement. These may or may not be the type of information systems that one commonly thinks about. The information improvement may be product information systems, manufacturing method systems, supply chain systems, advertising systems, management systems, human resource



systems, organizational learning systems, or innovation systems.

The Calculation of the Economic Value of Information and Retained Information - Knowledge/Intellectual Capital

The value of information objects and/or information systems can be directly estimated by applying the thoughts below.

1. Information causes Bias of Directional Action
2. Positive bias Reduces Uncertainty
3. Less Uncertainty Improves Decisions
4. Better Decisions Result In More Effective Actions
5. Effective Choices cause Improved Results

These steps can be stated in unambiguous mathematical terms. The mathematical model for this has been around since the mid 1800's. From this archetype the "elusive" value of information can be determined precisely.

Suddenly, the investment portfolio and improvement tactics are clarified. The largest gain available to the enterprise will be located in the largest gap. It is as simple as that. Investments for goal gains will need to be priority allocated in proportion to that necessary to close the weakness or extend the strength.

The profile will approximate organizational structure and functional responsibility. Sales, production, marketing, human resources, reengineering, and so on are performance "mapped" in comparison with competitors. A value delivery audit has been accomplished.



Whoa! Why Have I Never Heard of This?

What is shown above generates large quantities of questions. At the beginning there is a large degree of skepticism. The next round of questions typically inquires into "how" these universal killer scorecards are constructed. This subject is covered in other papers (available on the web) and more specifically in the publications. Obviously, the method is difficult; else it would have been shown long ago. This short paper cannot explain the "how." What we can address in the remaining space are a few of the roadblocks that have stymied progress and prevent widespread use. In so doing perhaps the reader will gain a flavor for the differences in thinking and approach required.

Resistance

One major reason that the adoption has been slowed is the major resistance from the financial and accounting profession. The fact that every penny has been corporately accounted and completely balances drives a passionately held view of completeness. Instead, the entire sets of formal corporate expense "books" contain less than half of the sufficient "intellectual" content. The participants are blind to the catastrophic design flaw. Here it is. Economic value is represented as worth beyond cost. By rule, all items in the accounting journals are exactly represented by their cost. Therefore, value content (worth beyond expense) is totally illegal in an expense accounting system by design. If any item is entered at other than cost, the journals become dreadfully out of balance. As a consequence all value oriented content is eliminated. Professionals that are sanctioned to police cost accounting purity make certain to purge all evidence of value content from their systems. The years of constant focus on expense information create a bias. It is typical for an extreme focus on one thing to cause blindness in another. The very thought that a different kind of system could be designed to measure value becomes unthinkable. In the hypocritical context, accounting ledgers do not measure the worth of the information produced. The tragic consequence is the single minded pursuit of expense minimization as the ultimate enterprise "goal."

Economic models (econometrics) are prone to a similar illness. It is simple to see. Historical economic doctrine incorporates a simplifying assumption relating to "perfect information." The market is "all knowing." This assumption immediately voids the entire notion of information content differentials. **Information content** is synonymous with **knowledge** that is synonymous

with what we are calling **intellectual capital**. One small invisible simplifying assumption voids the detection of information systems differences, knowledge differentials and intellectual capital.

Can there be any wonder why the models in use as guidance systems are causing problems? The consequences loom sufficiently large that it is going to take a bit of time to undo the previous to get to the "new."

A Non-trivial Measurement System

Another reason that resistance is significant is because the scope is universal and the work is hard. It is difficult to engage tasks thought to be "impossible." Correcting the "lack of proper" measurement arising from the valley of the anointed that conveniently ignored the subject is non-trivial.

Merit and performance in business are treated as if all economic systems guarantee a result of unfair rewards. If, for example, eight producers introduce a similar function product then it is possible that none actually know the exact consumer wants or needs. Yet, if one of these products more closely fits consumers' desires than the others, its producer may become wealthy as sales skyrocket, while the less fortunate competitors tempt bankruptcy. The unseen beneficiary of the lucky producer serves the larger purpose of allowing consumers to receive the product nearest their desires. In addition the same unseen force stops waste on the production of less satisfactory versions. Such is the power of the free choice marketplace. Had government made the choice a different product may have been selected. Completely invisible to most is the fact that luck cannot be sustained. The company that "lucked" into the close fit is dreadfully stuck into a position of inability to alter anything in the product for fear of voiding the very ingredient that is critical to success. Thus, the original instance of the product may have been due to a dose of luck but it is unrealistic to think that the longer time growth period continued to be luck driven. The competitors have ample time to adapt and improve their offering. Information is the thing that looks like luck but is measurable, manageable and trainable. Information changes the odds of success. It is the only thing in the universe that does such a thing.

