AN EMPIRICAL STUDY OF A SUSTAINABLE STRATEGY AND PROFITABILITY IN THE ELECTRICAL-MANUFACTURING INDUSTRY

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Abstract
The aim of this research is to verify empirically the kind of sustainable activity that contributes to the long-term profitability of a company. In many previous empirical studies, the conventional corporate social responsibility (CSR) activity of a company has not always correlated with the corporate performance. The stance in relation to conventional CSR activity was often a derivative activity for a company to carry out business. However, sustainable activities may be regarded as a strategy for finding a new market or raising the competitive advantage. In terms of the research methodology, statistical verification was carried out based on the sustainability statement, the various publicity materials and the financial data released by each company. The same conclusion was drawn from the quantitative and qualitative analyses in this research. When private enterprises adopt sustainable activities, unlike a simple redistribution of profits, the consumer value, corporate value and social value are expanded cyclically.

Key words: *sustainable strategy, creating shared value, empirical study, electrical-manufacturing industry*

1. INTRODUCTION

The aim of this research is to verify empirically that the strategy with which a company aims to sustain its growth increases its financial results on a long-term basis. In order for a company to sustain growth rather than to pursue short-term profits, it is desirable to manage its relationship with various social stakeholders and to continue developing within a society. Conventionally, such an activity of a business is classified as corporate society responsibility (CSR). The conventional CSR activity was hardly positioned in the growth strategy itself. The main purposes of CSR were risk reduction when growing and dispensation by partial reduction of profit. However, CSR activities have come to be positioned more positively nowadays. A social activity is often an opportunity for growth in a company and is regarded as a main business objective. Hence, the sustainable strategy of aiming to improve the triple bottom line, which combines the economic efficiency, sociality and environment of the company, has attracted attention.

As one of the big socioeconomic environmental transitions in which such a sustainable growth strategy came to attract attention, the extension of emerging country economies and the maturation of developed country economies can be highlighted. One of the significant transitions of the economic environment globally at the beginning of this century was the rapid economic growth of emerging countries, such as those in Southeast Asia, South Asia, South America, the Middle East, Central and Eastern Europe and Africa. The improvement of the living environment of developing nations is desirable. However, there is apprehension about various social problems due to the rapid industrialization of emerging countries. For example, there is increasing expenditure on natural resources, growing environmental pollution and an ever-widening economic discrepancy between the small number of wealthy and the much larger population of poor people. Developed countries also face social problems such as a low birth rate, the aging of the population or an energy problem. For example, the social burdens per individual increase with a decrease in the working population, and the energy supply and demand have become a major problem, triggered by a nuclear plant accident in Japan.

Political economist Malthus (1798) warned of a drain on resources and energy and the ravaging of the natural environment at the beginning of the nineteenth century. He described a scenario of poverty and ruin due to population increase and scarcity of food, and in order to prevent this, he endorsed population restraint. Present-day Malthusians warn of ruin because of the exhaustion of resources and environmental deterioration resulting from business activity. The solution, they assert, is restraint in resource utilization. This aims to tighten up regulations as "a governmental role" in the so-called "market failure". Mill (1848) introduced the concept of a "stationary state" in the "philosophy of economics". If a stationary state is seen from outside, its national income, expenditure, etc. are constant, but in fact the people are very active; there are continuous new technologies and cultural reform, and people's interchange is also active. Mill's "stationary state" may be equivalent to today's "sustainability" concept. On the other hand, Robert Solow (1956) highlighted the significance of technological progress as a factor of economic growth. According to Solow, the crisis of a global environment can be overcome by "innovation". It is internalization of the externality of a market transaction.

Porter (1991) presented a hypothesis about the relation between environmental regulation and the global competitiveness of a company. Suitable environmental regulation may stimulate an increase in the efficiency and technical innovation of a company and the company may exceed unregulated companies in competitiveness. Innovation often requires technical accumulation, and since there is a factor of serendipity, the success of an innovation takes time. A company that succeeds in innovation that requires time and solves a social problem receives high praise socially and achieves a sustainable competitive advantage. The hypothesis differs from the conventional view that environmental regulation becomes a burden for a company. Porter and Kramer (2011) presented the shared-value strategy with the aim of realizing simultaneous corporate value and social value, when a company tackles strategically a wide range of social problems in addition to an environmental problem. Creating shared value (CSV) is a corporate strategy that aims to achieve sustainable growth on a long-term basis by coexisting with society rather than merely maximizing the short-term profits.

