

**Diversification and Financial Interdependence: The Case of Japanese Electronics
Companies**

by

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Certification Page

I, MOHAMED IKRAM Mohamed Ithisham (Student ID 52117616) hereby declare that the contents of this Master's Thesis are original and true, and have not been submitted at any other university or educational institution for the award of degree or diploma.

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Contents

1. Introduction.....	1
1.1 Problem statement.....	2
1.2 Current revenue generation of Japanese electronics companies.....	3
1.3 Articulation of essential terms in this study.....	5
1.4 Research question	6
2. Literature review	7
2.1 Studies on diversification strategy and its impact on firm productivity.....	7
2.2 Studies on restructuring and firm performance	8
2.3 Studies on product variety and firm performance	9
2.4 Organizations in Action (Social Science Bases of Administrative Theory) – by James D. Thompson (initially developed in - 1967).....	11
2.5 The theory of the growth of the firm – by Edith Penrose (Originally developed in 1959).....	12
2.6 Strategies and Styles – by Campbell & Goold (1987).....	13
2.7 Adaptation, Specialization and the Theory of the Firm (Foundations of the Resource-Based View) – by Birger Wernerfelt (2016).....	13
3. Purpose of this research (Research Gap)	14
4. Conceptual Framework.....	17
5. Methodology	25
5.1 Data selection.....	25
5.2 Diversification criteria	27
5.3 Research Design	35
6. Hypothesis	37
7. Results and Discussion	41
7.1 Hitachi.....	41
7.2 Panasonic	43
7.3 Sharp	46
7.4 Sony	48
7.5 Toshiba.....	51
8. Conclusion	56
9. References.....	58

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Diversification and financial interdependence: The case of Japanese electronics companies

1. Introduction

The Japanese consumer electronics companies have recently been under immense pressure as its competitors from around the world have been developing cheaper and innovative products. In an interview with the British Broadcasting Corporation, Gerhard Fasol, a Tokyo-based economist, interpreted Japanese electronic products as sophisticated mechanical devices that did not include components to keep up with the digital revolution. He took 'Sony Walkman' as a perfect example of how the tornado of digital revolution could wipe such products off the market (BBC, 2013). Hitachi, which was once a big brand name in the consumer electronics industry, closed down its production of flat-panel televisions, liquid crystal displays, and personal computer divisions. (Hiroko, 2012). Panasonic has also cut down its production on low-end digital cameras and plasma screens and is now focusing more on supplying parts to automobiles and home construction (Pfanner, 2013). So, if these firms are cutting down on their traditional products and markets, the obvious question now would be, what is their survival strategy and what kind of changes have they done to their business model to exist in this market. The answer to this question, in broad terms, it would be restructuring and diversification

into related and unrelated businesses(Penrose, 1995).

Hitachi has now diversified into areas such as information technology services, networking systems, and infrastructure development (Hiroko, 2012). At the same time, Panasonic has steered its business away from being a consumer electronics producer and is adopting more of a business to business (B to B) model. It has started to produce electric car batteries, automotive electronics, and even recently added its smart housing as one of the leading business segments (Teo, 2015). In the case of Sony, it could be seen that they have ventured into the financing sector by the name of Sony Financial Holdings which has been a significant revenue driver for the company alongside its insurance business (Hiroko, 2013).

1.1 Problem statement

Studies on diversification strategies and their impact on firm performance and productivity are well-covered in the literature. Different disciplines such as strategic management, finance, and even economics, cover discussions ranging from the micro perspective of the division of labor, all the way to macro aspects such as the impact of different economic cycles and market conditions on diversification strategies of the firm. However, the focus of this paper is not about the after-effects of diversification. Instead, this paper focuses on how different divisions of the business, in broad categories, the diversified divisions, and traditional divisions cope up during the process of

diversification. In other words, this paper discusses financial interdependence in terms of resource re-allocation among diversified and traditional divisions of a company.

1.2 Current revenue generation of Japanese electronics companies

To further understand the importance of diversification strategy of these companies, I have depicted the company's revenue over the past ten years (FY2009 to FY2018) using a line graph. Some of the company's graphs are shown below as a reference and guide for understanding their means of diversification¹.