A huge problem existed regarding information systems value measurement. A proper method did not exist to measure the value of information objects and/or information systems until Thoresons' teams devised a rigorous technique. Simply put, one cannot manage what one cannot measure. The lack of measurement





caused investment choices to be random (luck based). Millions of system dollars were devoted to waste.

The issue is much deeper than the technology-based computer assisted systems. Organizational learning, core competencies and applied knowledge are all information based. These must also be measured. The scale above is offered as a **starting** point. Place "love" at one end (right) and "hate" at the opposite end.

A scale at the bottom ranges from zero to one hundred. Choose any topic (including knowledge or intellectual assets) and classify the bias. Be fair and unbiased.

The Nature of the Group Performance Measure Problem

Reasons that a measure technique for corporate competency has been lacking are similar to criticisms that plague the famous Scholastic Aptitude Test (SAT). Who is designing the questions in the test? Another critical design element of group-team testing and comparison of results is the distinction between merit and performance. Next follows the issue of potential versus actual. Finally, and perhaps most important to business executives is the issue of measurement expense. These are severe design elements necessary for incorporation in an accurate and trusted measures and scorecards.

The requirements for judging "merit" vastly exceed the requirements for judging behavior of performance. The notion creeps in that individual merit cannot explain all the differences in-group performance results. Individual performance may depend on factors well beyond the individual. The thought is that we do not know how much innate ability anyone has, and therefore we cannot assess how much of the observed performance is due to luck rather than the cause being exhausting, disciplined, orderly, or otherwise meritorious efforts.

Group "chemistry" is often hard to see. For example, nothing seems to be more of an individual feat than a baseball player hitting a home run. But, the number of home runs extends beyond the individual to the structure of the team. Ted Williams hit home runs with higher frequency to his time's at bat than either Roger Maris or Hank Aaron. Williams never came close to setting home run records. Why? Williams was "walked" far more often than either Maris or Aaron (approximately equal to both combined). That was due to the players that followed - the team structure. To walk Williams was to drastically avoid a home run, but to walk Maris or Aaron was to bring up Mickey Mantle or Eddie Mathews, each of them dangerous in their

own right. In short, business is has characteristics of a team sport. Performance cannot be completely individual merit where the influence of other people and circumstances is at work.

Perhaps a more vivid illustration is described in the teachings of Sun Tzu ^(Ref. 7) of "On War" tactics. Business is not war. A meaningful difference is the doctrine where war must win at any cost, however high. The consequence of losing is ultimate price - winner take all; extinction. Corporations and other institutions are sometimes attracted to this tactic but it eventually fails because it is not economic (in business).

Sun Tzu explains the situation where three teams of differing capabilities (assets) are to engage three opposing teams that are also of differing skills. The question is one of asset allocation. Which teams create an uneven advantage in an otherwise equal and level engagement? Sun Tzu instructs that his "A" team to engage the opponent "B" team, his "B" team engage the opponent "C" team and his "C" team engage the opponent "A" team. The measuring of intellectual capital is most interesting. Superior tactics bested equal physical assets. The measurement of intellectual capital must then take into account the tactics actually deployed.

The old and famous Western Electric "Hawthorne" plant consulting study introduces an apparent "show-stopper" design requirement for measuring intellectual capital. Measurement itself causes a (temporary) bias in the group behavior. The consulting firm or internal group collecting forms or asking questions introduces a bias that corrupts the results a bit or a lot.

Tough Measurement System Design Criteria.

The design criteria for activating a minimum bias "measurement system" to identify, and quantify value of **intellectual capital** related to competitive edges, practices, processes, systems, information, knowledge and competencies include the most severe design restrictions.

All typical requirements for "proper measurement" apply. In addition, an extended set of more restrictive criteria must be added to properly address the tough zero bias requirement. The expanded list is shown below.