CSV within a company and a society can attract attention with the expansion of enterprise activity, as well as trans-nationalization. As mentioned above, developed nations have such problems as growth attenuation and emerging countries have social problems, such as environmental problems. These problems can be approached within a CSV framework. Developed nations have already experienced various social problems, such as air pollution, in the past, and are also accumulating the component engineering for the solution. Probably, with such experience and technology of developed nations, the resources problem and the environmental problem, among others, of emerging countries will be solvable. If private enterprises approach such problem solving as business, they may also enable developed nations to follow a growth track again.

Incidentally, the disclosure of not only accounting information but also environmental or social effort information is required as a social responsibility of an enterprise, with regard to the development of the discussion on sustainable growth. In addition, there has been movement towards international standardization in relation to the format of information disclosure on the environment and society. Moreover, the contents of the information to disclose are becoming wider ranging year by year. Activities concerning the conventional sustainability of a company were previously disclosed through CSR statements. Nowadays, the various environmental and social activities, as well as CSR, are released in information that constitutes a sustainability statement. However, in many previous empirical studies, the conventional corporate social responsibility (CSR) activity of a company has not always correlated with the corporate performance. Each research finding may involve a positive correlation, a negative correlation or no correlation. The considerable differences in those previous research findings were related to the intermingling of industries, companies, activities or scales. The stance in relation to conventional CSR activity was often a derivative activity for a company to carry out business. However, sustainable activities may be regarded as a strategy for finding a new market or raising the competitive advantage. The companies that realize that sustainable activity is an opportunity to raise corporate value may also be increasing in number. Thus, the definition of sustainable activity may be diversified by a company or industry so that the sustainable activity is closer to its core business.

In this research, the focus is on the multinational large-scale corporations of the Japanese electrical industry, and the possible contents of a sustainable strategy suitable for the conditions peculiar to the electrical industry are investigated. The electrical industry is one of the industries with a close relation to social problem solutions, such as energy saving and air pollution removal. Moreover, the electrical industry is one of the most trans-nationalized industries in Japan. In terms of the research methodology, statistical verification was carried out based on the sustainability statement, the various publicity materials and the financial data released by each company.

2. A SURVEY OF THE PREVIOUS RESEARCH

2-1. Sustainability reports

The argument involving the environment and the economy has served as a movement in recent years. In 1972, the Club of Rome published *The Limits to Growth* (Meadows et al, 1972) and the environmental problem came to be recognized as a global problem. At the Earth Summit in Rio de Janeiro in 1992, an action plan for realizing sustainable development (Agenda 21) was adopted, and it became the preliminary move in the international framework development, which aimed to find a solution to global environment problems. Now, the argument involving the environment and the economy is united with the argument involving companies and society, and the recognition that the consideration of CSR or sustainability is indispensable to an enterprise's success has come to be shared extensively (Lacy et al, 2010).

The rise of the concern about sustainable corporate value creation also produced the motion that recognizes the importance of non-financial information, including environment, society and governance information, and its integrative reporting (Eccles & Krzus, 2010). Regarding sustainability reports, the Global Reporting Initiative (GRI) published the first edition of its *Sustainability Reporting Guidelines* in 2000 (GRI, 2000). In the GRI guidelines, sustainability is taken as the concept of the triple bottom line. That is, a company is evaluated by the triple bottom line, which consists of the environmental side, the social dimension and the economic side of corporate activity. Many company environmental reports drawn up these days are presented as social management reports, sustainability reports, CSR reports, etc.

Moreover, the International Standardization Organization (ISO) provides various guidelines for sustainability reports. Among them is a life cycle assessment (LCA) as an international standard tool. The life cycle of an industrial product is generally as follows, from an upper process to a lower process: raw-material mining, fulfilment, manufacture, sale and abandonment. The industrial product generates various environmental impacts in all the stages of the above life cycles. An environmental impact assessment method developed in order to calculate these environmental impacts in a quantitative and objective way is LCA. With this method, the use efficiency of resources, such as energy, water resources, raw material, etc., in the whole product life cycle is calculable. If LCA is used appropriately, it is possible to cut down the consumption of resources over the whole value chain and to reduce the total cost (Esty & Winston, 2009). By determining the weak point of a life cycle, it is possible to correct it in the product development stage. It is also possible to offer more value to customers and to expand the profit. For example, in the whole life cycle of a car, it is not the manufacturing stage but the use stage that pollutes the environment the most. By reducing the environmental impact in the use stage, the degree of satisfaction of consumers or society could be increased. Moreover, it is possible to calculate the influence of the emitted substance on the atmosphere, water, soil, etc. though the product life cycle and to acquire environmental impact authentication of the product by an independent organization. Utilizing the LCA method and reducing the environmental impact level of a product could lead to the preservation of the environment or an ecosystem as a result.

