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THESIS

CIRCUMSTANCES FOCUSED ON PRODUCTIVITY BASED ON COMPANY PROFILE

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A Thesis Submitted in Partial Fulfillment of
the Requirements for the Degree of
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The main aim of this research was to investigate the relation between importance level of productivity measurement and company profiles in order to fulfill knowledge on productivity measurement, gain better understanding on when to measure productivity. The scope of this study was the data use for analysis based on the survey developed by Phusavat and Kanchana (2007) Response from top management level on productivity importance and company profiles -1) industry type 2) number of employee 3) business year 4) ownership 5) customer target- were analyzed by using descriptive statistical analysis and were also tested for impacted factor by GLM (General Linear Model)

The analysis result has 2 topics which are one factor and pair-wise factors. At one factor consideration, the different company profiles which caused different importance level of productivity measurement are manufacturing size - lower number of employee higher productivity important level- and business-owner type – joint venture company has higher productivity important level compare to wholly local firm-. More detail consideration by company profiles pair-wise analysis showing that there is no particular pattern for productivity importance level, 18 percent of circumstance must-have productivity, 74 percent require-to-measure productivity measurement and other 8 percent perceive as should-measure. From 92 percent of circumstances define productivity as must-have or require-to-measure performance reveal the positive perception on productivity measurement from top management in Thailand

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Student's signature Thesis Advisor's signature

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Supattra Sujitwanit

April 2009

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CIRCUMSTANCES FOCUSED ON PRODUCTIVITY BASED ON COMPANY PROFILE

INTRODUCTION

Nowadays, the organizations are being force by global competition to rethink how to manage business performance and linked to strategic management of entire enterprise. The performance measurement created in organization plays an important role in identify and tracking progress against organizational goals acting as bridge from high level strategy to the operational level and also identify opportunity for improvement, moreover comparing performance against both internal and external standards.

Performance measurement is a critical part in large number of process model and managing tool. A process model of manufacturing strategy by Kim and Arnold (1996) has identified performance process to measure action plans which set from business strategy. Takala, Kamdee, Hirvela and Kyllonen (2006) design a model called Scenario-based strategic planning which use performance measurement as a tool to control strategy implementation process and feed back result from bottom to top. The requirement 8 of ISO 9001:2000 stresses a strong foundation of a management process for an effective quality management system (Traver and Will cock,2006). Even in businesses and nonprofit organizations, importance of performance measurement did not decreased as in prominence award like The Baldrige Criteria for Performance Excellence (2008), performance measurement and analysis is main criteria for selecting winner for this award. Knowledge management process is another model that used measurement as a tool called enabler to foster the development (Raub and Sthapit, 2001). Famous process like Benchmarking use performance measurement to be part of process also (Camp, 2001). In figure 1 show the role of performance measurement in management process and model.

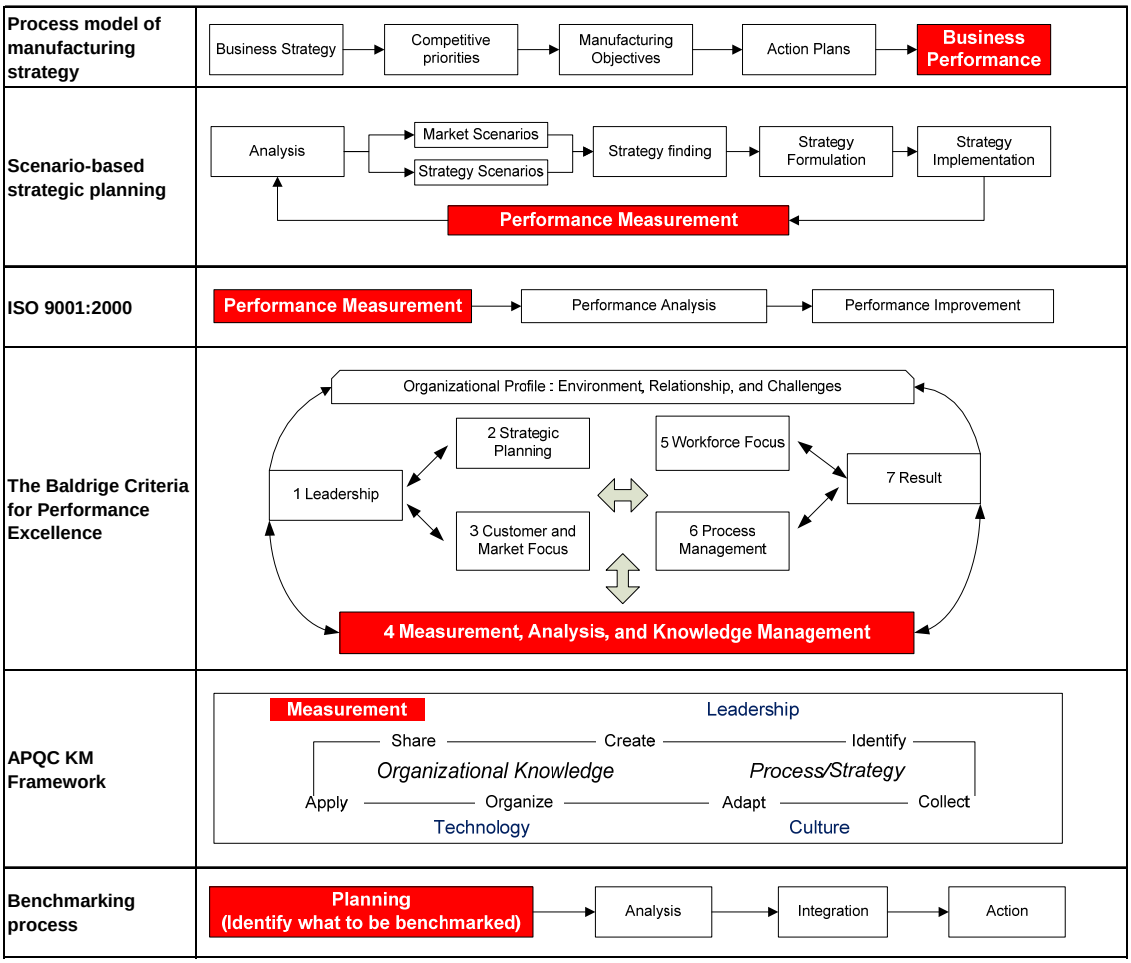

Figure 1 Various role of performance measurement in management process and model

By measuring and monitoring performance then management can take appropriate action in a timely fashion is one solution to reduce costs and becomes more efficient (Rao, 2006). In contrary selection of the wrong business performance can result in counterproductive and suboptimal results.

In the past, financial indicators used to be the fundamental management tool, perceive as corporate performance. Opponents of this approach suggest that it encourages management to take number of actions by effort to minimize the impact on costs side of the current year which this actions might actually jeopardize the company's overall performance in a long term rather than improve it(Shaw, 2008).

Anderson, Forness and Rust claimed that increasing in productivity are generally considered the major sources of economic growth (2001). Supported by rule of thumb that the companies that are able to have a high productivity rate are those that has more freedom and flexibility in production and income while companies having a low rate of productivity tend to have more difficulty keeping the company afloat(Miller, 2008).

Consequences of poor productivity has illustrated by Sink (1985), showing that poor productivity level does not effect only productivity performance itself but it create domino effect from poor productivity to uncompetitive cost in the market, less sale volume, lose market share, profitability declines, negative to organization in term of material and people then further productivity decrease eventually while improvement of productivity has opposite effect and result. Moreover slow productivity growth limits the rate at which real incomes can improve and also increases the likelihood of conflicting demands concerning the distribution of income (Englander and Gurney, 1994). At the present day productivity become the most well known performance measurement in management process and is a concept that all business would have to familiarize with. Because in the volatile world of business, facing the fact that all efforts exerted by every in the organization are directed towards gaining profit. Economists, politicians, industrial engineers, civil engineers, statisticians, quality-control personnel, consultants, labor unions, trade associations, special purpose centers, manufacturing engineers, dietitians, managers of all types and from all size of organizations and many others have been paying more and more attention to productivity concept (Sink, 1985). Melitz and P. Ottaviano (2008) mentioned that productivity is one of the key performance measures show if the organization's respond to changes in the world trading environment. More productivity firms are selected to export while lower productivity firms only serve their domestic market (Melitz, 2003; Clerides, Lach and Tybout; 1998, Ernard and Jensen, 1999; Aw, Chung and Roberts, 2000; Pavcnik, 2002; Bernard, Jensen and Schott, 2006)**,** this could define productivity as opportunity to globalize the organization

Large number of performance has productivity as one of the critical component. Miller mentioned that profit just cannot be gained without productivity in the equation (2007). Supported by Multi-factor Productivity Measurement Model (MFPMM) Change in productivity directly effect to change in profitability which developed by the American Productivity and Quality Center in 1977. Sink and Tuttle(1989) and Hoehn(2003) identified productivity to be probably the most crucial area out of seven performance criteria for operational and process management, seven performance criteria consist of profitability, productivity, quality of work life, innovation, effectiveness and efficiency. Productivity is in a performance dimension of resource utilization in upstream determinants and downstream results template (Fitzgerald, Johnston, Brignall, Silvestro and Voss, 2000). Productivity also one of the key indicators of knowledge work and that are critical in many knowledge intensive organization (Hass,2007; Eisenhardt and Tabrizi, 1995; Hansen, 1999; Cummings, 2004; Hass, 2006; Levin, 2000; McEvily, Das and McCabe,2000; Podolny, 1994) Network model has been developed by Harper(1984) in an attempt to measure finance and non-finance measurement in term of productivity ratios. Total Factor Productivity tried to measure productivity as a ratio of output to all types of inputs labor, capital, materials (Solow 1957, Griliches and Jomrgenson 1957). Example of productivity measurement in performance measurement theory as show in figure 2

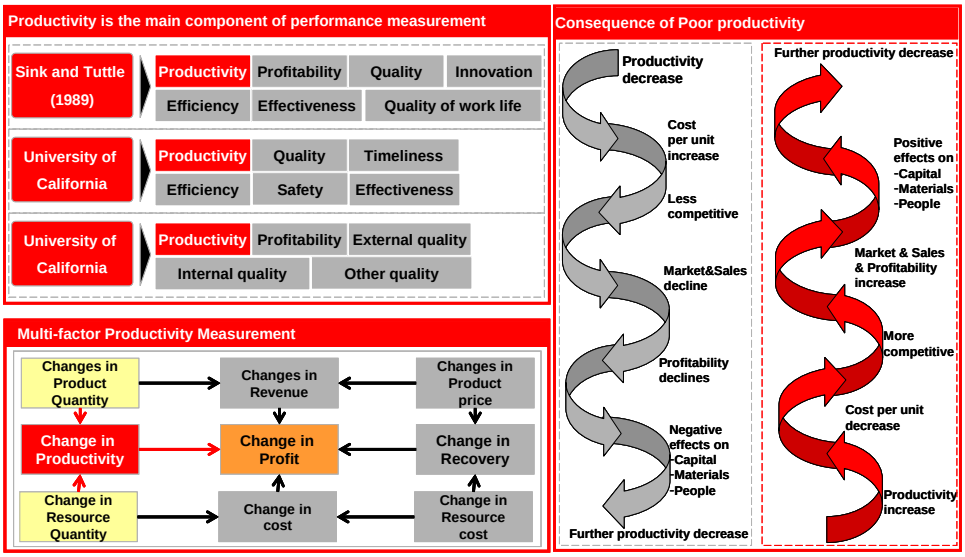

Figure 2 Example of productivity measurement in performance measurement theory

Problem statement

There is a high effort to study about productivity performance in various perspectives. Large number of research tried to find the factor that effect to productivity performance level, for example difference productivity level by difference information technology provided (Bailey and Gordon,1988; Brynjolfsson and Hitt,1993; Krueger,1993; Pine et al. 1993, Bessen 1993, Anderson, Fornell and Rust 1997), Argue by one study show that effect from information technology to productivity level will decrease and technological gains in the IT capital will end in the near future(Bosworth and Triplett, 2000). Manufacturing or service business that have create difference on productivity importance level (Argote, EbckmanandEpple, 1990; Darr,ArgoteandEpple,1995) Moreover human resource management systems is another factor that have correlation with business performance as measured by labor productivity (Ichniowski, 1990; Milgrom and Roberts,1995; Kandel and Lazear,1992; Huselid,1995; Delaney and Huselid, 1996) Or even practice in the organization like union that can lower productivity defined by Malcomson(1983). Nordhaus (2001) discussed the link between industry level and aggregate productivity measures based on value added. Presented alternative methods for measuring productivity growth those are derived from the link between productivity and welfare.

In the mean time there is an attempt to use productivity performance effectively. Various productivity measurements are conducted in different angles as shown in the studies of Sink and Tuttle(1989), Sumanth(1998), and Hoehn(2003) which represent their points of view that research areas on productivity should address : firstly, what to measure (e.g. labor productivity and value added productivity); secondly, how to measure (e.g. the linkage with databases, decision making process, and formula); and thirdly, where to measure (e.g. white-collar workers) For examples, the Michigan Manufacturing Technology Center proposes value added productivity as a way to better capture productivity-What to measure, The formula for measuring value added is provided as Sales or value of output turn over subtracted by Bought in Materials and Services such as raw materials, component, Goods/Services and

energy-How to measure. This productivity measurement is appropriate at the production/ manufacturing function –where to measure

Although productivity is vital, it is not necessary to all areas or circumstances. Due to the fact that productivity is a performance measurement and it requires resource and cost. Therefore, productivity is essential when it is really needed and ensured it is productive by studying result of action and change. Various researches study about circumstances that require productivity information such as the studies of Neely (2002) and Hoehn (2003). Whereas Frohlieh and Dixon (2001) and Prajogo (2007) indicate that there should be relationship between specified performance and strategies. As to the selection of a range of performance measures which are appropriate to a particular company, this selection ought to be made in the light of the company's strategic intentions which will have been formed to suit the competitive environment in which it operates and the kind of business that it is (Shaw,2008). Defining circumstance need productivity by linking with manufacturing strategy by Kanchana (2007), extending the knowledge by linking manufacturing strategy of organization and manufacturing strategy of supplier(Phusavat, 2007)

Finding correlation between organization characteristic and productivity is another attempt from many of researcher, study about the effects between the export oriented and the domestic market oriented(Aitken, Harrison 1999; Blomstrom, Kokko 2003; Smarzynska 2002, Gorg, Strobl 2001; Gestrin 2001; Kokko et al. 2001; Sgard, 2001; Harris, Robinson 2001; Vahter (2004)) , Moreover the ownership is another famous topic by identify "own firm" effect in the terminological tradition (Oulton,1998; Harris, Robinson 2001), the same topic has been intensive discuss in study from Aitken and Harrison (1999), Vahter(2004) Or even the effect of market size on productivity by Asplund and Nocke (2006)

By identify circumstance that productivity information is needed possibly helps strengthening an effort on performance measurement and a management process (Phusavat, 2007). The reason is that a lack of suitable productivity information could contribute to poor decision (Hoehn,2003; Rao,2006) and without proper information it

could be difficult for top executives to formulate effective plans and actions (Rich,2007) That is the one who use the information should realize the importance of each performance measurement so that the manager can focus their time and effort on that performance when conducting analysis or even making decision on improvement in an organization. By identify company profile and manufacturing strategy, better preparations for data collections, database and management reports can be made as show in scope of thesis in Figure 3 establish that there are diversify attempt to study about productivity measurement, some try to identify factor that effect to productivity performance level, then there is an attempt to identify how to use productivity performance effectively and rich number of research define the result from high productivity performance level. Anyway too much money spent on productivity measurement can diminish its importance (Phusavat, 2008) that is why this study tried to identify the circumstance answering the question when to measure productivity based on difference company profile as showed below.

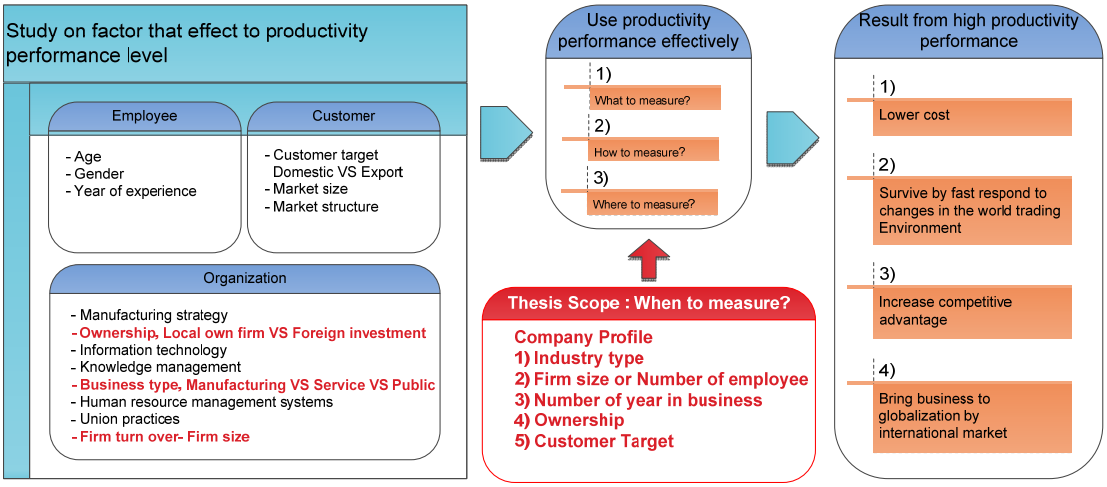

Figure 3 Scope of thesis

OBJECTIVES

Currently, the need to improve the knowledge on understanding and information requirement of productivity measurement is vital.The research intend to fulfill knowledge on productivity measurement by insights into productivity measurement in order to gain better understanding not only what to measure?, How to measure? and Where to measure? but also When to measure?.By answering these question

1. To identify what company profile has effect on productivity importance level.
2. To identify the circumstances which create difference productivity importance level

Research Framework

Investigate the relative between productivity performance measurement and company profile which are industry type, number of employee, business year, owner and customer type. . Purpose of this phase is to create template to be productivity performance measurement setting guideline. And the company profile data and productivity importance level consider referenced from previous research data to set template.

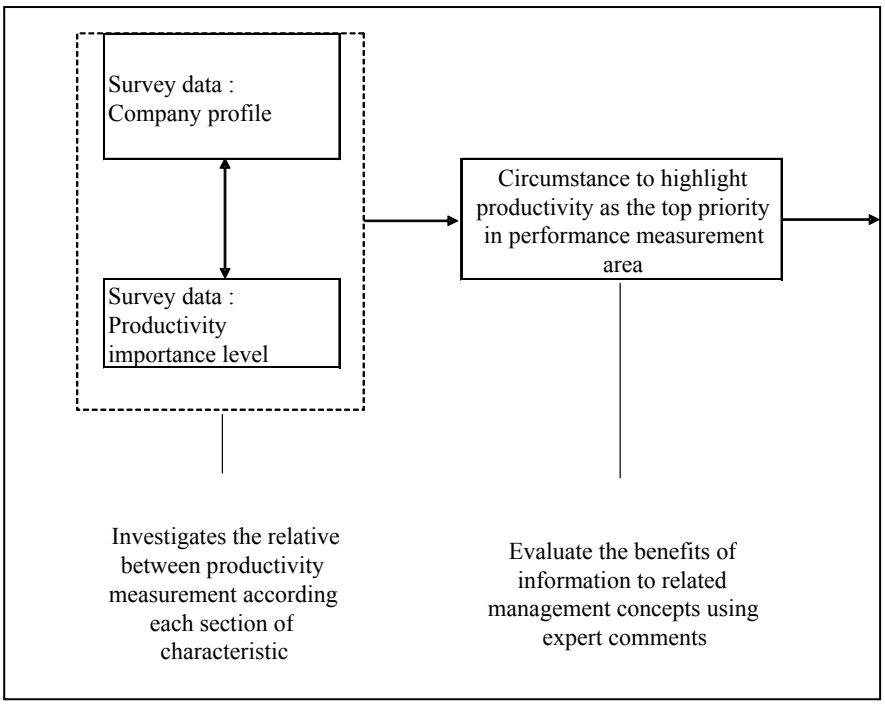

Figure 4 Research framework

Research outcome

The circumstance defined in this study could help management level to make decision on when the organization should measure productivity, in order to measure productivity at the right time to eliminate unnecessary cost. Not only cost point of view but also encourage people in the organization to use measurement information effectively and improve decision making process base on significant factor. The result of productivity information helps to strengthen performance measurement. A strong management process can drive organizational policies and objectives.

LITERATURE REVIEW

The literature review consists of

1. Productivity theory and research
2. GLM (General Linear Model) Theory
3. Performance measurement theory and research

Productivity

Productivity in economics refers to measures of output from production processes, per unit of input. Labor productivity, for example, is typically measured as a ratio of output per labor-hour, an input. Productivity may be conceived of as a measure of the technical or engineering efficiency of production. As such quantitative measures of input, and sometimes output, are emphasized. Productivity is distinct from measures of allocative efficiency, which take into account both the value of what is produced and the cost of inputs used, and also distinct from measures of profitability, which address the difference between the revenues obtained from output and the expense associated with consumption of inputs. (Courbois and Temple 1975, Gollop 1979, Kurosawa 1975, Pineda 1990, Saari 2006) Economic activity can be identified with production and consumption. Production is a process of combining various immaterial and material inputs of production so as to produce tools for consumption. The way of combining the inputs of production in the process of making output is called technology. Technology can be depicted mathematically by the production function which describes the function between input and output. The production function depicts production performance and productivity is the measure of it.

By help of the production function, it is possible to describe simply the mechanism of economic growth. Economic growth is a production increase achieved by an economic community. It is usually expressed as an annual growth percentage depicting (real) growth of the national product. Economic growth is created by two

factors so that it is appropriate to talk about the components of growth. These components are an increase in production input and an increase in productivity.(Genesca and Grifell 1992, Saari 2006)

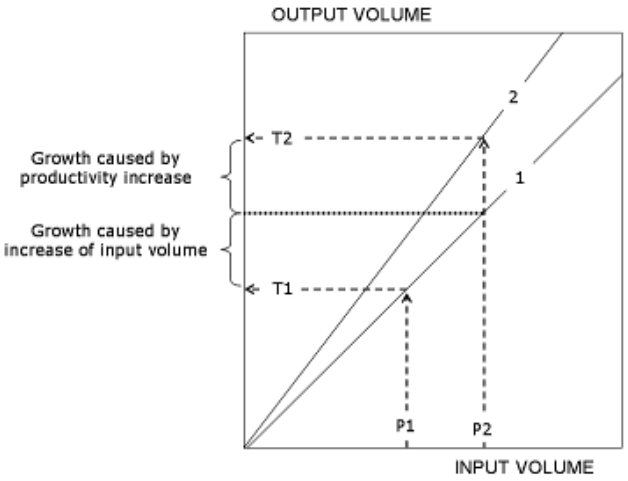

Figure 5 Economic growth process

The figure 5 presents an economic growth process. By way of illustration, the proportions shown in the figure are exaggerated. Reviewing the process in subsequent years (periods), one and two, it becomes evident that production has increased from Value T1 to Value T2. Both years can be described by a graph of production functions, each function being named after the respective number of the year, i.e., one and two. Two components are distinguishable in the output increase: the growth caused by an increase in production input and the growth caused by an increase in productivity. Characteristic of the growth effected by an input increase is that the relation between output and input remains unchanged. The output growth corresponding to a shift of the production function is generated by the increase in productivity. Accordingly, an increase in productivity is characterised by a shift of the production function and a consequent change to the output/input relation. The formula of total productivity is normally written as follows:

Total productivity = Output quantity / Input quantity

According to this formula, changes in input and output have to be measured inclusive of both quantitative and qualitative changes. (Jorgenson and Griliches 1967). In practice, quantitative and qualitative changes take place when relative quantities and relative prices of different input and output factors alter. In order to accentuate qualitative changes in output and input, the formula of total productivity shall be written as follows:

Total productivity = Output quality and quantity / Input quality and quantity

A company can be divided into sub-processes in different ways; yet, the following five are identified as main processes, each with a logic, objectives, theory and key figures of its own. It is important to examine each of them individually, yet, as a part of the whole, in order to be able to measure and understand them. The main processes of a company are as follows:

- Real process
- Income distribution process
- Production process
- Monetary process
- Market value process

Productivity is created in the real process, productivity gains are distributed in the income distribution process and these two processes constitute the production process. The production process and its sub-processes, the real process and income distribution process occur simultaneously, and only the production process is identifiable and measurable by the traditional accounting practices. The real process and income distribution process can be identified and measured by extra calculation, and this is why they need to be analyzed separately in order to understand the logic of production performance. Real process generates the production output, and it can be described by means of the production function. It refers to a series of events in production in which production inputs of different quality and quantity are combined into products of different quality and quantity. Products can be physical goods,

immaterial services and most often combinations of both. The characteristics created into the product by the manufacturer imply surplus value to the consumer, and on the basis of the price this value is shared by the consumer and the producer in the marketplace. This is the mechanism through which surplus value originates to the consumer and the producer likewise. Surplus value to the producer is a result of the real process, and measured proportionally it means productivity.