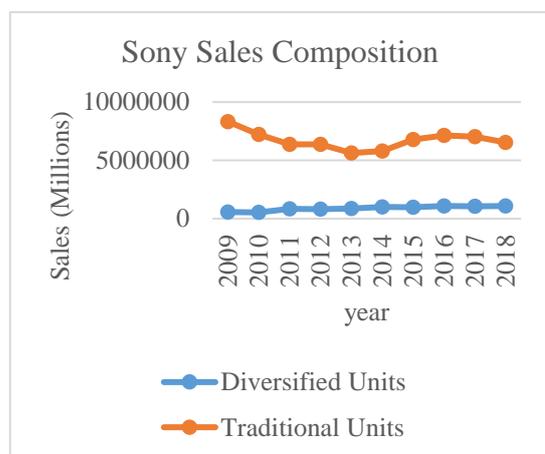


Figure 1 Source: Annual Securities Report

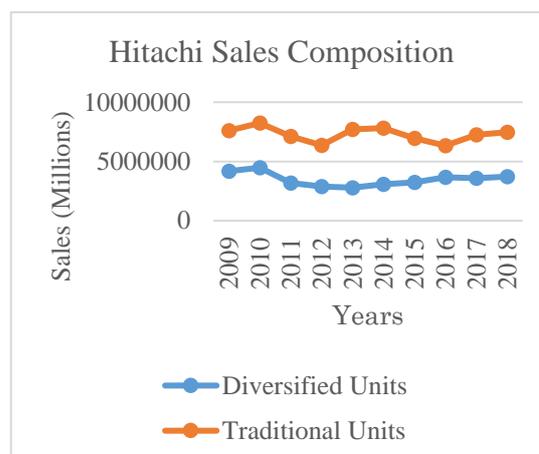


Figure 2 Source: Annual Securities Report

¹ The criteria used for identifying the diversified and traditional divisions is explained in the methodology section

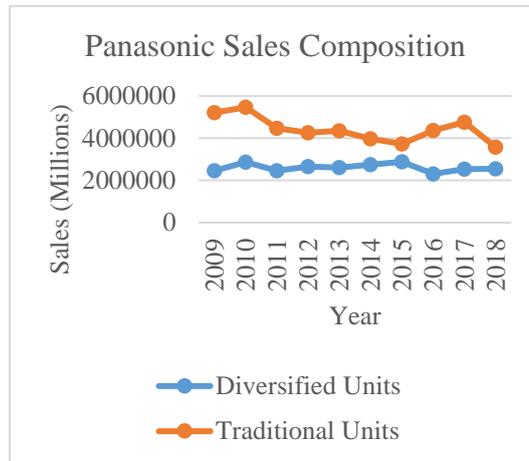


Figure 3 Source: Annual Securities Report

Based on the preceding figures, I could note that the companies’ traditional divisions total sales are volatile and downward sloping when compared to that of its diversified divisions' sales. It gives us a hint on how these Japanese companies might act in the future. Hence, to further understand the relationship between these different divisions in a single company, I examine the financial interdependence among these divisions and construct a relevant framework to capture it in this research.

In order to capture the essence of this study, I define diversification using the work of Montgomery & Wernerfelt (1988), who states that “a firm owns or shares a factor that has excess capacity and can be used beyond the firm's current scope. In such circumstances, it is important to consider the patterns of utilization that will allow the firm to extract maximum rent”. Using the above definition, I capture the current diversification strategy of Japanese electronics companies in this study. Having lost their

grip on traditional products, these companies tend to use their excess capacity in terms of cash, human resources, and other assets to diversify their business operations.

1.3 Articulation of essential terms in this study

Having understood diversification, it is also essential to understand the following terms, used in this study.

1.3.1 Portfolio management

In this study, portfolio management is not defined as merely managing the assets of a company. Instead, this research includes the companies that will take into consideration (1)feasible projects that currently undergo research and development, (2)consider those projects that can be fast-tracked, and (3)terminate those projects that are no longer adding value to the company. Based on the above situation, a company may decide to reallocate its resources, contemplate on moving to new locations and also think of the possibility where projects can be interrelated or interdependent (Cooper, Edgett, & Kleinschmidt, 2001).