2-2. The relationship between CSR and firm profitability

First, the previous studies on CSR and corporate performance are reviewed. A number of such studies have indicated that CSR and corporate performance are positively related. Waddock and Graves

(1997) developed two hypotheses concerning the relationship between CSR and corporate performance: 1) if the corporate performance is good, CSR will be addressed (the slack resource hypothesis); 2) the company will see good earnings as a result of addressing CSR (the good management hypothesis). Through the analysis of data from a U.S. firm, the relationship between CSR and corporate performance was found to be positive in both directions. According to McGuire et al (1988), the business results greatly influence the extent to which a CSR policy is followed, meaning that consideration is given primarily to financial results and then to social responsibility. Moreover, in terms of the relationship between CSR and business results, they found that CSR is not directly linked to subsequent strong business results, but that risk is reduced first and this then leads to high financial results in the future. Orlitzky et al (2003) undertook a meta-analysis of approximately 52 empirical studies performed in relation to sociality, such as environmental countermeasures and financial business results, in the 30 years following the 1970s. According to this study, there is a significant positive correlation between financial business results, price earnings and societal or environmental performance; the results also verify the existence of mutually complementary cause–effect relationships on the basis of a time series analysis.

On the other hand, Mahapatra (1984) and Jaggi and Freedman (1992), amongst others, found a negative relationship between CSR and corporate performance. According to Mahapatra (1984), eco management (or social responsibility) and financial business results are negatively related. Aupperle et al's (1985) study indicated that CSR and corporate performance are not related. Similarly, Ullman (1985) observed no significant trend between CSR and corporate performance and McWilliams and Siegel (2000) found that CSR has a neutral impact on corporate performance.

Vogel (2005) noted that no decisive conclusion has been reached about the relevance of social responsibility to company revenue. It has not yet been proved whether more responsible action suits the self-interests of all companies or whether CSR always takes a margin of the profit. Moreover, the direction of the correlation between CSR and profit is undetermined. Financial success may be a cause of social responsibility or an effect. The various study results reported here suggest that there may be high potential for a positive relationship between CSR and corporate performance in general, but the relationship could be negative or the two could be unrelated. To date, there is no positive established theory.

2-3. Sustainability

According to Hart (2007), "sustainability" is a keyword in shareholder value, which leads to a sustainable society. The umbrella term "sustainability" covers many different ways of thinking, issues and concepts, and modes of practice. The degree of involvement can be described using a 2×2 matrix: the first axis is today/tomorrow and the second axis is internal/external to an organization. A strategy and a return are considered for each of the four quadrants:

1) Today/internal: pollution prevention (reduction of cost and risk).

2) Today/external: product stewardship, reputation, fairness.

3) Tomorrow/internal: clean technology (innovation, repositioning).

4) Tomorrow/external: the base of the pyramid (BOP) (growth, route).

Pollution prevention, which seeks to prevent waste and emissions rather than cleaning them up "at the end of the pipe", is associated with lower costs. For example, removing pollutants from the production process can increase efficiency by (a) reducing the inputs required, (b) simplifying the process and (c) reducing the compliance and liability costs (Hart & Dowell, 2011).

Whereas pollution prevention focuses on internal operations, product stewardship extends beyond organizational boundaries to include the entire product life cycle – from raw material access, through production processes, to product use and the disposal of spent products. Product stewardship thus involves integrating the voice of the stakeholder into business processes through extensive interaction with external parties, such as suppliers, customers, regulators, communities, non-governmental organizations and the media (Hart & Milstein, 2003). Through stakeholder engagement, the "voice of

the environment" can be effectively integrated into the product design and development process. Product stewardship creates the potential for competitive advantage through strategic pre-emption, for example by securing exclusive access to resources (e.g., green raw materials) or by establishing standards that are advantageous to the focal company (Hart & Dowell, 2011).

Clean technology strategies deal with the way in which firms build new competencies and position themselves for competitive advantage as their industries evolve. Reduced material and energy consumption occurs through the pursuit of clean technologies that provide for human needs without straining the planet's resources (Hart & Dowell, 2011).

Regarding BOP, Hart (1995, 1997) suggests that "a sustainable development strategy means that firms must build markets in the South while reducing the environmental burden created by this new economic activity". BOP has also attracted growing attention from corporations (Immelt et al, 2009).