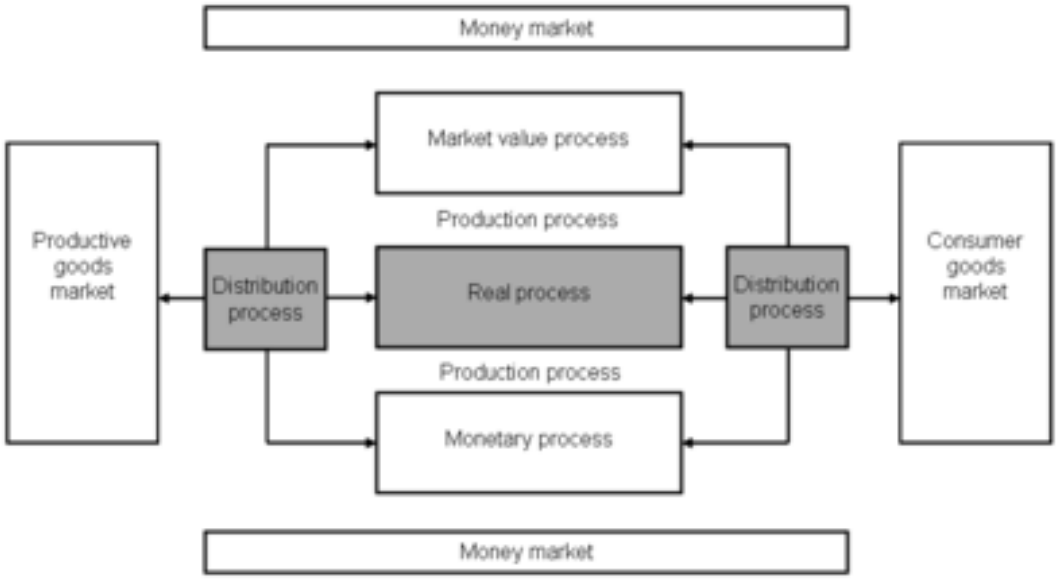

Figure 6 Real process and Distribution process

Income distribution process of the production refers to a series of events in which the unit prices of constant-quality products and inputs alter causing a change in income distribution among those participating in the exchange. The magnitude of the change in income distribution is directly proportionate to the change in prices of the output and inputs and to their quantities. Productivity gains are distributed, for example, to customers as lower product prices or to staff as higher pay. Davis has deliberated (Davis 1955) the phenomenon of productivity, measurement of productivity, distribution of productivity gains, and how to measure such gains. He refers to an article (1947, Journal of Accountancy, Feb. p. 94) suggesting that the measurement of productivity shall be developed so that it ”will indicate increases or decreases in the productivity of the company and also the distribution of the ’fruits of

production' among all parties at interest". According to Davis, the price system is a mechanism through which productivity gains are distributed, and besides the business enterprise, receiving parties may consist of its customers, staff and the suppliers of production inputs. In this article, the concept of "distribution of the fruits of production" by Davis is simply referred to as production income distribution or shorter still as distribution.

The production process consists of the real process and the income distribution process. A result and a criterion of success of the production process is profitability. The profitability of production is the share of the real process result the producer has been able to keep to himself in the income distribution process. Factors describing the production process are the components of profitability, i.e., returns and costs. They differ from the factors of the real process in that the components of profitability are given at nominal prices whereas in the real process the factors are at fixed prices. Monetary process refers to events related to financing the business. Market value process refers to a series of events in which investors determine the market value of the company in the investment markets.

Measurement of partial productivity refers to the measurement solutions which do not meet the requirements of total productivity measurement, yet, being practicable as indicators of total productivity. In practice, measurement in production means measures of partial productivity. In that case, the objects of measurement are components of total productivity, and interpreted correctly, these components are indicative of productivity development. The term of partial productivity illustrates well the fact that total productivity is only measured partially – or approximately. In a way, measurements are defective but, by understanding the logic of total productivity, it is possible to interpret correctly the results of partial productivity and to benefit from them in practical situations.

Typical solutions of partial productivity are:

1. Single-factor productivity
2. Value-added productivity
3. Unit cost accounting
4. Efficiency ratios
5. Managerial control ratio system

Single-factor productivity refers to the measurement of productivity that is a ratio of output and one input factor. A most well-known measure of single-factor productivity is the measure of output per work input, describing work productivity. Sometimes it is practical to employ the value added as output. Productivity measured in this way is called Value-added productivity. Also, productivity can be examined in cost accounting using Unit costs. Then it is mostly a question of exploiting data from standard cost accounting for productivity measurements. Efficiency ratios, which tell something about the ratio between the value produced and the sacrifices made for it, are available in large numbers. Managerial control ratio systems are composed of single measures which are interpreted in parallel with other measures related to the subject. Ratios may be related to any success factor of the area of responsibility, such as profitability, quality, position on the market, etc. Ratios may be combined to form one whole using simple rules, hence, creating a key figure system.

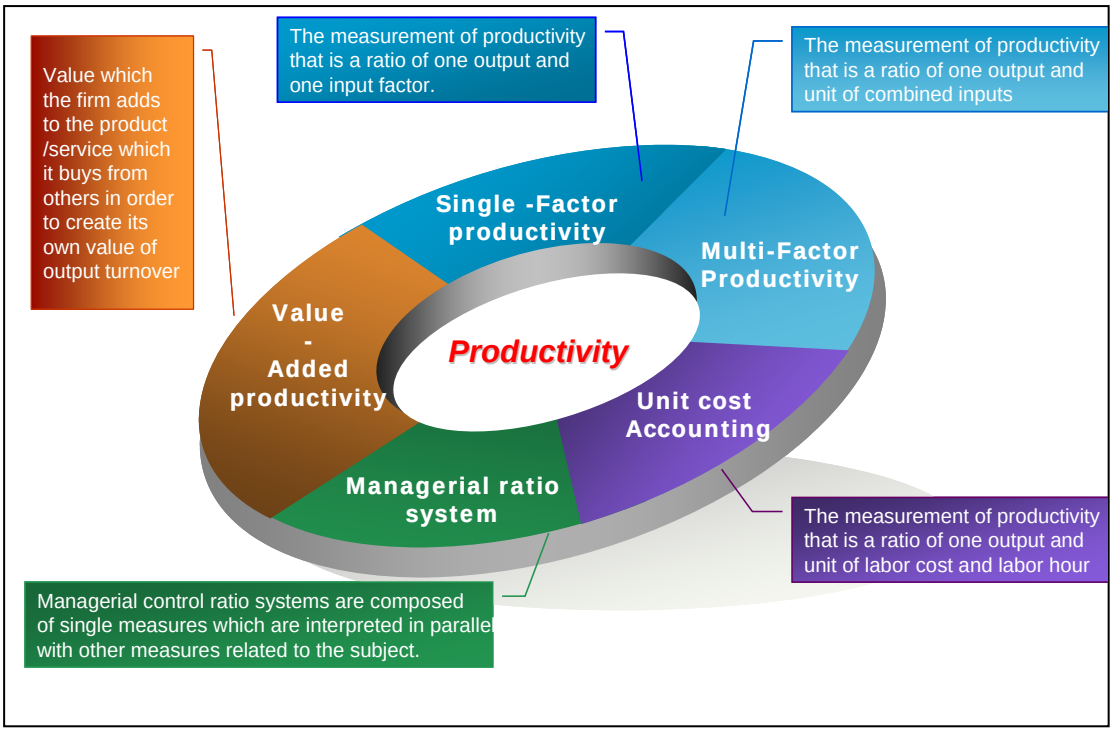

Figure 7 Various productivity methods.

The measures of partial productivity are physical measures, nominal price value measures and fixed price value measures. These measures differ from one another by the variables they measure and by the variables excluded from measurements. By excluding variables from measurement makes it possible to better focus the measurement on a given variable, yet, this means a more narrow approach. The table below was compiled to compare the basic types of measurement. The first column presents the measure types, the second the variables being measured, and the third column gives the variables excluded from measurement.

General Linear Model

The General Linear Model (GLM) underlies most of the statistical analyses that are used in applied and social research. It is the foundation for the t-test, Analysis of Variance (ANOVA), Analysis of Covariance (ANCOVA), regression analysis, and many of the multivariate methods including factor analysis, cluster analysis, multidimensional scaling, discriminant function analysis, canonical correlation, and

others. Because of its generality, the model is important for students of social research. Although a deep understanding of the GLM requires some advanced statistics training, general linear model can be written

$$y = b0 + bx + e$$

where:

y = a set of outcome variables

x = a set of pre-program variables or covariates

b0 = the set of intercepts (value of each y when each x=0)

b = a set of coefficients, one each for each x

The general linear model is a procedure by which a single target variable y is represented by a combination of variables x1, x2,..., x*p*. The combination in question is linear:

$$\widehat{y}_i = b_0 + b_1 x_{i1} + b_2 x_{i2} + \cdots + b_p x_{ip},$$

or in matrix notation, y= Xb.

Geometrically, this representation is obtained by projecting y into the into the space Vx of linear combinations of x1, x2,..., x*p*:

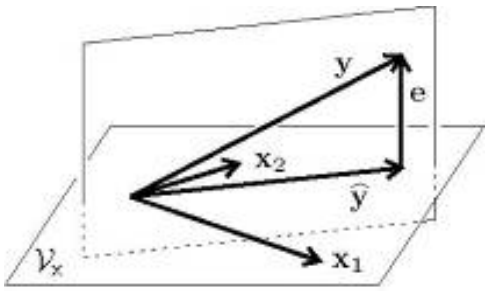

Figure 8 Geometrically to present projecting

Algebraically, the coefficient vector b for this projection is determined by multiplying y by the matrix

$$\mathbf{b} = (\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'\mathbf{y}.$$

This equation will be seen frequently. As the diagram above shows, it decomposes y into two orthogonal vectors, the prediction $\hat{y}$ and the error e. These vectors are chosen so that $|\hat{y}|$ is maximal, and consequently |e| is minimal. The complete general linear model includes an error component:

$$\mathsf{y}_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_p x_{p2} + \mathsf{e}_i,$$

or in matrix terms, y= Xβ+e.

Indicate the random variables typographically here with a sans-serif font. The letter β is used instead of b to indicate that it refers to the "true," if unobserved, values of the parameters. The errors e_i in this model are independent and identically distributed, having a Gaussian (i.e., normal) distribution with mean zero and variance σ^2. This assumption means that the actual observation y has a spherically symmetrical distribution about the true model value Xβ

The isotropy of the error keeps Xβ uncorrelated with the error e and allows b to be estimated by projection. It is an important consequence of the assumption of the Gaussian distribution. Under the general linear model, the estimate b of β has two somewhat different interpretations. One is as a least-squares fit $\hat{y}$ of to y. The estimate b gives the linear combination $\hat{y}$ that minimizes the length of the error e. Specifically, it gives the smallest possible value to sum of squared differences between y and $\hat{y}$:

$$|\mathbf{y} - \hat{\mathbf{y}}|^2 = \sum (y_i - \hat{y}_i)^2 = \sum (y_i - \mathbf{x}_i'\mathbf{b})^2.$$

The second interpretation is that of maximum likehood and is based on the probability distribution of y_i. Because this interpretation is so important to later developments,

1. Under the general linear model, the probability of observation y_i depends on the parameters β and σ^2, and can be written

$$P(y_i; \boldsymbol{\beta}, \sigma^2).$$

2. Because the observations are independent, the probability of the complete set of data y is the product of the probabilities of its individual obs€ervations:

$$P(\mathbf{y}; \boldsymbol{\beta}, \sigma^2) = \prod_{i=1}^{N} P(y_i; \boldsymbol{\beta}, \sigma^2).$$

3. In an estimation problem, a set of data has been obtained, hence it can no longer be treated as a random quantity. Instead, treat the probability above as a function of the parameters and call in the likelihood. For several reasons it is more convenient to work with the logarithm of the likelihood than the likelihood itself, so define :

$$\mathcal{L}(\boldsymbol{\beta}, \sigma^2) = \log P(\mathbf{y}; \boldsymbol{\beta}, \sigma^2).$$

4. To estimate the parameters β and σ_2, find the values band s^2 that maximize $L(b,s^2)$. These are the maximum-likehood estimates.

The least-squares and maximum-likelihood interpretations of the estimates are equivalent under the assumptions that observations are independent, identically distributed, and Gaussian. When they are not, the two procedures will give different estimates.

The importance of the General Linear Model

1. It is comprehensible, both easy to describe and to interpret. In particular the linear model y= Xb is both simple and very powerful, and the error distribution is cleanly separated from the effects.

2. The random structure is simple. The Gaussian distribution is completely described by its first two moments, μand σ^2 (or, in the multivariate case, by the mean vector μ and the covariance matrix Σ). These moments are stochastically independent, making them easier to estimate. The geometric space induced by the error is Euclidean and isotropic.

3. The spaces Vx and Vy in this diagram are actually linear (flat) spaces; the diagram is my attempt to project a four-dimensional configuration onto a two-dimensional page and show the relationship of u and v.

4. The model is computationally tractable. Closed-form estimates of the p arameters are available, and the mean and variance can be estimated separately. The estimated linear parameters are obtained by projection,

$$\mathbf{b} = (\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'\mathbf{y}$$

5. The different interpretation of the estimates (least squares and maximum likelihood) and the different forms of test yield identical results.

6. The model generalizes readily from univariate to multivariate form. Both the conditional and marginal distributions of the multivariate Gaussian distribution are also Gaussian, so tests on these distributions have the same form as those on the full multivariate model.

Performance measurement

Measurement of performance is a topic which is often discussed and is very importance for business executives. Literally, the term of “performance” has become more systematic and increasingly importance. Measures should cascade down through the organization and performance management pyramid as shown below in figure 9. Selection of the wrong KPIs can result in counterproductive behavior and suboptimal results.

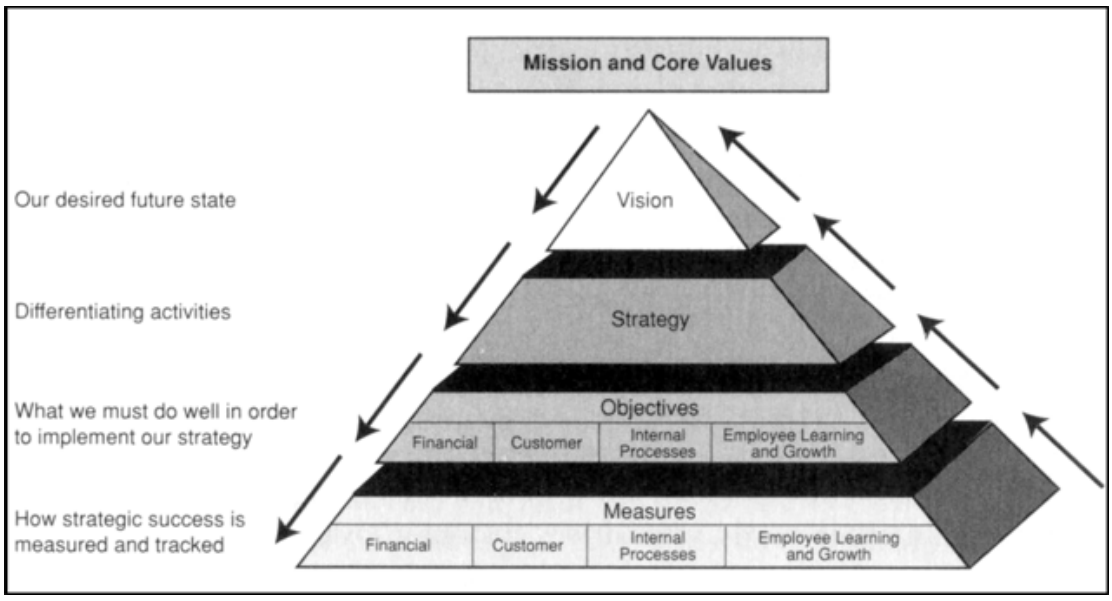

Figure 9 The organization and performance management pyramid

Between strategy and performance measures, a set of performance objective should be define and describe what organization must do well in order to execute the company strategy. The objectives created will act as bridge from the high-level strategy to the performance measures that will use to determine the progress toward overall goals. The selection of a range of performance measures will be appropriate to a particular company, this selection ought to be made in the light of the company's strategic intentions which will have been formed to suit the competitive environment in which it operates and the kind of business that it is. For example, if technical leadership and product innovation are to be the key source of a manufacturing company's competitive advantage, then it should be measuring its performance in this area relative to its competitors. But if a service company decides to differentiate itself in the marketplace on the basis of quality of service, then, amongst other things, it should be monitoring and controlling the desired level of quality. Whether the company is in the manufacturing or the service sector, in choosing an appropriate range of performance measures it will be necessary however to balance them, to make sure that one dimension or set of dimensions of performance is not stressed to the detriment of others. The mix chosen will in almost every instance be different. While most companies will tend to organize their accounting systems using common

accounting principles, they will differ widely in the choice, or potential choice, of performance indicators. There are example of Performance measurement in service business which define that there are 6 categories of performance dimensions refer to them either as upstream or as downstream indicators, where, for example, improved quality of service upstream leads to better financial performance downstream. (Fitzgerald, Johnston, Brignall 2008)

Table 1 Upstream Determinants and Downstream Results

Performance Dimensions	**Types of Measures**
Competitiveness	Relative market share and position Sales growth, Measures re customer base
Financial Performance	Profitability, Liquidity, Capital Structure, Market Rations, etc.
Quality of Service	Reliability, Responsiveness, Appearance, Cleanliness, Comfort, Friendliness, Communication, Courtesy, Competence, Access, Availability, Security etc.
Flexibility	Volume Flexibility, Specification and Speed of Delivery Flexibility
Resource Utilization	Productivity, Efficiency, etc.
Innovation	Performance of the innovation process, Performance of individual innovations, etc.

In many companies in the UK, as in the USA, the familiar cry "everything here is viewed in terms of the bottom line!" can be heard. In this sort of corporate environment, financial indicators remain the fundamental management tool and could be said to reflect the capital market's obsession with profitability as almost the sole

indicator of corporate performance. Opponents of this approach suggest that it encourages management to take a number of actions which focus on the short term at the expense of investing for the long term. It results in such action as cutting back on R and D revenue expenditure in an effort to minimize the impact on the costs side of the current year's P and L, or calling for information on profits at too frequent intervals so as to be sure that targets are being met, both of which actions might actually jeopardize the company's overall performance rather than improve it.
In general terms, the opponents of "the bottom line school" state that because of the pre-eminence of money measurement in the commercial world, the information derived from the many stages preceding the preparation of the annual accounts, such as budgets, standard costs, actual costs and variances, are actually just a one dimensional view of corporate activity. Increasingly, over the past decade, they have been emphasizing that executives should come to realize the importance of the non-financial type of performance measurement.

Research in support of this approach has come up with new dictums for the workplace: "the less you understand the business, the more you rely on accounting numbers" and "the nearer you get to operations, the more non-financial performance indicators you realize could be valuable aids to better management"; or "graphs and bars carry much more punch than numbers for the non-financial manager" But there is still a lot of resistance. Executives tend to avoid using multiple indicators because they are difficult to design and sometimes difficult to relate, one to another. They have a strong preference for single indicators of performance which are well tried and which produce ostensibly unambiguous signals. But the new school lays great emphasis on the fact that multiple indicators are made necessary by the sheer complexity of corporate activity. The example of performance measurement in each area of the business or organization

Table 2 Example of performance measurement in each area

Area	**Performance measurement**
Manufacturing and Production Indicators **Non-financial indicators : Depending on the exact nature of the production process**	• Indicators deriving from time and motion studies • Production line efficiency • Ability to change the manufacturing schedule when the marketing plan changes • Reliability of component parts of the production line • Production line repair record • Keeping failures of finished goods to a minimum • Ability to produce against the marketing plan • Product life cycle
Manufacturing and Production Indicators **Indicators concerned with controlling production quality - right first time**	• Measurement of scrap • Tests for components, sub-assemblies and finished products • Fault analysis • Actual failure rates against target failure rates • Complaints received against the quality assurance testing programme • Annualised failures as a % of sales value • Failures as a % of units shipped • Various indicators of product / service quality

Table 2 (Continued)

Area	Performance measurement
Manufacturing and Production Indicators **Indicators concerned with the purchasing department's external relationships with its suppliers**	• Inventory levels and timing of deliveries • "Just in time" inventory control measurements • Stock turnover ratio • Weeks stocks held • Suppliers delivery performance • Analysis of stock-outs • Parts delivery service record • % of total requests supplied in time • % supplied with faults
Indicators of sales delivery and service	• Shipments vs. first request date • Average no. of days shipments late • Response time between enquiry and first visit
Sales and Marketing	• Shipments vs. first request date • Measurements based on "staying close to the customer" • Complaints re manuals • Complaints re packaging / ease of opening • Quality of packaging materials • Customer satisfaction analysis • Price of products comparisons • Check on unsuccessful visit reports • Monitoring repeated lost sales by individual

Table 2 (Continued)

Area	Performance measurement
People	• Shipments vs. first request date • Head count control • Head count by responsibility • Mix of staff analysis\ • Mix of business analysis vs. staff personnel needs • Skilled vs. non skilled • Management numbers vs. operations staff • Own labour / outside contractor analysis • Workload activity analysis • Vacancies existing and expected • Labour turnover • Labour turnover vs. local economy • % of overtime worked to total hours worked • Absence from work • Staff morale • Cost of recruitment • Number of applicants per advert • Number of employees per advertising campaign • Staff evaluation techniques • Evaluation of staff development plans • Monitoring of specific departments, eg. Accounting • Speed of reporting to internal managers vs. HQ • Accuracy of reporting as measured by misallocations and mispostings • Queries re what reports mean • Monitoring of departments performance long term

Table 2 (Continued)

Area	Performance measurement
Research and Development	• Evaluation vs. basic RandD objectives, strategic objectives and project objectives • Product improvement against potential market acceptance • RandD against technical achievement criteria, against cost and markets • RandD priority vs. other projects • RandD vs. competition • RandD technical milestones • Analysis of market needs over the proposed product / service life of RandD outcome • Top management audit of RandD projects • Major programme milestones • Failure rates of prototypes • Control by visibility - releases, eg. definition release, design release, trial release, manufacturing release, first shipment release, RandD release
Employment	• Work place environment yardsticks • Cleanliness • Tidiness • Catering facilities vs. competition • Other facilities vs. competition

However the performance measurement should be revise in order to support the dynamic and globalizing of the world's market, the main sighs that a new performance measurement is needed are: Performance is acceptable on all dimensions except profit.

1. Customers don't buy even when prices are competitive.
2. No one notices when performance measurement reports aren't produced.
3. Managers spend significant time debating the meaning of the measures.
4. Share price is lethargic despite solid financial performance.
5. Performance measurement has no be changed in a long time
6. Corporate strategy has just been changed

In order to revise and improve performance measurement it is necessary to understand each performance model. In year 1999 Rothman has criticize about what performance measurement should be measured, claimed that measurements are only good if you know what you want to do with them. Then in the year 2001, Steffen P. Raub and Bhushan Sthapit study on linking performance measurement with knowledge management by identify strength and weakness among difference performance measurement system

Table 3 An overview of knowledge measurement approaches

	Benchmarking focus	**Performance measurement focus**	**IC measurement focus**	**Value focus**
Key ideas	Knowledge processes and enablers	Combine financial and non-financial indicators	• IC consists of human, structural and relational	• Guide and evaluate BPR efforts

Table 3 (Continued)

	Benchmarking focus	**Performance measurement focus**	**IC measurement focus**	**Value focus**
Main strength	• Rapid assessment of current practices	• Balanced perspective on performance	• Clearest focus on knowledge	• Disciplined methodology
Main weakness	• No true measurement of organizational knowledge	• No direct measurement of knowledge	• Indicators need refining	• Limited to pasts of the organization
Examples	• KMAT	• Balanced Scorecard	• Intangible Asset Monitor • Skandia's Business Navigator	• Knowledge Value Added (KVA)

Not only understanding concept of measurement approaches, defining the performance measurement has been worldwide discussed, Eckerson(2005), Director of Research, TDWI has defined ten characteristics of a good KPI as show below

1. KPIs Reflect Strategic Value Drivers : Value drivers move the organization in the right direction to achieve its stated financial and organizational goals.

2. KPIs Are Defined by “Executives” : Executives define value drivers in planning sessions which determine the short- and long-term strategic direction of the organization.

3. KPIs Cascade throughout an Organization : All KPIs are based on and tied to the overarching corporate strategy and value drivers.

4. KPIs Are Based on Corporate Standards : The only way cascading KPIs work is if an organization has established standard measurements. Only with enough top executive support can organizations overcome the political obstacles associated with standardizing definitions for commonly used KPIs.

5. KPIs Are Based on Valid Data

6. KPIs Must Be Easy to Comprehend : One problem with most KPIs is that there are too many of them. As a result, they lose their power to grab the attention of employees and modify behavior and KPIs must be understandable.

7. KPIs Are Always Relevant: If a KPI isn’t being looked at, it should probably be discarded or rewritten.

8. KPIs Provide Context : The context is provided using 1) thresholds (i.e. upper and lower ranges of acceptable performance), or 2) targets (i.e. predefined gains, such as 10% new customers per quarter), or 3) benchmarks, which can be based on industrywide measures or various methodologies, such as Six Sigma. In addition, most KPIs indicate the direction of the performance, either “up,” “down,” or “static.”

9. KPIs Empower Users : KPIs must be reinforced with incentives.

10. KPIs Lead to Positive Action : KPIs should generate the intended action—improved performance.

As shown about performance measurement in literature review show that it is a critical part in large number of process model and managing tool.