1.3.2 Interdependence

In some organizations, I could note that its overall performance depends on how well its separate divisions are doing in the market. Hence, some divisions tend to support the overall organization, and if that division fails, it could cause a considerable threat to the

existence of that company. However it is not necessary that there must be any direct link between these different divisions, but there is said to be interdependence and support by each of these divisions for the survival of the organization as a whole (Thompson, Zald, & Scott, 2003)

1.3.3 Financial Interdependence

In this study, financial interdependence is described using the situation of diversification. In the case of excess capacity, a firm must use its resources effectively to become successful in its diversification, or it may form interdependence (Penrose, 1995). In other words, I could describe this situation as, firms need to ensure that its investment flows are well managed among its different divisions, or it may result in financial interdependence among the divisions.

1.4 Research question

Based on the preceding parts described in this study, the main research question will be to find out how financially interdependent the Japanese electronics companies are and how will this relationship affect the future of these companies. Furthermore, this research will answer questions on how these firms manage their overall business structure and its current asset portfolio.

2. Literature review

2.1 Studies on diversification strategy and its impact on firm productivity

Majority of the studies under this area has been comparative, where a firm measures the changes in firm performance before and after diversification and then provide a recommendation on to what extent a firm should diversify its business. The study of (Pandya & Rao, 1998), illustrates the concept of risk and return for businesses that are highly diversified and undiversified. If an undiversified firm that performs better than a highly diversified business, decides to diversify, its returns will decrease but its percentage reduced in risk will be higher than its decrease in returns. Thus, a firm that has over diversified would then tend to scale down its operations to arrive at the optimum level, which is said to increase its profitability (Markides, 1995). In the case, of Japanese manufacturing companies, the relationship between diversification and company performance tends to be negative, and their mitigation strategy of limiting diversification to related businesses with the aim of increasing profitability does not seem to last long. Similarly, the results of the international diversification of Japanese multinational companies do not seem to vary over time (Fukui & Ushijima, 2007; Geringer, Tallman, & Olsen, 2000). The above argument of negative impact on profitability is also consistent with the idea from Montgomery & Wernerfelt (1988) who states that firms tend to have a negative relationship between diversity and profitability as they move further away from

their primary business. However, this does not mean that they are not making profits, but their marginal returns tend to decline with diversification. It is also essential to understand the measure used for firm performance, as literature identifies several factors such as, marginal contribution, profitability and efficiency ratios like Return on Assets (ROA), Return on Equity (ROE) and other methods such as Tobin's Q that tends to focus on different aspects of a market (Lang & Stulz, 1994; Lu & Beamish, 2004; Markides, 1995; Pandya & Rao, 1998). It is important to remember that most of these studies were for manufacturing companies all around the globe, indicating a particular form of consistency in these types of researches.

2.2 Studies on restructuring and firm performance

When a firm decides on restructuring its business, the external factors related to the firm plays a vital role because after structure reformation, it is challenging for a firm to go back to its original state. Such that, those firms which have maintained a moderate level of diversification during intense environmental uncertainty, have faced problems in managing their affiliate businesses, which have led to restructuring (Bergh & Lawless, 2008). This situation has been undoubtedly right when firms have a threat of takeover and excess free cash flow in which case the managers opt for restructuring (Gibbs, 1993). On the other hand, during better economic forecasts, these firms have acquired new business

as they have been able to manage their subsidiaries efficiently (Bergh & Lawless, 1998). The literature further emphasizes that, during such a restructuring procedure, the company's expansion or contraction in terms of the product portfolio is a crucial factor. Usually higher performance is achieved by those firms that focus on a single domain and stay within their competent core industry and, vice versa for those firms that are in unrelated businesses (Byerly et al., 2011). Furthermore, the literature supports the idea that those firms that restructured their business and then reduced their diversification, have focused on investing more on their research and development (R&D) expenditure while those firms that diversified further after their restructuring has not been active in their R&D investments (Hoskisson & Johnson, 1992). In the case of Japanese companies, the decision on restructuring is also highly influenced by the ownership structure. The findings show that firms affiliation with business groups, foreign ownership, shares held by managers and influence of Japanese banks on management activities are few determinants that affect restructuring process of a company (Hanazaki & Development Bank of Japan, 2016; Wu & Delios, 2009)

