HRG

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HRG PRODUCTIVITY INDEX

Summary Introduction

Classifying business opportunities would be much easier if performance of organizations and their use of Information Technology could be quantified.

The major difficulty with any traditional ROI, TCO or other quantifying technique is the lack of pertinent data. Few, if any, organizations have the data necessary to quantify productivity and its correlation with Information Technology.

The paper outlines a computation technique that is simple and easy to use in a sales or survey situation to calculate a productivity index and the impact of Information Technology. The calculations were tested with sample data from a small number of surveys.

Summary Conclusions

1) An index can be calculated using a limited number of available financial statement data points that can position an organization and its productivity trend amongst its peers.
2) The index can be extended with data readily available from IT departments to indicate the impact of IT on the productivity of an organization, and show the value of an IT investment.
3) To calibrate the extended index requires a one-time analysis of user IT and business data to quantify the assumptions, relationships, and industry norms used in the calculations.

Background

The Harvard Research Group (HRG) has a continuing program to upgrade techniques used to compute Return-On-Investment (ROI) and Total Cost of Ownership (TCO). HRG first departed from the traditional ROI/TCO models by incorporating balance sheet items in the calculations to link business and IT investment decisions.

More recently HRG has been exploring methods to measure a company's productivity to provide a numerical means of comparing companies in the same business sector. The impetus to do this is the need to quantitatively position the hundreds of companies surveyed yearly by HRG's primary research group.

The experience gained from years of surveys is that few, if any, Information Technology (IT) departments have determined how to link their procurement decisions to corporate strategies. As a result the data that is required to do meaningful business oriented ROI/TCO calculations is not readily available, if at all.

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This made it abundantly clear that the need was for a quantifying method that used only readily available data. One possibility for publicly traded companies is to base the calculations on the financial information available from annual SEC 10k reports. This approach provides a numerical positioning of organizations but does not provide any means of measuring the effect of IT on a company's performance.

Since our survey experience showed that there was no possibility of getting performance data directly from IT departments the challenge was how to determine some useful measure using the limited data available from IT departments.

The data availability issues led to defining two productivity indices. One, the Global Productivity Index (GPI), that can be calculated using only 10k data, and the other, the Information Technology Productivity Index (ITPI), using 10k data and IT department information.

A) The need to define a quantitative measure (Productivity Index) of an organization's productivity that enables comparison of peers and identification of "best-in-class" can be met using a small number of items from financial statements.

B) Building a database of peers is primarily a numerical exercise since the required data is publicly available.

C) The data required to directly measure the IT/productivity relationship is not readily available, but it is possible to develop a model that uses substitute data that is available to calculate an IT-related productivity index (ITPI).

D) The assumptions used in the calculator described in this document require a one-time analysis of user IT and business data to quantify the assumptions, relationships and industry norms used in the calculations.

Methodology - Global PI - Macro Level

The purpose of the GPI is to define a quantitative measure of an organization's productivity that enables comparison of peers and identification of "best-in-class". The GPI provides a quantitative scale that can be used to compare organizations in the same business sector. The principal condition put on the method of calculating the index is to limit input to data available in 10k and annual reports. Since many companies in the survey are not publicly traded, the index calculation had to be applicable to private and not-for-profit organizations that make income and balance sheet data available.

These restrictions dictate that the representation is top-down, simple, and captures critical measures of an organization's operations. At the macro level all organizations have two input factors - labor and capital, and one output[1]. This can be represented as simply as:

$$GPI = \frac{\text{Output}}{\text{Labor} + \text{Capital}}$$

This representation with the three key factors: output, labor, capital, replaced by an appropriate set of business parameters can result in a measure of productivity. The calculation can be applied to a number of companies in the same business sector for the same fiscal year to compare their relative positions and the "best-in-class".

The calculation can also be applied to a number of fiscal years for a company to show its performance trend.

Methodology - Global PI - Micro Level

There are a number of considerations in selecting the set of business parameters to represent labor, capital, and output for the computation of the Global Productivity Index:

1) The parameters must be available from financial statements.
2) The parameters must represent "value" not just "accounting profits".
3) The parameters must include the most significant business variables.
4) The number of parameters must be as few as possible, but sufficient to provide a relative measure of an organization's productivity.