1. The Office of Mental Health Performance Measurement Model

The Office of Mental Health has provide performance management model, first conceptualized in the late 1990s, describes performance management as a continuous process enabling data-driven quality improvement. The processes include

gathering input from stakeholders on relevant areas of performance, collecting and analyzing data related to the area of performance, reporting performance results, and subsequently refining programs and services based on user feedback. Together, these processes form a continuous quality improvement cycle (Figure 10). This model continues to guide agency efforts to produce performance measures and it will be used to implement the long-term quality improvement processes needed to realize the goals and objectives in our Strategic Plan.

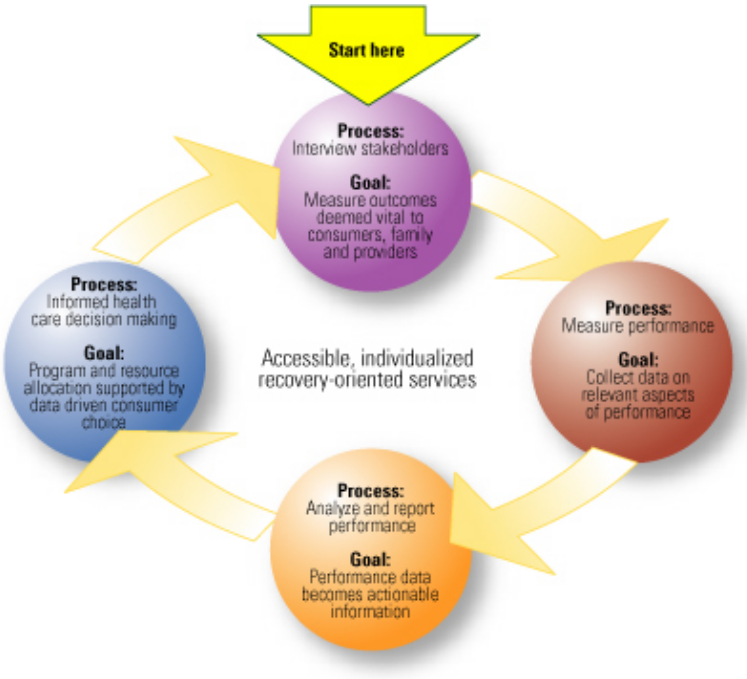

Figure 10 OHM's Performance Measurement Model

The OMH Strategic Plan guides agency executives in the development and oversight of a targeted set of management activities and in the initiation of new planning activities. This Strategic Plan reflects OMH's response to the significant public input received on the 2004-2008 Statewide Comprehensive Plan. The Major Goals and Objectives was included in the Strategic Plan. OMH has crafted, with assistance from the expanded stakeholder input efforts of 2004, a Strategic Plan

consisting of: overarching goals, objectives related to each goal, specific management strategies to advance each objective, and specific performance indicators to gauge success.

2. Knowledge Management Assessment Tool (KMAT)

The KMAT was jointly developed by Arthur Andersen and the American Productivity and Quality Center (APQC), Represents a collaborative and qualitative benchmarking tool, designed to help organizations make an initial high-level assessment of how well they manage knowledge. Completing the KMAT can direct organizations toward areas that require more attention and help identify knowledge management practices in which they excel. The tool is based on an organizational knowledge management model that illustrates how four so-called enablers (leadership, culture, technology and measurement) can be used to foster the development of organizational knowledge through a typical knowledge management process. The model, which is illustrated in Figure 11, places the major knowledge management activities and enablers together in a dynamic system.

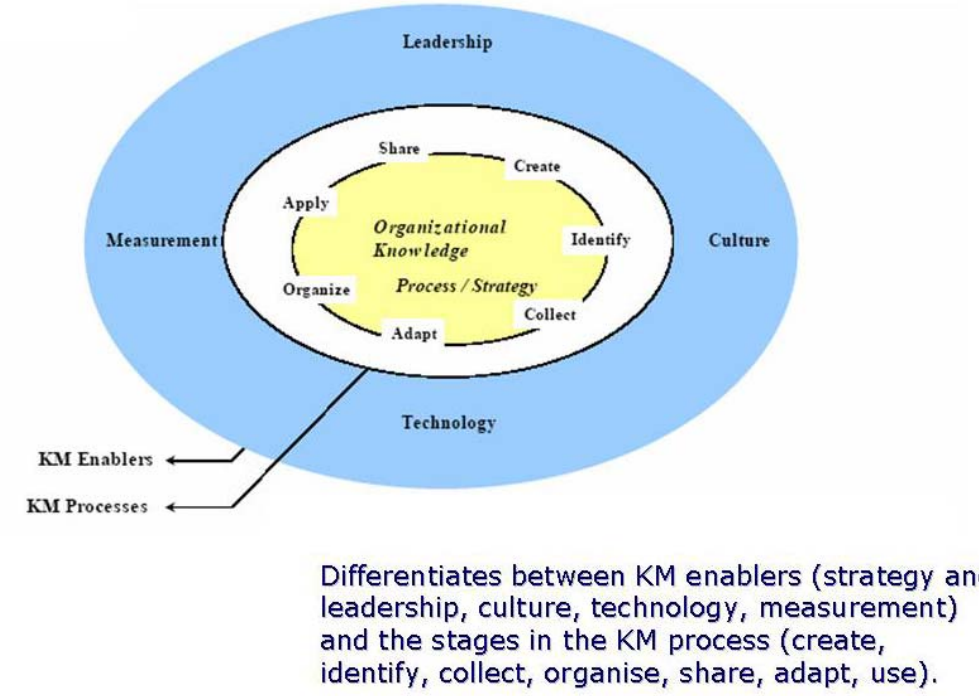

Figure 11 The KMAT – An example of the benchmarking focus

Each of the five sections of the tool – leadership, culture, technology, measurement and knowledge processes – encompasses a set of knowledge management practices. Organizations can have their performance rated and benchmarked with those of other organizations for each of 24 practices.

3 The Balanced Scorecard (BSC)

Kaplan and Norton (1992) have proposed a new measurement system that provides managers with a comprehensive framework to translate a company's str\ategic objectives into a coherent set of performance measures. The BSC has been immensely popular in the corporate arena and many organizations are already using the BSC in one form or another to measure organizational performance.

The four perspectives of the scorecard create a balance between short-term and long-term objectives, between outcomes desired and the performance drivers of those outcomes, and between hard, objective measures and softer, more subjective measures. It provides a framework or a language to communicate the mission and strategy and it uses measurement to inform employees about the drivers of current and future success.

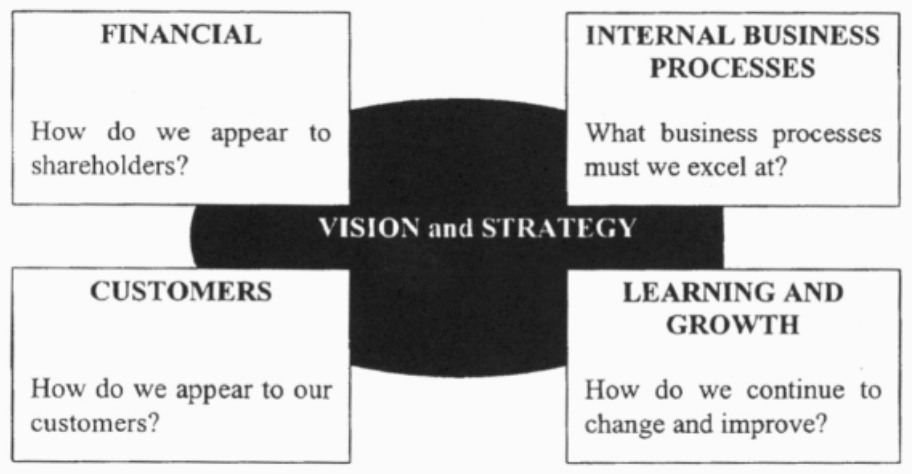

Figure 12 Balance scorecard

The BSC allows managers to look at the business from four different perspectives by asking the following questions:

1. How do customers see us? (Customer perspective)
2. What must we excel at? (Internal perspective)
3. Can we continue to improve and create value? (Innovation and learning perspective)
4. How do we look to shareholders? (Financial perspective)

In summary, the BSC translates vision and strategy of an organization into objectives and measures across a balanced set of perspectives. The scorecard includes

measures of desired outcomes as well as processes that will drive the desired outcomes for the future.

4. Performance measurement with the IC measurement focus

Intellectual capital approaches come closest to a true measurement of organizational knowledge. There are a variety of terms for describing the organizational wealth of knowledge, such as, for instance, knowledge capital, knowledge assets, intangible assets, intellectual capital, invisible assets etc. The notion of the 'organizational stock of knowledge' is often extended to include intellectual property such as patents, trademarks or copyrights. The conversion of knowledge (a raw material) into something valuable (a product of knowledge) has come to be known as an intellectual asset or intellectual capital. According to Klein and Prusak (1994) "we can define intellectual capital operationally as intellectual material that has been formalized, captured and leveraged to produce a higher valued asset."

Several classification systems have been proposed in order to organize the different components of intellectual capital into useful categories. Many agree with Sveiby (1997) who suggests that IC consists of three major elements:

4.1 Human capital - which includes the know-how, capabilities, skills, and expertise of organization members

4.2 Structural capital (or Organizational capital) - which includes the systems, networks, policies, culture, distribution channels, and other "organizational capabilities" developed to meet market requirements as well as intellectual property

4.3 Relational capital (or Customer capital) - which includes the connections of outsiders with the organization, such as customer loyalty, market share, rate of new customer acquisition etc. Another, slightly different distinction, has been suggestedby Brooking (1996). According to her, intellectual capital is composed of the following assets

4.4 Market assets (or customer assets) - all market-related intangibles, including brands, customers, customer loyalty, distribution channels, backlog, etc.

4.5 Human-centered assets - skills and expertise, problem-solving abilities, leadership styles and abilities and everything that is embodied by the employees

4.6 Intellectual properly assets - know-how, trademarks and patents, and any intangible that can be protected by copyright

4.7 Infrastructure assets - all the technologies, processes and methodologies enabling a company to function.

Stewart (1997) summarizes a number of methods for measuring IC. He divides his overview in measures that attempt to capture IC "as a whole" and those that focus on its components. Measures of the whole include

4.8 Market-to-book ratios - which simply compare the difference between published historical cost book value and the market value of the firm.

4.9 Tobin‘s Q - which relates the market value of the company to the replacement cost of its fixed assets and defines the difference as the value of IC and

4.10 Calculated intangible value (CIV) - which computes the value of the intangible assets by a comparison between the company's performance and an average competitor that has similar tangible assets

The so-called 'Konrad track' is at the origin of several different knowledge measurement efforts. Its followers consist of managers who use primarily non - financial indicators to monitor and publicly present their intangible assets. The 'Konrad track' is based on a concept originally brought forward by a working group consisting of members from several Swedish knowledge companies, the so-called 'Konrad Group'. The results of this work have been summarized by Sveiby (1988, 1989). Based on the concept of the Knowledge Organization (Sveiby, 1986) the Konrad track outlines a theoretical framework for public reporting of intangible assets and has coined the concepts 'Structural Capital' and 'Human/Individual Capital'. Its principles have been further developed in practice by companies like WM-data,

Skandia and KREAB and via Skandia' s 'Business Navigator' they later found their way into the USA and Canada. We will briefly illustrate two of the most popular applications of IC-based indicator systems for knowledge measurement.

5. The Intangible Asset Monitor (IAM)

Sveiby, who pioneered the intangible asset monitor, started its development based on the observation that in knowledge-intensive companies the value of intangible assets far exceeds the value of tangible assets and that this gap increases continuously. According to him, intangible or invisible assets can be categorized as being of three types:

External structure - refers to assets that depend on relationships outside your organization, for example customer and supplier relationships and the organization's image

Internal structure - includes patents, concepts, manuals, systems processes, models and computer and administrative systems that are part of the organization

Employee competence - refers to the capacity (education, skills, experience, energy and attitudes) of employees to act in a wide variety of situations

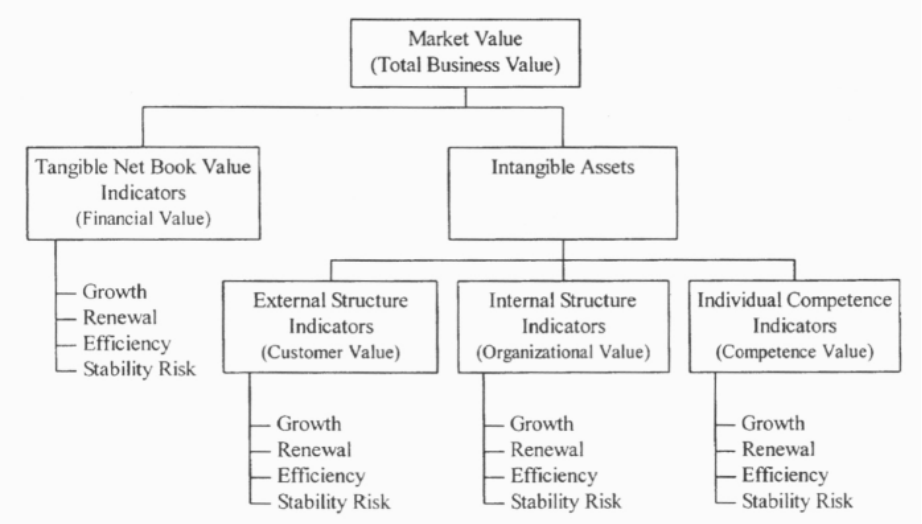

Figure 13 The Intangible Asset Monitor

The indicators that Sveiby believes to be more relevant, are the ones that are able to tell whether the intangible assets of a company are growing or not, whether they are being renewed, how efficiently they are utilized and how stable they are. Hence there are the four dimensions of growth, renewal, efficiency and stability risk in the IAM diagram. Moreover, different values are assigned to each of the four assets, which determine the Financial Value, Customer Value, Organizational Value and Competence Value respectively.

6. Skandia's 'Business Navigator'

Skandia AFS, a subsidiary of the Skandia insurance group, has chosen to turn the measurement of intangible assets into a tool for competitive differentiation. The company actively and publicly promotes its 'Business Navigator', which incorporates a large number of key indicators and is one of the driving forces in the intellectual capital movement. The report on its intangible assets issued by Skandia AFS has attracted international attention. It is the result of a program headed by the company's 'Director for Intellectual Capital', Leif Edvinsson. This program is based on the structure of concepts presented in Sveiby's Invisible Balance Sheet. Skandia

has taken it several steps further by incorporating a form of presentation similar to the Balanced Scorecard and applying it to several areas.

The Skandia Navigator is a future-oriented business-planning model providing a more balanced overall picture of operations. It represents a balance between the Past (the Financial Focus), the Present (the Customer, Human and Process Foci) and the Future (the Renewal and Development Focus). The Navigator allows the breakdown of Skandia's operational vision and objectives into concrete factors that can be coupled to an individual's own work. Skandia believes the investments made in renewing and developing the Human, Customer and Process capital drive financial success. The Navigator visualizes this belief and forms the basis for business planning processes. Skandia's Business Navigator incorporates a total of about thirty key indicators in various areas, which are monitored internally on a yearly basis.

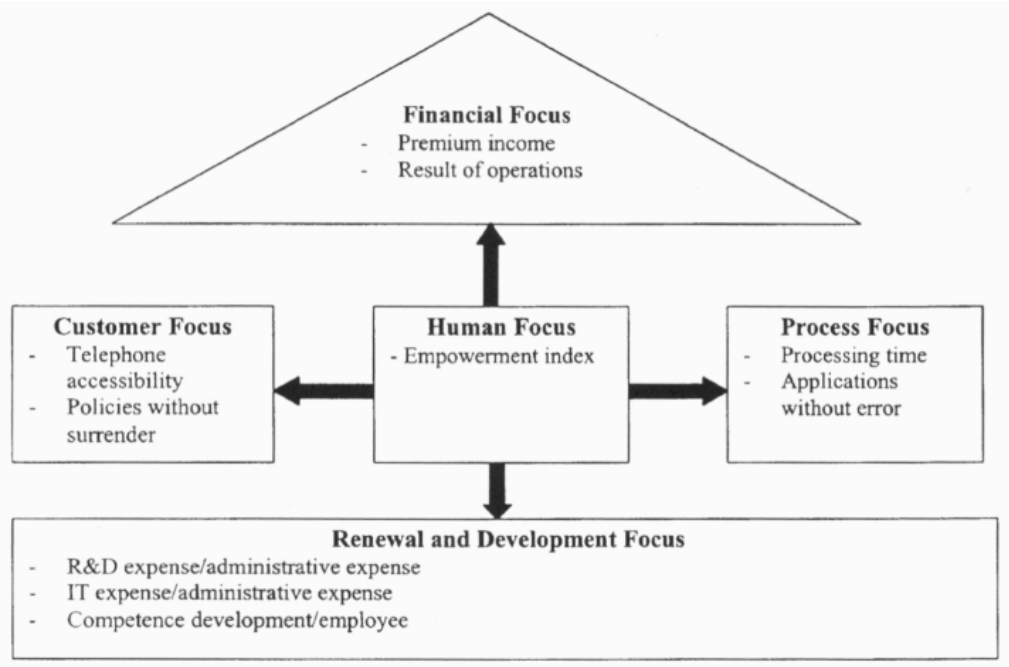

Figure 14 Skandia's Business Navigator with selected indicators

7 Performance measurement with Knowledge Value Added (KVA)

KVA is a framework for measuring the value of corporate knowledge assets. The concept addresses one of the weaknesses of traditional cost accounting, namely that the latter does not address the measurement of value being generated by a specific process. KVA was created in response to the business process reengineering efforts of many organizations, which have mostly focused on cutting costs, rather than delivering value. It is designed to facilitate the analysis of value created through business process reengineering. KVA is based on the assumption that the value added by a process is the change which occurs between its input and its output and this change is caused by the knowledge value that is added in the input to output process.

The KVA methodology firstly identifies the core processes and sub-process within the activity of interest. It then allows the individual to quantify the value of each core process and its sub-processes by looking at the outputs and the inputs. Knowledge Value Added uses revenue as a surrogate for value. Allocated revenues are then divided by the costs incurred in using the knowledge required to produce the core process outputs. Since revenues are being matched with the costs incurred in generating those revenues, this methodology is consistent with the matching principle of generally accepted accounting principles (GAAP).

Instead of viewing KVA as a separate and different method, it should be looked upon as a method that complements traditional cost accounting practices. The objective of cost accounting is to determine the cost of the processing of a given product, service, or project (cost object); whereas the objective of KVA is to determine the value of each process exercised in generating a given product, service, or project. So if cost accounting is profitability-focused, KVA is focused on determining the value that is being generated.

The Knowledge Value Added (KVA) approach emphasizes Business Process Auditing (BPA), a tool that allows managers to focus on creating value, rather than just cutting cost. A key goal of business process reengineering should be twofold: to

increase process capacity while at the same time increasing demand for a product or service. There are three approaches to BPA (Learning Time Approach, Process Description Approach, Binary Query Approach) that use different methods of measuring the amount of knowledge contained in a process. When possible, a KVA team should use as many of these approaches as possible and compare the results to validate their findings.

Knowledge Value Added provides an objective method for measuring and comparing the amount of value added by a given component process before and after reengineering efforts. The seven-step methodology measures processes in terms of their Return on Process (ROP) and Return on Knowledge (ROK):

1. Identify the compound process and its component processes
2. Create the shortest description possible for each component process, using the same language
3. Count the number of process language "words" in the component output descriptions
4. Designate a time period long enough to capture a representative sample of the company's final product/service outputs following common statistical sampling practices
5. Add up the total amount of K-complexity ("words") produced by each component during the designated time period
6. Calculate the total cost to produce the output for each component
7. Compute the ROP/ROK for each component process

The essential benefit of KVA is that it provides managers with a relatively objective means of determining where and what to re-engineer in business processes. It also allows a much more refined quantification of the success of BPR efforts.

Additionally a process model of manufacturing strategy by Kim and Arnold (1996) has identified performance process to measure action plans which set from business strategy. Takala, Kamdee, Hirvela and Kyllonen (2006) design a model

called Scenario-based strategic planning which use performance measurement as a tool to control strategy implementation process and feed back result from bottom to top. The requirement 8 of ISO 9001:2000 stresses a strong foundation of a management process for an effective quality management system (Traver and Will cock,2006). Even in businesses and nonprofit organizations, importance of performance measurement did not decreased as in prominence award like The Baldrige Criteria for Performance Excellence (2008), performance measurement and analysis is main criteria for selecting winner for this award. Knowledge management process is another model that used measurement as a tool called enabler to foster the development (P. Raub and Sthapit, 2001). Famous process like Benchmarking use performance measurement to be part of process also (Camp, 2001). By measuring and monitoring performance then management can take appropriate action in a timely fashion is one solution to reduce costs and becomes more efficient (Rao, 2006). In contrary selection of the wrong business performance can result in counterproductive and suboptimal results.

MATERIALS AND METHODS

This chapter provides an overview of the research methodology including the analysis approaches, and a concept used to test the applicability of the models.

Materials

1. Survey instruments
2. Personal Computer
3. Microsoft Office Application
4. Statistical Package for the Social Sciences (SPSS)

Methods

Scope of Study

We assume the following conditions:

1. The research will be done for manufacturing with differ company profile like industry type, number of employee, business year of experience, ownership type and customer type
2. The circumstances to be determined by this research will be based productivity importance level linking with industry type, number of employee, business year of experience, ownership type and customer type
3. In this study, company profile indicate key performance objectives for an organization to achieve successful results

The obtained surveyed data were analyzed using General linear model (GLM)

Research Planning Process

1. Identification of the problem
2. Assessment of value of the research process
3. Development of the research proposal
4. Development of the research design
5. Determinations of analytical procedures
6. Evaluation of results
7. Final report including results, evaluation and recommendations

Quantitative analysis

1. Questionnaire data is based on the survey developed by Phusavat and Kanchana (2007), the focus of productivity is primary on production and inventory management processes.
2. Define possible circumstances by one factor and pair-wise factor analysis
3. Define testing hypothesis from all possible circumstances

One factor Hypothesis

H_{01} : Industry type has no impact on the perceived important level of productivity.

H_1 : Industry type impacts the perceived important level of productivity.

H_{02} : Number of employee has no impact on the perceived important level of productivity.

H_2 : Number of employee impacts the perceived important level of productivity.

H_{03} : Business year has no impact on the perceived important level of productivity.

H_3 : Business year impacts the perceived important level of productivity.

H_{04} : Ownership has no impact on the perceived important level of productivity.

H_4 : Ownership impacts the perceived important level of productivity.

H_{05} : Customer target has no impact on the perceived important level of productivity.

H_5 : Customer target the perceived important level of productivity.

Pair-wise, two factors Hypothesis

H_{06} : Within the automotive industry, the number of employee has no impact on the perceived important level of productivity.

H_{6} : Within the automotive industry, the number of employee impacts the perceived important level of productivity.

H_{07} : Within the automotive industry, the business year has no impact on the perceived important level of productivity.

H_{7} : Within the automotive industry, the business year impacts the perceived important level of productivity.

H_{08} : Within the automotive industry, the ownership has no impact on the perceived important level of productivity.

H_{8} : Within the automotive industry, the ownership impacts the perceived important level of productivity.

H_{09} : Within the automotive industry, the customer target has no impact on the perceived important level of productivity.

H_{9} : Within the automotive industry, the customer target impacts the perceived important level of productivity.

H_{010} : Within the electronics industry, the number of employee has no impact on the perceived important level of productivity.

H_{10} : Within the electronics industry, the number of employee impacts the perceived important level of productivity.

H_{011} : Within the electronics industry, the business year has no impact on the perceived important level of productivity.

H_{11} : Within the electronics industry, the business year impacts the perceived important level of productivity.

H_{012} : Within the electronic industry, the ownership type has no impact on the perceived important level of productivity.

H_{12} : Within the electronic industry, the ownership type impacts the perceived important level of productivity.

H_{013} : Within the electronic industry, the customer target has no impact on the perceived important level of productivity.

H_{13} : Within the electronic industry, the customer target impacts the perceived important level of productivity.

H_{014} : Within the food industry, the number of employee has no impact on the perceived important level of productivity.

H_{14} : Within the food industry, the number of employee impacts the perceived important level of productivity.

H_{015} : Within the food industry, the business year has no impact on the perceived important level of productivity.

H_{15} : Within the food industry, the business year impacts the perceived important level of productivity.

H_{016} : Within the food industry, the ownership type has no impact on the perceived important level of productivity.

H_{16} : Within the food industry, the ownership type impacts the perceived important level of productivity.

H_{017} : Within the food industry, the customer target has no impact on the perceived important level of productivity.

H_{17} : Within the food industry, the customer target impacts the perceived important level of productivity.

H_{018} : Within the petrochemical industry, the number of employee has no impact on the perceived important level of productivity.

H_{18} : Within the petrochemical industry, the number of employee impacts the perceived important level of productivity.

H_{019} : Within the petrochemical industry, the business year has no impact on the perceived important level of productivity.

H_{19} : Within the petrochemical industry, the business year impacts the perceived important level of productivity.

H_{020} : Within the petrochemical industry, the ownership type has no impact on the perceived important level of productivity.

H_{20} : Within the petrochemical industry, the ownership type impacts the perceived important level of productivity.