2.3 Studies on product variety and firm performance

Based on the preliminary literature review, it is clear that diversification and restructuring go hand in hand and, leads to different outcomes in firm performance. An underlying

factor for both diversification and restructuring would be the product variety of a firm. Studies on this part have been mainly drawn from the economics discipline, as most literature begins with the market a company is operating in and, then identifies how a change in product variety based on their market condition will affect the firm performance. If we take a commonly practiced market structure such as the monopolistic market, it notes that usually, an increase in economies of scale leads to a reduction in product variety as firms tend to focus on specialization of labor. On the other hand, a firm that faces declining economies to scale tends to increase product variety to improve its profitability (Lancaster, 1990). However, in the case of Japanese manufacturing companies, a broad product variety, and products switching would tend to have higher labor productivity and improvements in firm performance. It may indeed be true to a certain extent with the Japanese electronics, as product-switching using unrelated diversification has let these companies gain momentum in the recent past. Such that, firms that reduce their product variety, is facing a downward trend on labor productivity as the percentage change in output is more significant than the percentage change in employment (Kawakami & Miyagawa, 2013). If the market condition of a firm invites competitors, then the firms that are already in this market tends to reduce its domestic product range and focus more on international markets to make up for their lost sales. It also helps the firms to reduce

their per-unit cost while trying to enter into new markets, which will ultimately enable them to sustain their brand in the industry (Eckel & Neary, 2010). Although market conditions are an essential determinant in deciding product variety, it also needs to be remembered that a crucial prerequisite for companies to increase their product variety lies with their manufacturing ability and capacity (Williams, D'Souza, Rosenfeldt, & Kassae, 1995)

Based on the above literature, it is clear that the area of diversification tends to focus on firm performance, restructuring, market conditions, product variety, and firm capacity only. However, as the focus of this paper has been about interdependence in terms of resource allocation, the following conceptual theories on administration and business strategies were studied for further understanding of the research area.

2.4 Organizations in Action (Social Science Bases of Administrative Theory) – by James D. Thompson (initially developed in - 1967)

This literature defines organizations in terms of domains that they operate in and provides scenario-based explanations on how a change in the task environment of a company can lead to a change in their organizational domain. A firm would usually try to minimize the power of the actors in the task environment by having other substitute actors to support

their business. Thus, it is inevitable, that a firm may be powerful when it is receiving its inputs for the company (dealing with suppliers) but maybe in a relatively less dominant position to whom it provides its services (dealing with consumers). Furthermore, the book explains about how a firm should deal with interdependence among its divisions based on the complexity of the organization, and different types of coordinating activities it should initiate to withstand its position in the market.

2.5 The theory of the growth of the firm – by Edith Penrose (Originally developed in 1959)

In her book, she defines firms as individually operating administrative planning units whose activities are captured under their business portfolio using interrelated and coordinated policies. She further denotes indivisibility of resources as, when a firm may not require full-time worker of particular specialty to complete a task, but it may still end up recruiting them as the idea of part-time does not work with all the resources. Thus, expansion of a firm may use these resources in different ways to optimize production. It adds to the literature of James D. Thompson, who also describes the indivisibility of resources and coordination of activities within a firm. Furthermore, diversification is captured in this book using vertical integration and expansion of primary areas of production

2.6 Strategies and Styles – by Campbell & Goold (1987)

This book defines organizations in terms of ‘Centre’ that delegate’s task to business unit managers. It emphasizes on three different approaches of strategic planning, financial control, and strategic control to influence the results of an organization. The book also studies about companies with an extensive product portfolio and provides insight on how the ‘Centre’ allocates resources to different business divisions to enhance performance.