2-4. Sustainability and competitive superiority

Porter (1991) took up the position of competitive strategy related to the environmental problem and corporate management. According to Porter (1991), economic competitiveness and environmental measures have a mutually complementary relation. The strengthening of environmental regulation becomes a factor whereby costs are increased and competitive power reduced in the short term. However, in the long term, by urging companies to undertake technical innovations, environmental pollution may decrease, products' costs may fall and their quality may increase. Companies can acquire a competitive advantage in the international market as a result. This paradoxical opinion reversed the previously accepted theory that "environmental regulation leads to a cost rise and competitiveness losses" and was suddenly brought into the limelight. A series of arguments on the competitive advantage resulting from environmental regulation that Porter asserted come to be widely known as the Porter hypothesis. Various arguments, including the pros and cons, were developed thereafter concerning environmental regulation and competitiveness. According to Porter and van der Linde (1995), although environmental protection may increase costs, technology, products, processes, needs, etc. are changeable. If advanced resource productivity placing a minimal load on the environment is realized, competitiveness may increase. The cost reduction achieved by manufacturing technique innovation and the improvement in the market value resulting from product development innovation can improve a firm's competitive advantage.

Porter and others claimed that companies could build more advantageous positioning in their competitive strategy with environmental measures. Moreover, the management strategy theory researchers of the resource-based view of the firm (RBV) discussed eco management from the viewpoint of the competitiveness of management resources. Management resources consist of financial resources, material resources, human resources and organization resources. By utilizing those management resources in relation to a social concern, the scarcity and the imitation difficulty of management resources increase and a sustainable competitive advantage can be established (Barney & Clark, 2007). In the author's past papers, a questionnaire completed by companies showed that sustainable activity contributes to an improvement in long-term organizational ability rather than a short-term improvement in sales (Isada & Isada, 2013, 2014). Moreover, the improvement in this organizational ability led to an improvement in the relationship with various global customers, supply chain partners, etc. and an improvement in talented people's capability to manage those management resources for an innovation.

According to information and decision-making theory (Williams & O'Reilly, 1998), regarding the management of diversity, it is claimed that the performance of a group with various attributes is higher than the performance of a group consisting of homogeneous members. If the team members vary, the width of the information and knowledge that the team has will spread, and the external network will also spread (Ancona & Caldwell, 1992). Therefore, it is supposed that diversity has a positive influence on performance, such as the decision making of a team (Williams & O'Reilly, 1998).

Moreover, there are research findings confirming that diversity has a positive influence on outcomes, such as innovation (Bantel & Jackson, 1989) and creativity (Milliken & Martins, 1996). In relation to diversity and performance, the appointment of women is one of the important subjects of research.

Dezsö and Ross (2012) presented research findings showing that the promotion of women to executive officers has a positive effect on the corporate value or the profits on accounts in a company that actively performs innovations, as a result of having investigated U.S. S&P1500 companies.

3. HYPOTHETICAL DERIVATION

The goal of this research is to verify empirically the kind of sustainable activity that contributes to the long-term profitability of a company. In other words, sustainable activity in this research does not include all the social activities of a company. For example, corporate activity that promotes culture and entertainment that are not directly related to the main business by returning part of the profit to the area in which a factory is located is not included. Sustainable activity in this research aims to gain profit as the main business in principle. The activity can be continuously expanded by the profit.

Moreover, probably, activity that maximizes the immediate short-term profits is not included, either. For example, if the maximization of only short-term profits is the goal, mass advertisement and a conspicuous appearance may be more easily achieved than an improvement of the contents of goods and service. Alternatively, the way to acquire a profitable enterprise may succeed quicker. If the aim is to achieve short-term profits, even a speculative activity or an opportunistic activity tends to be included. On the other hand, difficult subjects, such as radical technical innovation and a change in the social structure, are often involved in the solution of social problems, such as load reduction on the environment. For example, considering an antipollution measure, an industrial organization, a public office and various stakeholders are also concerned, and the work does not progress simply. Stakeholder groups, such as environmental organizations and consumer organizations, are often opposed to corporate activity in general. They rather desire companies to build cooperative relations with them and to take into consideration particular information and know-how that they have in relation to the solution of a social problem. If a company can solve such a complicated and time-consuming problem, it will become difficult for other companies to catch up. Thereby, a sustainable competitive advantage resulting from the high level of imitation difficulty is acquired. It can be assumed that such sustainable activity will generate long-term profits, although it implies a cost increase in the short term.