H_{021} : Within the petrochemical industry, the customer target has no impact on the perceived important level of productivity.

H_{21} : Within the petrochemical industry, the customer target impacts the perceived important level of productivity.

H_{022} : Within the number of employee less than 50, the business year has no impact on the perceived important level of productivity.

H_{22} : Within the number of employee less than 50, the business year impacts the perceived important level of productivity.

H_{023} : Within the number of employee less than 50, the ownership has no impact on the perceived important level of productivity.

H_{23} : Within the number of employee less than 50, the ownership impacts the perceived important level of productivity.

H_{024} : Within the number of employee less than 50, the customer target has no impact on the perceived important level of productivity.

H_{24} : Within the number of employee less than 50, the customer target impacts the perceived important level of productivity.

H_{025} : Within the number of employee 50 to 100, the business year has no impact on the perceived important level of productivity.

H_{25} : Within the number of employee 50 to 100, the business year impacts the perceived important level of productivity.

H_{026} : Within the number of employee 50 to 100, the ownership has no impact on the perceived important level of productivity.

H_{26} : Within the number of employee 50 to 100, the ownership impacts the perceived important level of productivity.

H_{027} : Within the number of employee 50 to 100, the customer target has no impact on the perceived important level of productivity.

H_{27} : Within the number of employee 50 to 100, the customer target impacts the perceived important level of productivity.

H_{028} : Within the number of employee 101 to 200, the business year has no impact on the perceived important level of productivity.

H_{28} : Within the number of employee 101 to 200, the business year impacts the perceived important level of productivity.

H_{029} : Within the number of employee 101 to 200, the ownership has no impact on the perceived important level of productivity.

H_{29} : Within the number of employee 101 to 200, the ownership impacts the perceived important level of productivity.

H_{030} : Within the number of employee 101 to 200, the customer target has no impact on the perceived important level of productivity.

H_{30} : Within the number of employee 101 to 200, the customer target impacts the perceived important level of productivity.

H_{031} : Within the number of employee 201 to 500, the business year has no impact on the perceived important level of productivity.

H_{31} : Within the number of employee 201 to 500, the business year impacts the perceived important level of productivity.

H_{032} : Within the number of employee 201 to 500, the ownership has no impact on the perceived important level of productivity.

H_{32} : Within the number of employee 201 to 500, the ownership impacts the perceived important level of productivity.

H_{033} : Within the number of employee 201 to 500, the customer target has no impact on the perceived important level of productivity.

H_{33} : Within the number of employee 201 to 500, the customer target impacts the perceived important level of productivity.

H_{034} : Within the number of employee greater than 500, the business year has no impact on the perceived important level of productivity.

H_{34} : Within the number of employee greater than 500, the business year impacts the perceived important level of productivity.

H_{035} : Within the number of employee greater than 500, the ownership has no impact on the perceived important level of productivity.

H_{35} : Within the number of employee greater than 500, the ownership impacts the perceived important level of productivity.

H_{036} : Within the number of employee greater than 500, the customer target has no impact on the perceived important level of productivity.

H_{36} : Within the number of employee greater than 500, the customer target impacts the perceived important level of productivity.

H_{037} : Within the business year less than 5, the customer target has no impact on the perceived important level of productivity.

H_{37} : Within the business year less than 5, the customer target impacts the perceived important level of productivity.

H_{038} : Within the business year less than 5, the ownership has no impact on the perceived important level of productivity.

H_{38} : Within the business year less than 5, the ownership impacts the perceived important level of productivity.

H_{039} : Within the business year 5 to 10, the ownership has no impact on the perceived important level of productivity.

H_{39} : Within the business year 5 to 10, the ownership impacts the perceived important level of productivity.

H_{040} : Within the business year 5 to 10, the customer target has no impact on the perceived important level of productivity.

H_{40} : Within the business year 5 to 10, the customer target impacts the perceived important level of productivity.

H_{041} : Within the business year 11 to 15, the ownership has no impact on the perceived important level of productivity.

H_{41} : Within the business year 11 to 15, the ownership impacts the perceived important level of productivity.

H_{042} : Within the business year 11 to 15, the customer target has no impact on the perceived important level of productivity.

H_{42} : Within the business year 11 to 15, the customer target impacts the perceived important level of productivity.

H_{043} : Within the business year 16 to 20, the ownership has no impact on the perceived important level of productivity.

H_{43} : Within the business year 16 to 20, the ownership impacts the perceived important level of productivity.

H_{044} : Within the business year 16 to 20, the customer target has no impact on the perceived important level of productivity.

H_{44} : Within the business year 16 to 20, the customer target impacts the perceived important level of productivity.

H_{045} : Within the business year 21 to 25, the ownership has no impact on the perceived important level of productivity.

H_{45} : Within the business year 21 to 25, the ownership impacts the perceived important level of productivity.

H_{046} : Within the business year 21 to 25, the customer target has no impact on the perceived important level of productivity.

H_{46} : Within the business year 21 to 25, the customer target impacts the perceived important level of productivity.

H_{047} : Within the business year greater than 25, the ownership has no impact on the perceived important level of productivity.

H_{47} : Within the business year greater than 25, the ownership impacts the perceived important level of productivity.

H_{048} : Within the business year greater than 25, the customer target has no impact on the perceived important level of productivity.

H_{48} : Within the business year greater than 25, the customer target impacts the perceived important level of productivity.

H_{049} : Within the wholly local company, the customer target has no impact on the perceived important level of productivity.

H_{49} : Within the wholly local company, the customer target impacts the perceived important level of productivity.

H_{050} : Within the joint venture company, the customer target has no impact on the perceived important level of productivity.

H_{50} : Within the joint venture company, the customer target impacts the perceived important level of productivity.

4. Perceived productivity importance score will be compared with other business performance in order to gain rank of productivity performance.

5. The rank will by classified into 3 classes. : (1) must-measure or the most importance, (2) require-to-measure, and (3) should-measure First of all, the “must-measure” level implies that productivity information has to be made for top executives during their performance reviews or top twenty of business performance area— reflecting the first piece of information to be examined before other interested

business areas with rank at top 20 percent. Secondly, the "require-to-measure" level indicates that productivity information is necessary to ensure an effective management process— productivity information to be reviewed simultaneously with others business areas with rank at top 20 to 50 percent. Thirdly, the "should-measure" level suggests that productivity information is expected to be reviewed after examining information from other business areas with rat at lower than top 50 percent.

6. Apply GLM or General Linear Model to test all of the hypothesis
7. Sensitivity analysis was applied to set significant level to the circumstances

General Linear Mode (or the Correlation Analysis) represents a primary technique. See Figure 15.

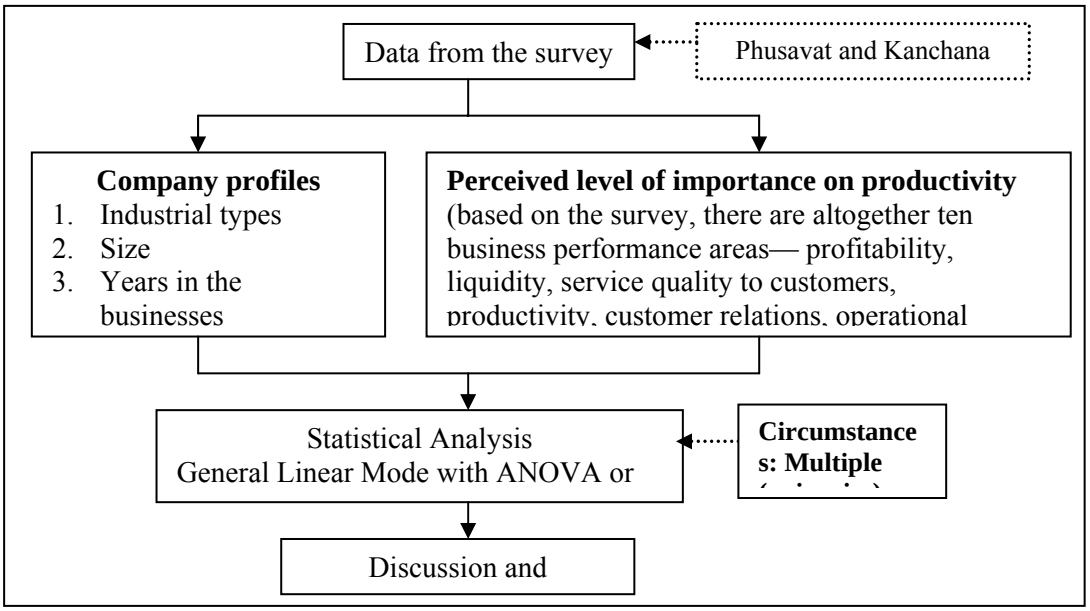

Figure 15 Research methodology

RESULTS AND DISCUSSION

Result

Survey data

The survey is distributed to 100 FTI-member companies in 2007.Forty survey are returned. Among them, 32.5% of returned survey is Automotive and auto parts industries, 27.50% of returned survey is Food industries, 22.50% of returned survey is Electrical and electronics industries and the other 17.50% is Petrochemical industries. Most of company that returns survey has number of employees more than 500 and business year more than 25 years. More than 75% is joint-ventureship and have domestic market as a customer target.

Table 4 Survey Profile from 40 Participating Firms

Parameters		Total	
		Frequency	**Percentage (%)**
Industrial Type			
Automotive and auto parts		13	32.50
Electrical and electronics		9	22.50
Food		11	27.50
Petrochemical		7	17.50
	Total	**40**	**100.00**
Number of Employees			
<50		3	7.50
50 -100		1	2.50
101-200		8	20.00
201-500		5	12.50
>500		23	57.50
	Total	**40**	**100.00**

Table 4 (Continued)

Parameters		Total	
		Frequency	**Percentage (%)**
Number of Years in Business			
< 5		3	7.50
5-10		4	10.00
11-15		1	2.50
16-20		4	10.00
21-25		2	5.00
>25		26	65.00
	Total	**40**	**100.00**
Ownership			
Wholly local		30	75.00
Joint Venture		10	25.00
	Total	**40**	**100.00**
Customer Target			
Domestic market		31	77.50
International market		9	22.50
	Total	**40**	**100.00**

The data of productivity importance level of each company will be ranked with other business performance and classify into classification of must-measure, require-to measure and should measure according to definition

Table 5 Productivity score, ranking when compare with others business performances and classification.

No.	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	5.00	1	1	Must measure
2	4.75	2	1	Must measure
3	4.25	4	2	Require-to-measure
4	4.75	3	2	Require-to-measure
5	3.00	7	3	Should measure
6	3.25	9	3	Should measure
7	4.50	2	1	Must measure
8	5.00	1	1	Must measure
9	4.50	3	2	Require-to-measure
10	5.00	1	1	Must measure
11	2.75	10	3	Should measure
12	4.00	3	2	Require-to-measure
13	4.50	5	2	Require-to-measure
14	4.50	1	1	Must measure
15	3.00	5	2	Require-to-measure
16	4.75	4	2	Require-to-measure
17	3.50	6	3	Should measure
18	3.00	4	3	Should measure
19	4.00	2	1	Must measure
20	4.00	3	2	Require-to-measure
21	5.00	1	1	Must measure
22	4.25	9	3	Should measure
23	4.50	2	1	Must measure
24	5.00	1	1	Must measure
25	4.00	1	1	Must measure
26	3.25	3	2	Require-to-measure
27	5.00	1	1	Must measure
28	5.00	1	1	Must measure
29	4.50	1	1	Must measure
30	4.50	1	1	Must measure
31	4.75	3	2	Require-to-measure
32	4.75	3	2	Require-to-measure
33	4.50	1	1	Must measure
34	3.00	3	2	Require-to-measure
35	4.25	9	3	Should measure
36	4.25	6	3	Should measure
37	4.25	6	3	Should measure
38	1.75	10	3	Should measure
39	4.00	2	1	Must measure
40	5.00	1	1	Must measure

The data is the importance weight on productivity measurement by respondent which give value between 1 (Last importance) to 5 (Most importance) show average value is 4.19 while range is from 1.75 to 5. Ranking value result show that 32.5% of all respondent give the productivity measurement as the performance that must measure or top 20% of performance measurement ranking in the organization, 45% of all respondent give the productivity measurement as the performance that should measure or top 50% of all performance measurement ranking in the organization and another 22.5% give the importance to other business performance measurement.

Table 6 Result from classification for productivity measurement

Topic	Total		Must-measure		Require-to-measure		Should-measure	
	Frequency	Percentage of all data (40)	Frequency	Percentage of each topic data	Frequency	Percentage of each topic data	Frequency	Percentage of each topic data
Industry type								
Automotive	13	33%	5	38%	5	38%	3	23%
Electrical	9	23%	3	33%	5	56%	1	11%
Food	11	28%	1	9%	6	55%	4	36%
Petrochemical	7	18%	4	57%	2	29%	1	14%
Total	40	100%	13	33%	18	45%	9	23%
Number of Employee								
<50	3	8%	2	67%	1	33%	0	0%
50-100	1	3%	1	100%	0	0%	0	0%
101-200	8	20%	3	38%	4	50%	1	13%
201-500	5	13%	1	20%	4	80%	0	0%
>500	23	58%	6	26%	9	39%	8	35%
Total	40	100%	13	33%	18	45%	9	23%

Table 6 (Continued)

Topic	Total		Must-measure		Require-to-measure		Should-measure	
	Frequency	Percentage of all data (40)	Frequency	Percentage of each topic data	Frequency	Percentage of each topic data	Frequency	Percentage of each topic data
Business year								
<5	3	8%	2	67%	1	33%	0	0%
5-10	4	10%	2	50%	1	25%	1	25%
11-15	1	3%	0	0%	1	100%	0	0%
16-20	4	10%	1	25%	3	75%	0	0%
21-25	2	5%	1	50%	0	0%	1	50%
>25	26	65%	7	27%	12	46%	7	27%
Total	40	100%	13	33%	18	45%	9	23%
Ownership								
Wholly local own	30	75%	7	23%	16	53%	7	23%
Joint venture	10	25%	6	60%	2	20%	2	20%
Total	108	270%	13	33%	18	45%	9	23%
Customer Target								
Domestic	31	78%	10	32%	15	48%	6	19%
International	9	23%	3	33%	3	33%	3	33%
Total	188	470%	13	33%	18	45%	9	23%
Number of data			**13**	**33%**	**18**	**45%**	**9**	**23%**

The result from survey further subjected to the General Linear Model to test the hypothesis by finding the correlation between company profile and productivity ranking, first we consider one factor of company profile which impact to productivity importance level

Test hypothesis for one factor

1. Industries type factor,

H_{01}: Industry type has no impact on the perceived important level of productivity.

H_1: Industry type impacts the perceived important level of productivity.

Table 7 Details on company profiles for industry type factor

No.	Industry type	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Automotive	5.00	1	1	Must measure
2	Electrical	4.75	2	1	Must measure
3	Food	4.25	4	2	Require-to-measure
4	Automotive	4.75	3	2	Require-to-measure
5	Food	3.00	7	3	Should measure
6	Food	3.25	9	3	Should measure
7	Food	4.50	2	1	Must measure
8	Automotive	5.00	1	1	Must measure
9	Petrochemical	4.50	3	2	Require-to-measure
10	Petrochemical	5.00	1	1	Must measure
11	Electrical	2.75	10	3	Should measure
12	Petrochemical	4.00	3	2	Require-to-measure
13	Electrical	4.50	5	2	Require-to-measure
14	Petrochemical	4.50	1	1	Must measure
15	Automotive	3.00	5	2	Require-to-measure
16	Food	4.75	4	2	Require-to-measure
17	Food	3.50	6	3	Should measure
18	Electrical	3.00	4	3	Should measure
19	Food	4.00	2	1	Must measure
20	Food	4.00	3	2	Require-to-measure
21	Electrical	5.00	1	1	Must measure
22	Automotive	4.25	9	3	Should measure
23	Food	4.50	2	1	Must measure
24	Food	5.00	1	1	Must measure
25	Petrochemical	4.00	1	1	Must measure

Table 7 (Continued)

No.	Industry type	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
26	Automotive	3.25	3.00	2.00	Require-to-measure
27	Electrical	5.00	1	1	Must measure
28	Electrical	5.00	1	1	Must measure
29	Automotive	4.50	1	1	Must measure
30	Automotive	4.50	1	1	Must measure
31	Automotive	4.75	3	2	Require-to-measure
32	Electrical	4.75	3	2	Require-to-measure
33	Petrochemical	4.50	1	1	Must measure
34	Electrical	3.00	3	2	Require-to-measure
35	Automotive	4.25	9	3	Should measure
36	Food	4.25	6	3	Should measure
37	Petrochemical	4.25	6	3	Should measure
38	Automotive	1.75	10	3	Should measure
39	Automotive	4.00	2	1	Must measure
40	Automotive	5.00	1	1	Must measure

By applying the General Linear Mode to the results from Table B.1, the p-value is 0.764. This indicates the null hypothesis cannot be rejected. In other words, different types of industry have no impact on the perceived level of importance on productivity information. See Figure 16

```
Source  DF   Seq SS   Adj SS  Adj MS     F      P
IND      3   0.8225   0.8225  0.2742  0.39  0.764
Error   36  25.5775  25.5775  0.7105
Total   39  26.4000

S = 0.842904   R-Sq = 3.12%   R-Sq(adj) = 0.00%
```

Figure 16 Results from the Statistical Analysis for industry type factor

From Table 6: The average number from the level of importance for every industry is 2.00. As a result, productivity information is classified as require to measure

2. Number of employee factor,

H_{02}: Number of employee has no impact on the perceived important level of productivity.

H_2: Number of employee impacts the perceived important level of productivity.

Table 8 Details on company profiles for number of employee factor

No.	Number of employee	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of import ance	Classification
1	Greater than 500	5.00	1	1	Must measure
2	Greater than 500	4.75	2	1	Must measure
3	Greater than 500	4.25	4	2	Require-to-measure
4	Greater than 500	4.75	3	2	Require-to-measure
5	Greater than 500	3.00	7	3	Should measure
6	Greater than 500	3.25	9	3	Should measure
7	Greater than 500	4.50	2	1	Must measure
8	Greater than 500	5.00	1	1	Must measure
9	Less than 50	4.50	3	2	Require-to-measure
10	50 to 100	5.00	1	1	Must measure
11	Greater than 500	2.75	10	3	Should measure
12	101 to 200	4.00	3	2	Require-to-measure
13	201 to 500	4.50	5	2	Require-to-measure
14	Less than 50	4.50	1	1	Must measure
15	Greater than 500	3.00	5	2	Require-to-measure
16	Greater than 500	4.75	4	2	Require-to-measure
17	Greater than 500	3.50	6	3	Should measure
18	101 to 200	3.00	4	3	Should measure
19	201 to 500	4.00	2	1	Must measure
20	201 to 500	4.00	3	2	Require-to-measure
21	Greater than 500	5.00	1	1	Must measure
22	Greater than 500	4.25	9	3	Should measure

Table 8 (Continued)

No.	Number of employee	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of import ance	Classification
23	101 to 200	4.50	2	1	Must measure
24	201 to 500	5.00	1	1	Must measure
25	101 to 200	4.00	1	1	Must measure
26	201 to 500	3.25	3	2	Require-to-measure
27	101 to 200	5.00	1	1	Must measure
28	Greater than 500	5.00	1	1	Must measure
29	Greater than 500	4.50	1	1	Must measure
30	Greater than 500	4.50	1	1	Must measure
31	Greater than 500	4.75	3	2	Require-to-measure
32	Greater than 500	4.75	3	2	Require-to-measure
33	Less than 50	4.50	2	1	Must measure
34	101 to 200	3.00	3	2	Require-to-measure
35	Greater than 500	4.25	9	3	Should measure
36	Greater than 500	4.25	6	3	Should measure
37	Greater than 500	4.25	6	3	Should measure
38	101 to 200	1.75	10	3	Should measure
39	Greater than 500	4.00	2	1	Must measure
40	101 to 200	5.00	1	1	Must measure

By applying the General Linear Mode to the results from Table B.1, the p-value is 0.078. This indicates the null hypothesis can be rejected. In other words, different number of employee has impact on the perceived level of importance on productivity information. See Figure 17

```
Analysis of Variance for Classification_1, using Adjusted SS for Tests

Source  DF   Seq SS   Adj SS  Adj MS     F      P
EMP_1    4   4.9286   4.9286  1.2321  2.41  0.078
Error   23  11.7500  11.7500  0.5109
Total   27  16.6786

S = 0.714751   R-Sq = 29.55%   R-Sq(adj) = 17.30%
```

Figure17 Results from the Statistical Analysis for number of employee factor

From Table 8: The average number from the level of importance for number of employee less than 100 is 1.0; productivity information is classified as must-measure. The average number for number of employee greater than 100 is 1.89; productivity information is classified as require to measure.

3. Business year factor,

H_{03}: Business year has no impact on the perceived important level of productivity.

H_3: Business year impacts the perceived important level of productivity.

Table 9 Details on company profiles for business year factor

No.	Business year	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Greater than 25	5.00	1	1	Must measure
2	Greater than 25	4.75	2	1	Must measure
3	Greater than 25	4.25	4	2	Require-to-measure
4	Greater than 25	4.75	3	2	Require-to-measure
5	Greater than 25	3.00	7	3	Should measure
6	Greater than 25	3.25	9	3	Should measure
7	Greater than 25	4.50	2	1	Must measure
8	5 to 10	5.00	1	1	Must measure
9	11 to 15	4.50	3	2	Require-to-measure
10	Greater than 25	5.00	1	1	Must measure
11	Greater than 25	2.75	10	3	Should measure
12	16 to 20	4.00	3	2	Require-to-measure
13	Less than 5	4.50	5	2	Require-to-measure
14	Less than 5	4.50	1	1	Must measure
15	Greater than 25	3.00	5	2	Require-to-measure
16	16 to 20	4.75	4	2	Require-to-measure
17	Greater than 25	3.50	6	3	Should measure
18	Greater than 25	3.00	4	3	Should measure
19	Greater than 25	4.00	2	1	Must measure
20	Greater than 25	4.00	3	2	Require-to-measure
21	16 to 20	5.00	1	1	Must measure

Table 9 (Continued)

No.	Business year	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
22	Greater than 25	4.25	9	3	Should measure
23	Greater than 25	4.50	2	1	Must measure
24	5 to 10	5.00	1	1	Must measure
25	21 to 25	4.00	1	1	Must measure
26	16 to 20	3.25	3	2	Require-to-measure
27	Greater than 25	5.00	1	1	Must measure
28	Greater than 25	5.00	1	1	Must measure
29	Greater than 25	4.50	1	1	Must measure
30	Greater than 25	4.50	1	1	Must measure
31	Greater than 25	4.75	3	2	Require-to-measure
32	Greater than 25	4.75	3	2	Require-to-measure
33	Less than 5	4.50	1	1	Must measure
34	Greater than 25	3.00	3	2	Require-to-measure
35	Greater than 25	4.25	9	3	Should measure
36	21 to 25	4.25	6	3	Should measure
37	Greater than 25	4.25	6	3	Should measure
38	5 to 10	1.75	10	3	Should measure
39	5 to 10	4.00	2	1	Must measure
40	Greater than 25	5.00	1	1	Must measure

By applying the General Linear Mode to the results from Table B.1, the p-value is 0.341. This indicates the null hypothesis cannot be rejected. In other words, different business year have no impact on the perceived level of importance on productivity information. See Figure18

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF   Seq SS   Adj SS  Adj MS     F      P
BY       5   3.8955   3.8955  0.7791  1.18  0.341
Error   34  22.5045  22.5045  0.6619
Total   39  26.4000

S = 0.813571   R-Sq = 14.76%   R-Sq(adj) = 2.22%
```

Figure 18 Results from the Statistical Analysis for business year factor

From Table 9: The average number from the level of importance for all business year is 2.00. As a result, productivity information is classified as require to measure

4. Ownership factor,

H_{04}: Ownership has no impact on the perceived important level of productivity.

H_4: Ownership impacts the perceived important level of productivity.

Table 10 Details on company profiles for ownership factor

No.	Ownership	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Joint venture	5.00	1	1	Must measure
2	Wholly local	4.75	2	1	Must measure
3	Wholly local	4.25	4	2	Require-to-measure
4	Wholly local	4.75	3	2	Require-to-measure
5	Wholly local	3.00	7	3	Should measure
6	Wholly local	3.25	9	3	Should measure
7	Wholly local	4.50	2	1	Must measure
8	Joint venture	5.00	1	1	Must measure
9	Wholly local	4.50	3	2	Require-to-measure
10	Joint venture	5.00	1	1	Must measure
11	Wholly local	2.75	10	3	Should measure
12	Wholly local	4.00	3	2	Require-to-measure
13	Wholly local	4.50	5	2	Require-to-measure
14	Wholly local	4.50	1	1	Must measure
15	Wholly local	3.00	5	2	Require-to-measure
16	Joint venture	4.75	4	2	Require-to-measure
17	Wholly local	3.50	6	3	Should measure
18	Wholly local	3.00	4	3	Should measure
19	Wholly local	4.00	2	1	Must measure
20	Wholly local	4.00	3	2	Require-to-measure
21	Joint venture	5.00	1	1	Must measure
22	Wholly local	4.25	9	3	Should measure

Table 10 (Continued)

No.	Ownership	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
23	Wholly local	4.50	2.00	1.00	Must measure
24	Wholly local	5.00	1.00	1.00	Must measure
25	Wholly local	4.00	1	1	Must measure
26	Wholly local	3.25	3	2	Require-to-measure
27	Joint venture	5.00	1	1	Must measure
28	Wholly local	5.00	1	1	Must measure
29	Wholly local	4.50	1	1	Must measure
30	Joint venture	4.50	1	1	Must measure
31	Wholly local	4.75	3	2	Require-to-measure
32	Wholly local	4.75	3	2	Require-to-measure
33	Wholly local	4.50	1	1	Must measure
34	Wholly local	3.00	3	2	Require-to-measure
35	Wholly local	4.25	9	3	Should measure
36	Wholly local	4.25	6	3	Should measure
37	Joint venture	4.25	6	3	Should measure
38	Joint venture	1.75	10	3	Should measure
39	Joint venture	4.00	2	1	Must measure
40	Wholly local	5.00	1	1	Must measure

By applying the General Linear Mode to the results from Table B.1, the p-value is 0.012. This indicates the null hypothesis can be rejected. In other words, different ownership has impact on the perceived level of importance on productivity information. See Figure 19

