

# A Study of Growth Factors on Sustainable Manufacturing in Small and Medium-Sized Enterprises: Case Study of Japan Manufacturing

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**Abstract**—Japan's semiconductor industries have developed greatly in recent years. Many were started from a Small and Medium-sized Enterprises (SMEs) that found at a good circumstance and now become the prosperous industries in the world. Sustainable growth factors that support the creation of spirit value inside the Japanese company were strongly embedded through performance. Those factors were not clearly defined among each company. A series of literature research conducted to explore quantitative text mining about the definition of sustainable growth factors. Sustainable criteria were developed from previous research to verify the definition of the factors. A typical frame work was proposed as a systematical approach to develop sustainable growth factor in a specific company. Result of approach was review in certain period shows that factors influenced in sustainable growth was importance for the company to achieve the goal.

**Keywords**—SME, manufacture, sustainable, growth factor.

## I. INTRODUCTION

CONCEPT of sustainable manufacture was generally applied in common manufacturing nowadays. Moreover, there are many definitions and understanding about definition of sustainable manufacture Moldavska et al. [1]. A series of novel approach was developed by company to identified opportunity of improvement and provide systematize generic rules for maximize resource efficiency in manufacturing process Despeisse et al. [2]. Integration between business leader and professional required full commitment and mutual trust to enable creation of value in manufacturing practices. Therefore, implementation of resource efficiency and social responsibility fully achieved Badurdeen et al. [3].

The complexity and challenge in manufacturing practice for companies that provide products and services, in order to grow their business that meet market needs (customer value) and recover profits was studied in many research fields England [4]. The success company had strategies road map and systematic indicators which cover and maintain their achievements. In order to ensure its competitiveness based on "core technology" owned by the company, competitors offer excellent products and services with QCD to serve better result Golini et al. [5]. Various concepts of management are proposed (strategic theory

quotation) as a strategy in accordance with such a change in the life cycle and a change in the external environment. However, in response to these changes, it is difficult for all companies to implement and respond to their advanced strategies from time to time Longoni et al. [6].

In the period of high economic growth in Japan, the historical review as research study performed extensively. One of the success companies 'Hitachi' as a representative in the region's enterprises castle town, small businesses have belonged there and can grow with major companies met Hitomi [7]. A further study about influence of human resource in manufacturing and changing comparative advantage in skill obtained that some countries which produce skill-intensive goods nowadays gap between producer and user has been narrowing. It was a signal that human skill may equal after a few times, the winner is the first introduce skill technology Kiyota [8]. This is a dependence growth model in the life cycle of SMEs that stable growth can be expected by placing a company in the growth business domain. The competitive environment of small and medium-sized enterprises becomes more severe as the industry's growth slows down.

Many Japan Company's productivity investigated in previous study. Moderation in technology and non-technology considered structural changes in Japan society. Productivity-enhancing technology, therefore technology shock was a major role to explain productivity growth. While, non-technology shock influenced the labor input Ko [9]. Quality management also has significant role determine competitive performance. Stability and consistency of Japanese management was the strategic weapon for pursuing competitive advantage of Japanese manufacturing companies Phan et al. [10]. Further analysis on corporate governance determined operational performance in manufacturing. Japanese corporate governance characterized by unique features, such as monetary system, lifetime working, and board of director was chosen from insider Sueyoshi et al. [11]. Changing in governance policy affected on manufacturing strategy, while maintaining continuity business. Manufacturing high quality product however not the ultimate success facing the competitor. It should support by manufacturing services. Transition period that kind of shifted

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product-services in Japanese manufacturing created life cycle value creation platform Ūmeda [12]. Comparison study of sustainable manufacturing outside Japan also investigated in India. It has similar implementation between two countries. Quality management was adopted in certain ways. Different social structure and governance policy resulted competitive strategic scope limited to manufacturing sizing Shankar et al. [13].

Therefore, this research based on the results of previous study, considering about the sustainable growth factor of a company, and analyzing the factors necessary for sustainable growth of companies indicated by previous research. Furthermore, in order to more detailed discussion on the corporate structure to train and develop the factors, the domestic semiconductor business was investigated as an example.

## II. METHODOLOGY

### A. Survey on Current Situation and Issues of SMEs in Japan

Prior to considering the management system, we survey the current situation surrounding Japanese SMEs. It will not come true that aim for sustained growth unless it continues to exist. In other words, we explore paradoxically the survival conditions as the premise of sustainable growth from the reasons such as the closing and bankruptcy of small and medium enterprises.