According to the previous research on sustainability, the components can be classified into the following groups:

1) Today/internal: pollution prevention (reduction of cost and risk).

2) Today/external: product stewardship (reputation, fairness).

3) Tomorrow/internal: clean technology (innovation, repositioning).

4) Tomorrow/external: the BOP (growth, route).

The first category is pollution prevention. In the electrical manufacturing industry, it is a sustainable measure to reduce waste through operation. In factory production or a distribution process, it is indispensable to prevent the emission of harmful controlled substances to humans and the environment. Moreover, a measure that for example reduces the amount of abandonment of raw materials or sub-materials, or improves the efficiency of scarce resources, such as water and energy, in the design of a product and a process is also included. The cost in connection with abandonment can be suppressed by improving a product and a process so that a controlled substance may not be used. An improvement that reduces the level of inferior goods and marginal material also becomes a cost reduction. Moreover, the measure of greenhouse gas reduction is included and a secondary cost reduction effect from emission trading is expected. The following hypothesis can be formulated:

H1. Companies that tackle the disposal and reduction of controlled substances, resources, greenhouse gas, etc. will raise their profits in the long term.

The second category is product stewardship. It seems that the term “product stewardship” means the product liability for the consumer in relation to the product itself in a narrow sense. However,

preceding researchers, such as Hart, have defined product stewardship more widely as building a good relation with the various stakeholders concerned over the whole product life cycle. It becomes possible to harmonize with the environment surrounding a company and to work continuously by changing a product's design and process in the desirable direction, for various stakeholders. The direct persons concerned, such as the consumers and customers of the company, and the indirect persons concerned, such as the community and a self-governing body, are included in the stakeholders. Moreover, the employees within a company are important stakeholders.

In order to build a continuously good relation with consumers or customers, it is desirable to follow laws and regulations, such as environmental regulations, to manage the environmental impact appropriately in the material and manufacturing process of a product and to disclose information. In addition, measures covering the whole product life cycle, such as after-purchase support and the collection of useless articles, are also desirable. For that purpose, it is advantageous to raise the management quality not only of a product but of the whole business process by customer orientation.

Moreover, an improvement in the employment and workplace environment of the employees, who are internal stakeholders, is also important. A safe and appropriate place of work suitable for various employees' situation raises the employees' motivation, heightens their capability in the long term and can be expected to contribute to the corporate earnings. If a factory improves the social welfare in its location, such as by employing disabled persons, it may be easy to obtain cooperation from the community. In connection with the trans-nationalization of corporate activity, the importance of global talented people's promotion or practical use cannot be overemphasized. Moreover, the promotion of women and an improvement of the workplace environment and work–life balance have more value than mere work-sharing. It is also considered that broadly talented people's acceptance leads to the inducement of innovation. Schumpeter (1934) presented discontinuous thinking and new combinations as a definition of innovation. It is thought that the discontinuous way of thinking and new combinations are easy to produce from talented people's diversity. Although an improvement of an internal system, like personnel affairs, may not immediately be connected with a short-term result, heightening of the organizational ability of a company in the long term is expected. Therefore, the following hypotheses can be formulated:

H2. Companies that observe environmental regulations, etc., manage processes appropriately and strive for information disclosure will grow continuously.

H3. Companies that tackle operating quality improvement to build a good relation with consumers or customers through the whole product life cycle will grow in the long term.

H4. Companies that tackle issues such as the improvement of safety in the workplace environment will grow in the long term.

H5. Companies that tackle the diversity of talented people, such as trans-nationalization of employment and women's promotion, will grow over a long period of time.

The third category is clean technology. The assumption of clean technology here implies a reduction of the environmental impact not only in the manufacturing process of a product but also in the whole life cycle. In other words, technical developments, etc., which solve an environmental problem through the use of a product or service, are assumed. For example, the development of the CVCC engine by Honda, which cleared the regulation (Muskie Act) on environmental pollution in the United States in the 1970s, is recollected. Restraint in accordance with a regulation in the short term regarding an environmental problem may be required. If an innovation is attempted so that a company may overcome such a regulation, the problem is solved radically and the company can expect a big return. Honda heightened its popularity at the time of the development success of an environmentally considerate engine, and subsequently accomplished fast growth in the auto car market. The major American manufacturers were intending to avoid the environmental measure in the short term by means of miniaturizing the track, which was too loose for the regulation, and it took them a long time to catch up in environmental technology development as a result.