- First hand. All measurements **must** be based on first hand data that have consumed at least a bit of energy from the object being measured.
- No people. The measurement system **must not** depend on or utilize people to conduct it or on interventions.
- No information added. The measurement system **must not** introduce any information, forms, questions, queries, documents or data.
- Cultural sensitivity. The measurement system **must** transcend or automatically adjust to culture, language and geography.
- Industry independence. The measurement system **must** perform consistently and reliability in every industry.
- Auditable/Trusted. The measurement **must** be able to be audited for integrity and accuracy. Results must balance with audited and trusted financials.
- Goal oriented. The measurement **must** create metrics and measures depicting the state of goal achievement and the amount remaining to goal satisfaction.
- Actionable results. The measurement system **must** create measurements that foster goal directed actions.
- Truthful. The measurement system **must** be provably correct. The measurement system must be unimpeachable.
- Rapid/Timely/Responsive. The measurement **must** accomplish the task responsively such that the situation does not change during the process.
- Repeatable. The measurement **must** be able to be repeated such that time wise differences can be detected.
- Measurement Impact. The act of measuring must not substantially alter the object being measured. The bias introduced **must** be zero to claim precision.
- Practical/Economical/Effective. The measurement system **must** be sufficiently practical that the whole entity consumes less net resource after installation than prior to installation. The measurement system must be more practical and effective than doing "nothing."
- Ahead of need. The results of the measure **must** look both backward and forward in time so that the goal consequences of actions can be seen ahead retrospectively and prospectively.

knowledge. Any extraneous object entering the system for purposes of measurement will introduce bias. Introducing people and/or consultants is known to create large bias. Our measurement is OF bias, which is what information creates and turns into knowledge. It is imprecise for one (biased) information system to be measuring another and claim the result is unbiased and unimpeachable.

The ITOP method or derivatives of it will be the only method to satisfy the measurement criteria.

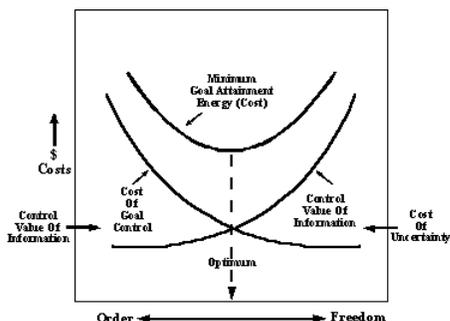
The reason for such severe design criteria incorporates sensitivity to the way information works and forms





Prior Art

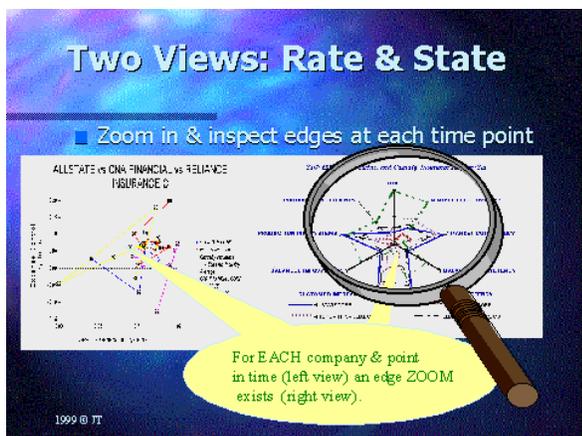
Dr. Arthur Laffer expressed a significant business theory resulting in a "classic" diagram (below). It has rightfully been a mainstay in economic theory despite not being able to be fully appreciated or implemented. Rigor concerning the scales had been missing. Thoreson led teams accomplished the finding and measuring of the missing scale (order – to – freedom).



A subtle warning is inherent in the Laffer diagram. The tax on control is information. At some point the cost of information for the next increment of improvement exceeds the value gained. The point of diminishing economic returns has been reached.

Indictment of a Missing System

Whatever the reasons, that which is unknown is missing. Given the extremes of the risks and benefits of business investments in processes, competitive edges, information systems and competencies it is easy to see how critical it is to tell the difference between the "right" investment decision and the "wrong" one.



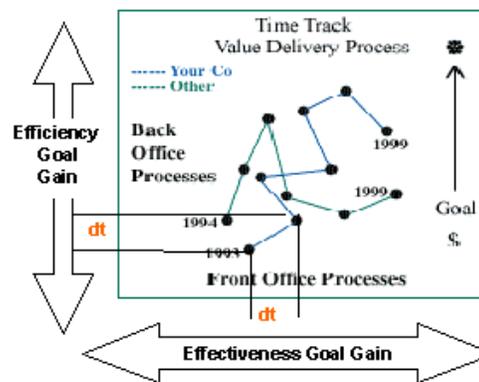
A rational and systematic analysis of the expected costs and benefits is essential. However, even with extreme differences in returns on investments, most decision-makers find it difficult to determine which investments will be a phenomenal success and which will be a crippling failure. The decision-maker is confronted

with many seemingly abstract and intractable questions.

