

# DUPONT ANALYSIS OF AN INFORMATION TECHNOLOGY ENABLED COMPETITIVE ADVANTAGE

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## Abstract

*The transformation of business caused by e-business and e-commerce applications of the internet and related technologies demonstrates that information systems and information technologies are essential ingredients for business survival and success. The most often cited benefit of IT are integrating business process, increasing efficiency, sales, productivity, and competitiveness. This study is designed for determining where managers considering investment in information technology (IT) projects and users of financial statements can expect competitive advantage through an IT-enabled strategy to shown up in accounting performance measures. Thus it places a major emphasis on examining whether firms enjoying competitive advantage from IT is differ significantly from those who gain competitive advantage from other factors. Return on Assets (ROA) decomposition (DuPont Analysis) allows financial statement users to examine what is the difference between companies who gain competitive advantage shown up in accounting performance measures. From the hypothesis tested, we found that high IT-capable firms were not significantly different from their direct competitor on a number of accounting performance measure.*

**Key words:** *Information technology, Competitive advantage DuPont analysis, Return on assets.*

## INTRODUCTION

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Polaris Software is a company that is successfully installed computer system in Citibank. No wonder that another bank such as Bank Artha Graha is then interested to be the client of Polaris Software. This Information Technology (IT) company from India was contracted by Bank Artha Graha to install retail banking system implementation. Unfortunately, the board of directors of Bank Artha Graha was not satisfied with the result of Polaris Software work. They thought that the system neither proper nor far from the expectation. As a result, the director demanded that IT project with the value of Rp 11,5 billion was cancelled and the money was paid in return. Because of no further deal, two of Polaris Software top executive were sent to the jail (Investor Magazine, 2003).

The fact above is the extreme example of the failure in implementing IT within a company. There is a possibility that what happened in Bank Artha Graha was also faced by others. Therefore, it

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is relevant for the top manager to ask question to the one who is responsible for the IT investment and implantation in the company. It will include IT division, vendor, and integrator system consultant. Managers usually ask, "Where is the payoff?"

In March-June, 2003, SWA Sembada Magazine conducted a survey to obtain a description about company's strategy in investing and implementing information technology in Indonesia. The survey involved 209 companies. Most of them were national and foreign private companies. The method chosen were in-depth interview and questionnaire. One result, which was relevant to this research was, that most companies confident that information technology will lead to increase efficiency related to operational cost (99 respondents), to integrate business process (39 respondents), to increase productivity (28 respondents), and to increase sales (19 respondents).

Although the Standish Group in 1995 said that only 28 % of big IT project met its objective, the managers still believed on the competitive advantage offered by information technology if it was implemented properly. Another recent research in the area of information technology (IT) and competitive advantage has also shown that high IT-capable firms outperform their direct competitors on a number of performance measures (Bharadwaj, 2000) and those companies that have implemented an IT-enabled strategy have an accounting performance advantage over their direct competitors (Stratopoulos and Dehning, 2000). This growing body of evidence was contrary to the findings superior firm performance (Barua et al., 1995; Dos Santos et al., 1993; Landauer, 1995; Strassmann, 1990, 1997; Weill, 1992). The explanation seems to lie in the fact that although IT assets themselves are readily replicated by competitors, other factors such as successful IT project implementation and managerial IT skills play an important role in determining whether IT assets give a firm competitive advantage (Dehning and Stratopoulos, 2002).

We will attempt to determine where managers considering investment in IT projects and users of financial statements can expect competitive advantage through an IT-enabled strategy to show up in accounting performance measures. This will be accomplished in three steps. The first step will be to identify companies that have achieved an IT enable competitive advantage. The second step will be to identify companies with a competitive advantage that was not necessarily achieved with IT. The third step will be to compare the result of step 1 and 2 to ascertain where the IT enable competitive advantage appears in financial performance relative to other types of competitive advantage such as market, regulation, employee or work.

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## RESEARCH OBJECTIVES

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Running a business to day is more complicated than ever before. The new business environment has also complicated the task of those who try to determine why certain businesses are more successful than others. The fast growing of computer development in 1980s made technology place its self as the important factor in running the business. No wonder, plenty of managers tried to invest and implement IT enabled strategy in their company and hope that it could bring betterment in financial performance measures.