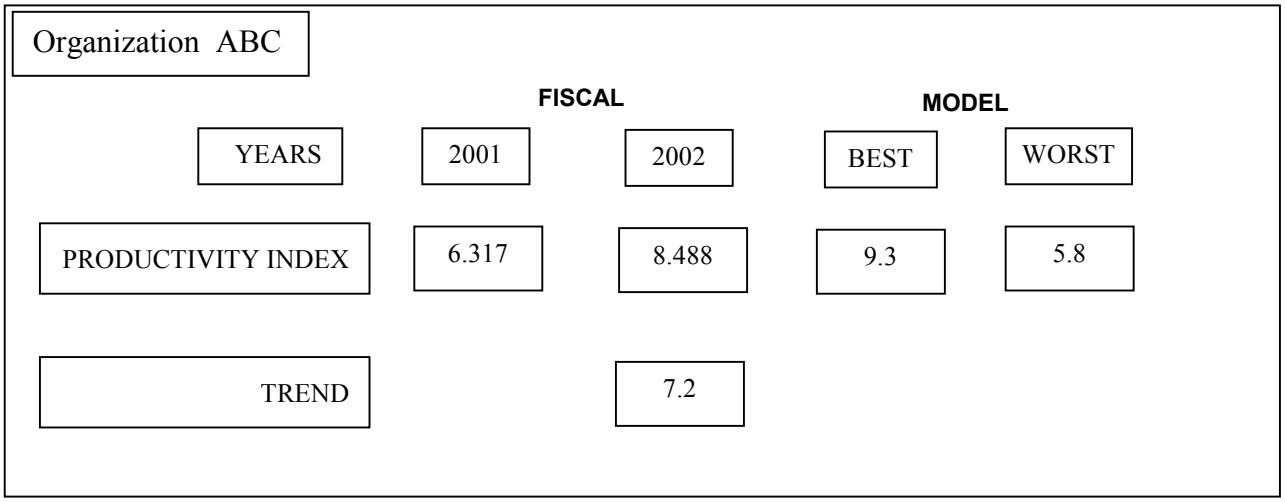
The selection process was started by determining which variables help to define "value". Much has been discussed and written[2] illustrating that true representation of "value" requires going beyond the variables that make up "accounting profit". Previously while developing the HRG ROI models we saw the same phenomena and for that reason incorporated balance sheet items and placed much more emphasis on cash and cash flow than "net profit". In developing the GPI we followed the same approach and purposely avoided the use of "revenue". Even in the best of times (pre-Enron) "revenue" was not consistently defined or measured in any one country, and especially not across international borders. Because of the vagaries of "revenue" and the resulting impact on "net profit" we have found that cash based items are more meaningful for ROI, or in this case PI, calculations.

From trying various permutations and combinations we arrived at four parameters to define capital, two to define expenses, and six to define output. Some of the items are transitory, such as receivables, others are accumulative such as "investments". Since we are calculating an index rather than computing an absolute measure we are not concerned with the different time durations of the accumulative variables.

The selected financial parameters met the four requirements stated previously and provide the basis for calculating the Global Productivity Index. The GPI can be used to compare organizations or to calculate year-to-year performance of an organization. In the year-to-year measurement of the productivity index of an organization it is possible to increase the visibility of trends by computing a "trend" number. The "trend" number is derived from the GPI and is on a scale of -10 to 10, where 10 is top performance.

In the case of a positive change in productivity the "trend" number is derived from the year-to-year productivity improvement compared to a target productivity index which is calculated from the best combination of fiscal numbers. Like the Index the "trend" number is abstract and not a direct measurement, but it highlights an organization's progress in improving its productivity. If the productivity change is negative the "trend" number is derived from the year-to-year productivity decline compared to a target productivity index that is calculated from the worst combination of fiscal numbers.

Applying the GPI calculations provides the numerical profile of an organization as shown below.



This example shows a productivity improvement from the year 2001. The "trend" number is calculated from the fiscal year index numbers and the "best" model year number. If the productivity had decreased from the year 2001, the calculation would have used the fiscal year index numbers and the "worst" model year number.