```
Analysis of Variance for Classification_1, using Adjusted SS for Tests

Source  DF   Seq SS   Adj SS  Adj MS     F      P
OWN_1    1   3.7934   3.7934  3.7934  6.98  0.012
Error   36  19.5750  19.5750  0.5438
Total   37  23.3684

S = 0.737394   R-Sq = 16.23%   R-Sq(adj) = 13.91%
```

Figure 19 Results from the Statistical Analysis for ownership factor

From Table 10: The average number from the level of importance for joint venture own is 1.0; productivity information is classified as must-measure. The average number for joint venture own is 1.9; productivity information is classified as require to measure.

5. Customer target factor,

H_{05}: Customer target has no impact on the perceived important level of productivity.

H_5: Customer target the perceived important level of productivity.

Table 11 Details on company profiles for customer target factor

No.	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Domestic	5.00	1	1	Must measure
2	Domestic	4.75	2	1	Must measure
3	Domestic	4.25	4	2	Require-to-measure
4	Domestic	4.75	3	2	Require-to-measure
5	Domestic	3.00	7	3	Should measure
6	International	3.25	9	3	Should measure
7	Domestic	4.50	2	1	Must measure
8	Domestic	5.00	1	1	Must measure
9	International	4.50	3	2	Require-to-measure
10	Domestic	5.00	1	1	Must measure
11	Domestic	2.75	10	3	Should measure
12	Domestic	4.00	3	2	Require-to-measure
13	Domestic	4.50	5	2	Require-to-measure
14	Domestic	4.50	1	1	Must measure
15	Domestic	3.00	5	2	Require-to-measure
16	International	4.75	4	2	Require-to-measure
17	International	3.50	6	3	Should measure
18	Domestic	3.00	4	3	Should measure
19	Domestic	4.00	2	1	Must measure
20	Domestic	4.00	3	2	Require-to-measure

Table 11 (Continued)

No.	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
21	International	5.00	1	1	Must measure
22	Domestic	4.25	9	3	Should measure
23	Domestic	4.50	2	1	Must measure
24	Domestic	5.00	1	1	Must measure
25	Domestic	4.00	1	1	Must measure
26	Domestic	3.25	3	2	Require-to-measure
27	International	5.00	1	1	Must measure
28	International	5.00	1	1	Must measure
29	Domestic	4.50	1	1	Must measure
30	Domestic	4.50	1	1	Must measure
31	Domestic	4.75	3	2	Require-to-measure
32	Domestic	4.75	3	2	Require-to-measure
33	Domestic	4.50	1	1	Must measure
34	Domestic	3.00	3	2	Require-to-measure
35	Domestic	4.25	9	3	Should measure
36	International	4.25	6	3	Should measure
37	Domestic	4.25	6	3	Should measure
38	Domestic	1.75	10	3	Should measure
39	International	4.00	2	1	Must measure
40	Domestic	5.00	1	1	Must measure

By applying the General Linear Mode to the results from Table B.1, the p-value is 0.928. This indicates the null hypothesis cannot be rejected. In other words, different customer target have no impact on the perceived level of importance on productivity information. See Figure 20

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF   Seq SS   Adj SS  Adj MS     F      P
CUS      1   0.0057   0.0057  0.0057  0.01  0.928
Error   38  26.3943  26.3943  0.6946
Total   39  26.4000

S = 0.833418   R-Sq = 0.02%   R-Sq(adj) = 0.00%
```

Figure 20 Results from the Statistical Analysis for customer target factor

From Table11: The average number from the level of importance for all business year is 2.00. As a result, productivity information is classified as require to measure

Productivity measurement is vital in every circumstance according to the results. Therefore, more details are considered by conducting two factors of company profile at the same time and create possible circumstances from survey data as show in Figure 21 below

		EMP					BY						OWN		CUS	
		<50	50-100	101-200	201-500	>500	<5	5-10	11-15	16-20	21-25	>25	Wholly own	Joint venture	Domestic	International
IND	Automotive	-	-	1/2	2/1	3/10	-	4/3	-	5/1	6/1	7/8	8/8	9/5	10/12	11/1
	Electrical	-	-	12/3	13/1	14/5	15/2	-	-	16/2	17/1	18/4	19/7	20/2	21/6	22/3
	Food	-	-	23/1	24/3	25/7	-	26/1	-	27/1	28/1	29/8	30/10	31/1	32/7	33/4
	Petrochemical	34/3	35/1	36/2	-	37/1	38/2	-	39/1	40/1	41/1	42/2	43/5	44/2	45/6	46/1
EMP	<50						47/2	-	48/1	-	-	-	49/3	-	50/2	51/1
	50-100						-	-	-	-	-	52/1	-	53/1	54/1	-
	101-200						-	55/1	56/1	57/1	58/1	59/4	60/6	61/2	62/7	63/1
	201-500						64/1	65/1	66/1	67/1	-	68/1	69/4	70/1	71/5	-
	>500						72/1	73/2	74/3	75/2	76/3	77/12	78/16	79/7	80/16	81/7
BY	<5												82/3	-	83/3	-
	5-10												84/1	85/3	86/2	87/2
	11-15												88/1	-	-	89/1
	16-20												90/3	91/1	92/3	93/1
	21-25												94/1	95/1	96/1	97/1
	>25												98/20	99/6	100/23	101/3
OWN	Wholly own														102/25	103/5
	Joint venture														104/6	105/4

#	Available of data to analyze
-	Unavailable of data to analyze

Figure 21 Possible circumstances for pair-wise analysis

Remark: Number in table

Ex.1 / 2: In automotive industry which has number of employee 101 to 200 is circumstance number 1 and there are 2 company match the pair-wise profile

Ex 12/3: In Electrical industry which has number of employee 101 to 200 is circumstance number 12 and there are 3 company match the pair-wise profile

There are 138 possible circumstances from 2 factors of company profile pair wise. However, due to limitation of data 33 out of 138 circumstances have no

available data to run statistical test represent by gray dot area in the table. Therefore number of circumstance to analyze is 105 circumstances as in number of green area in the table above.

Test hypothesis for two factors

1. When industry type is automotive

1.1 When industry type is automotive, number of employee

H_{06}: Within the automotive industry, the number of employee has no impact on the perceived important level of productivity.

H_6: Within the automotive industry, the number of employee impacts the perceived important level of productivity.

There are 13 companies which is automotive industry

Table 12 Details on the automotive industry and number of employee profiles

No.	Number of employee	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Greater than 500	5.00	1	1	Must-measure
2	Greater than 500	4.75	3	2	Require-to-measure
3	Greater than 500	5.00	1	1	Must-measure
4	Greater than 500	3.00	5	2	Require-to-measure
5	Greater than 500	4.25	9	3	Should-measure
6	201 to 500	3.25	3	2	Require-to-measure
7	Greater than 500	4.50	1	1	Must-measure
8	Greater than 500	4.50	1	1	Must-measure
9	Greater than 500	4.75	3	2	Require-to-measure
10	Greater than 500	4.25	9	3	Should-measure
11	101 to 200	1.75	10	3	Should-measure
12	Greater than 500	4.00	2	1	Must-measure
13	101 to 200	5.00	1	1	Must-measure

By applying the General Linear Mode to the results from Table 12, the p-value is 0.881. This indicates the null hypothesis cannot be rejected. In other words, within the automotive industry, the different number of employee has no impact on the perceived level of importance on productivity information. See Figure 24

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
EMP      2  0.2077  0.2077  0.1038  0.13  0.881
Error   10  8.1000  8.1000  0.8100
Total   12  8.3077

S = 0.9   R-Sq = 2.50%   R-Sq(adj) = 0.00%
```

Figure 22 Results from the Statistical Analysis of automotive industry and number of employee profiles

From Table 12: The average number from the level of importance for automotive companies is 1.87. As a result, productivity information is classified as require-to-measure no matter how many number of employee that automotive industry has

1.2 When industry type is automotive, business year factor

H_{07}: Within the automotive industry, the business year has no impact on the perceived important level of productivity.

H_7: Within the automotive industry, the business year impacts the perceived important level of productivity.

There are 13 companies which is automotive industry

Table 13 Details on the automotive industry and business year profiles

No.	Business year	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Greater than 25	5.00	1	1	Must-measure
2	Greater than 25	4.75	3	2	Require-to-measure
3	5 to 10	5.00	1	1	Must-measure
4	Greater than 25	3.00	5	2	Require-to-measure
5	Greater than 25	4.25	9	3	Should-measure
6	16 to 20	3.25	3	2	Require-to-measure
7	Greater than 25	4.50	1	1	Must-measure
8	Greater than 25	4.50	1	1	Must-measure
9	21 to 25	4.75	3	2	Require-to-measure
10	Greater than 25	4.25	9	3	Should-measure
11	5 to 10	1.75	10	3	Should-measure
12	5 to 10	4.00	2	1	Must-measure
13	Greater than 25	5.00	1	1	Must-measure

By applying the General Linear Mode to the results from Table 13, the p-value is 0.983. This indicates the null hypothesis cannot be rejected. In other words, within the automotive industry, the different business year has no impact on the perceived level of importance on productivity information. See Figure 23

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
BY       3  0.1410  0.1410  0.0470  0.05  0.983
Error    9  8.1667  8.1667  0.9074
Total   12  8.3077

S = 0.952579   R-Sq = 1.70%   R-Sq(adj) = 0.00%
```

Figure 23 Results from the Statistical Analysis of automotive industry and business year profile

From Table 13: The average number from the level of importance for automotive companies is 1.87. As a result, productivity information is classified as require-to-measure no matter how many business year that automotive industry has

1.3 When industry type is automotive, ownership factor

H_{08}: Within the automotive industry, the ownership has no impact on the perceived important level of productivity.

H_8: Within the automotive industry, the ownership impacts the perceived important level of productivity.

There are 13 companies which is automotive industry

Table 14 Details on the automotive industry and ownership profiles

No.	Ownership	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Joint venture	5.00	1	1	Must-measure
2	Wholly local	4.75	3	2	Require-to-measure
3	Joint venture	5.00	1	1	Must-measure
4	Wholly local	3.00	5	2	Require-to-measure
5	Wholly local	4.25	9	3	Should-measure
6	Wholly local	3.25	3	2	Require-to-measure
7	Wholly local	4.50	1	1	Must-measure
8	Joint venture	4.50	1	1	Must-measure
9	Wholly local	4.75	3	2	Require-to-measure
10	Wholly local	4.25	9	3	Should-measure
11	Joint venture	1.75	10	3	Should-measure
12	Joint venture	4.00	2	1	Must-measure
13	Wholly local	5.00	1	1	Must-measure

By applying the General Linear Mode to the results from Table 14, the p-value is 0.220. This indicates the null hypothesis cannot be rejected. In other words, within the automotive industry, the different ownership has no impact on the perceived level of importance on productivity information. See Figure 24

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
OWN      1  1.1077  1.1077  1.1077  1.69  0.220
Error   11  7.2000  7.2000  0.6545
Total   12  8.3077

S = 0.809040   R-Sq = 13.33%   R-Sq(adj) = 5.45%
```

Figure 24 Results from the Statistical Analysis of automotive industry and ownership profile

From Table 14: The average number from the level of importance for automotive companies is 1.87. As a result, productivity information is classified as require-to-measure no matter what ownership type that automotive industry has

1.4 When industry type is automotive, customer target factor

H_{09}: Within the automotive industry, the customer target has no impact on the perceived important level of productivity.

H_9: Within the automotive industry, the customer target impacts the perceived important level of productivity.

There are 13 companies which is automotive industry

Table 15 Details on the automotive industry and customer target profiles

No.	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Domestics	5.00	1	1	Must-measure
2	Domestics	4.75	3	2	Require-to-measure
3	Domestics	5.00	1	1	Must-measure
4	Domestics	3.00	5	2	Require-to-measure
5	Domestics	4.25	9	3	Should-measure
6	Domestics	3.25	3	2	Require-to-measure
7	Domestics	4.50	1	1	Must-measure
8	Domestics	4.50	1	1	Must-measure
9	Domestics	4.75	3	2	Require-to-measure
10	Domestics	4.25	9	3	Should-measure
11	Domestics	1.75	10	3	Should-measure
12	International	4.00	2	1	Must-measure
13	Domestics	5.00	1	1	Must-measure

By applying the General Linear Mode to the results from Table 15, the p-value is 0.358. This indicates the null hypothesis cannot be rejected. In other words, within the automotive industry, the different customer target has no impact on the perceived level of importance on productivity information. See Figure 25

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
CUS      1  0.6410  0.6410  0.6410  0.92  0.358
Error   11  7.6667  7.6667  0.6970
Total   12  8.3077

S = 0.834847   R-Sq = 7.72%   R-Sq(adj) = 0.00%
```

Figure 25 Results from the Statistical Analysis of automotive industry and customer target profile

From Table 15: The average number from the level of importance for automotive companies is 1.87. As a result, productivity information is classified as require-to-measure no matter what customer target that automotive industry has

2. When industry type is electronics

2.1 When industry type is electronics, number of employee factor

H_{010}: Within the electronics industry, the number of employee has no impact on the perceived important level of productivity.

H_{10}: Within the electronics industry, the number of employee impacts the perceived important level of productivity.

There are 9 companies which is electronics industry

Table 16 Details on the electronics industry and number of employee profiles

No.	Number of employee	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Greater than 500	4.75	2	1	Must-measure
2	Greater than 500	2.75	10	3	Should-measure
3	201 to 500	4.50	5	2	Require-to-measure
4	101 to 200	3.00	4	3	Should-measure
5	Greater than 500	5.00	1	1	Must-measure
6	101 to 200	5.00	1	1	Must-measure
7	Greater than 500	5.00	1	1	Must-measure
8	Greater than 500	4.75	3	2	Require-to-measure
9	101 to 200	3.00	3	2	Require-to-measure

By applying the General Linear Mode to the results from Table 16, the p-value is 0.820. This indicates the null hypothesis cannot be rejected. In other words, within the electronic industry, the different number of employee has no impact on the perceived level of importance on productivity information. See Figure 26

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
EMP      2  0.3556  0.3556  0.1778  0.21  0.820
Error    6  5.2000  5.2000  0.8667
Total    8  5.5556

S = 0.930949   R-Sq = 6.40%   R-Sq(adj) = 0.00%
```

Figure 26: Results from the Statistical Analysis of electronic industry and number of employee profile

From Table 16: The average number from the level of importance for electronics companies is 1.78. As a result, productivity information is classified as require-to-measure no matter how many number of employee that electronics industry has

2.2 When industry type is electronics, business year factor

H_{011}: Within the electronics industry, the business year has no impact on the perceived important level of productivity.

H_{11}: Within the electronics industry, the business year impacts the perceived important level of productivity.

There are 9 companies which is electronics industry

Table 17: Details on the electronics industry and business year profiles

No.	Business year	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Greater than 25	4.75	2.00	1.00	Must-measure
2	Greater than 25	2.75	10.00	3.00	Should-measure
3	16 to 20	4.50	5.00	2.00	Require-to-measure
4	Greater than 25	3.00	4.00	3.00	Should-measure
5	16 to 20	5.00	1.00	1.00	Must-measure
6	Less than 5	5.00	1.00	1.00	Must-measure
7	Less than 5	5.00	1.00	1.00	Must-measure
8	21 to 25	4.75	3.00	2.00	Require-to-measure
9	Greater than 25	3.00	3.00	2.00	Require-to-measure

By applying the General Linear Mode to the results from Table 17, the p-value is 0.091. This indicates the null hypothesis can be rejected. In other words, within the electronic industry, the different business year impacts the perceived level of importance on productivity information. See Figure 27

```
Analysis of Variance for Classification_1, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
BY_1     3  3.3333  3.3333  1.1111  5.00  0.091
Error    3  0.6667  0.6667  0.2222
Total    6  4.0000

S = 0.471405   R-Sq = 83.33%   R-Sq(adj) = 66.67%
```

Figure 27 Results from the Statistical Analysis of electronic industry and business year profile

From Table 17: The average number from the level of importance for business year less than 5 within the electronic industry is 1.0. As a result, productivity information is classified as must-measure when simultaneously considering the profiles of electronic industry and business year less than 5

From Table 17: The average number from the level of importance for business year within the electronic industry is 2.0. As a result, productivity information is classified as require-to-measure when simultaneously considering the profiles of electronic industry and business year greater than 16

2.3 When industry type is electronics, ownership factor

H_{012}: Within the electronic industry, the ownership type has no impact on the perceived important level of productivity.

H_{12}: Within the electronic industry, the ownership type impacts the perceived important level of productivity.

There are 9 companies which is electronics industry

Table 18 Details on the electronics industry and ownership profiles

No.	Ownership	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Wholly local	4.75	2.00	1.00	Must-measure
2	Wholly local	2.75	10.00	3.00	Should-measure
3	Wholly local	4.50	5.00	2.00	Require-to-measure
4	Wholly local	3.00	4.00	3.00	Should-measure
5	Joint venture	5.00	1.00	1.00	Must-measure
6	Joint venture	5.00	1.00	1.00	Must-measure
7	Wholly local	5.00	1.00	1.00	Must-measure
8	Wholly local	4.75	3.00	2.00	Require-to-measure
9	Wholly local	3.00	3.00	2.00	Require-to-measure

By applying the General Linear Mode to the results from Table 18, the p-value is 0.078. This indicates the null hypothesis can be rejected. In other words, within the electronic industry, the different types of ownership impact the perceived level of importance on productivity information. See Figure 28

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source             DF  Seq SS  Adj SS  Adj MS     F      P
Locally-owned     1   1.5000  1.5000  1.5000  4.50  0.078
Error              7   2.0000  2.0000  0.3333
Total              8   3.5000

S = 0.577350   R-Sq = 42.86%   R-Sq(adj) = 33.33%
```

Figure 28 Results from the Statistical Analysis of electronics industry and ownership profile

From Table 18: The average number from the level of importance for joint-venture companies within the electronic industry is 1. As a result, productivity information is classified as must-measure when simultaneously considering the profiles of electronic industry and joint-venture ownership

From Table 18: The average number from the level of importance for locally-owned firms within the electronic industry is 1.85. As a result, productivity information is classified as require-to-measure when simultaneously considering the profiles of electronic industry and locally-owned ownership

2.4 When industry type is electronics, customer target factor

H_{013}: Within the electronic industry, the customer target has no impact on the perceived important level of productivity.

H_{13}: Within the electronic industry, the customer target impacts the perceived important level of productivity.

There are 9 companies which is electronics industry

Table 19 Details on the electronics industry and customer target profiles

No.	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance	Level of importance	Classification
1	Domestics	4.75	2	1	Must-measure
2	Domestics	2.75	10	3	Should-measure
3	Domestics	4.50	5	2	Require-to-measure
4	Domestics	3.00	4	3	Should-measure
5	International	5.00	1	1	Must-measure
6	International	5.00	1	1	Must-measure
7	International	5.00	1	1	Must-measure
8	Domestics	4.75	3	2	Require-to-measure
9	Domestics	3.00	3	2	Require-to-measure

By applying the General Linear Mode to the results from Table 19, the p-value is 0.036. This indicates the null hypothesis can be rejected. In other words, within the electronic industry, the different types of ownership impact the perceived level of importance on productivity information. See Figure 29

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
CUS      1  2.7222  2.7222  2.7222  6.73  0.036
Error    7  2.8333  2.8333  0.4048
Total    8  5.5556

S = 0.636209   R-Sq = 49.00%   R-Sq(adj) = 41.71%
```

Figure 29 Results from the Statistical Analysis of electronics industry and customer target profile

From Table 19: The average number from the level of importance for international customer target companies within the electronic industry is 1.0. As a result, productivity information is classified as must-measure when simultaneously considering the profiles of electronic industry and international customer target

From Table 19: The average number from the level of importance for domestic customer target firms within the electronic industry is 2.00. As a result, productivity information is classified as require-to-measure when simultaneously considering the profiles of electronic industry and domestic customer target

3. When industry type is food

3.1 When industry type is food, number of employee factor

H_{014}: Within the food industry, the number of employee has no impact on the perceived important level of productivity.

H_{14}: Within the food industry, the number of employee impacts the perceived important level of productivity.

There are 11 companies which is food industry

Table 20 Details on the food industry and number of employee profiles

No.	Number of employee	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance	Level of importance	Classification
1	Greater than 500	4.25	4	2	Require-to-measure
2	Greater than 500	3.00	7	3	Should-measure
3	Greater than 500	3.25	9	3	Should-measure
4	Greater than 500	4.50	2	1	Must-measure
5	Greater than 500	4.75	4	2	Require-to-measure
6	Greater than 500	3.50	6	3	Should-measure
7	201 to 500	4.00	2	1	Must-measure
8	201 to 500	4.00	3	2	Require-to-measure
9	101 to 200	4.50	2	1	Must-measure
10	201 to 500	5.00	1	1	Must-measure
11	Greater than 500	4.25	6	3	Should-measure

By applying the General Linear Mode to the results from Table 20, the p-value is 0.090. This indicates the null hypothesis can be rejected. In other

words, within the food industry, the different number of employee impact on the perceived level of importance on productivity information. See Figure 30

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
EMP      2  3.6190  3.6190  1.8095  3.30  0.090
Error    8  4.3810  4.3810  0.5476
Total   10  8.0000

S = 0.740013   R-Sq = 45.24%   R-Sq(adj) = 31.55%
```

Figure 30 Results from the Statistical Analysis of food industry and number of employee profile

From Table 20: The average number from the level of importance for company which has number of employee 100 to 200 within the food industry is 1.5. As a result, productivity information is classified as require-to-measure when simultaneously considering the profiles of food industry and number of employee 100 to 200

From Table 20: The average number from the level of importance for domestic customer target firms within the electronic industry is 2.72. As a result, productivity information is classified as should-measure when simultaneously considering the profiles of electronic industry and number of employee greater than 500

3.2 When industry type is food, business year factor

H_{015}: Within the food industry, the business year has no impact on the perceived important level of productivity.

H_{15}: Within the food industry, the business year impacts the perceived important level of productivity.

There are 11 companies which is food industry

Table 21 Details on the food industry and business year profiles

No.	Business year	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Greater than 25	4.25	4.00	2.00	Require-to-measure
2	Greater than 25	3.00	7.00	3.00	Should-measure
3	Greater than 25	3.25	9.00	3.00	Should-measure
4	Greater than 25	4.50	2.00	1.00	Must-measure
5	16 to 20	4.75	4.00	2.00	Require-to-measure
6	Greater than 25	3.50	6.00	3.00	Should-measure
7	Greater than 25	4.00	2.00	1.00	Must-measure
8	Greater than 25	4.00	3.00	2.00	Require-to-measure
9	Greater than 25	4.50	2.00	1.00	Must-measure
10	5 to 10	5.00	1.00	1.00	Must-measure
11	21 to 25	4.25	6.00	3.00	Should-measure

By applying the General Linear Mode to the results from Table 21, the p-value is 0.015. This indicates the null hypothesis can be rejected. In other words, within the food industry, the different business year impacts the perceived level of importance on productivity information. See Figure 31

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
EMP      3  4.7556  4.7556  1.5852  9.91  0.015
Error    5  0.8000  0.8000  0.1600
Total    8  5.5556

S = 0.4   R-Sq = 85.60%   R-Sq(adj) = 76.96%
```

Figure 31 Results from the Statistical Analysis of food industry and business year profile

From Table 21: The average number from the level of importance for business year 5 to 10 within the electronic industry is 1.0. As a result, productivity

information is classified as must-measure when simultaneously considering the profiles of food industry and business year less than 5

From Table 21: The average number from the level of importance for business year greater than 10 within the electronic industry is 2.1. As a result, productivity information is classified as require-to-measure when simultaneously considering the profiles of electronic industry and business year greater than 10

3.3 When industry type is food, ownership factor

H_{016}: Within the food industry, the ownership type has no impact on the perceived important level of productivity.

H_{16}: Within the food industry, the ownership type impacts the perceived important level of productivity.

There are 11 companies which is food industry

Table 22 Details on the food industry and ownership profiles

No.	Ownership	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Wholly local	4.25	4	2	Require-to-measure
2	Wholly local	3.00	7	3	Should-measure
3	Wholly local	3.25	9	3	Should-measure
4	Wholly local	4.50	2	1	Must-measure
5	Joint venture	4.75	4	2	Require-to-measure
6	Wholly local	3.50	6	3	Should-measure
7	Wholly local	4.00	2	1	Must-measure
8	Wholly local	4.00	3	2	Require-to-measure
9	Wholly local	4.50	2	1	Must-measure
10	Wholly local	5.00	1	1	Must-measure
11	Wholly local	4.25	6	3	Should-measure

By applying the General Linear Mode to the results from Table 22, the p-value is 1.000. This indicates the null hypothesis cannot be rejected. In other words, within the food industry, the different ownership has no impact on the perceived level of importance on productivity information. See Figure 32

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
OWN      1  0.0000  0.0000  0.0000  0.00  1.000
Error    9  8.0000  8.0000  0.8889
Total   10  8.0000

S = 0.942809   R-Sq = 0.00%   R-Sq(adj) = 0.00%
```

Figure 32 Results from the Statistical Analysis food industry and ownership profile

From Table 22: The average number from the level of importance for food companies is 2.00. As a result, productivity information is classified as require-to-measure no matter what ownership type that food industry has

3.4 When industry type is food, customer target factor

H_{017}: Within the food industry, the customer target has no impact on the perceived important level of productivity.