Therefore, the researcher will attempt to determine where managers considering investment in Information Technology (IT) projects and users of financial statements can expect competitive advantage through an IT-enabled strategy to show up in accounting performance measures. The research places a major emphasis on examining whether firms enjoying competitive advantage from IT is differ significantly from those who gain competitive advantage from other factors.

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## THEORY AND HYPOTHESIS DEVELOPMENT

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### Information Technology

Information technology has not only changed the way people work, it has also changed the way business competes. Although at first computers were primarily used by the business to gain efficiencies by automating what have been done manually before, automation is taken for granted in the information age. Today's firms are not just automating, but are actively seeking new ways to use IT to outperform their competitors.

We define IT to include not only computer technology (hardware and software) for processing and storing information but also communication technology for transmitting information. The technological fuel for this IT pervasiveness has not been a just smaller computer that fit on the desktop, but also "marriage" of computers and communications: the use of computers that are linked to networks.

Our definition of IT is a broad one, encompassing all forms of technology involved in capturing, manipulating, communicating, presenting and using data (and data transformed to information).

Thus, information technology includes all computers (both the hardware and the software), peripheral devices attached to computers, communication devices and network—clearly incorporating the internet—photocopies, facsimile machines, cellular telephone and related wireless devices, computer controlled factory machines, robots, video

recorders and players, end even the microchip embedded in products such as car, airplanes, elevators and home appliances.

Before we go further to revise the discussion, Figure 1 will show terms used in this study so that we will have same perception.

**Figure 1:** Definition of Terms

<b>Terms</b>	<b>Definition</b>
Competitive advantage	Performing business better than competition (Dehning and Stratopoulos, 2002).
IT-enabled competitive advantage	Companies with a competitive advantage that were achieved with IT (Dehning and Stratopoulos, 2002).
Not IT-enabled competitive advantage	Companies with a competitive advantage that were not necessarily achieved with IT (Dehning and Stratopoulos, 2002).
IT	Information technology encompassing all forms of technology involved in capturing, manipulating, communicating, presenting, and using data (and data transformed to information).
IT-enabled strategy	A competitive business strategy that focuses on information technology as an enabling resources.
Direct competitors	The close rivals in the business (Webster's Dictionary, 1996).
ROA	Return on Assets, income available to common shareholders from continuing operations dividend by average total sales.
NPM	Net Profit Margin, income from continuing operation divided by net sales, measures income from ongoing operations per dollar of sales.
TAX	Total Assets Turnover, net sales divided by average total assets, measures how many dollars in sales the firm is bale to produce for each dollar invested in total assets or how efficient management utilized assets to generate sales.
ERP	Enterprise Resource Planning, integrated cross-functional software that reengineers manufacturing, distribution, finance, human resource and other business process of a company to improve its efficiency, agility and profitability (James A. O'Brien, 2002).
SCM	Supply Chain Management, integrating management practices and information technology to optimize information and product flows among the processes and business partner within the supply chain (James A. O'Brien, 2002).
CRM	Customer Relationships Management, managing the process of implementing major changes in information technology, business process, organizational structure, and job assignment to reduce the risk and cost of change optimize its benefit (James A. O'Brien, 2002).

### **New Ways to Compete**

Businesses have strived to achieve a competitive advantage in the past (Porter, 1980) by competing in two Ways:

1. By cost, by being a low-cost producer of goods or services.
2. By differentiation of products and services, by competing on customer perceptions or product quality and customer support services.

Since the 1960s when large firms began to bring computers into their accounting departments, IT has played a significant role in enabling firms to compete on low-cost. Computers have been used to automate transaction processing, shorten cycle time and provide operational data for decision-making. A flood of technology innovations in the 1980s enabled additional efficiencies gains such as shortening the time to developed new products with computer aided design tools, optimizing a shop floor process with computerized control systems that have captured a human expert's decision rules, and quickly changing a production line with planning systems that integrate research and development (R&D), production and sales information.

### **The Advantage of Information Technology**

The point of information technology is to improve the ability of enterprise, public or private sector, large or small company to achieve these objectives. In other words, to help it to be successful in the eyes of its stakeholders i.e., customers, constituents and employees. The demands of the changing environment in which enterprises operate today dictate that providing value to stakeholders and especially customers, is what really counts.