The productivity index and "trend" numbers for organizations provide an effective means to compare peers and identify "best-in-class" as shown in the next section of this document.

Methodology - Global PI - Test Data

The GPI equation was tested with a small sample of data from organizations in banking, retail, and manufacturing. The calculations were performed for two contiguous years to show an organization's trend and its standing amongst its peers.

The "trend" number represents a target based on the better of the parameters within the two year period. Although probably not achievable in practice the number provides a context for the degree of improvement or decline in GPI from the previous to the present year.

GLOBAL PRODUCTIVITY INDEX
Peer Comparisons and Trends

ORGS	YEARS PREVIOUS	LATEST	TREND
MANU			
A	6.32	8.49	7.2
B	4.70	4.86	2.0
C	2.10	2.40	4.4
D	4.47	3.93	-2.6
E	6.11	5.73	-5.9
F	5.90	4.61	-6.2
RETAIL			
A	2.96	3.42	8.51
B	2.98	4.08	6.67
C	1.57	1.05	-6.58
D	2.12	2.18	1.90
BANKS			
A	5.47	5.59	2.56
B	5.78	6.08	4.46
C	6.41	6.67	4.12
D	5.26	5.40	1.65

A database with a larger number of organizations in each business sector would probably show a clustering around a norm and outliers.

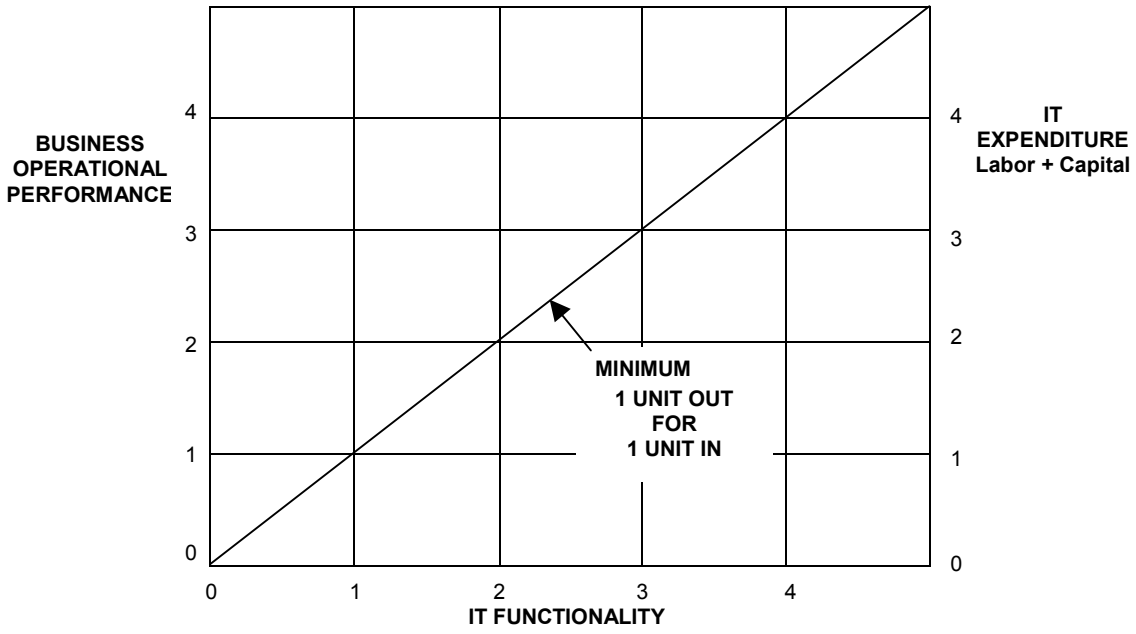
The value of the GPI is that it is a quick and easy calculation to show organizations by peer standings, relationship to "best-in-class", and individual productivity trends.