It is thought that environment-friendly cars, such as the hybrid car of Toyota, are included in clean

technology today in respect of energy-saving product development. In the electrical manufacturing industry, air purification technology, such as that of Daikin, Sharp and Panasonic, has induced a large demand resulting in serious air pollution, which is called PM2.5, in present-day China, India, etc. Moreover, clean technology is considered to include product development that makes recycling and reuse easy. The regulations about the recycling and reuse of goods have spread in order to mitigate the public refuse disposal burden. Although regulations may increase the costs for a company, by improving its product from the development and a design phase, the company can reduce the costs or change and differentiate the business model. However, the development of such clean technology takes long time and involves a high level of uncertainty. For example, stability, the cost side of the development of renewable energy, such as sunlight, etc., is still immature. If a company succeeds in a time-consuming innovation, the contribution to society will be large and will bring the company sustained profit. Therefore, the following hypothesis can be formulated:

H6. Companies that tackle research and development of products and services that reduce environmental impacts will grow in the long term.

Finally, the fourth category is BOP business. While the BOP layer in African countries, for example, is an object of many social problems that should be solved, such as poverty and the increased demand for resources, it is also a market in which growth is expected. The solution of the social problem at the BOP can represent a business opportunity for a company. For example, if a company contributes to infrastructure building, regional industries will be activated, the living standard will improve and the attraction of the market will also increase. Moreover, it is expected to succeed in the creation of new market needs, the innovation of commercial production technology, etc. in the process of tackling the social problems of the area. If a company does not consider the BOP to be a source of cheap unskilled labour but instead contributes to the development of a community from a long-term viewpoint, the good relationship between the company and the area may turn into a sustainable competitive advantage. The economic magnitude of the BOP is not still particularly large compared with that of western countries. Moreover, various social subjects are a prevention factor of industrial prosperity. However, the potential of the BOP is a big challenge for the future of a company. Therefore, the following hypothesis can be formulated:

H7. Companies that tackle the social problems of a BOP market will grow in the long term.

4. THE VERIFICATION APPROACH AND RESULT

4-1. The verification approach

The aim of the present study is to verify empirically whether companies that adopt sustainable strategies improve their profitability on a long-term basis. This is based on the public information that companies disclose in the electrical manufacturing industry in Japan. In order to evaluate global sustainable activity as an object of verification, multinational firms were selected. Furthermore, companies that have undertaken positive sustainable activity were selected. As a result, the sample included large-scale corporations with a margin in managerial resources. Moreover, it takes a long time for the achievement of sustainable activity accompanied by long-term innovation to be reflected in the revenue. Since it was necessary to evaluate the long-term achievement until an activity is reflected in the revenue, the analytic period covered 10 years. The sustainable activity and financial achievement from the fiscal years 2002 to 2012 were compared. Therefore, enterprises that underwent significant transition in structure, business category, etc. in these 10 years were excluded from the analysis. As a result of the above sorting, 19 companies that met all the conditions were selected for analysis.

4-2. The appraisal of sustainable activity

Each sustainable activity of the selected multinational firms in the electrical manufacturing industry was analysed, in order to verify each of the abovementioned hypotheses. The sustainable activities were extracted from the sustainability statement, the CSR statement, press releases or company home pages of the preceding 10 years of each company. A sustainable activity is described by textual

information, although for financial measurement the information can be expressed numerically. Therefore, the context of the various statements of each year was read and the degree of sustainable activity was evaluated on five levels. For example, the environmental consideration of the product was evaluated based on the evaluation of the following two public certificates: the Energy Conservation Award (Product, Business), which the Energy Conservation Centre (www.eccj.or.jp/index_e.html) authenticates, and the Eco Products Award, which the Global Environmental Forum (http://www.gef.or.jp/en/index.html) authenticates. The occasions of receiving an award for both for the past five years were totalled, and the degree of sustainable activity was classified as follows:

1: The number of awards received is 0.

2: The number of awards received is 1 or more.

3: The number of awards received is 3 or more.

4: The number of awards received is 5 or more.

5: The number of awards received is 10 or more.

4-3. Verification result

The following statistical analyses were conducted for the hypothetical verification. In the statistical analysis, the valuation of the above-mentioned sustainable activity serves as an explanatory variable. Furthermore, the rate of change in the sales amount of the preceding 10 years in the financial statements of each company serves as the objective variable. First, since the sustainable activities written in the sustainability statement varied, explanatory variables were collected by principal component analysis. A correlation analysis was conducted between each principal component and an objective variable. SPSS ver. 21 by International Business Machines was used for each statistical procedure.