A positive contribution of information technology can come from three forms:

1. Efficiency measured by productivity--doing things better.
2. Effectiveness accomplished by broadening the scope of individual task, jobs or processes within organization--doing better thing including what an organization could never do before.
3. Competitive advantage gained by the enterprise--doing better and new things for the customer.

These three results are often achieved successfully overtime. As shown in figure 2, information technology tends to migrate through multiple areas or phases within specific organization. Era I involves the initial company purchase of a computer, which usually becomes the responsibility of a departmental manager. This "owner of information technology" within the organization becomes the regulator of the com-

puter as an organizational resource. In this first era, the role of information technology is to gain efficiencies on behalf of the entire organization. Traditionally accounting and finance were the first applications of the new computer. In recent years company can acquire first-ever computers in multiple application area based on the availability of software and application package.

**Figure 2:** The Information Technology Environment

<b>THE IT ENVIRONMENT</b>	Administrative Framework	Primary Target	Justification Purpose
<b>Era I</b> Data Processing	Regulated Monopoly	Organizational	Productivity Efficiency
<b>Era II</b> End-User Computing	Free Market	Individual	Effectiveness
<b>Era III</b> Strategic Systems	Regulated Free Market	Business Processes	Competitive Advantage

Source: Jack D Callon, *Competitive Advantage through Information Technology* McGraw-Hill International Editions, 1996, page 12, adapted.

Era II welcomed the personal computer, which fundamentally changed organizational computing forever. The IBM announcement of its PC in 1981 legitimized the desktop devices in corporate America, and the rest is history. While PCs may not be free, they broke the computer monopoly within the company while providing new individual computing capabilities. At the individual level these computer not only provide efficiencies, but also broaden capabilities to address tasks and even entire jobs. Traditional "number crunchers" can be transformed into financial analysts. Bookkeepers can become broader scope accountants since the computer performs the routine tasks.

Era III the strategic system era, is significantly more challenging than the first two. There is certainly nothing wrong with the first two eras. Most organizations will gladly take all of the possible efficiency and effectiveness benefits that they can get. The era I and II experiences often provide the basis to pursue strategic systems. Competitively focused application can be the first computer-based systems within a company, but they are not frequently the result of previous experience with successful information systems. The earlier experiences provide the best of traditional data processing and the end-user com-

puting to developed and implement competitive applications. The strategic systems that can involve new or reengineered business process are an extension of the traditional data processing application and end-user processing.

### Strategic Planning Framework

E-Commerce (EC) Implementation usually occurs at different levels. Companies start with a presence on the Internet and move to application that is more complex. The Gartner Group suggests the following four EC levels.

- Level one—**Basic presence**. Here the company uses the Internet to feature company information and provide brochures.

**Figure 3:** Level of E Commerce

Level of E-Commerce	Level 1	Level 2	Level 3
	Experimentation	Integration	Transformation
<b>E-Business Strategy</b>	No e-business strategy	E-business strategy support current (as is) corporate strategy	E-business strategy supports breakout (to be) corporate strategy
<b>Corporate Strategy</b>	E-business strategy not linked to corporate strategy	E-business strategy subservient to corporate strategy	E-business strategy is a driver corporate strategy
<b>Scope</b>	Departmental/functional orientation	Cross-Functional participation	Cross enterprise involvement (interconnected customers, supplier, and partners).
<b>Payoffs</b>	Unclear	Cost reduction, business support and enhancement of existing business practices, revenue enhancement	New revenue streams, new business line, drastic improvements in customer service and customer satisfaction.
<b>Levers</b>	Technological Infrastructure and software applications	Business process	People, intellectual capital and relationships, cooperation
<b>Role of Information</b>	Secondary to technology	Supports process efficiency and effectiveness	Information asymmetries use to create business opportunities.

Source: Kettinger and Hackbarth (2000)

Also found in Efrain Turban, *Electronic Commerce a Managerial Perspective* Prentice-Hall, 2002, page 703, adapted

- Level two—**Prospecting**. Many features are added to EC initiative, such as the search engine, extensive product information, link to services, and the ability to interact with the company. Basic customer service is provided.
- Level three—**Business integration**. More features are added, primarily EC transaction capabilities, customization and personalization services, and tools fostering the creation of a community.
- Level four—**Business transformation**. At this stage supplier and customer integration is added. In addition, multi channel integration, advanced customization and configuration, and superb customer service are achieved.