Methodology - ITPI - Macro Level

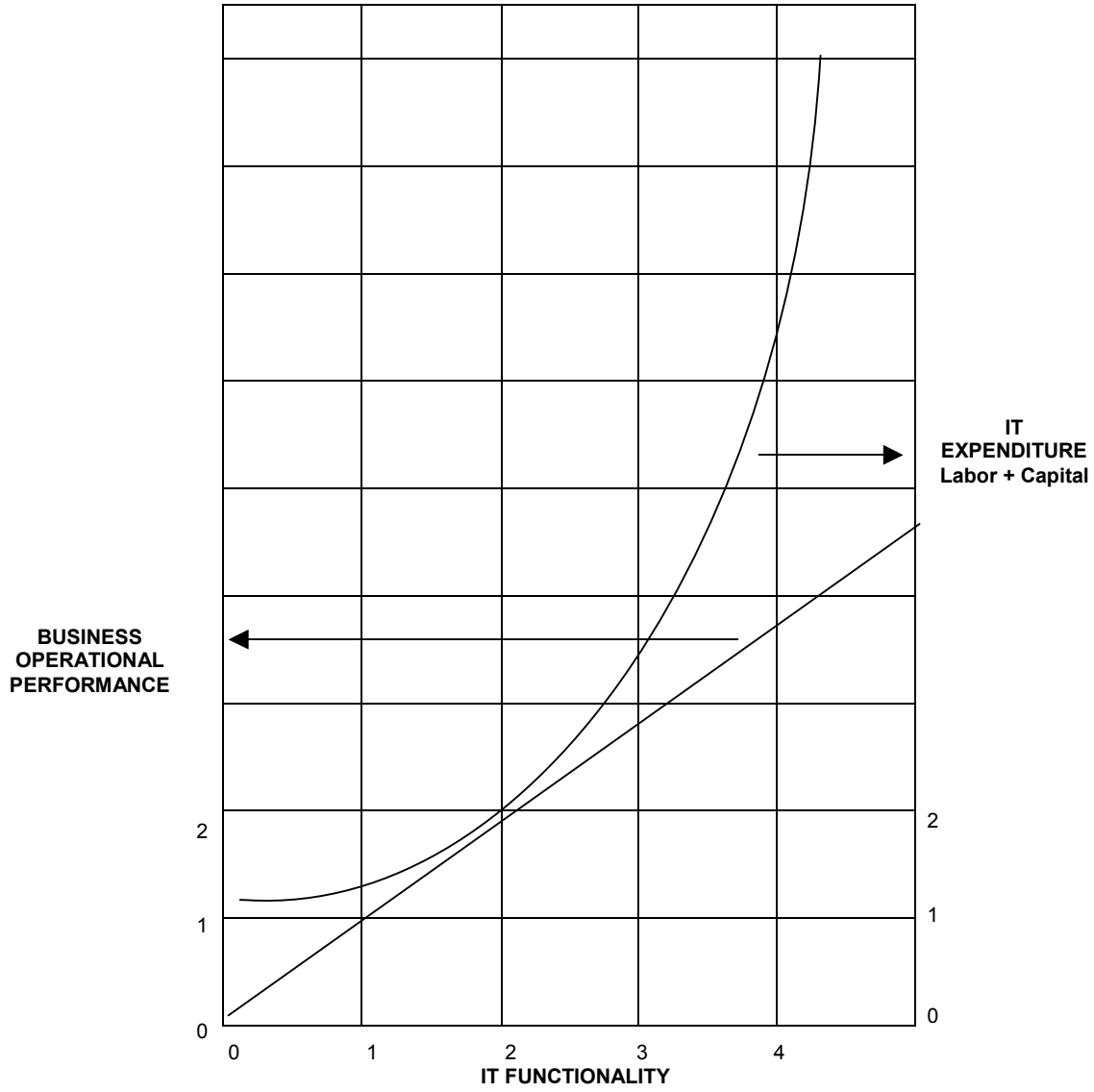
The GPI Index provides no measure of the relationship between an organization's use of IT and its productivity. The ITPI is an extension of the GPI to measure the impact of information technology on the business, and to measure the business value per dollar of IT investment.

Any measure relating to IT investment is complicated by the fact that meaningful data is not available without a fairly detailed analysis of a company's performance and its financials. Most companies do not know how to do this analysis so it is not too surprising that from thousands of surveys HRG has not found one company that has meaningfully computed its business ROI for its IT investments. Because of this ITPI has to use readily available data that is a substitute for the preferred information.