- ◆ How do I estimate the value of information systems /knowledge or human capital?
- ◆ How do I deal with the apparently extreme uncertainties in the estimates of information system costs and benefits?
- ◆ How do I know whether one technology investment is "better" than another investment (IT or otherwise)?
- ◆ How do I know when to stop analyzing, accept some risk, and make a decision?"

The fact that these questions are even asked about "which information systems create how much value" is a terrible indictment. Among other things it means that a pathetic state has been reached where **the most critical system** of all is missing. The system is missing that calculates the value of business information systems.!! A sorry state indeed.

A clear business issue becomes evident. What business measures accurately show the current value if the information/knowledge/intellectual systems and which systems are able to be created and/or improved that will accelerate the success of the business? What is the process for allocating scarce resource to the highest goal gain activity?



If and when the value analysis diagnostic system is missing the enterprise is destined to navigate the competitive landscape as if blindfolded. Such a thing is akin to walking through a minefield without noticing the path.

Called for is a robust technique for systematic analytical decomposition of the knowledge assets in the corporation (any corporation).





Weighted Scoring Methods

There are several recent attempts to improve IT investment decisions by using various forms of "weighted" scoring methods. (Ref. 13, 14, 15, 16) The ITOP technique does NOT use subjective weighted scoring. All others that do so corrupt the results to a degree from the bias of the "weight assignors" whether consultants or surveyed executives. The historical biases creep in. What is actually being measured is the

Surveys don't count when real measurement is a real requirement. Just consider the results that Moses would have gotten from "polling" about Christ, the Lord and Christianity.

Voting is a weak excuse for measure!

"goodness" of the measuring process. The results are not good. The process is corrupt.

A report by Barbara McNurlin demonstrates the impotence of traditional "subjective weight methods." (Ref. 17) Ms. McNurlin analyzed 25 different benefit estimation techniques including various weighted scoring methods. She characterizes those methods, none of which she classified as based in theory, as "useless."

Paul Gray, a book reviewer for the Journal of Information Systems Management, may have summed it up best. He reviewed a book titled, "Information Economics: Linking Business Performance to Information Technology," one of the definitive books of a popular type of weighted scoring method. (Ref. 16) He wrote: "Don't be put off by the word 'economics' in the title: the only textbook economics discussed is in an appendix on cost curves." (Ref. 18) Gray sums up the key weakness of the approach: "**There are no economics in this version of information economics.**"

None of the "weighted score" methods are sufficiently strong to address the consistent and tough issues of complete value determination. Were they able to do so, the sticky problem of information system value management would have been long ago solved! They too would be able to map value-creating edges of corporations.

ITOP is science based. Knowledge causes BIAS. That is exactly what it does. Bias is measurable. Most often bias is considered a "bad" thing. However, a **prejudice for excellence** is a good thing. A bias for the correct answer is what **knowledge** is all about.

The ITOP method is sufficiently robust to integrate all of the methods listed above through use of the fundamental information archetype of science - entropy. The results connect the information value measures directly to the corporation. The results are auditable at any level because the measures balance to the corporate financials. The ITOP technique is proven in science.

Until Thoreson teams developed the zero bias tool (ITOP) for measurement, ALL other methods included the unfortunate design property of including the subjective bias of the evaluation personnel that were participating in the measurement. Reference papers develop a complete and comprehensive calculus of value delivery, knowledge metrics, and describe the Super-Ordinate Optimization algorithm.

Application of the proper method optimizes choices as described by Bellman and all other Operations Research and Management Science practices and processes.

Applied Information Economics has distinct advantages over other methods for assessing the value of competitive investments. It is the only method that has specific tools to deal with the uncertainty, intangibility, and ambiguity typical of IT investments in a way which is financially meaningful. As the power of information systems increase, as the influence of information technology on economic prosperity grows, it will be even more critical that we develop and utilize rational business methods in the analysis on IT investments. **Applied Information Economics is and will continue to be at the forefront of methods to keep business prosperous in the growing information economy.**

IT IS NOT THE SCORECARD OF YOUR HOME COMPANY THAT COUNTS FOR MUCH. IT IS ALL THE SIGNIFICANT OTHERS OUTSIDE THE CORPORATION THAT ARE MOST IMPORTANT! CUSTOMERS ARE WHERE ALL THE "NEXT" WEALTH IS GOING TO COME FROM.

"Therefore I say, 'Know the enemy and know yourself; in a hundred battles you will never be in peril.'" Sun Tzu - "The Art of War"





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