H_{17}: Within the food industry, the customer target impacts the perceived important level of productivity.

There are 11 companies which is food industry

Table 23: Details on the food industry and customer target profiles

No.	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Domestics	4.25	4	2	Require-to-measure
2	Domestics	3.00	7	3	Should-measure
3	International	3.25	9	3	Should-measure
4	Domestics	4.50	2	1	Must-measure
5	International	4.75	4	2	Require-to-measure
6	International	3.50	6	3	Should-measure
7	Domestics	4.00	2	1	Must-measure
8	Domestics	4.00	3	2	Require-to-measure
9	Domestics	4.50	2	1	Must-measure
10	Domestics	5.00	1	1	Must-measure
11	International	4.25	6	3	Should-measure

By applying the General Linear Mode to the results from Table 23, the p-value is 0.026. This indicates the null hypothesis can be rejected. In other words, within the food industry, the different customer target impact on the perceived level of importance on productivity information. See Figure 33

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
CUS      1  3.5357  3.5357  3.5357  7.13  0.026
Error    9  4.4643  4.4643  0.4960
Total   10  8.0000

S = 0.704295   R-Sq = 44.20%   R-Sq(adj) = 38.00%
```

Figure 33 Results from the Statistical Analysis food industry and customer target profile

From Table 23: The average number from the level of importance for domestic customer target within the food industry is 1.57. As a result, productivity information is classified as require-to-measure when simultaneously considering the profiles of food industry and domestic customer target

From Table 23: The average number from the level of importance for international customer target within the food industry is 2.75. As a result, productivity information is classified as should-measure when simultaneously considering the profiles of food industry and international customer target

4 When industry type is petrochemical

4.1 When industry type is petrochemical, number of employee factor

H_{018}: Within the petrochemical industry, the number of employee has no impact on the perceived important level of productivity.

H_{18}: Within the petrochemical industry, the number of employee impacts the perceived important level of productivity.

There are 7 companies which is petrochemical industry

Table 24 Details on the petrochemical industry and number of employee profiles

No.	Number of employee	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Less than 50	4.50	3	2	Require-to-measure
2	50 to 100	5.00	1	1	Must-measure
3	101 to 200	4.00	3	2	Require-to-measure
4	Less than 50	4.50	1	1	Must-measure
5	101 to 200	4.00	1	1	Must-measure
6	Less than 50	4.50	3	2	Require-to-measure
7	Greater than 500	4.25	6	3	Should-measure

By applying the General Linear Mode to the results from Table 24, the p-value is 0.098. This indicates the null hypothesis can be rejected. In other

words, within the petrochemical industry, the different number of employee impact on the perceived level of importance on productivity information. See Figure 34

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
EMP      3  3.7083  3.7083  1.2361  4.24  0.098
Error    4  1.1667  1.1667  0.2917
Total    7  4.8750

S = 0.540062   R-Sq = 76.07%   R-Sq(adj) = 58.12%
```

Figure 34 Results from the Statistical Analysis of petrochemical industry and number of employee profile

From Table 24: The average number from the level of importance for company which has number of employee less than 200 within the petrochemical industry is 1.60. As a result, productivity information is classified as require-to-measure when simultaneously considering the profiles of petrochemical industry and number of employee less than 200

From Table 24: The average number from the level of importance for company which has number of employee greater than 500 within the petrochemical industry is 3.00. As a result, productivity information is classified as should-measure when simultaneously considering the profiles of electronic industry and greater than 500

4.2 When industry type is petrochemical, business year factor

H_{019}: Within the petrochemical industry, the business year has no impact on the perceived important level of productivity.

H_{19}: Within the petrochemical industry, the business year impacts the perceived important level of productivity.

There are 7 companies which is petrochemical industry

Table 25 Details on the petrochemical industry and business year profiles

No.	Business year	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	11 to 15	4.50	3	2	Require-to-measure
2	Greater than 25	5.00	1	1	Must-measure
3	16 to 20	4.00	3	2	Require-to-measure
4	Less than 5	4.50	1	1	Must-measure
5	21 to 25	4.00	1	1	Must-measure
6	Less than 5	4.50	3	2	Require-to-measure
7	Greater than 25	4.25	6	3	Should-measure

By applying the General Linear Mode to the results from Table 25, the p-value is 0.015. This indicates the null hypothesis can be rejected. In other words, within the food industry, the different business year impacts the perceived level of importance on productivity information. See Figure 35

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
BY       4  2.7692  2.7692  0.6923  2.77  0.093
Error    3  2.0000  2.0000  0.2500
Total    7  4.7692

S = 0.5   R-Sq = 58.06%   R-Sq(adj) = 37.10%
```

Figure 35 Results from the Statistical Analysis of petrochemical industry and business year profile

From Table 25: The average number from the level of importance for business year less than 5 or between 21 and 25 within the petrochemical industry are 1 and 1- Data no.6 is unusual observation from Minitab. As a result, productivity

information is classified as must-measure when simultaneously considering the profiles of petrochemical industry and business year less than 5 or 21 to 25 years

From Table 25: The average number from the level of importance for business year greater than 11 to 20 or greater than 25 within the petrochemical industry is 2.00. As a result, productivity information is classified as require-to-measure when simultaneously considering the profiles of electronic industry and business year 11 to 20 or greater than 25 years

4.3 When industry type is petrochemical, ownership factor

H_{020}: Within the petrochemical industry, the ownership type has no impact on the perceived important level of productivity.

H_{20}: Within the petrochemical industry, the ownership type impacts the perceived important level of productivity.

There are 7 companies which is petrochemical industry

Table 26 Details on the petrochemical industry and ownership profiles

No.	Ownership	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Wholly local	4.50	3.00	2.00	Require-to-measure
2	Joint venture	5.00	1.00	1.00	Must-measure
3	Wholly local	4.00	3.00	2.00	Require-to-measure
4	Wholly local	4.50	1.00	1.00	Must-measure
5	Wholly local	4.00	1.00	1.00	Must-measure
6	Wholly local	4.50	3.00	2.00	Require-to-measure
7	Joint venture	4.25	6.00	3.00	Should-measure

By applying the General Linear Mode to the results from Table 26, the p-value is 0.576. This indicates the null hypothesis cannot be rejected. In other

words, within the petrochemical industry, the different ownership has no impact on the perceived level of importance on productivity information. See Figure 36

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
OWN      1  0.2286  0.2286  0.2286  0.36  0.576
Error    5  3.2000  3.2000  0.6400
Total    6  3.4286

S = 0.8   R-Sq = 6.67%   R-Sq(adj) = 0.00%
```

Figure 36 Results from the Statistical Analysis of petrochemical industry and ownership profiles

From Table 26: The average number from the level of importance for petrochemical companies is 1.71. As a result, productivity information is classified as require-to-measure no matter what ownership type that petrochemical industry has

4.4 When industry type is petrochemical, customer target factor

H_{021}: Within the petrochemical industry, the customer target has no impact on the perceived important level of productivity.

H_{21}: Within the petrochemical industry, the customer target impacts the perceived important level of productivity.

There are 7 companies which is petrochemical industry

Table 27 Details on the petrochemical industry and customer target profiles

No.	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	International	4.50	3	2	Require-to-measure
2	Domestics	5.00	1	1	Must-measure
3	Domestics	4.00	3	2	Require-to-measure
4	Domestics	4.50	1	1	Must-measure
5	Domestics	4.00	1	1	Must-measure
6	Domestics	4.50	3	2	Require-to-measure
7	Domestics	4.25	6	3	Should-measure

By applying the General Linear Mode to the results from Table 27, the p-value is 0.576. This indicates the null hypothesis cannot be rejected. In other words, within the petrochemical industry, the different customer target has no impact on the perceived level of importance on productivity information. See Figure 37

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
CUS      1  0.0952  0.0952  0.0952  0.14  0.721
Error    5  3.3333  3.3333  0.6667
Total    6  3.4286

S = 0.816497   R-Sq = 2.78%   R-Sq(adj) = 0.00%
```

Figure 37 Results from the Statistical Analysis of petrochemical industry and customer target profile

From Table 27: The average number from the level of importance for petrochemical companies is 1.71. As a result, productivity information is classified as require-to-measure no matter what customer target that petrochemical industry has The conclusion when simultaneously considering industry type and others profile show in table below

Table 28 When-to-measure Productivity from the Industrial Type Profiles

Profiles	Size					Years Operating in Business						Ownership		Targeted Customers	
	< 50	50 - 100	101 - 200	201 - 500	> 500	< 5	5 - 10	11 - 15	16 - 20	21 - 25	> 25	Local	Joint Venture	Local	Inter
Automobile	X	X	□	□	□	X	□	X	□	□	□	□	□	□	□
Electronics	X	X	□	□	□	●	X	X	□	□	□	□	●	□	●
Food	X	X	□	□	★	X	●	X	□	□	□	□	□	□	★
Petrochemical	□	□	□	X	★	●	X	□	□	●	□	□	□	□	□

Note:

● for Must-have

□ for Require-to-measure

★ for Should-have

X for Data not sufficient for statistical analysis

5. When number of employee less than 50

5.1 When number of employee less than 50, business year factor

H_{022}: Within the number of employee less than 50, the business year has no impact on the perceived important level of productivity.

H_{22}: Within the number of employee less than 50, the business year impacts the perceived important level of productivity.

There are 3 companies which number of employee less than 50

Table 29 Details on the number of employee less than 50 and business year profiles

No.	Business year	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	11 to 15	4.50	3	2	Require-to-measure
2	Less than 5	4.50	1	1	Must-measure
3	Less than 5	4.50	1	1	Must-measure

By applying the General Linear Mode to the results from Table 29, Denominator of F-test is zero. In other words, within the number of employee less than 50, the different business year impact on the perceived level of importance on productivity information.

From Table 29: The average number from the level of importance for business year less than 5 within number of employee less than 50 is 1.0. As a result, productivity information is classified as must-measure when simultaneously considering the profiles of number of employee less than 50 and business year less than 5

From Table 29: The average number from the level of importance for business year 11 to 15 within number of employee less than 59 is 2.0. As a result, productivity information is classified as should-measure when simultaneously considering the profiles of petrochemical industry and business year 11 to 15

5.2 When number of employee less than 50, ownership factor

H_{023}: Within the number of employee less than 50, the ownership has no impact on the perceived important level of productivity.

H_{23}: Within the number of employee less than 50, the ownership impacts the perceived important level of productivity.

There are 3 companies which number of employee less than 50

Table 30 Details on the number of employee less than 50 and ownership profiles

No.	Ownership	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Wholly local	4.50	3	2	Require-to-measure
2	Wholly local	4.50	1	1	Must-measure
3	Wholly local	4.50	1	1	Must-measure

From Table 30: There is only one level of data for company that has number of employee less than 50 that is wholly local own. The average number from the level of importance for wholly local ownership within number of employee less than 50 is 1.0- Data no.3 is unusual observation. As a result, productivity information is classified as must-measure when simultaneously considering the profiles of number of employee less than 50 and wholly local own

5.3 When number of employee less than 50, customer target factor

H_{024}: Within the number of employee less than 50, the customer target has no impact on the perceived important level of productivity.

H_{24}: Within the number of employee less than 50, the customer target impacts the perceived important level of productivity.

There are 3 companies which number of employee less than 50

Table 31 Details on the number of employee less than 50 and customer target profiles

No	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	International	4.50	3	2	Require-to-measure
2	Domestics	4.50	1	1	Must-measure
3	Domestics	4.50	1	1	Must-measure

By applying the General Linear Mode to the results from Table 31, Denominator of F-test is zero. In other words, within the number of employee less than 50, the different customer target impact on the perceived level of importance on productivity information.

From Table 31: The average number from the level of importance for domestic customer target within number of employee less than 50 is 1.0. As a result, productivity information is classified as must-measure when simultaneously considering the profiles of number of employee less than 50 and domestic customer target

From Table 31: The average number from the level of importance for international customer target within number of employee less than 50 is 2.0. As a result, productivity information is classified as should-measure when simultaneously considering the profiles of petrochemical industry and international customer target.

6. When number of employee 50 to 100

6.1 When number of employee 50 to 100, business year factor

H_{025}: Within the number of employee 50 to 100, the business year has no impact on the perceived important level of productivity.

H_{25}: Within the number of employee 50 to 100, the business year impacts the perceived important level of productivity.

There is 1 company which number of employee 50 to 100

Table 32 Details on the number of employee less 50 to 100 and business year, ownership, customer target profiles

No.	Number of employee	Business year	Ownership	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	50 to 100	Greatert a	Joint ventu	Domestics	5.00	1	1	Must-measure

From Table 32: There is only one level of data for company that has number of employee 50 to 100. The average number from the level of importance for business year greater than 25 within number of employee 50 to 100 is 1.0. As a result, productivity information is classified as must-measure when simultaneously considering the profiles of number of employee 50 to 100 and business year greater than 25

6.2 When number of employee 50 to 100, ownership factor

H_{026}: Within the number of employee 50 to 100, the ownership has no impact on the perceived important level of productivity.

H_{26}: Within the number of employee 50 to 100, the ownership impacts the perceived important level of productivity.

From Table 32: There is only one level of data for company that has number of employee 50 to 100. The average number from the level of importance for the joint venture company within number of employee 50 to 100 is 1.0. As a result,

productivity information is classified as must-measure when simultaneously considering the profiles of number of employee 50 to 100 and joint venture

6.3 When number of employee 50 to 100, customer target factor

H_{027}: Within the number of employee 50 to 100, the customer target has no impact on the perceived important level of productivity.

H_{27}: Within the number of employee 50 to 100, the customer target impacts the perceived important level of productivity.

From Table 32: There is only one level of data for company that has number of employee 50 to 100. The average number from the level of importance for the domestic customer target company within number of employee 50 to 100 is 1.0. As a result, productivity information is classified as must-measure when simultaneously considering the profiles of number of employee 50 to 100 and international customer target

7. When number of employee 101 to 200

7.1 When number of employee 101 to 200, business year factor

H_{028}: Within the number of employee 101 to 200, the business year has no impact on the perceived important level of productivity.

H_{28}: Within the number of employee 101 to 200, the business year impacts the perceived important level of productivity.

There are 8 companies which number of employee 101 to 200

Table 33 Details on the number of employee 101 to 200 and business year profiles

No.	Business year	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance	Level of importance	Classification
1	16 to 20	4.00	3	2	Require-to-measure
2	11 to 15	3.00	4	3	Should-measure
3	Greater than 25	4.50	2	1	Must-measure
4	21 to 25	4.00	1	1	Must-measure
5	Greater than 25	5.00	1	1	Must-measure
6	Greater than 25	3.00	3	2	Require-to-measure
7	5 to 10	1.75	10	3	Should-measure
8	Greater than 25	5.00	1	1	Must-measure

By applying the General Linear Mode to the results from Table 33, the p-value is 0.096This indicates the null hypothesis can be rejected. In other words, within the number of employee 101 to 200, the different business year impact on the perceived level of importance on productivity information. See Figure 38

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
BY       4  4.7500  4.7500  1.1875  4.75  0.096
Error    3  0.7500  0.7500  0.2500
Total    7  5.5000

S = 0.5   R-Sq = 86.36%   R-Sq(adj) = 68.18%
```

Figure 38 Results from the Statistical Analysis of number of employee 101 to 200 and business year profile

From Table 33: The average number from the level of importance for business year greater than 15 within number of employee 101 to 200 is 1.6. As a result, productivity information is classified as require-to-measure when simultaneously considering the profiles of number of employee 101 to 200 and business year greater than 15

From Table 33: The average number from the level of importance for business year 5 to 15 within number of employee 101 to 200 is 3.0. As a result, productivity information is classified as should-measure when simultaneously considering the profiles of number of employee 101 to 200 and business year 5 to 15

7.2 When number of employee 101 to 200, ownership factor

H_{029}: Within the number of employee 101 to 200, the ownership has no impact on the perceived important level of productivity.

H_{29}: Within the number of employee 101 to 200, the ownership impacts the perceived important level of productivity.

There are 8 companies which number of employee 101 to 200

Table 34 Details on the number of employee 101 to 200 and ownership profiles

No.	Ownership	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance	Level of importance	Classification
1	Wholly local	4.00	3	2	Require-to-measure
2	Wholly local	3.00	4	3	Should-measure
3	Wholly local	4.50	2	1	Must-measure
4	Wholly local	4.00	1	1	Must-measure
5	Joint venture	5.00	1	1	Must-measure
6	Wholly local	3.00	3	2	Require-to-measure
7	Joint venture	1.75	10	3	Should-measure
8	Wholly local	5.00	1	1	Must-measure

By applying the General Linear Mode to the results from Table 34, the p-value is 0.680This indicates the null hypothesis cannot be rejected. In other words, within the number of employee 101 to 200, the different ownership has no impact on the perceived level of importance on productivity information. See Figure 39

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
OWN      1  0.1667  0.1667  0.1667  0.19  0.680
Error    6  5.3333  5.3333  0.8889
Total    7  5.5000

S = 0.942809   R-Sq = 3.03%   R-Sq(adj) = 0.00%
```

Figure 39 Results from the Statistical Analysis of number of employee 101 to 200 and ownership profile

From Table 34: The average number from the level of importance for number of employee 101 to 200 is 1.75. As a result, productivity information is classified as require-to-measure no matter what ownership that number of employee 101 to 200.

7.3 When number of employee 101 to 200, customer target factor

H_{030}: Within the number of employee 101 to 200, the customer target has no impact on the perceived important level of productivity.

H_{30}: Within the number of employee 101 to 200, the customer target impacts the perceived important level of productivity.

There are 8 companies which number of employee 101 to 200

Table 35 Details on the number of employee 101 to 200 and customer target profiles

No.	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance	Level of importance	Classification
1	Domestics	4.00	3	2	Require-to-measure
2	Domestics	3.00	4	3	Should-measure
3	Domestics	4.50	2	1	Must-measure
4	Domestics	4.00	1	1	Must-measure
5	International	5.00	1	1	Must-measure
6	Domestics	3.00	3	2	Require-to-measure
7	Domestics	1.75	10	3	Should-measure
8	Domestics	5.00	1	1	Must-measure

By applying the General Linear Mode to the results from Table 35, the p-value is 0.680This indicates the null hypothesis cannot be rejected. In other words, within the number of employee 101 to 200, the different ownership has no impact on the perceived level of importance on productivity information. See Figure 40

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
CUS      1  1.8000  1.8000  1.8000  5.40  0.100
Error    3  1.0000  1.0000  0.3333
Total    4  2.8000

S = 0.577350   R-Sq = 64.29%   R-Sq(adj) = 52.38%
```

Figure 40: Results from the Statistical Analysis of number of employee 101 to 200 and customer target profile

From Table 35: The average number from the level of importance for international customer target within number of employee 101 to 200 is 1.00. As a result, productivity information is classified as must-measure when simultaneously considering the profiles of number of employee 101 to 200 and international customer target

From Table 35: The average number from the level of importance for domestic customer target within number of employee 101 to 200 is 1.86. As a result, productivity information is classified as require-to-measure when simultaneously considering the profiles of number of employee 101 to 200 and domestic customer target

8. When number of employee 201 to 500

8.1 When number of employee 201 to 500, business year factor

H_{031}: Within the number of employee 201 to 500, the business year has no impact on the perceived important level of productivity.

H_{31}: Within the number of employee 201 to 500, the business year impacts the perceived important level of productivity.

There are 5 companies which number of employee 201 to 500

Table 36 Details on the number of employee 201 to 500 and business year profiles

No.	Business year	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Less than 5	4.50	5	2	Require-to-measure
2	11 to 15	4.00	3	2	Require-to-measure
3	Greater than 25	4.00	3	2	Require-to-measure
4	5 to 10	5.00	1	1	Must-measure
5	16 to 20	3.25	3	2	Require-to-measure

By applying the General Linear Mode to the results from Table 36, Denominator of F-test is zero. In other words, within the number of employee 201 to

500, the different business year impact on the perceived level of importance on productivity information.

From Table 36: The average number from the level of importance for business year 5 to 10 within number of employee 201 to 500 is 1.0. As a result, productivity information is classified as must-measure when simultaneously considering the profiles of number of employee 201 to 500 and business year 5 to 10

From Table 36: The average number from the level of importance for business year less than 5, 11 to 20 and greater than 25 within number of employee 201 to 500 is 2.0. As a result, productivity information is classified as should-measure when simultaneously considering the profiles of number of employee 201 to 500 and business year less than 5, 11 to 20 and greater than 25.

8.2 When number of employee 201 to 500, ownership factor

H_{032}: Within the number of employee 201 to 500, the ownership has no impact on the perceived important level of productivity.

H_{32}: Within the number of employee 201 to 500, the ownership impacts the perceived important level of productivity.

There are 5 companies which number of employee 201 to 500

Table 37: Details on the number of employee 201 to 500 and ownership profiles

No.	Ownership	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Wholly local	4.50	5.00	2.00	Require-to-measure
2	Joint venture	4.00	3.00	2.00	Require-to-measure
3	Wholly local	4.00	3.00	2.00	Require-to-measure
4	Wholly local	5.00	1.00	1.00	Must-measure
5	Wholly local	3.25	3.00	2.00	Require-to-measure

By applying the General Linear Mode to the results from Table 37, the p-value is 0.680This indicates the null hypothesis cannot be rejected. In other words, within the number of employee 101 to 200, the different ownership has no impact on the perceived level of importance on productivity information. See Figure 41

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
OWN      1  0.0500  0.0500  0.0500  0.20  0.685
Error    3  0.7500  0.7500  0.2500
Total    4  0.8000


S = 0.5   R-Sq = 6.25%   R-Sq(adj) = 0.00
```

Figure 41 Results from the Statistical Analysis of number of employee 201 to 500 and ownership profile

From Table 37: The average number from the level of importance for number of employee 201 to 500 is 1.80. As a result, productivity information is classified as require-to-measure no matter what ownership that number of employee 201 to 500.

8.3 When number of employee 201 to 500, customer target factor

H_{033}: Within the number of employee 201 to 500, the customer target has no impact on the perceived important level of productivity.

H_{33}: Within the number of employee 201 to 500, the customer target impacts the perceived important level of productivity.

There are 5 companies which number of employee 201 to 500

Table 38 Details on the number of employee 201 to 500 and customer target profiles

No.	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Domestics	4.50	5	2	Require-to-measure
2	Domestics	4.00	3	2	Require-to-measure
3	Domestics	4.00	3	2	Require-to-measure
4	Domestics	5.00	1	1	Must-measure
5	Domestics	3.25	3	2	Require-to-measure

From Table 38: There is only one level of data for company that has number of employee 201 to 500 that is domestic customer target. The average number from the level of importance for domestic customer target within number of employee 201 to 500 is 1.80. As a result, productivity information is classified as require-to-measure when simultaneously considering the profiles of number of employee 201 to 500 and domestic customer target.

9. When number of employee greater than 500

9.1 When number of employee greater than 500, business year factor

H_{034}: Within the number of employee greater than 500, the business year has no impact on the perceived important level of productivity.

H_{34}: Within the number of employee greater than 500, the business year impacts the perceived important level of productivity.

There are 23 companies which number of employee greater than 500

Table 39 Details on the number of employee greater than 500 and business year profiles

No.	Business year	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Greatert ahn 25	5.00	1	1	Must-measure
2	Greatert ahn 25	4.75	2	1	Must-measure
3	Greatert ahn 25	4.25	4	2	Require-to-measure
4	Greatert ahn 25	4.75	3	2	Require-to-measure
5	11 to 15	3.00	7	3	Should-measure
6	11 to 15	3.25	9	3	Should-measure
7	11 to 15	4.50	2	1	Must-measure
8	5 to 10	5.00	1	1	Must-measure
9	Greatert ahn 25	2.75	10	3	Should-measure
10	Greatert ahn 25	3.00	5	2	Require-to-measure
11	16 to 20	4.75	4	2	Require-to-measure
12	Greatert ahn 25	3.50	6	3	Should-measure
13	16 to 20	5.00	1	1	Must-measure
14	Greatert ahn 25	4.25	9	3	Should-measure
15	Less than 5	5.00	1	1	Must-measure
16	Greatert ahn 25	4.50	1	1	Must-measure
17	Greatert ahn 25	4.50	1	1	Must-measure
18	21 to 25	4.75	3	2	Require-to-measure
19	21 to 25	4.75	3	2	Require-to-measure
20	Greatert ahn 25	4.25	9	3	Should-measure
21	21 to 25	4.25	6	3	Should-measure
22	Greatert ahn 25	4.25	6	3	Should-measure
23	5 to 10	4.00	2	1	Must-measure

By applying the General Linear Mode to the results from Table 38, the p-value is 0.385This indicates the null hypothesis cannot be rejected. In other words, within the number of employee greater than 500, the different business year has no impact on the perceived level of importance on productivity information. See Figure 42

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF   Seq SS   Adj SS  Adj MS     F      P
BY       5   4.2065   4.2065  0.8413  1.12  0.386
Error   17  12.7500  12.7500  0.7500
Total   22  16.9565

S = 0.866025   R-Sq = 24.81%   R-Sq(adj) = 2.69%
```

Figure 42 Results from the Statistical Analysis of number of employee 201 to 500 and business year profile

From Table 38: The average number from the level of importance for number of employee greater than 500 is 1.96. As a result, productivity information is classified as require-to-measure no matter what ownership that number of employee greater than 500.