#### 1. Current Situation and Issues

Even in Higashi Osaka, Ota Ward, Hamamatsu City, which is the center of Japan's representative SMEs, in the case of 1986 as a standard 32% - 42% of business establishments disappear in 20 years until 2006, Has exceeded the start of business since the 1990s.

Regarding the current situation and problems in small and medium-sized enterprises, the regional economy is exhausted due to the prolonged recession in addition to the declining population and the decline of public works. Even if management is anticipated to deteriorate in the future and forced to continue the business because of the maintenance of employment and a large debt due to personal guarantee. New business development is difficult due to lack of margin alone, and it is difficult to develop new business", while new business development is necessary securing adequate earnings with existing business, human, capital, and technology. It is indicated by the Ministry of Economy, Trade and Industry survey (extracted from Ministry of Economy, Trade and Industry 2011). Revised industrial revitalization forced regeneration of SMEs more difficult.

#### 2. Failure Analysis of Corporate Bankruptcy

In the 2011 annual report of the Imperial Data Bank, the number of main causes of bankruptcy is ranked as (1) poor sales, (2) industry slump, and (3) emergency management. Here, it is thought that there was also a part that prevented poor selling and industry slump depending on how to approach competition problems, otherwise due to autonomous factors (mistakes made by management) of these unavailable reasons, it seems like a true cause that many small and medium-sized enterprises came

along with management based on experienced that belongs to a major company.

### B. Study on the Definition on Sustainable Growth

Based on public surveys in Japan, we examined the conditions of survival of Small and Medium-sized Enterprises. Many companies have set sustainable growth goals, but it is not necessarily clear what to bring with sustainable growth. Therefore, it will be difficult to return to specific numerical targets, and sustainable growth will not make sense beyond the slogan. Looking at the definitions in the preceding research that investigated sustainable growth companies in Japan and overseas, many companies have promoted sustainable growth and many researches on sustainable growth companies are cited. Nonetheless, we could not find a definite and quantitative definition of what sustainable growth is, but as a result of investigations the following items are being explored and used as scales.

- 1) Growth rate exceeding GDP by at least 1% Nitida [14]
- 2) Report a history of more than 50 years, sustainably holding Japanese companies whose stock prices are generally upward trend for more than 30 years as "sustainable growth enterprises" Nonaka [15].
- 3) Small and medium-sized enterprises (SMEs) with a ratio of current profits to assets of about 6% or more in the past 10 years [16].
- 4) Business value (FMV) of a company is defined as the present value or liquidation value of cumulative profit that will be created in the future. It is clear that the corporate value (FMV) will be the cash flow that will be produced by the main business in the future and that it will utilize the DCF method, similar company comparison method, similar transaction method, etc. [17].
- 5) Maximum profit renewal rate (sustainability) Miwa [18]. Scale to measure sustainability of profit growth. Percentage of total number of years when operating margin exceeded record high.
- 6) Profit level magnification, Miwa [18]. Scale to measure the jumping power of profit growth. Divide the analysis period into the preceding term and the latter term and judge by how many times the average value of operating profit made a leap in the previous term and the latter term.
- 7) Re-lower margin ratio (Strategy function degree, risk judgment) Miwa [18]. Scale to measure the risk of management strategy. Accumulation of real operating profit and its cumulative real sales judge by relative ratio.

Although these items are meaningful when it is judged as a goal or corporate value judgment, however these items were mainly discussed for listed companies when compare target based on the calculation of stock price or disclosure of performance. On the other hand, none of these defined the definition for SMEs. In addition, the definition in the past research strongly suggests sampling conditions for exploring the factors of sustainable growth afterwards, and in the case that the stock price is used as a sample for the listed companies.

For this reason, as an easy-to-express indicator for setting targets in Small and Medium-sized Enterprises, the numerical

value definition in sustainable growth is basically based on a ratio of current profits to assets of 6% or more. Since it is a short-term performance alone, we propose to further use indices combining the ratio of sales, R&D expenses, percentage of new product sales, and operating profit per employee. In addition, as the index of ordinary profit margin of sales varies according to the social environment, the journals of Small Business Enterprise on Small and Medium-sized Enterprises [16] published by the Small and Medium Business Administration Agency.