According to Hackbarth and Kettinger (2000), e-business strategies pass through three similar stages, as shown in figure 3.

### Hypothesis Formulations

After examining the theoretical background and previous researches, we finally come to hypothesis below:

- H** : *Firms enjoying competitive advantage from IT differs significantly from those who gain competitive advantage from other factors.*
- H1** : ROA of firms enjoying competitive advantage from IT differs significantly from ROA of those who gain competitive advantage from other factors.
- H2** : NPM of firms enjoying competitive advantage from IT differs significantly from NPM of those who gain competitive advantage from other factors.
- H3** : TAX of firms enjoying competitive advantage from IT differs significantly from TAX of those who gain competitive advantage from other factors.

## METHODOLOGY

### Source of Data

This study was based on two subsets of a database. The first was compiled from a survey of leading practice of e-business conducted by *Warta Ekonomi* magazine no. 47/THN. XIII November 26, 2001. The second was compiled from a survey of top performer companies conducted by *Investor* magazine 32<sup>nd</sup> edition, May 23 - June 5, 2001. The former survey designed to collect information concerning management practices related to implementation of information technology as well as e-business while the latter concerning to the aggregate financial performances of the companies.



### Population and Sample

Given the intrinsic complexity of the task of identifying companies with an IT-enabled strategy, we consider surrogate lists that could offer a reasonable fit to our description. The *Warta Ekonomi* (WRTE) 24 Best Companies in Implementing E-Business for the year 2001 seems to be a good fit. The list was based on criteria that were directly related to our description of companies that have earned a competitive advantage with an information technology (IT) in general and e-business in particular.

The list of companies was limited to those that conduct some e-commerce activities, yet their primarily business is done in the physical world. (telecommunication, dotcom, IT vendor, and IT company were excluded).

The term commerce is defined by some as describing transactions conducted between business partners. When this definition of commerce is used, some people find term electronic commerce to be fairly narrow. Thus, many use the term e-business. E-business refers to a broader definition of e-commerce, not just buying and selling of goods and services, but also servicing customers, collaborating with business partners and conducting electronic transactions within organization. In this research, we use the broadest meaning of electronic commerce, which is basically equivalent to e-business.

**Figure 4:** Criteria used to select the best companies in implementing e-business.

No.	Criteria	Definition
1.	Innovation	The system's ability to provide new ideas
2	Tools selection	Solution application product owned, such as ERP, SCM, CRM.
3	Product support	Hardware owned by the company
4	Efficiency	The system's ability to reduce overall costs
5	Human resource	The capability of human resource in IT
6	Organizational	Management's commitment in implementing IT
7	Revenue per total assets	Total revenue in the last three years compare to the total assets
8	Profit per total assets	Net profit in the last three years compare to the total assets

By default, companies that have a competitive advantage but were not selected by *Warta Ekonomi* use a less IT-enabled strategy. To identify companies with a competitive advantage that is not necessarily IT-enabled, we will use the *investor* (INVR) 100 best-listed companies.

The aggregate performance measure used to select the INVR 100 companies combines a year return, a year sales growth, net margin, return on assets, return in equity, volatility, liquidity, and number of shareholder, using principal component factor analysis (see figure 5). An aggregate performance measure was used based on Zammuto's (1984) and Barney's (1997) recommendation that multiple measures of performance be used to identify companies with competitive advantage

**Figure 5:** Performance variables used to select the top industry performers

No.	Criteria
1	A year return (%)
2	A year sales growth (%)
3	Three years sales growth (%)
4	Net margin 2000 (%)
5	Return on assets (%)
6	Return in equity (%)
7	Volatility
8	Liquidity
9	Number of share holder

### Research Instrument

Data collection was executed by gathering secondary data that was available and quoting properly from data sources in the library of Faculty of Economics, Islamic University of Indonesia, Jakarta Stock Exchange (JSX) Corner Faculty of Economics, Islamic University of Indonesia, official company's web site and other supporting world wide web. Those are:

1. List of companies recognized as IT-enabled strategy gathered from *Warta Ekonomi* magazine no. 47/THN. XIII November 26, 2001.
2. List of companies recognized as best aggregate performance collected from *Investor* magazine 32<sup>nd</sup> edition, May 23 - June 5, 2001.
3. Companies audited financial statement for the year 1997-2002 obtained from Jakarta Stock Exchange (JSX) corner, Faculty of Economics, Islamic University of Indonesia and

<http://www.jsx.co.id>. Note that the companies audited financial statement for the year 2002 only covered for 9 months.