9.2 When number of employee greater than 500, ownership factor

H_{035}: Within the number of employee greater than 500, the ownership has no impact on the perceived important level of productivity.

H_{35}: Within the number of employee greater than 500, the ownership impacts the perceived important level of productivity.

There are 23 companies which number of employee greater than 500

Table 40 Details on the number of employee greater than 500 and ownership profiles

No.	Ownership	Average score on the perceive importance of	Ranking results (relatively to other business performance	Level of importance	Classification
1	Joint venture	5.00	1	1	Must-measure
2	Wholly local	4.75	2	1	Must-measure
3	Wholly local	4.25	4	2	Require-to-measure
4	Wholly local	4.75	3	2	Require-to-measure
5	Wholly local	3.00	7	3	Should-measure
6	Wholly local	3.25	9	3	Should-measure
7	Wholly local	4.50	2	1	Must-measure
8	Joint venture	5.00	1	1	Must-measure
9	Wholly local	2.75	10	3	Should-measure
10	Wholly local	3.00	5	2	Require-to-measure
11	Joint venture	4.75	4	2	Require-to-measure
12	Wholly local	3.50	6	3	Should-measure
13	Joint venture	5.00	1	1	Must-measure
14	Wholly local	4.25	9	3	Should-measure
15	Wholly local	5.00	1	1	Must-measure
16	Wholly local	4.50	1	1	Must-measure
17	Joint venture	4.50	1	1	Must-measure
18	Wholly local	4.75	3	2	Require-to-measure
19	Wholly local	4.75	3	2	Require-to-measure
20	Wholly local	4.25	9	3	Should-measure
21	Wholly local	4.25	6	3	Should-measure
22	Joint venture	4.25	6	3	Should-measure
23	Joint venture	4.00	2	1	Must-measure

By applying the General Linear Mode to the results from Table 40 the p-value is 0.001. This indicates the null hypothesis can be rejected. In other words, within the number of employee greater than 500, the different ownership impact on the perceived level of importance on productivity information. See Figure 43

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF   Seq SS  Adj SS  Adj MS      F      P
OWN      1   5.8954  5.8954  5.8954  15.11  0.001
Error   21   6.6310  6.6310  0.3901
Total   22  12.5263

S = 0.624545   R-Sq = 47.06%   R-Sq(adj) = 43.95%
```

Figure 43 Results from the Statistical Analysis of number of employee greater than 500 and ownership profile

From Table 40: The average number from the level of importance for joint venture own within number of employee greater than 500 is 1.62. As a result, productivity information is classified as require-to-measure when simultaneously considering the profiles of number of employee greater than 500 and joint venture own

From Table 40: The average number from the level of importance for wholly local own within number of employee greater than 500 is 2.70. As a result, productivity information is classified as should-measure when simultaneously considering the profiles of number of employee greater than 500 and wholly local own

9.3 When number of employee greater than 500, customer target factor

H_{036}: Within the number of employee greater than 500, the customer target has no impact on the perceived important level of productivity.

H_{36}: Within the number of employee greater than 500, the customer target impacts the perceived important level of productivity.

There are 23 companies which number of employee greater than 500

Table 41 Details on the number of employee greater than 500 and customer target profiles

No.	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Domestics	5.00	1	1	Must-measure
2	Domestics	4.75	2	1	Must-measure
3	Domestics	4.25	4	2	Require-to-measure
4	Domestics	4.75	3	2	Require-to-measure
5	Domestics	3.00	7	3	Should-measure
6	International	3.25	9	3	Should-measure
7	Domestics	4.50	2	1	Must-measure
8	Domestics	5.00	1	1	Must-measure
9	Domestics	2.75	10	3	Should-measure
10	Domestics	3.00	5	2	Require-to-measure
11	International	4.75	4	2	Require-to-measure
12	International	3.50	6	3	Should-measure
13	International	5.00	1	1	Must-measure
14	Domestics	4.25	9	3	Should-measure
15	International	5.00	1	1	Must-measure
16	Domestics	4.50	1	1	Must-measure
17	Domestics	4.50	1	1	Must-measure
18	Domestics	4.75	3	2	Require-to-measure
19	Domestics	4.75	3	2	Require-to-measure
20	Domestics	4.25	9	3	Should-measure
21	International	4.25	6	3	Should-measure
22	Domestics	4.25	6	3	Should-measure
23	International	4.00	2	1	Must-measure

By applying the General Linear Mode to the results from Table 41, the p-value is 0.879. This indicates the null hypothesis cannot be rejected. In other words, within the number of employee greater than 500, the different customer target has no impact on the perceived level of importance on productivity information. See Figure 44.

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF   Seq SS   Adj SS  Adj MS     F      P
CUS      1   0.0190   0.0190  0.0190  0.02  0.879
Error   21  16.9375  16.9375  0.8065
Total   22  16.9565

S = 0.898080   R-Sq = 0.11%   R-Sq(adj) = 0.00%
```

Figure 44 Results from the Statistical Analysis of number of employee greater than 500 and customer target profile

From Table 41: The average number from the level of importance for number of employee greater than 500 is 1.96. As a result, productivity information is classified as require-to-measure no matter what customers target that number of employee greater than 500. The conclusion when simultaneously considering number of employee and others profile show in table below

Table 42 When-to-measure Productivity from the Size Profile

Profiles	Years Operating in Business						Ownership		Targeted Customers	
	< 5	**5-10**	**11-15**	**16-20**	**21-25**	**> 25**	**Local**	**Joint Venture**	**Local**	**Inter**
< 50	●	X	□	X	X	X	●	X	●	□
50-100	X	X	X	X	X	●	X	●	●	X
101-200	X	★	★	□	□	□	□	□	□	●
201-500	□	●	□	□	X	□	□	□	□	X
> 500	□	□	□	□	□	□	★	□	□	□

Note:

● for Must-measure

□ for Require-to-measure

★ for Should-measure

X for Data not sufficient for statistical analysis

10. When business year less than 5

10.1 When business year less than 5, ownership factor

H_{037}: Within the business year less than 5, the ownership has no impact on the perceived important level of productivity.

H_{37}: Within the business year less than 5, the ownership impacts the perceived important level of productivity.

There are 3 companies which business year less than 5

Table 43 Details on the business year less than 5, ownership and customer target profile

No.	Ownership	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance	Level of importance	Classification
1	Wholly local	Domestics	4.50	1.00	1.00	Must-measure
2	Wholly local	Domestics	5.00	1.00	1.00	Must-measure
3	Wholly local	Domestics	5.00	1.00	1.00	Must-measure

From Table 43: There is only one level of data for company that wholly local own. The average number from the level of importance for wholly local ownership within business year less than 5 is 1.0. As a result, productivity information is classified as must-measure when simultaneously considering the business year less than 5 and wholly local own

10.2 When business year less than 5, customer target factor

H_{038}: Within the business year less than 5, the customer target has no impact on the perceived important level of productivity.

H_{38}: Within the business year less than 5, the customer target impacts the perceived important level of productivity.

From Table 43: There is only one level of data for company that has domestic customer target. The average number from the level of importance for wholly local ownership within business year less than 5 is 1.0. As a result, productivity information is classified as must-measure when simultaneously considering the business year less than 5 and domestic customer target

11 When business year 5 to 10

11.1 When business year 5 to 10, ownership factor

H_{039}: Within the business year 5 to 10, the ownership has no impact on the perceived important level of productivity.

H_{39}: Within the business year 5 to 10, the ownership impacts the perceived important level of productivity.

There are 4 companies which business year 5 to 10

Table 44 Details on the business year 5 to 10, ownership profiles

No.	Ownership	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Joint venture	5.00	1	1	Must-measure
2	Wholly local	5.00	1	1	Must-measure
3	Joint venture	1.75	10	3	Should-measure
4	Joint venture	4.00	3	2	Require-to-measure

By applying the General Linear Mode to the results from Table 44, the p-value is 0.095This indicates the null hypothesis can be rejected. In other words, within the business year 5 to 10, the different ownership impact on the perceived level of importance on productivity information. See Figure 45

```
Analysis of Variance for Classification_1, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
OWN_1    1  2.2500  2.2500  2.2500  9.00  0.095
Error    2  0.5000  0.5000  0.2500
Total    3  2.7500

S = 0.5   R-Sq = 81.82%   R-Sq(adj) = 72.73%
```

Figure 45 Results from the Statistical Analysis of business year 5 to 10 and ownership profile

From Table 44: The average number from the level of importance for wholly local own within business year 5 to 10 is 1.00. As a result, productivity information is classified as must-measure when simultaneously considering the profiles of business year 5 to 10 and wholly local own

From Table 44: The average number from the level of importance for joint venture own within business year 5 to 10 is 2.24. As a result, productivity information is classified as require-to-measure when simultaneously considering the profiles of business year 5 to 10 and joint venture own.

11.2 When business year 5 to 10, customer target factor

H_{040}: Within the business year 5 to 10, the customer target has no impact on the perceived important level of productivity.

H_{40}: Within the business year 5 to 10, the customer target impacts the perceived important level of productivity.

There are 4 companies which business year 5 to 10

Table 45 Details on the business year 5 to 10, customer target profiles

No.	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Domestics	5.00	1	1	Must-measure
2	Domestics	5.00	1	1	Must-measure
3	International	1.75	10	3	Should-measure
4	International	4.00	3	2	Require-to-measure

By applying the General Linear Mode to the results from Table 45, the p-value is 0.095This indicates the null hypothesis can be rejected. In other words, within the business year 5 to 10, the different ownership impact on the perceived level of importance on productivity information. See Figure 46

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
CUS      1  2.2500  2.2500  2.2500  9.00  0.095
Error    2  0.5000  0.5000  0.2500
Total    3  2.7500

S = 0.5   R-Sq = 81.82%   R-Sq(adj) = 72.73%
```

Figure 46: Results from the Statistical Analysis of business year 5 to 10 and ownership profile

From Table 45: The average number from the level of importance for domestic customer target within business year 5 to 10 is 1.00. As a result, productivity information is classified as must-measure when simultaneously considering the profiles of business year 5 to 10 and domestic customer target

From Table 45: The average number from the level of importance for domestic customer target within business year 5 to 10 is 2.0. As a result, productivity

information is classified as require-to-measure when simultaneously considering the profiles of business year 5 to 10 and domestic customer target.

12 When business year 11 to 15

12.1 When business year 11 to 15, ownership factor

H_{041}: Within the business year 11 to 15, the ownership has no impact on the perceived important level of productivity.

H_{41}: Within the business year 11 to 15, the ownership impacts the perceived important level of productivity.

There is 1 company which business year 11 to 15

Table 46 Details on the business year 11 to 15, ownership profiles

No.	Ownership	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Wholly local	International	4.50	3.00	2.00	Require-to-measure

From Table 46: There is only one level of data for company that has business year 11 to 15. The average number from the level of importance for the wholly local company within business year 11 to 15 is 2.0. As a result, productivity information is classified as require-to-measure when simultaneously considering the profiles of business year 11 to 15 and wholly local company

12.2 When business year 11 to 15, customer target factor

H_{042}: Within the business year 11 to 15, the customer target has no impact on the perceived important level of productivity.

H_{42}: Within the business year 11 to 15, the customer target impacts the perceived important level of productivity.

From Table 46: There is only one level of data for company that has business year 11 to 15. The average number from the level of importance for the international customer target company within business year 11 to 15 is 2.0. As a result, productivity information is classified as require-to-measure when simultaneously considering the profiles of business year 11 to 15 and international customer target

13 When business year 16 to 20

13.1 When business year 16 to 20, ownership factor

H_{043}: Within the business year 16 to 20, the ownership has no impact on the perceived important level of productivity.

H_{43}: Within the business year 16 to 20, the ownership impacts the perceived important level of productivity.

There are 4 companies which business year 16 to 20

Table 47 Details on the business year 16 to 20, ownership and customer target profiles

No.	Ownership	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance	Level of importance	Classification
1	Wholly local	Domestics	4.00	3	2	Require-to-measure
2	Wholly local	Domestics	4.50	5	2	Require-to-measure
3	Joint venture	International	4.75	4	2	Require-to-measure
4	Wholly local	Domestics	3.25	3	2	Require-to-measure

By applying the General Linear Mode to the results from Table 47, Denominator of F-test is zero. In other words, within the business year 16 to 20, the different ownership or customer target has no impact on the perceived level of importance on productivity information.

From Table 47: The average number from the level of importance for business year 16 to 20 is 2.00. As a result, productivity information is classified as require-to-measure no matter what ownership that business year 16 to 20 has

13.2 When business year 16 to 20, customer target factor

H_{044}: Within the business year 16 to 20, the customer target has no impact on the perceived important level of productivity.

H_{44}: Within the business year 16 to 20, the customer target impacts the perceived important level of productivity.

From Table 47: The average number from the level of importance for business year 16 to 20 is 2.00. As a result, productivity information is classified as require-to-measure no matter what customer target that business year 16 to 20 has

14. When business year 21 to 25

14.1 When business year 21 to 25, ownership factor

H_{045}: Within the business year 21 to 25, the ownership has no impact on the perceived important level of productivity.

H_{45}: Within the business year 21 to 25, the ownership impacts the perceived important level of productivity.

There are 2 companies which business year 21 to 25

Table 48 Details on the business year 21 to 25, ownership and customer target profiles

No.	Ownership	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance	Level of importance	Classification
1	Joint venture	Domestics	4.00	1.00	1.00	Must-measure
2	Wholly local	International	4.25	6.00	3.00	Should-measure

By applying the General Linear Mode to the results from Table B.1, Denominator of F-test is zero. In other words, within the business year 21 to 25, the different ownership or customer target impact on the perceived level of importance on productivity information.

From Table 48: The average number from the level of importance for joint venture company customer target within business year 21 to 25 is 1.00. As a result, productivity information is classified as must-measure when simultaneously considering the profiles of business year 21 to 25 and joint venture

From Table 48: The average number from the level of importance for wholly local company customer target within business year 21 to 25 is 3.00. As a result, productivity information is classified as require-to-measure when simultaneously considering the profiles of business year 21 to 25 and wholly local own

14.2 When business year 21 to 25, customer target factor

H_{046}: Within the business year 21 to 25, the customer target has no impact on the perceived important level of productivity.

H_{46}: Within the business year 21 to 25, the customer target impacts the perceived important level of productivity.

By applying the General Linear Mode to the results from Table 48, Denominator of F-test is zero. In other words, within the business year 21 to 25, the different ownership or customer target impact on the perceived level of importance on productivity information.

From Table 48: The average number from the level of importance for domestic customer target company customer target within business year 21 to 25 is 1.00. As a result, productivity information is classified as must-measure when simultaneously considering the profiles of business year 21 to 25 and joint venture

From Table 48: The average number from the level of importance for international customer target t within business year 21 to 25 is 3.00. As a result, productivity information is classified as require-to-measure when simultaneously considering the profiles of business year 21 to 25 and wholly local own

15 When business year greater than 25

15.1 When business year greater than 25, ownership factor

H_{047}: Within the business year greater than 25, the ownership has no impact on the perceived important level of productivity.

H_{47}: Within the business year greater than 25, the ownership impacts the perceived important level of productivity.

There are 26 companies which business year greater than 25

Table 49 Details on the business year greater than 25, ownership profiles

No.	Ownership	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Joint venture	5.00	1	1	Must-measure
2	Wholly local	4.75	2	1	Must-measure
3	Wholly local	4.25	4	2	Require-to-measure
4	Wholly local	4.75	3	2	Require-to-measure
5	Wholly local	3.00	7	3	Should-measure
6	Wholly local	3.25	9	3	Should-measure
7	Wholly local	4.50	2	1	Must-measure
8	Joint venture	5.00	1	1	Must-measure
9	Wholly local	2.75	10	3	Should-measure
10	Wholly local	3.00	5	2	Require-to-measure
11	Wholly local	3.50	6	3	Should-measure
12	Wholly local	3.00	4	3	Should-measure
13	Wholly local	4.00	2	1	Must-measure
14	Wholly local	4.00	3	2	Require-to-measure
15	Wholly local	4.25	9	3	Should-measure
16	Wholly local	4.50	2	1	Must-measure
17	Wholly local	4.50	1	1	Must-measure
18	Joint venture	4.50	1	1	Must-measure
19	Wholly local	3.00	3	2	Require-to-measure
20	Wholly local	4.25	9	3	Should-measure
21	Joint venture	4.25	6	3	Should-measure
22	Wholly local	5.00	1	1	Must-measure
23	Wholly local	4.75	3	2	Require-to-measure
24	Joint venture	4.75	3	2	Require-to-measure
25	Joint venture	5.00	1	1	Must-measure
26	Wholly local	4.50	1	1	Must-measure

By applying the General Linear Mode to the results from Table 49, the p-value is 0.274. This indicates the null hypothesis cannot be rejected. In other words, within the business year greater than 25, the different ownership has no impact on the perceived level of importance on productivity information. See Figure 47

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF   Seq SS   Adj SS  Adj MS     F      P
OWN      1   1.0101   1.0101  1.0101  1.27  0.274
Error   20  15.9444  15.9444  0.7972
Total   21  16.9545

S = 0.892873   R-Sq = 5.96%   R-Sq(adj) = 1.26%
```

Figure 47 Results from the Statistical Analysis of business year greater than 25 and ownership profiles

From Table 49: The average number from the level of importance for business year greater than 25 is 1.88As a result, productivity information is classified as require-to-measure no matter what ownership that business year greater than 25

15.2 When business year greater than 25, customer target factor

H_{048}: Within the business year greater than 25, the customer target has no impact on the perceived important level of productivity.

H_{48}: Within the business year greater than 25, the customer target impacts the perceived important level of productivity.

There are 26ompanies which business year 21 to 25

Table 50 Details on the business year greater 25, customer target profiles

No.	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance	Level of importance	Classification
1	Domestics	5.00	1	1	Must-measure
2	Domestics	4.75	2	1	Must-measure
3	Domestics	4.25	4	2	Require-to-measure
4	Domestics	4.75	3	2	Require-to-measure
5	Domestics	3.00	7	3	Should-measure
6	International	3.25	9	3	Should-measure
7	Domestics	4.50	2	1	Must-measure
8	Domestics	5.00	1	1	Must-measure
9	Domestics	2.75	10	3	Should-measure
10	Domestics	3.00	5	2	Require-to-measure
11	International	3.50	6	3	Should-measure
12	Domestics	3.00	4	3	Should-measure
13	Domestics	4.00	2	1	Must-measure
14	Domestics	4.00	3	2	Require-to-measure
15	Domestics	4.25	9	3	Should-measure
16	Domestics	4.50	2	1	Must-measure
17	Domestics	4.50	1	1	Must-measure
18	Domestics	4.50	1	1	Must-measure
19	Domestics	3.00	3	2	Require-to-measure
20	Domestics	4.25	9	3	Should-measure
21	Domestics	4.25	6	3	Should-measure
22	Domestics	5.00	1	1	Must-measure
23	Domestics	4.75	3	2	Require-to-measure
24	Domestics	4.75	3	2	Require-to-measure
25	International	5.00	1	1	Must-measure
26	Domestics	4.50	1	1	Must-measure

By applying the General Linear Mode to the results from Table 50, the p-value is 0.143. This indicates the null hypothesis can be rejected. In other words, within the business year greater than 25, the different customer target impact on the perceived level of importance on productivity information. See Figure 48

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF   Seq SS   Adj SS  Adj MS     F      P
CUS      1   1.7616   1.7616  1.7616  2.32  0.143
Error   20  15.1930  15.1930  0.7596
Total   21  16.9545

S = 0.871579   R-Sq = 10.39%   R-Sq(adj) = 5.91%
```

Figure 48 Results from the Statistical Analysis of business year greater than 25 and customer target profile

From Table 50: The average number from the level of importance for business year greater than 25 is 1.88. As a result, productivity information is classified as require-to-measure no matter what customer target that business year greater than 25. The conclusion when simultaneously considering business year and others profile show in table below

Table 51: When-to-measure Productivity from the Years-in-business Profile

Profiles		Ownership		Targeted Customers	
		Local	**Joint Venture**	**Local**	**Inter**
Years Operating in Business	**< 5**	●	**X**	●	**X**
	5- 10	●	□	●	□
	11-15	□	**X**	**X**	□
	16- 20	□	□	□	□
	21- 25	□	□	●	★
	> 25	□	□	□	□

Note

● for Must-measure

□ for Require-to-measure

★ for Should-measure

X for Data not sufficient for statistical analysis

15 When wholly local company

15.1 When wholly local company, customer target factor

H_{049}: Within the wholly local company, the customer target has no impact on the perceived important level of productivity.

H_{49}: Within the wholly local company, the customer target impacts the perceived important level of productivity.

There are 30 companies which business is wholly local company

Table 52: Details on wholly local company, customer target profiles

No.	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Domestics	4.75	2	1	Must-measure
2	Domestics	4.25	4	2	Require-to-measure
3	Domestics	4.75	3	2	Require-to-measure
4	Domestics	3.00	7	3	Should-measure
5	International	3.25	9	3	Should-measure
6	Domestics	4.50	2	1	Must-measure
7	International	4.50	3	2	Require-to-measure
8	Domestics	2.75	10	3	Should-measure
9	Domestics	4.00	3	2	Require-to-measure
10	Domestics	4.50	5	2	Require-to-measure
11	Domestics	4.50	1	1	Must-measure
12	Domestics	3.00	5	2	Require-to-measure
13	International	3.50	6	3	Should-measure
14	Domestics	3.00	4	3	Should-measure
15	Domestics	4.00	2	1	Must-measure
16	Domestics	4.00	3	2	Require-to-measure
17	Domestics	4.25	9	3	Should-measure
18	Domestics	4.50	2	1	Must-measure
19	Domestics	5.00	1	1	Must-measure
20	Domestics	4.00	1	1	Must-measure
21	Domestics	3.25	3	2	Require-to-measure
22	International	5.00	1	1	Must-measure
23	Domestics	4.50	1	1	Must-measure
24	Domestics	4.75	3	2	Require-to-measure
25	Domestics	4.75	3	2	Require-to-measure
26	Domestics	4.50	1	1	Must-measure
27	Domestics	3.00	3	2	Require-to-measure
28	Domestics	4.25	9	3	Should-measure
29	International	4.25	6	3	Should-measure
30	Domestics	5.00	1	1	Must-measure

By applying the General Linear Mode to the results from Table 52, the p-value is 0.129. This indicates the null hypothesis can be rejected. In other words, within the wholly local company, the different customer target has no impact on the perceived level of importance on productivity information. See Figure 49

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF   Seq SS   Adj SS  Adj MS     F      P
CUS      1   1.5000   1.5000  1.5000  2.44  0.129
Error   28  17.2000  17.2000  0.6143
Total   29  18.7000

S = 0.783764   R-Sq = 8.02%   R-Sq(adj) = 4.74%
```

Figure 49 Results from the Statistical Analysis of wholly local company and customer target profile

From Table 52: The average number from the level of importance for wholly local company is 1.90. As a result, productivity information is classified as require-to-measure no matter what customer target of wholly local company has

16 When joint venture company

16.1 When joint venture company, customer target factor

H_{050}: Within the joint venture company, the customer target has no impact on the perceived important level of productivity.

H_{50}: Within the joint venture company, the customer target impacts the perceived important level of productivity.