It is important to make reference to the ordinary profit ratio of sales in the manufacturing industry's quarterly report [16], [17], not to deviate from the change in ordinary income and operating profit margin of the world. And when we consider it as a sustainably growing company, the numerical value can be achieved with only this quantitative value. Sustainable in the management philosophy that is a qualitative indicator and corporate culture is necessary to consider the mechanisms such as the common philosophy and consciousness of growing into the company, the priority of stakeholders for small and medium enterprises, and the degree of employee satisfaction.

### III. RESULTS

#### A. Factors of Corporate Sustainable Growth Method of Analysis

Next, in order to examine what is the factor of sustainable growth in the enterprise, 26 subjects of paper, research reports, books from Japanese literature with keyword of sustainable growth are targeted and organized sustainable growth's chapters and sections that were deemed necessary from the survey into chapters and sections with about 20,000 letters, and extracted important factors using text mining.

#### B. Factors of Sustainable Growth Analysis

Important factors of sustainable growth indicated by previous researchers, as important factors from the results of the journals based on frequently used keywords (see the analysis results in Table I), ①,1 Management Philosophy/ Vision, ②,2 Corporate Culture/ Organizational Culture, ③,3 Business Management/ Management System, ④,4 Innovation, proved to be an important factor item. Here, ⑤,5 Strategy and ⑥,6 Technology extracted as a new single keyword shall be excluded from ③,3 Management/ management system.

Next, there are points to be highlighted as the considered contents to indicate the sustainable growth factors as follows.

##### 1) Management Philosophy/ Vision

Collins et al. [19], new management methods of today be innovative management approach was not a new thing. Based on the universal philosophy, anyone can learn, and decide the lessons. Also pointed by Drucker [20], that the CEO may decide values, standards, and morals within the organization. It is determined that the organization's direction whichever its way. Nonaka [15] says that if it is uncertain, he needs to draw a goal in line with philosophy and values in order to create the future himself, and to draw the process of reaching it.

##### 2) Corporate Culture/ Organization Culture

Tanaka et al. [25], companies which have achieved a sustained growth has a basic philosophy that does not change either and sharing rigorous succession. It is pushing constantly the process of "self-innovation", which creates an organization that always learns to become a living company (Longevity Company). Zoltan et al. [22] have previously achieved through repeated trial and error many innovative management techniques, the stack of ad hoc correspondence repeatedly has such many small improvements, and finally it becomes solid foundation. Nonaka [15] suggests that organizations and individuals who constitute a company do not continue to move towards realization, even though skill of organization and human resources will influence sustainable growth and have a wonderful strategy/ business model.

TABLE I  
KEY FACTORS IN SUSTAINABLE GROWTH THROUGH KEYWORD SEARCH

Cause Item	Count number
① Management Philosophy/ vision	25
② Corporate/ organizational culture	30
③ Business management system	38
④ Innovation	82
⑤ Strategy	42
⑥ Technology	33
⑦ Marketing	1
⑧ Core competence	3
⑨ Mergers & Acquisitions	2

##### 3) Business Management System

Drucker [20] forward an idea that the company's purpose is customer creation, entrepreneurs are behavior rather than temperament, and the basis for it is not intuitive but principle and method. With technology, entrepreneurship and innovation will emerge. Morris et al. [23] learns by adjusting the process and can change its ability. Zoltan et al. [22] develop a methodology as integration with corporate acquisitions, along with all of the leaders to share the results of a study on the online communication plan and functional integration checklist, agenda list of workshops, consulting information resources and so on. A high-growth company without exception and actually applies its strategic attitude to the business in the market. Meanwhile, low-performance companies thinking only along the existing growth path.

##### 4) Innovation

Drucker [20] stated that innovation rather than caused by some inspiration and intuition with creativity, which generates the systematic management. Dyer et al. [24] states that the ability of innovation is neither mystery nor magic, but even if it knows how to do it, it can be organized and learned by anyone.

#### C. A Study on Basic Framework to Achieve Sustainable Growth

Based on the results of extracting the factors of sustainable growth in the previous research, regarding the important points and connections in each factor item and their meaning. The priority of stakeholders in SMEs is regarded as an employee, and it is easy to understand when explaining the policy

necessary to convert. Therefore, we propose Fig. 1 as a basic framework of management in SMEs. The framework point 1) from the basic idea of sustainable growth factors. Point 2) clearly shows the points and thoughts to be cherished about its

contents, and then point 3) explains points to keep in mind. 4) Methodology to achieve and 5) process to achieve are the systems and processes that need to be targeted as a result.