The ITPI is a drill down from the GPI equation incorporating the changes necessary to accommodate the available IT data. There are two factors relating to IT; functionality and efficiency. Functionality relates to how well IT enhances business output, and/or reduces labor, and/or reduces capital requirements. For example IT can be used to streamline point-of-sale operations and record inventory usage on-line. With an increase in sophistication the system can be linked to suppliers to reduce the amount of inventory in the organization's supply chain. There are thousands of examples of the correlation between improved operations and the use of IT functionality, but for a given functionality there is a broad spectrum of implementations ranging from low to very high efficiency. In an ideal situation the relationships between business operational performance, IT functionality and IT expenditure are as follows:



Experience has shown that in the vast majority of installations the relationship between functionality and IT expenditures is far from ideal. Many factors contribute to this, not the least being the departmental organization of companies that leads to islands of isolated computer systems, lack of coupling between business strategies and IT, the tendency to use labor to compensate for inadequate planning, and the continuous changes demanded of business. In fact there are many case histories and books[3] that suggest the situation is the following:



Typical IT deployment combined with today's economic environment of flat IT budgets, and growing demand for more IT functionality presents a unique opportunity. Vendors can assist customers with IT consolidation to free up dollars that can be used to enhance functionality, which in turn increases operational productivity. In turn this generates more profit, some of which can be spent to increase functionality that further enhances business productivity. In such a scenario a company can leverage IT to continually improve its operations.

However, senior management needs to be convinced that this cycle of investment/reward can occur. The role of ITPI is to help quantify the cycle.

The basic GPI representation shown previously can be expanded to include the impact of IT within the organization and becomes:

$$ITPI = \frac{output_{IIT} + output_{DIT}}{(labor + capital)_{IIT} + (labor + capital)_{DIT} + (labor + capital)_{IT}}$$

where: $output_{IIT}$ = the output of the organization that is independent of IT systems
$output_{DIT}$ = the output of the organization that is dependent upon computer systems
$(labor + capital)_{IIT}$ = labor and capital that contributes to $output_{IIT}$
$(labor + capital)_{DIT}$ = labor and capital that contributes to $output_{DIT}$
$(labor + capital)_{IT}$ = labor and capital spent on IT infrastructure and operations.

Although this computation can be performed the IT related parameters in the equation will be masked by the "IIT" values in the equation. To avoid this, the equation is modified and separated into two. One is an equation used to compute the productivity that would result if IT were hypothetically turned off and the other computes the productivity of the IT infrastructure. The no-IT equation is:

$$ITPI_{NIT} = \frac{Output_{NIT}}{(Labor\ and\ Capital)_{NIT}}$$

Where: $output_{NIT}$ = the hypothetical output of the organization as if it had no IT systems
$(labor + capital)_{NIT}$ = corresponding labor and capital that contributes to $output_{NIT}$

The second equation is:

$$ITPI_{DIT} = \frac{(Labor\ and\ Capital)_{DIT} + Output_{DIT}}{(Labor\ and\ Capital)_{IT}}$$

With these two equations and the Global PI (GPI) equation it is possible to compute indices that indicate the impact of IT on the organization, the efficiency of the IT infrastructure, and the dollar value of an IT investment.

Methodology - ITPI - Micro Level

As stated previously the GPI shows trends and comparisons but it does not reflect IT factors because of the restrictions put on the choice of input parameters. The Macro ITPI section outlined a possible approach to incorporating IT impact into the measurement of the productivity index even with the limited data available from IT departments.

The twelve business parameters used for calculating GPI are applicable for the computation of the ITPI. Ideally there should be two groups of the twelve parameters; one group to represent the portion of the business impacted by IT, and the other group to represent the rest of the business. From the hundreds of surveys conducted by HRG it is apparent that such detailed information is not readily available.

The available data is fairly restricted compared to the preferred two groups of business parameters. From a review of the data that is available from IT departments it was decided to use the number of IT users in the organization as a proxy for the preferred data. The proxy data consists of: the total number of users, the number of users at peak time, the number of users considered power users, the number of casual users, the number of moderate users, the application functionality available to the users, the number of employees, and the total yearly IT budget for staff, maintenance contracts, procurement, and services.