There are 10 companies which business is joint venture company

Table 53 Details on joint venture Company, customer target profiles

No.	Customer target	Average score on the perceive importance of productivity	Ranking results (relatively to other business performance areas)	Level of importance	Classification
1	Domestics	5.00	1	1	Must-measure
2	Domestics	5.00	1	1	Must-measure
3	Domestics	5.00	1	1	Must-measure
4	International	4.75	4	2	Require-to-measure
5	International	5.00	1	1	Must-measure
6	International	5.00	1	1	Must-measure
7	Domestics	4.50	1	1	Must-measure
8	Domestics	4.25	6	3	Should-measure
9	Domestics	1.75	10	3	Should-measure
10	International	4.00	2	1	Must-measure

By applying the General Linear Mode to the results from Table 53, the p-value is 0.489. This indicates the null hypothesis can be rejected. In other words, within the joint venture company, the different customer target has no impact on the perceived level of importance on productivity information. See Figure 50

```
Analysis of Variance for Classification, using Adjusted SS for Tests

Source  DF  Seq SS  Adj SS  Adj MS     F      P
CUS      1  0.4167  0.4167  0.4167  0.55  0.480
Error    8  6.0833  6.0833  0.7604
Total    9  6.5000

S = 0.872019   R-Sq = 6.41%   R-Sq(adj) = 0.00%
```

Figure 50 Results from the Statistical Analysis of joint venture Company and \ customer target profile

From Table 53: The average number from the level of importance for the joint venture company is 1.70. As a result, productivity information is classified as require-to-measure no matter what customer target of the joint venture company has

The conclusion when simultaneously considering ownership and others profile show in table below

Table 54: When-to-measure Productivity from the Ownership Profile

Profiles		Targeted Customers	
		Local	**Joint Venture**
Ownership	**Local**	☐	☐
	Joint Venture	☐	☐

Note:

☐ for Require-to-measure

Discussion

One company profile

Profile		Confident level for Hypothesis				
		99%	95%	90%	65%	23%
Industry type	Automotive	□	□	□	□	□
	Electrical	□	□	□	□	□
	Food	□	□	□	□	□
	Petrochemical	□	□	□	□	●
Number of employee	<50	□	□	●	●	●
	50-100	□	□	●	●	●
	101-200	□	□	□	□	□
	201-500	□	□	□	□	□
	>500	□	□	□	□	□
Business year	<5	□	□	□	●	●
	5-10	□	□	□	□	□
	11-15	□	□	□	□	□
	16-20	□	□	□	□	□
	21-25	□	□	□	□	□
	>25	□	□	□	□	□
Ownership	Wholly local owner	□	□	□	□	□
	Joint venture	□	●	●	●	●
Target customer	Domestic	□	□	□	□	□
	International	□	□	□	□	□

Note

● for Must-have

□ for Require-to-measure

★ for Should-have

X for Data not sufficient for statistical analysis

Figure 51 Circumstance to measure productivity with one factor consideration

At 95% confident level, the ownership of the business impact to significant difference productivity importance level. The joint-venture own must measure productivity performance to drive the organization while wholly local own identified with less productivity importance level should have productivity performance measurement as well. This result related to the study on the factor that impact to productivity performance level which show that the joint-venture has higher productivity performance level higher compare to wholly-local own (Blomstrom,

Kokko 2003; Smar-zynsak 2002; gorg, strobl 2001; Oulton 1998: 144; Harris, Robinson 2001:4)

One of the important study found out that foreign owned firms will have higher productivity than rest because production equipment and an inflow of non-tangible assets can be transferred from the parent company (Aitken, Harrison, 1999) is one of the reason when foreign investor invest in an organization utilizing resource and assets by focus

At 90% confident level, the number of employees creates significant different productivity importance level. When number of employees is less than 100, there is high productivity importance level. On the others hand, when number of employees is more than 100, the particular company should measure productivity. The result imply that the lower higher size of the organization the lower productivity importance level. Due to the questionnaire response was design to be the top management and top management in large organization tend to evaluate the performance from balance sheet or financial measurement while most the small organization that has number of employee less than 100 the top management and operation manager is the same person so productivity is like the balance sheet for them also.

This could be show that the top management of the large organization still define productivity importance lower than others. In another hand there is a significant positive signal of productivity importance level for small organization in Thailand.

Additional factor impact to productivity importance when confident level lower than 65%, when business year is less than 5 years, there is high productivity importance level which means the organization must measure productivity. In contrast, when business year is greater than 5 years the productivity still should be one of the business performance. The first priority for every business especially the business that at the start in the market is profitability but even if the intimate solution for every business is profitability there are various scenarios to increase profitability

one of the most famous one from MFPMM is improve productivity as show in Figure below.

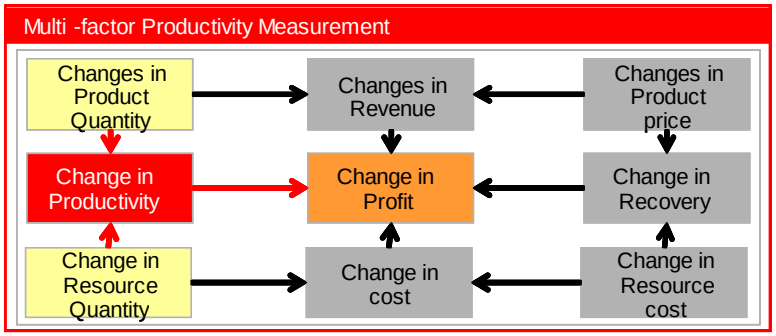

Figure 52 MFPMM

And productivity importance level has no significant difference among different of industries type and customer market at confidence level Average mean of productivity importance for all two factors is in rank 2 which mean the organization should measure productivity so the related information is defined as optional performance in order to increase competitive in the market and support manufacturing strategy of the organization.

Simultaneously pair-wise company profile

The conclusion when simultaneously considering industry type and others profile show in table below

Table 55 When-to-measure Productivity from the Industrial Type Profiles

Profiles	Size					Years Operating in Business						Ownership		Targeted Customers	
	< 50	50 - 100	101 - 200	201 - 500	> 500	< 5	5 - 10	11 - 15	16 - 20	21 - 25	> 25	Local	Joint Venture	Local	Inter
Automobile	X	X	□	□	□	X	□	X	□	□	□	□	□	□	□
Electronics	X	X	□	□	□	●	X	X	□	□	□	□	●	□	●
Food	X	X	□	□	★	X	●	X	□	□	□	□	□	□	★
Petrochemical	□	□	□	X	★	●	X	□	□	●	□	□	□	□	□

Note:

● for Must-have

□ for Require-to-measure

★ for Should-have

X for Data not sufficient for statistical analysis

In automotive industry, the productivity importance level does not difference in any factor. Productivity is required in any size, business year, ownership and target customer. From the definition of questionnaire define the productivity; all of these performances is one of the famous production system deployed by Toyota

1 Lead time: Waste from waiting time

2 Inventory turn over: Waste from useless and excess inventories

3 MTTR: Waste from scrap and defects

4 MTBF: Waster from waiting time

From the information show that main automotive industry in Thailand is investment from Japan. Toyota Production System (TPS) has persuade the automotive or even related industry to focus on productivity, moreover it is uncomplicated to apply the same concept to the same industry

In Electronics industry, the industry which has business year less than 5 years, joint venture ownership or international customer market must measure productivity. The new comer in the business try to take market share from current player so improvement on MTTR and MTBF will impact to lower cost and increase price competitiveness. Progressively of product variety and shorter product life cycle in current electronic industry less lead time and high inventory turn over will increase flexibility with controllable cost. In the mean time current players which already in the market play a difference role by create and increase customer loyalty by provide customer's value and try to maintain current customer. Vahter, 2004 also confirm that foreign owned firms have, on average, higher productivity levels than domestic enterprises.

In Food industry, the industry which has business year less than 10 years must measure productivity and the lowest level of productivity importance with difference business year is required level. Because food is the spoilage product and mostly is continuous process so all of the productivity factor in questionnaire directly effect to the product and process characteristics. Importance of the productivity decrease when number of employee is greater than 500 or customer target is international. These company profiles show that the organization is large and high potential business so the productivity has been developed and change business focus to other direction for example quality, reliability or service.

In Petrochemical industry, there are difference productivity importance levels when there are difference number of employee and business year with no particular pattern. But the ownership and customer target does not affected to productivity importance level with require-to measure

The conclusion when simultaneously considering number of employee and others profile show in table below

Table 56 When-to-measure Productivity from the Size Profile

Profiles	Years Operating in Business						Ownership		Targeted Customers	
	< 5	**5-10**	**11-15**	**16-20**	**21-25**	**> 25**	**Local**	**Joint Venture**	**Local**	**Inter**
< 50	●	X	□	X	X	X	●	X	●	□
50-100	X	X	X	X	X	●	X	●	●	X
101-200	X	★	★	□	□	□	□	□	□	●
201-500	□	●	□	□	X	□	□	□	□	X
> 500	□	□	□	□	□	□	★	□	□	□

The result of pair-wise of number of employee and the others factor relate to one factor analysis. Most of circumstance that has number of employee less than 100 must measure and the lowest importance level is require-to measure. When the organization has number of employee 101 to 200 then the higher business year tend to has higher productivity importance level as well as when targeted customer is international. There is no difference on ownership type but the lowest level still is require-to measureWhen the organization has number of employee greater than 500, most of the circumstance define the importance at require-to measure which also relate with one factor analysis the same as the result that number of employee less than 100

The conclusion when simultaneously considering business year and others profile show in table below

Table 57 When-to-measure Productivity from the Years-in-business Profile

Profiles		Ownership		Targeted Customers	
		Local	**Joint Venture**	**Local**	**Inter**
Years Operating in Business	**< 5**	●	**X**	●	**X**
	5- 10	●	□	●	□
	11-15	□	**X**	**X**	□
	16- 20	□	□	□	□
	21- 25	□	□	●	★
	> 25	□	□	□	□

Note

● for Must-measure

□ for Require-to-measure

★ for Should-measure

X for Data not sufficient for statistical analysis

Most of the firm which has business year less than 10 years is own by wholly local and has a domestic as a targeted customer. Most of the circumstance defines productivity importance level as must-measure and the lowest level is require-to measure. This result show the relate result with one factor analysis that lower business year give more productivity importance level than higher business year.When business year higher than 10 years, only one circumstance that define productivity as must to measure when target customer is domestic while the others circumstance define productivity importance level as require-to measure

The conclusion when simultaneously considering ownership and others profile show in table below

Table 58: When-to-measure Productivity from the Ownership Profile

Profiles		Targeted Customers	
		Local	**Joint Venture**
Ownership	**Local**	□	□
	Joint Venture	□	□

Note

□ for Require-to-measure

The pair-wise circumstance between ownership and customer target show that there is no significant difference of productivity importance level.

		EMP					BY						OWN		CUS	
		<50	50-100	101-200	201-500	>500	<5	5-10	11-15	16-20	21-25	>25	Wholly own	Joint venture	Domestic	International
IND	Automotive	-	-	□	□	□	-	□	-	□	□	□	□	□	□	□
	Electrical	-	-	□	□	□	●	-	-	□	□	□	□	●	□	●
	Food	-	-	□	□	★	-	●	-	□	□	□	□	□	□	★
	Petrochemical	□	□	□	-	★	●	-	□	□	●	□	□	□	□	□
EMP	<50						●	-	□	-	-	-	●	-	●	□
	50-100						-	-	-	-	-	●	-	●	●	-
	101-200						-	★	★	□	□	□	□	□	□	●
	201-500						□	●	□	□	-	□	□	□	□	-
	>500						□	□	□	□	□	□	★	□	□	□
BY	<5												●	-	●	-
	5-10												●	□	●	□
	11-15												□	-	-	□
	16-20												□	□	□	□
	21-25												□	□	●	★
	>25												□	□	□	□
OWN	Wholly own														□	□
	Joint venture														□	□

● **for Must-measure**
□ **for Require-to-measure**
★ **for Should-measure**
X **for Data not sufficient for statistical analysis**

Figure 53 Circumstance to measure productivity with two factors consideration

The figure show circumstances which combine from each data level of 2 factors, there are 138 possible circumstances The result from survey again further subjected to the General Linear Model to test the hypothesis by finding the correlation between 2 factors of company profile and productivity ranking, P-value 0.1(Confidence level 90%). There are 19 circumstances out of 138 circumstances or 14 percent that need productivity measurement. And there are 93 circumstances out of 138 circumstances or 67 percent that require productivity measurement as optional performance in order to increase competitive in the market and support manufacturing strategy of the organization. While the others 26 circumstances out of 138 circumstances or 14 percent give more importance ratio to other business performance.

The pattern of pair-wise analysis is related with one factor show that the lower employee, lower business year and joint venture own has higher productivity importance level than others.

CONCLUSION AND RECOMMENDATION

This study reveals the criteria in interesting factor that productivity measurement remarks as the important performance measurement. The interesting factor is company profile which consists of general data that are industry type, number of employee, business year, ownership and customer market. The questionnaire has been analyzed by using analysis of variance. At the first phase the study considered single criteria that effect to productivity importance level. The analyzed result discovered that business size which based on number of employee and type of business owner is the criteria that create difference on productivity importance level. It could be concluded that the organization with number of employee less than 100 or owned by joint-venture must define productivity as business performance; while the other circumstances, productivity is still defined as optional business performance as well. Furthermore, the study is analyzed in more details by using two criteria to create 108 possible circumstances to find whether there is any significant difference among these circumstances. According to the result, more than 90 percent of circumstances require productivity measurement in the organization; and another 10 percent focus on other business performance rather than productivity.

The result from single criteria represents that the company with less than 100 number of employee has more importance level to productivity measurement. When small to medium size of business which eager to enter into the marketplace focus on profitability as the first concern. There are various scenarios to increase profitability; the most famous one is productivity improvement. From other point of view, the company with less than 100 number of employee might happen as the result of high productivity performance level. Therefore, improvement focuses on labor productivity. From prior study of Aitken and Harrison (1999), foreign owned firms have higher productivity than the rest because of production equipment and an inflow of non-tangible assets can be transferred from the parent company. It could be concluded that the most critical performance when foreign investor invests in an organization utilizing resources and assets is to focus on productivity. Vahter (2004) also confirms that foreign owned firms have averagely higher labor productivity

levels than domestic enterprises. When focuses in more details, export orientation together with the majority of foreign capital in a firm represents higher productivity level and more competitive advantages proved by higher value added and skilled labor. In additions, the positive results of productivity level and competitive advantage are another evidence to support one of the circumstances (analyzed by using two criteria of joint-venture ownership with export market orientation) requires productivity as a performance measurement for the organization.

The study has identified factors in which productivity information is required. Those factors are derived from data and opinions of 40 top executives of manufacturing firms belonging to the FTI. Information consists of the company profile and expressions of interviewers' rankings on productivity importance level preferences through a survey. The analysis of variance and correlation are applied to identify impacted factor. From the analysis result, company with less than 100 number of employee and a joint-venture own between Thai and foreign investor must measure productivity; while in other circumstances, productivity measurement is still required to strengthen organization management process. In more details, analysis by considering two factors at the same time created 108 circumstances in which 90 percent of all circumstances still remark productivity measurement as performance measurement that is at least the organization should have productivity measurement. These results reflect the company top management perceptions that productivity is still one of the most important performance measurements. The follow-up reviews with expert of performance measurement underline the usefulness of the findings and help to reveal the study's weaknesses. This study is part of the overall effort to better understand productivity measurement.

Implementation

The findings from this study could provide information about company profiles which effect to productivity measurement base on top management opinion. This information could be beneficial to reflect the productivity perspective in Thailand for managing process. Furthermore, the result could be useful to be

benchmark information for other study. Moreover the factor could help Thailand inventor to understand the productivity importance in order to work align with the define company profile.

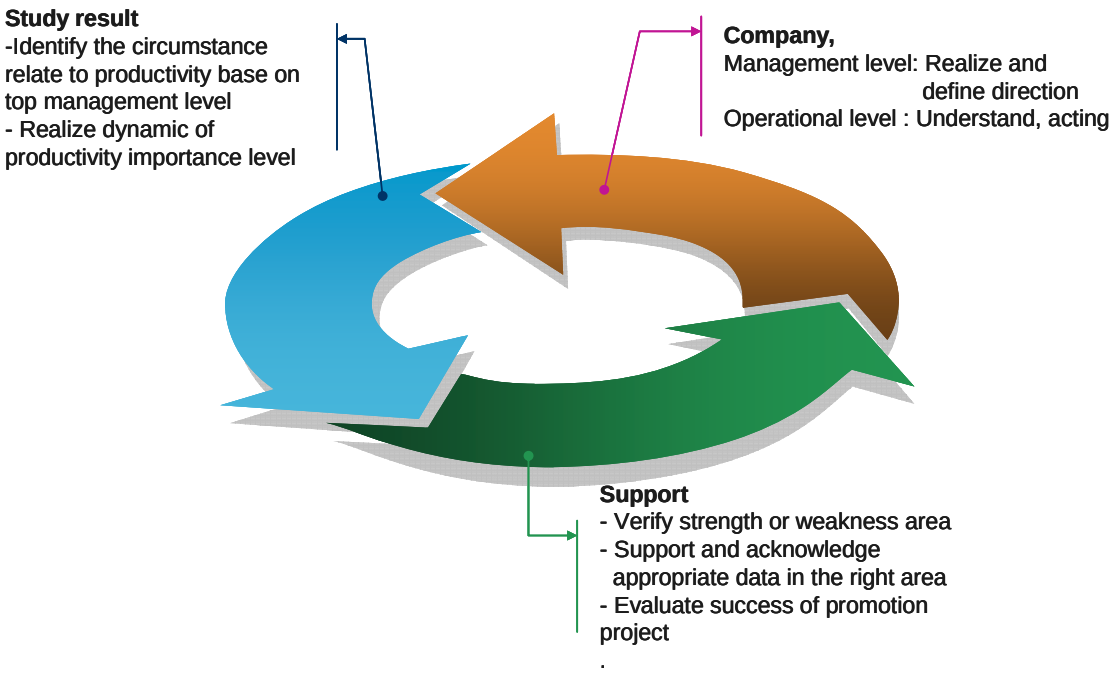

Figure 54 Practical Implication

Research difficulties and Limitations

Limitation of this study is the findings should be recognized as dynamics and may change over time. The data from questionnaire is cover only manufacturing industry and limited of key indicators and ratios on productivity-especially on labor and materials- should be included. Larger participation on questionnaire will help on analysis and reliability of data used.

Recommendations for Further Research

Study on other factors that impacts to productivity importance for example top management profile or other economic conditions and competition. Study on further

company profile in order to under stand more on company profile. Other business performance could be studied and identify importance level by conducted the same concept and method in order to understand perspective of other business performance in manufacturing industry. Extend the scope of the industry in to service or even public organization could be potential information with the aim to understand the different and relation between industry types.

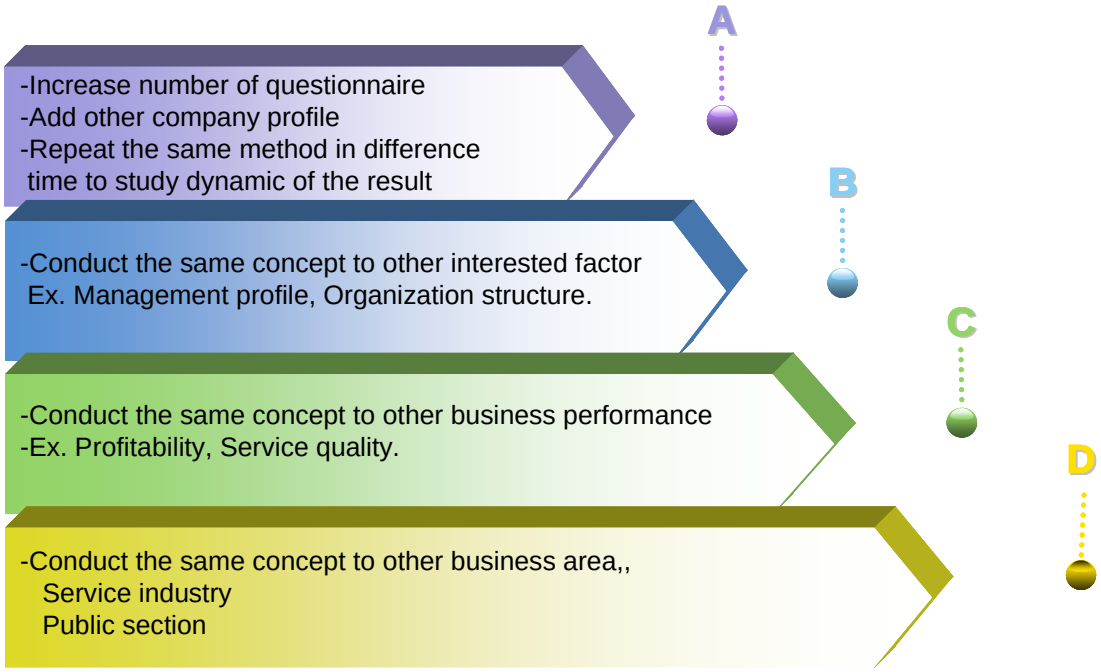

Figure 55 Recommendation

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APPENDICES

Appendix A

Survey on manufacturing company profile

and business performance

Part 1 company profile

1. Industrial Type

◯ Automotive and auto parts ◯ Electrical and electronics
◯ Food ◯ Petrochemical ◯ Others……..

2. Number of Employees

◯ <50 ◯ 50 -100 ◯ 101-200 ◯ 201-500 ◯ >500

3. Number of Business Years

◯ <50 ◯ 50 -100 ◯ 101-200 ◯ 201-500 ◯ >500

4. Ownership

◯ Wholly Local ◯ Joint Venture

5. Main Customer

◯ Domestic market ◯ International market

Respondent Profile

6. Position

◯ President ◯ General Manager ◯ Purchasing Manager
◯ Engineering Manager ◯ Production Manager ◯ Factory Manager
◯ Others……..

7. Gender

◯ Male ◯ Female

8. Age

◯ <30 ◯ 31-40 ◯ 41-50 ◯ 51-60 ◯ >60

9. Work Experience

◯ <5 ◯ 5-10 ◯ 11-15 ◯ 16-20 ◯ 21-25
◯ >25

10. Education Background

◯ Engineering ◯ Non-engineering

Appendix Table A1 Business Performance: Indicating the performance areas that represented the major concern relatively to the competition in the markets

Criteria	Important Rating				
BP_LQ: Liquidity	High				Low
Cash flow	5	4	3	2	1
Return on investment	5	4	3	2	1
BP_PF: Profitability					
Revenues per total assets	5	4	3	2	1
Profit margin	5	4	3	2	1
Market value	5	4	3	2	1
Earnings Before Interest, Taxes, Depreciation, Amortization, and Restructuring or Rent Costs (EBITDAR)	5	4	3	2	1
BP_CC: Corporate competency					
Market share	5	4	3	2	1
Profit per Customer	5	4	3	2	1
BP_SQ: Service quality					
Satisfied - customer index	5	4	3	2	1
Number of customer complaints	5	4	3	2	1
BP_CR: Customer relation					
Average direct communications to customers	5	4	3	2	1
New customers per Total customers	5	4	3	2	1
BP_PP: Productivity and process efficiency					
Average lead time	5	4	3	2	1
Inventory turnover	5	4	3	2	1
Mean time to repair (MTTR)	5	4	3	2	1
Mean time between failures (MTBF)	5	4	3	2	1
BP_PS: Partnership					
Supplier on-time delivery	5	4	3	2	1
Total supply chain delivery performance to end customer	5	4	3	2	1

Appendix Table A1 (Continued)

Criteria	Important Rating				
BP_OQ: Operational and technical quality					
On - time delivery	5	4	3	2	1
Maintenance cost per revenue	5	4	3	2	1
BP_PI: Product innovation					
RandD expense per total expenses	5	4	3	2	1
Ratio of employees involved in the strategic planning	5	4	3	2	1
BP_QW: Quality of work life					
Staff turnover	5	4	3	2	1
Satisfied - employee index	5	4	3	2	1

Appendix B

Reliability testing on manufacturing and supplier selection strategies and business performance

Appendix Table B1 Reliability testing on business performance

Criteria	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Business performance : Cronbach's Alpha = 0.957				
BP_L_CF	92.6000	231.953	.635	.956
BP_L_RI	92.7429	230.432	.841	.953
BP_P_RT	92.8571	229.773	.787	.954
BP_P_PM	92.8000	228.165	.619	.956
BP_P_MV	93.1143	231.398	.728	.955
BP_P_EBITDAR	92.9429	230.938	.598	.956
BP_C_MS	92.7429	236.550	.607	.956
BP_C_PC	93.0286	231.499	.735	.954
BP_S_SCI	92.5714	231.487	.703	.955
BP_S_NCC	92.6286	230.358	.714	.955
BP_CR_DC	92.3429	237.114	.652	.955
BP_CR_NC	93.0286	229.970	.818	.954
BP_PP_LT	92.4286	235.017	.615	.956
BP_PP_IT	92.4000	244.365	.433	.957
BP_PP_MTTR	92.5143	233.963	.726	.955
BP_PP_MTBF	92.5714	231.252	.761	.954
BP_PS_SOT	92.4286	237.487	.730	.955
BP_PS_STC	92.4571	237.844	.724	.955
BP_O_OT	92.2286	243.534	.527	.957
BP_O_MC	92.6857	236.634	.659	.955
BP_PI_RD	93.0571	225.232	.786	.954
BP_PI_HR	92.7429	232.255	.742	.954
BP_Q_ST	92.8286	232.499	.636	.956
BP_Q_SEI	92.6857	238.810	.718	.955

Appendix C

Descriptive statistics of all measures

Appendix Table C1 Descriptive statistics on three construct measures

Descriptive Statistics

Criteria	N	Minimum	Maximum	Mean	Std. Deviation
BP_LQ	40	2.00	5.00	4.100	0.963
BP_PF	40	1.75	5.00	3.844	1.091
BP_CC	40	2.00	5.00	3.850	0.956
BP_SQ	40	2.00	5.00	4.150	0.982
BP_CR	40	2.50	5.00	4.038	0.892
BP_PP	40	1.75	5.00	4.188	0.919
BP_PS	40	3.00	5.00	4.263	0.707
BP_OQ	40	2.50	5.00	4.225	0.779
BP_PI	40	1.50	5.00	3.800	1.060
BP_QW	40	2.50	5.00	3.963	0.849
Valid N (listwise)	40				

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