4-3-1. Principal component analysis

Seven principal components were extracted as a result of the principal component analysis of the explanatory variable. The accumulation of the sum of squares of the loading dose of four principal components was 86.565%.

The first principal component consisted of items such as trans-nationalization of employment, women's promotion and work–life balance. This principal component can be named a diversity principal component.

The second principal component consisted of items of improvement in the organization of consumers' support, long-term relationships with customers and operating quality. This principal component can be named a stewardship principal component.

The third principal component consisted of items such as eco-friendly product development, recycling and reuse. This principal component can be named a clean tech principal component.

The fourth principal component consisted of items such as the removal of controlled substances from a factory, waste reduction and the reduction of greenhouse gases. This principal component can be named a waste principal component.

The fifth principal component consisted of items such as the safety of the workplace environment and the employment of disabled persons. This principal component can be named a safe workplace principal component.

The sixth principal component consisted of items such as information disclosure about the raw material of a product and the disclosure of various kinds of business information based on a statute. This principal component can be named a legal compliance principal component.

The seventh principal component consisted of BOP business and supplier support of newly emerging countries. This principal component can be named a BOP principal component.

4-3-2. Correlation analysis

Next, a correlation analysis of each of the above-mentioned principal components and the rate of change in the revenue of the preceding 10 years, which is the objective variable, was conducted. The result of the correlation analysis is presented in table 1 (* indicates the 5% significance level).

the principal component	correlation coefficient
1. diversity	.534*
2. stewardship	.492*
3. clean tech	.635*
4. waste	.064
5. safe workplace	-.003
6. legal compliance	.233
7. BOP	-.052

Table 1. the result of the correlation analysis

As a result of the analysis, the first, second and third principal components were significantly correlated with the revenue. On the other hand, the fourth, fifth, sixth and seventh principal components were not significantly correlated with the revenue.

4-4. Consideration

4-4-1. Consideration of the statistical analysis results

Each of the above-mentioned hypotheses is verified based on a statistical analysis result. The hypotheses are divided into groups and the statistical analysis results are considered for every group.

First, according to the classification of Hart etc., the first hypothesis of pollution prevention and the sixth hypothesis of clean technology are classified in the internal sustainability group. Of these, it is thought that the first hypothesis is related to the above-mentioned waste principal component, which is the fourth principal component. Moreover, it is thought that the sixth hypothesis is related to the above-mentioned clean technology principal component, which is the third principal component. In addition, while the clean technology principal component is significantly correlated with the long-term profit, the waste principal component is less related to the profit. Japanese electrical equipment manufacturers have been competing on environmental performance in various domains. Generally, neither a customer company nor consumers can easily purchase goods for which the economic rationality is spoiled, even if the environmental performance is high. In order to satisfy customers in the research and development of an eco-friendly product, the usability must be improved and the costs must be lowered. The innovation for such product development is considered to be connected with the improvement in profit of an electrical equipment manufacturer by differentiating it from other companies. The result of product development with a small environmental impact and high resource efficiency by such a private enterprise leads to an increase in social value.

Meanwhile, Japan has imposed severe regulations on industrial abandonment in the face of the serious environmental pollution problem since around the 1960s. Japanese electronics manufacturers have tackled environmental measures, such as the removal of pollutants released from factories, paying a large amount of social external costs over many years. In present-day Japan, the waste reduction of factories could be referred to as a precondition for company survival instead of a differentiation factor. Therefore, hypothesis 1 is rejected and it can be said that hypothesis 6 is verified.

Next, the four hypotheses about product stewardship are divided into consumer- and customer-related

hypotheses and employee-related hypotheses. First, the second and third hypotheses are related to consumers or customers, and the second hypothesis is related to the above-mentioned legal compliance principal component, which is the sixth principal component. Moreover, the third hypothesis is related to the above-mentioned stewardship principal component, which is the second principal component. Furthermore, while the stewardship principal component is significantly correlated with the long-term profit, the legal compliance principal component is almost unrelated to the profit. In order to build a long-term relation with consumers or customers, it is desirable to understand their various needs and to solve their problems continuously. Through problem solving for various stakeholders, opportunities for growth can be discovered, reliance gained and a rise in the customer share expected. Now, the reputation of the company tends to be easily spread across the world through the Internet, etc. Taking action that harmonizes with various stakeholders as a good corporate citizen will contribute to the long-term profit. For good relationship construction, it is desirable for a company to communicate with various stakeholders, to discover their needs and to correspond organizationally. By improving an organization and business structure, a company accumulates experience continuously and more desirable management will be realized.