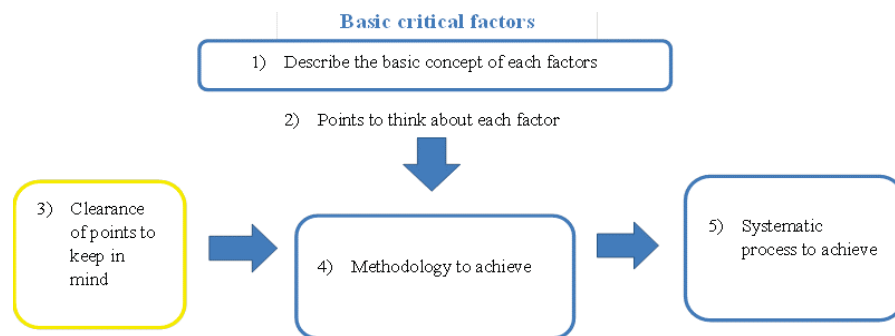


Fig. 1 Basic framework diagrams

#### *D. Development of Basic Framework for Sustainable Growth Important Factors*

Next, based on the contents for each factor indicated by the previous researcher, applying the basic framework of management in the SMEs management newly proposed can be arranged as follows.

##### 1. (Management Philosophy/ Vision) Management Framework

###### *a. Concept Based on Each Factor*

The management philosophy establishes a solid starting point of thinking and viewpoint of things, and decides what appearance and direction should be.

###### *b. Points to Think*

To express the idea clearly with plain expressions, to be honorably content.

###### *c. Clearance Points to Keep in Mind*

Maintain basic philosophy and prepare concrete mechanism to promote progress. We need two fundamental principles to be maintained and progress toward the ideal in the future.

###### *d. Method and Methodology to Achieve*

Values, criteria, morals within the organization are determined, clarifying the judgment axis, implementing the philosophy as a systematic effort to penetrate the management philosophy and conduct regular training.

###### *e. Systems and Processes to Achieve*

Penetrate organizations and all mechanisms (goals, strategies, policies, processes, corporate culture, management team actions, offices, accounting and payroll systems, job planning, etc.)

##### 2. (Corporate Culture/ Organizational Culture) Management Framework

###### *a. Concept Based on Each Factor*

It is important to decide what kind of talent the company should be composed, build common values, appoint human

resources, develop abilities, evaluate individual abilities, and observe employment contracts.

###### *b. Points to Think*

Always think creativity as an asset of people.

###### *c. Points to Keep in Mind*

It covers not only creativity and innovation talent, but also management ability, business know-how, and sufficient personal connections. The organization is a community that human beings constitute, a community that is doing business to survive.

###### *d. Method and Methodology to Achieve*

Organizations and employees who change their skills by learning and integrating new knowledge through interested business process making a climate where companies and employees are concerned about each other.

###### *e. Systems and Processes to Achieve*

Create an organization to continue and learn. First and foremost, pay attention to the development of employees.

##### 3. (Management System) Management Framework

###### *a. Concept Based on Each Factor*

The important is how to construct a management system to manage technology and innovation and how to define domains.

###### *b. Points to Think*

Business model and business management determined corporate performance.

###### *c. Points to Keep in Mind*

Define domain definitions and establish activity areas. Also, when reaching the stable period for redefining the domain aiming for de-maturation. Business management innovation is far more important than other innovations in creating the dramatic and long-term change in competitive advantage.



#### d. Method and Methodology to Achieve

In order to avoid from maturation and cope with the environmental change, a series of improvements need to change daily and build a future-oriented management system making full use of IT technology.

#### e. Systems and Processes to Achieve

Strengthen management by modeling company knowledge and strategies with overcoming many crises, such as building management indicators and crisis management capabilities.

#### 4. [Innovation] Management Framework

##### a. Concept Based on Each Factor

Innovation is not limited to technological development but involves the whole process up to "commercialization" of marketing, including accumulation and management of intellectual property created in the process of development of financing, and marketing. The driving force of economic development lies in innovation (execution of new combination) by business owners. ① Introduction of practically unknown production methods in the relevant industrial field ② Pioneering new sales channels ③ Acquisition of new sources of raw materials or semi-finished products ④ Realization of new organization.