### Research Variables

Variable used in this research were independent and dependent variable. The former is variable that is not depending on other variables or called free variable while the latter is variable that depends on other variable. Those were:

1. Return on Assets (ROA) measured from income available to common shareholders from continuing operations divided by average total sales.
2. Net Profit Margin (NPM) measured from income from continuing operation divided by net sales. It also measures income from ongoing operations per dollar of sales.
3. Total Assets Turnover (TAX) measured from net sales divided by average total assets. It also measures how many dollars in sales the firm is able to produce for each dollar invested in total assets or how efficient management utilized assets to generate sales.

## TECHNIQUES OF DATA ANALYSIS

### Method of Analysis

#### 1. DuPont Analysis

DuPont analysis makes possible a simultaneous analysis of efficiency and profitability, and its show how they interact to determine ROA. ROA measures the accounting income return to a company for each dollar of assets employed in the business. As shown in Equations (1) and (2), this can be expressed as a mathematical formula, consisting of profitability measure (NPM) and efficiency measure (TAX).

Figure 6: ROA Equation

$$\text{Return on Assets} = \text{Net Profit Margin} \times \text{Total Asset Turnover} \quad (1)$$

Or

$$\frac{\text{NI}}{\text{TA}} = \frac{\text{NI}}{\text{Sales}} \times \frac{\text{Sales}}{\text{TA}} \quad (2)$$

NI = net income, TA = averages total assets, Sales = total net sales for the period.

NPM measures income from on going operations per dollar of sales. TAX measures how many dollars in sales the firm is able to purchase for each dollar invested in total assets, or in other words, how efficient the management utilized assets to generate sales.

We proposed the use of DuPont analysis in order to address the following research question: First, where do we expect to observe the performance pay-off for firms with the competitive advantage due to IT-enabled strategy and their direct competitors.

The second research question considers the performance pay-off for firms with competitive advantage not due to IT-enabled strategy. Decomposition of the difference in ROA between firms with a competitive advantage not due to an IT enable strategy and their direct competitors would help us answer this question. A side-by-side comparison of the results of both research question will furnish us with the necessary evidence regarding similarities and differences in the performance pay offs between an IT and non IT-enable competitive advantage (Dehning, Stratopoulos, and Smith, 2002).

### **Analysis Steps**

The analysis steps to recognize this research were described as follows:

1. Identifying companies that achieved an IT-enabled competitive advantage as well as e-business strategy.
2. Identifying companies with competitive advantage that was not necessarily achieved with IT.
3. Comparing the results of step 1 and 2 to ascertain where IT-enabled competitive advantage appears in financial performance relative to other type of competitive advantage.

### **Statistical Test**

Those hypotheses were tested with a different paired t-test using Statistical Package for Social Science (SPSS) 10.0 software for windows, the recommended test in case of paired data where the distribution of the data is normal. To test on whether the distribution of the data was normal, we will use one sample Kolgomorov Smirnov Test for normality.

## **DISCUSSION OF EMPIRICAL RESULT**

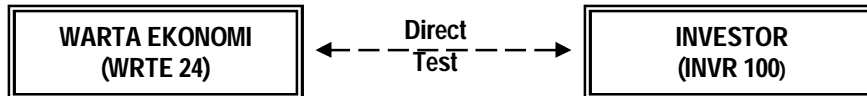
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### **Research Description**

To test the hypothesis on whether firms enjoying competitive advantage from IT is differ significantly from those who gain competitive advantage from other factors, the researcher identify firms that were

recognized technology users with competitive advantage and firms who were relatively less technology users who also enjoying competitive advantage. Both group of companies were then matched and compared directly as illustrated in figure 7.