The proxy data in conjunction with weighting factors based on industry norms can be used to compute the required business parameters, which in turn can be used to compute the previously defined $ITPI_{NIT}$ and $ITPI_{DIT}$.

The resulting calculations for an organization would be as follows:-

	Global PI using corporate numbers	**No IT** Global PI equivalent	**IT Dept. Value**
Organization XYZ	5.24	3.74	6.79

The comparison between the no-IT and GPI provides a measure of the positive impact IT has on the organization's productivity. This combined with the IT Department Value index provides an overall indication of an organization's use and quality of its IT. Grouping the index numbers for a number of similar organizations provides a direct comparison of IT utilization.

The model can also show the value of an IT investment for a particular organization, say YYY. This can be done by selecting an organization (say XXX) as a reference point and determining the cost of hardware, software, and services to increase functionality and number of users for YYY to be comparable to the IT use by XXX. This data can then be used to calculate the expected productivity impact and the value of the IT investment. A sample calculation is shown below.

IT PRODUCTIVITY INDEX - Value of IT Investment

ORGANIZATIONS	GPI	NO - IT	IMPACT	IT DEPT VALUE
XXX	3.01	1.88	1.14	4.85
YYY	0.64	0.50	0.14	4.36
YYY What If	0.64	-0.53	1.17	16.57

Methodology - ITPI - Test Data

The ITPI concept is that a small amount of readily available IT data can be extrapolated to compute, IT impact on operations, IT efficiency, and IT value. Working within the constraints of readily available data eliminates the possibility of directly measuring the IT impact, but using an appropriate set of assumptions based on industry norms it is possible to compute the relationship between IT usage and productivity.

The dilemma when acquiring data is that IT departments do not have access to business operational data, and accounting departments do not know the extent to which IT impacts business operations. This creates a situation where we are confined to the type of information known by IT that has some relationship to the use of IT in the operations of the organization. The number and type of users is the most readily available so we explored whether this data could be a proxy for the preferred data. The user data provides no direct information about the impact of IT on the business so it is necessary to use assumptions and industry norms to link IT to business.

Completing some surveys showed that the required user and IT data (total of about 12 data points) is available from most organizations. However, what we did not do at this time was to complete the type of surveys that would be required to develop the assumptions based on industry norms. For the purposes of the present model it was assumed that all linkages are linear between IT usage and business operations.

A few of the surveys are summarized below.

IT PRODUCTIVITY INDEX - Comparison of Peers

ORGANIZATIONS	GPI	NO - IT	IMPACT	IT DEPT VALUE
WWW	2.40	0.97	1.44	7.30
ZZZ	7.62	3.82	3.80	5.03
XXX	3.01	1.88	1.14	4.85
YYY	0.64	0.50	0.14	4.36

Three indices were calculated. The GPI is based on current year financials, the no-IT index and the IT Department Index are derived from the IT data. The no-IT Index assumes a scenario in which the organization is operating with no IT. The differential between the GPI and the no-IT indices shows the IT impact on the business. The IT Department Index is a measure of IT efficiency.

These calculations show the concept, but without the underlying assumptions based on real world factors the individual numbers are not meaningful.

However, with appropriate assumptions in the calculator and a database of profiles any organization could be quickly assessed relative to its peers, ands to its own use of IT.

Conclusions

The value of the models are:-

GPI

Quick, easy calculations to view organizations by:-

- Peer standings
- Relationship to best in class
- Individual productivity trends

ITPI

- Quick, easy calculations to compare impact of IT amongst a set of peers.
- Calculations can be used to show return on investment of incremental IT spending.

Further work that needs to be done to the models is:-

GPI

Build a database of similar organizations for comparison purposes. Building this database would be primarily a numerical exercise since the required data is publicly available.

ITPI

A one-time survey program of a sufficiently large cross section of organizations to get the data required to quantify the assumptions, relationships, and industry norms used to link user IT to business operational data.

References

1 The Micro Economy Today - Bradley R. Schiller

2 Wall Street Journal Articles, June 2/03 - Stewart, senior partner at Stern Stewart & Co.
- Wallison, Fellow American Enterprise Institute

3 Information Technology and the Productivity Paradox - Henry C. Lucas