On the other hand, managing in accordance with regulations or various kinds of laws and disclosing information are preconditions for a company to continue. Legal compliance is considered not to be an opportunity for growth for a company and not to lead to differentiation from competitors, like the above-mentioned waste reduction. Therefore, it could be said that hypothesis 2 is rejected and hypothesis 3 is verified.

Next, the fourth and fifth hypotheses are concerned with employees. The fourth hypothesis is related to the above-mentioned workplace safety principal component, which is the fifth principal component. Moreover, the fifth hypothesis is related to the above-mentioned diversity principal component, which is the first principal component. In addition, while the diversity principal component is significantly correlated with the long-term profit, the workplace safety principal component is less related to the profit. In order for a company to grow continuously, it is important to appoint a broad range of excellent, talented people and to develop them. As a matter of course, talented people's superiority is not related to their gender, nationality, etc. However, in Japanese companies, a workplace environment in which able talented people who are foreigners or women can play an active part has seldom existed until now. It is becoming easy for a company to create innovation based on the new way of thinking that is expected from accepting a broad range of talented people and improving the labour environment, such as the personal rating system, so that it can be made easy to commit. Moreover, it is desirable for a society as a whole for a company to offer a place of employment so that various talented people can play an active part in the long term.

On the other hand, for a company to continue, it is considered to be a precondition to improve the safety of the workplace environment and to realize barrier-free employment. Like the above-mentioned waste reduction and legal compliance, measures for workplace safety, for example, have already spread and are considered in Japan not to be a new opportunity for the growth for a company and not to lead to differentiation from competitors. Therefore, it is possible to say that hypothesis 4 is rejected and hypothesis 5 is verified.

Next, the seventh hypothesis is related to the BOP principal component, which is the seventh principal component. However, the BOP principal component is seldom correlated with the long-term profit. There are many social problems that should be solved regarding the BOP. Moreover, it is thought that the size of a future growth opportunity is very important for private enterprises. On the other hand, the Japanese companies in this research are generally assumed to have been considerably behind in the correspondence to the BOP in African countries, for example, compared with western countries, China, etc. Sufficient achievement may not be acquired in ten years from the beginning of the 2000s, which is the evaluation period. Future progress is expected, although hypothesis 7 is rejected.

4-4-2. Qualitative analysis by a case study

Finally, in addition to the quantitative analysis, a case study of some of the companies investigated quantitatively is carried out.

Daikin has developed a power-saving solution for a business-use air-conditioning machine. In addition, its products, which make an important environmental contribution, have obtained a high evaluation in the world and it has gained the top market share globally.

Toshiba is developing outstanding environmentally considerate products by goal setting in relation to the environment and improving its employees' environmental awareness. The environmental vision 2050 was developed and the performance goal by 2050 was clarified. To achieve its vision, Toshiba has exerted itself to train its personnel about the environment and has nourished all its workers' environmental awareness through employee education and environmental activity participation. As a result, many prizes related to eco-friendly goods from an external public institution have been won and high corporate earnings are being maintained.

Hitachi regards social problems as an opportunity for growth and is tackling the social innovation business. For example, solutions in preparation for a large-scale disaster are included. A local environmental responsibility section is installed in all of its location in the world, and sustainable business management is conducted. Moreover, products, technologies and activities that consider the environment are also encouraged by the in-company management. Furthermore, the workplace improvement is concentrated on globally through the promotion of women, the strengthening of work–life management, diversity education, etc. The corporate earnings are very good now.

This survey confirmed that the efforts of many of these companies have expanded their revenue on a long-term basis.

5. CONCLUSION

The objective of this research was to demonstrate empirically that the sustainable activity of private enterprises contributes to their revenue on a long-term basis. The main focus was the electrical manufacturing industry, which is an industry that is closely related to environmental improvement. In previous empirical studies on CSR activity and financial results, the correlations were not always coherent. One contribution of this research is the focus on sustainable activities and the clarification of their effect on revenue. The same conclusion was drawn from the quantitative and qualitative analyses in this research. When private enterprises adopt sustainable activities, unlike a simple redistribution of profits, the consumer value, corporate value and social value are expanded cyclically.

The implication of this research sends a message to business administrators, for example. A business administrator may have confidence in investing in a sustainable activity because good circulation with a sustainable activity and profitability are clear empirically. However, in this research, the survey was limited to major multinational firms in Japan, and there were not many survey samples. A future objective is to extend the survey and to undertake a comparative study between companies of various countries.

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