**Figure 7:** Illustration of direct sample comparison



**Matching Concept**

WRTE 24 and INVR 100 were matched using industry (ICMD code) and size (total assets and net sales). This resulted in a set of companies with competitive advantages, each matches with their nearest competitor. Matching on size and industry help to rule them out as alternative explanation for any difference found in performance between two groups (Stratopoulos and Dehning 2002).

First, all companies that were not listed in Jakarta Stock Exchange (JSX) removed from the list. Second, the companies were identified based on sector. Third, companies from WRTE were matched with companies from INVR based on size. Forth, the rest companies were removed from the list of potential matches. The result of industry matching and the relative size can be found in figure 8 and 9. The former shows the success in matching by industry and size while the latter provide summary statistic for the group in terms of total assets and net sales. By design, the group should have means sales and total assets that are approximately equal.

**Figure 8:** Industry matching by ICMD code and Size matching by total assets and net sales

Item	Warta Ekonomi	Investor
Initial Population	24	100
Less: Not listed in Jakarta Stock Exchange	(12)	(0)
: No appropriate matched firms available	(2)	(90)
Final sample	10	10

**Figure 9:** Comparative statistic for the year 2001 (rupiah amounts in million)

Item	Mean		S.D	
	WRTE 10	INVR 10	WRTE 10	INVR 10
Total assets	24.546.345	22.267.708	31.963.008	38.274.767
Net sales	5.659.945	5.189.904	5.045.375	6.223.954

### Test of Normality

The One-Sample Kolmogorov-Smirnov Test procedure compares the observed cumulative distribution function for a variable with a specified theoretical distribution, which may be normal, uniform, Poisson, or exponential. In this study, the Kolmogorov-Smirnov Z was computed from the largest difference (in absolute value) between the observed and theoretical cumulative distribution functions. This goodness-of-fit test tests whether the observations could reasonably have normal distribution.

The Kolmogorov-Smirnov test assumes that the parameters of the test distribution are specified in advance. This procedure estimates the parameters from the sample. The sample mean and sample standard deviation is the parameters for a normal distribution.

The data obtained were ROA, NPM, and TAX. Those were in the form of ratio. When the data gathered in the form of ratio it could be examined further using either parametric or non-parametric statistical test. The former was applicable if the distribution of data was normal while the latter applicable if the distribution of data tends to be non-normal.

To test whether the data normally distributed, it was recommended to use Kolmogorov-Smirnov test for testing the normality of the data distribution. There were 36 variables and each would be tested independently. The summary of the test result could be seen in figure 10 and 11.

**Figure 10:** Summary of Kolmogorov Smirnov Test for WRTE

YEAR	ROA		NPM		TAX	
	Absolute	Asymp.Sig.	Absolute	Asymp.Sig.	Absolute	Asymp.Sig.
1997	0.318	0.264	0.342	0.193	0.342	0.193
1998	0.295	0.349	0.299	0.331	0.299	0.331
1999	0.313	0.279	0.324	0.243	0.324	0.243
2000	0.471	0.023	0.317	0.266	0.317	0.266
2001	0.254	0.538	0.304	0.313	0.304	0.313
2002	0.292	0.362	0.321	0.254	0.321	0.254

**Figure 11:** Summary of Kolmogorov Smirnov Test for INVR

YEAR	ROA		NPM		TAX	
	Absolute	Asymp.Sig.	Absolute	Asymp.Sig.	Absolute	Asymp.Sig.
1997	0.273	0.445	0.221	0.715	0.360	0.150
1998	0.249	0.565	0.398	0.084	0.365	0.139
1999	0.203	0.806	0.335	0.212	0.257	0.521
2000	0.297	0.339	0.166	0.946	0.262	0.499
2001	0.256	0.529	0.178	0.909	0.255	0.532
2002	0.117	0.999	0.344	0.187	0.237	0.629

Next, we have to calculate Kolmogorov Smirnov Table. The formula is:

**Figure 12:** The Formula of Kolmogorov Smirnov Table.

$$D = \frac{1,36}{\sqrt{n}}$$

Where  $n=10$ , we can find that the amount of Kolmogorov Smirnov Table (D) was 0.43

In testing the normality, we compared the test statistic to the formula result. If Kolmogorov Smirnov Statistic (Absolute) less than Kolmogorov Smirnov Table (D) 0.43, the distribution of data was normal or if the probability (Asymp. Sig.) was higher than 0.05 significant level, the distribution of the data was normal.