##### b. Points to Think

In order to create innovation, it is necessary to have the knowledge and entrepreneurial spirit. The purpose of the company is the creation of customers, and the starting point of creation captured the desired outcome required by customers.

##### c. Points to Keep in Mind

"Destructive innovation" is not restricted to technology, but various new developments such as the development of new

sales methods and service forms may change the structure of the market and threaten the sustained growth of existing companies. Ability of a company has "absorption capacity". Think about what you can earn from your partner and what you can offer to your partner.

#### d. Method and Methodology to Achieve

Open innovation to organically combine ideas inside and outside the company to create value and collaborate management and licensing in technology development, partnership in sales/ marketing, mergers and acquisitions (M & A) including internal management of the company Use it as well as resources. Use open and closed strategies in parallel.

#### e. Systems and Processes to Achieve

Collaboration with universities is an indispensable activity as a place for experiments in diversifying ideas and further developing into business.

#### E. Adaptive Verification in Small and Medium-Sized Enterprises Based on Proposed Important Factors of Sustainable Growth

Founded in 1991 as a verified company called PMT Ltd, it is now a company with approximately 5-billion-yen group sales and 220 total employees (Note: as of the end of July 2017) and categorized as Small and Medium-sized Enterprise that is considered continued to grow. Fig. 2 shows the company's annual sales with ordinary income margin ratio that makes it easy for Small and Medium-sized Enterprises to explicitly specify as the goal for sustainable growth. The company develops various products from the semiconductor and metal processing retail industry through industry-academic collaboration and supplies it to the market, and now it is developing and transforming the business to companies with own brand products.

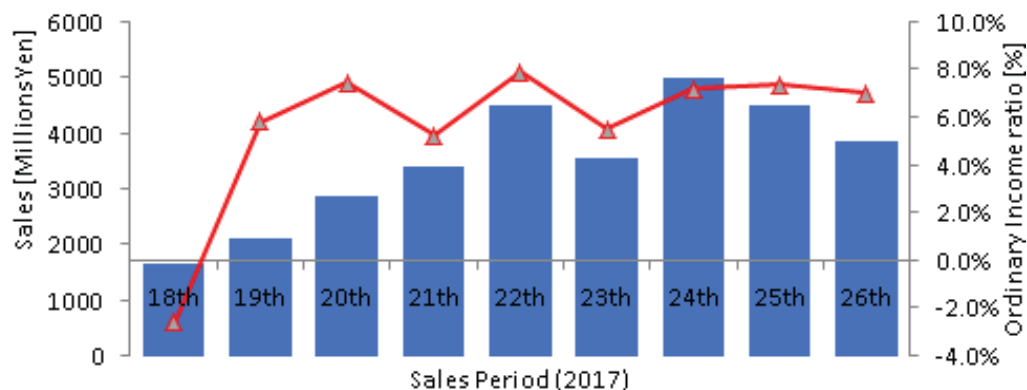


Fig. 2 PMT Ltd. Sales and ordinary income ratio

In the early stage PMT Ltd establish steady increase of sales trend until 5 periods. Then continue with slightly decrease at 23<sup>th</sup> period. Although sales trend decreases at 23<sup>th</sup>, sales revenue was bigger than basic period (18<sup>th</sup>) about 116,03%. In end period of comparison (26<sup>th</sup>) sales revenue was increase 133,61%, operating margin 4.5%, and ordinary income 7%.

#### 1. Contrast with Sustainable Growth Factors

We conducted a hearing survey based on the basic framework of the verified company and examined each factor. As a comparison results, proficiency level of each factor content was expressed in 5 stages of 1 to 5. The current situation and its improvement contents, and the method of showing the priority

and degree of importance of the execution in the company were adopted. Also, describe only the results of Nonaka [21] management philosophy/ vision, Miwa [18] corporate culture/ organization culture, which are the factors of sustainable growth.

#### IV. DISCUSSION

In addition, the sluggish sales and productivity of Small and Medium-sized Enterprises is remarkable. From 2010 to 2014, the number of enterprises as a whole has decreased from 4.21 million to 3.84 million, the number of decreased around 370,000 companies, especially small enterprises (the number of employees is 29 people or less). 1.13 million Companies are out of business. Meanwhile, the total number of employees has remained steady (from 48.33 million to 47.94 million), only the number of employees of medium-sized enterprises has increased by about 2 million, especially in companies that employ 500 or more employees. Increase in employment is steady. This is believed due to the fact that comprehensive human resource development and systematic response are more required for stable and sustainable growth within the company.