Based on comparison of the data above, we can state that, most of Kolmogorov Smirnov Count (Absolute) of each variable was less than Kolmogorov Smirnov Table (D) 0.43 and most of the probability (Asymp. Sig.) of each variable was higher than 0.05 significant levels. Therefore, we can conclude that the distribution of the data was normal.

### Research Finding

For hypothesis testing, we were interested in the distribution of the differences in the ROA, NPM, and TAX values. Hence, there were three different samples. To put it more formally, we were interested in investigating whether the mean of the distribution of differences in the ROA, NPM, and TAX values is zero. The Three samples were made up of the differences between the ROA, NPM, and TAX of firms enjoying competitive advantage from IT and those who gain competitive advantage from other factors. If the two groups of the company reporting similar values, then sometimes firms enjoying competitive advantage from IT would be the higher value and sometimes firms who gain competitive advantage from other factors would have the higher values. However, the mean of the distributions of differences will be about zero. On the other hand, if one of the firms consistently reports the larger values, the mean of the distribution of the differences will not be zero.

**Figure 13:** Results reported are Means and  $\rho$  value of paired t-test between WRTE 10 and INVR 10

	Mean/ $\rho$ Value	1997	1998	1999	2000	2001	2002
<b>Hypothesis 1</b> ROA	Mean	-0.0394	-0.2096	-0.1006	-0.1284	0.0037	0.0222
	$\rho$ Value	0.056	0.190	0.230	0.251	0.876	0.062
<b>Hypothesis 2</b> NPM	Mean	-0.0903	-0.6273	-0.3324	-0.4855	-0.0141	0.1372
	$\rho$ Value	0.080	0.276	0.357	0.330	0.917	0.091
<b>Hypothesis 3</b> TAX	Mean	-0.5253	-1.2545	-0.0313	0.0297	0.0829	0.0478
	$\rho$ Value	0.258	0.278	0.751	0.649	0.244	0.487

**Bold** = significant at the  $\alpha = 0.05$  level (two-tailed test).

In Hypothesis testing, we compared the test statistic with critical value. A decision was made either to reject the null hypothesis or not to reject it. In recent years, spurred by the availability of computer software, additional information was often reported on the strength of rejection. That is how confident were we in rejecting null hypothesis? This approach reports the probability (assuming that the null hypothesis was true) of getting a value of the test statistic at least as extreme as the value actually obtained. This process compares the probability, called the  $\rho$ -value, with the significant level. If the  $\rho$ -value was smaller than the significant level,  $H_0$  was rejected if it was larger than the significant level,  $H_0$  was not rejected (Mason, Lind, and Marchal, 1999).

**Figure 14:** Interpreting Weight of Evidence Against  $H_0$

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|--|
| <p>If the <math>\rho</math>-value is less than (<math>\alpha = 10\%</math>)</p> <ul style="list-style-type: none"> <li>a. 0.10 we have <i>some</i> evidence that <math>H_0</math> is not true</li> <li>b. 0.05 we have <i>strong</i> evidence that <math>H_0</math> is not true</li> <li>c. 0.01 we have <i>very strong</i> evidence that <math>H_0</math> is not true.</li> <li>d. 0.001 we have <i>extremely strong</i> evidence that <math>H_0</math> is not true.</li> </ul> |
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Source: Mason, Lind, and Marchal *Statistical Techniques in Business and Economics*. Irwin Mc Graw-Hill 10<sup>th</sup> edition page 317, adapted.



Results of paired t-test were presented briefly in figure 13. The result showed that the competitive advantage achieved through the successful use of IT was not differs significantly from those who gain competitive advantage from other factors. The WRTE 10 and INVR 10 had the same performance as measured by ROA, NPM, and TAX from 1997 to 2002.

Specifically, for hypothesis 1, which relates to ROA, none of six years observed showed significant. H1 showed significant at the  $\alpha = 0.05$  level with paired t-test.

Hypothesis 2 regarding NPM did not show significance for company's competitive advantage with IT-enabled strategy at the 0.05 level on the paired t-test. ( $p$  value greater than 0.05 in all years).

Hypothesis 3, TAX, had result that company's competitive advantage with IT-enabled strategy did not differ from those who gain competitive advantage from other factors on significant rating. H3 showed  $p$  value greater than 0.05 significant levels.

The hypothesis could also be tested by comparing  $t$  (count) statistic with  $t$  table. With the  $df$  ( $n-1$ ) 9, we could find that the value of the  $t$  table was 2.262 ( $\alpha = 5\%$ , two-tailed test). If  $t$  counts less than  $t$  table, the null hypothesis was not rejected. From the comparison, we could conclude that all of the data showed that  $t$  count was less than  $t$  table or all of them were not significant at the 0.05 levels.

### **Research Implication**

The result of the study shows that Competitive advantage achieved through successful use of IT was not differs significantly from those who gain competitive advantage from other factors. It can be seen in accounting performance measure that the WRTE 10 was not outperformed the INVR 10 as measured by ROA, NPM, and TAX.

The implication of this result was unclear payoff offered by IT-enabled competitive advantage relatives to the other type of competitive advantage in case of accounting performance measure. It means that the implementation of information technology in general and e-business in particular of companies in Indonesia still occurred at the experimentation level, the lowest level according to Kettinger and Hackbarth, 2000 (see figure 3 for visual representation). Other wise, there were failure in implementing information technology. It can be caused by low utilization and or idle capacity (Heru Prasetyo, 2003, Country Managing Director of Accenture). The Standish Group also stated that only 28% of big IT project met its objectives. To examine the factors that determine what

makes an IT-enabled competitive advantage successful for certain companies and not for others need further work.

The results of empirical analysis carry an important message for company managers that consider different strategies to support their quest for competitive advantage.

## **CONCLUSION AND RECOMMENDATION**

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### **Conclusion**

Based on the study result we can learn a great deal about information technology and competitive advantage. We found that firms enjoying competitive advantage from IT was not differ significantly from those who gain competitive advantage from other factors. Some of the finding that can be gleaned from the financial data and statistical test result as follows:

1. There was no significant difference between WRTE 10 and INVR 10 in ROA from 1998 until 2002.
2. There was no significant difference between WRTE 10 and INVR 10 in NPM, from 1997 until 2002.
3. There was no significant difference between WRTE 10 and INVR 10 in TAX from 1997 until 2002.

The ROA performance of the company can be determined by the behavior of its profitability (NPM) and efficiency (TAX). In cases when both measures moves in opposite direction or stay the same, ROA will follow the same path. The behavior of ROA during periods when profitability and efficiency measures move in the opposite directions will be determined by the direction and magnitude of these changes.

Consider this light of the fact that ROA is adversely affected by the acquisition of new IT assets. In the numerator of ROA calculation, there will be lower operating income due to increased depreciation expense and in the denominator of ROA calculation, increased total assets. As we discussed previously, substantial investment in IT assets is very important to the company. The only way that ROA will increase after acquisition of significant amount of IT assets will be if these assets make enough of a contribution to the company's revenue to make for the increase in assets and depreciation expense (Dehning and Stratopoulos, 2002).

### Recommendation

ROA decomposition itself has some limitations that might affect the result reported in this research. One of the examples is difference in accounting method between companies. Accounting procedure choices and estimates such as depreciation method and assets life will affect ROA and possibly causes differences in ROA between companies that are unrelated to the performances. Assets life is especially problematic if companies continue to use assets after they are fully depreciated, leading to inflated ROA. Further research, for example, could examine this issue to better control for differences in accounting method between companies.

Net Income used in this study still includes interest expense, so, portion of financial effect is still present in the numerator. To remove this effect financial researcher recommended substituting net operating profit after tax (NOPAT) rather than net income in ROA analysis.

For this kind of research, it will be necessary for managers to consider about new investment in IT projects. Besides the research, which deals with the success and failure, other factors must be fully developed. Further work examining the factor that determine what makes IT-enabled competitive advantage can be successful for certain companies but not for others. Most likely, this research will include a combination of methods, including in-depth case studies of successful and unsuccessful organizations, survey to determine best practice in using IT to obtain competitive advantage, and additional cross-sectional empirical work to ascertain the characteristics of the industries and companies most likely to obtain competitive advantage through IT (Dehning and Stratopoulos, 2002).

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