Furthermore, many small business owners are performing centralized management by KKD (KAN-KEIKEN-DOKYO) known as (Intuition-Experience-Courage) as an implicit knowledge, and organizational knowledge as seen in SECI model (Socialization-Externalization-Combination-Internalization) indicated by Nonaka [15]. It shows that the creative process is more important.

In the enterprise journey's period (childhood-growth-maturity) and corporate life In the process of changing cycle, we acquire the source of innovation to satisfy market needs (existence/latency) at the start of the entrepreneurial establishment, development of new product and market based on the core technology which becomes the source of income. Aiming for business development, there are products that mature and improve competitiveness from the viewpoint of QCD and continuously meet the market needs, while some products withdraw their business after the end of their life as a product. Moreover, it is a common recognition objective for corporate managers to sustainably grow a company, but sufficient consideration is given to items of sustainable growth and factors necessary for sustainable growth has not been done.

TABLE II  
CONTINUOUS GROWTH FACTOR AND PROMOTION PROGRESS INDICATOR

Keywords for sustainable growth	Factors indicated by previous researchers	Proficiency level	Company status of SMEs	What to improve	Priority / importance
① Management Philosophy / Vision	① Establish and maintain basic philosophy	123④5	Establish management philosophy, active on penetration in the philosophy notebook	Revised in 2017	B2
	② CEO decides values, standards, morals within the organization	123④5	Values as a company, the judgment axis is represented in 60 items	Same as above	B2
	③ Preparing concrete mechanism to urge progress	123④5	Implementation of periodic training and reading of the philosophy notebook at the morning meeting to disseminate the management philosophy	Conventionally, morning assembly is mainly conducted	B2
	④ penetrate every corner of the organization, all parts cooperate	12③45	It is necessary to enhance the holding of the ideal training accompanying the increase of new recruitment	Each hierarchical workshop is held twice a year	A2
	① Continually push forward the process of self-reform, create an organization to constantly learn	1②345	Initiatives for vigorous organizations, goal management sheets, personnel evaluations, making a Waigaya field, promoting departmental compilation	Divisional learning program created by work and individual	A2
	② Can share common values and basic policy	12③45	Whole group annual policy meeting only	Plan a regular workshop	B2
	③ The community is concerned with each employee and company's going	1②345	Only for new year opening	Management information disclosure and quarterly performance report	B2
② Corporate culture / organization culture	④ We can rethink about the common sense of companies and the focus of corporate strategy, approaches such as customers, assets, capabilities, contents offered of products and services, etc	1②345	Study only at the management planning meeting	Re-negotiate efforts in strategic policy in the half year	B2
	⑤ Not only the talent of identity and innovation, but also combines management skills, business know-how, and adequate personal connections	1②345	Promote education by participating in management planning of mid-level leaders	Promotion of external talent tailored to specialist as well as internal education	B1
	⑥ The organization learns various things through experience. I have my own strategy, personality and culture	12③45	Sharing experience as amenable as possible	Break down Ameba to make a lot of organization management leaders and let them learn	B2
	⑦ Tackle employee motivation and trust, create organization to enhance sense of unity	1②345	Conduct periodic section meetings and social gatherings	Lack of efforts as a whole, planning	B2

## V. CONCLUSION

In this research, we clarified the definition of sustainable growth and important factors necessary for sustainable growth of small and medium enterprises from the investigation of the previous research and proposed as a basic framework of management in SME management. Based on the proposed framework, we examined the effectiveness of the framework from the actual survey in small and medium enterprises and gained the following conclusion.

- 1) From the survey of the previous research as an important factor of sustainable growth in the enterprise, I. Management Philosophy/ Vision, II. Corporate Culture/ Organization Culture, III. Business Management/ Management System, IV. Innovation.
- 2) A systematic approach of sustainable growth factor classified in this item as basic framework of management are necessary for small and medium enterprises to achieve sustainable growth, the framework can be shared easily in explaining policies to employees and to clarify management with objectivity.
- 3) To confirm the effectiveness of the basic framework, we compare and examine it in Small and Medium-sized Enterprises and quantify it as a management framework, so that it is easy to promote PDCA by measuring the degree of achievement based on the management index as progress degree and priority importance.

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