2.7 Adaptation, Specialization and the Theory of the Firm (Foundations of the Resource-Based View) – by Birger Wernerfelt (2016)

This author defines organization in terms of their available resources, which are particular to a firm. The author emphasizes on attractive resources for a firm which acts as a resource position barrier and prevents competitors from entering the market. Furthermore, the book emphasizes on the specialization of labor to reduce cost, which is conceptualized using the average cost theory. Hence, the author defines resources as subsets of productive assets of a company which is non-transferable due to its extensive cost. On that perspective, Wernerfelt identifies that firms that have excess indivisible resources that is available for diversification in a company.

3. Purpose of this research (Research Gap)

Based on the above literature, it is clear that research studies on diversification mainly focuses on firm productivity, restructuring, and product variety. From this, we could deduce that these studies focused on the impact on firms *after* its different forms of diversification. Hence, limited research exists on how firms allocate resources *during* the process of its long term diversification. Thus, this paper tries to capture this resource allocation using the idea of financial interdependence. In order to further develop the understanding of this matter, the literature review section illustrated different theoretical concepts on the firm structure, resource allocation, and interdependence.

By further developing my research question, I arrive at my first purpose for this study. It would be to identify the significance of the relationship between diversified and traditional divisions within a company.

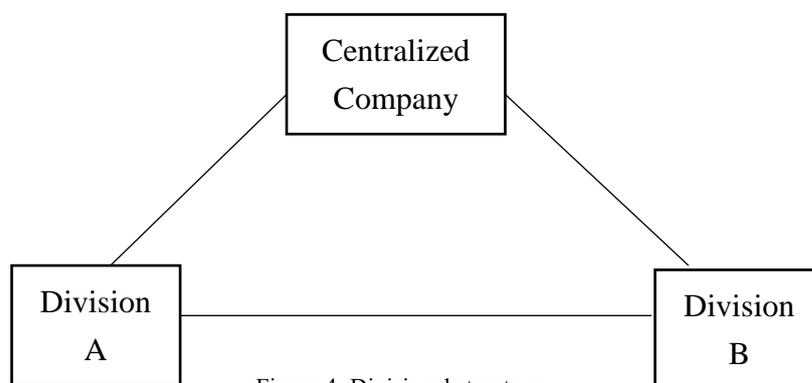


Figure 4: Divisional structure

The above figure provides a simplified view of how a company and its different divisions

may work during its day to day business. In this case, I assume that a company is made up of two divisions, which are involved in manufacturing unrelated items. During their daily operations, we could expect the divisions to some extent, be working together or being interdependent for their resources and activities. An important note here is that the ‘centralized company’ in the above does not depict the model of a holding company. In brief, a holding company has limited business activities compared to that of a centralized company (Campbell & Goold, 1987). This figure is merely to explain that a company can be having two divisions, and they may work together to some extent on their operations. Hence, there could be a significant relationship between the two divisions of the company at any point in time.

The above explanation of the relationship between divisions leads to the second purpose of this study. The two divisions identified in the above figure is referred to as ‘diversified division’ and ‘traditional division’ of a company in this study. As their name suggests, diversified divisions are those divisions whose business activities differ from the common nature of business. Traditional divisions are those divisions whose activities represent the common nature of a business or a brand. In this research, I intend to explain the relationship between the diversified and traditional divisions of a company.

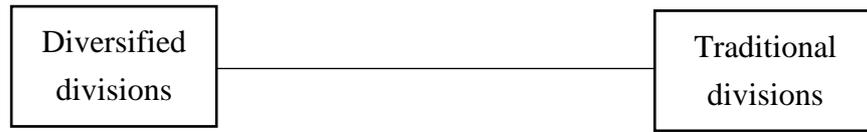


Figure 5: Diversified and traditional divisions

This study aims to define the above relationship in terms of either positive or negative affinity using a financial approach. Thus, this study would help to understand the direction the Japanese electronics take and its impact on their business.

The ultimate purpose of this study would be to identify the prospects of Japanese electronics giants with diversified and traditional business divisions while defining their overall business structure, product portfolio management, and interdependence management.

4. Conceptual Framework

To capture the above purposes of this study under one formation, I have developed the following conceptual framework mainly using the idea of administrative theory by James D. Thompson (1967).

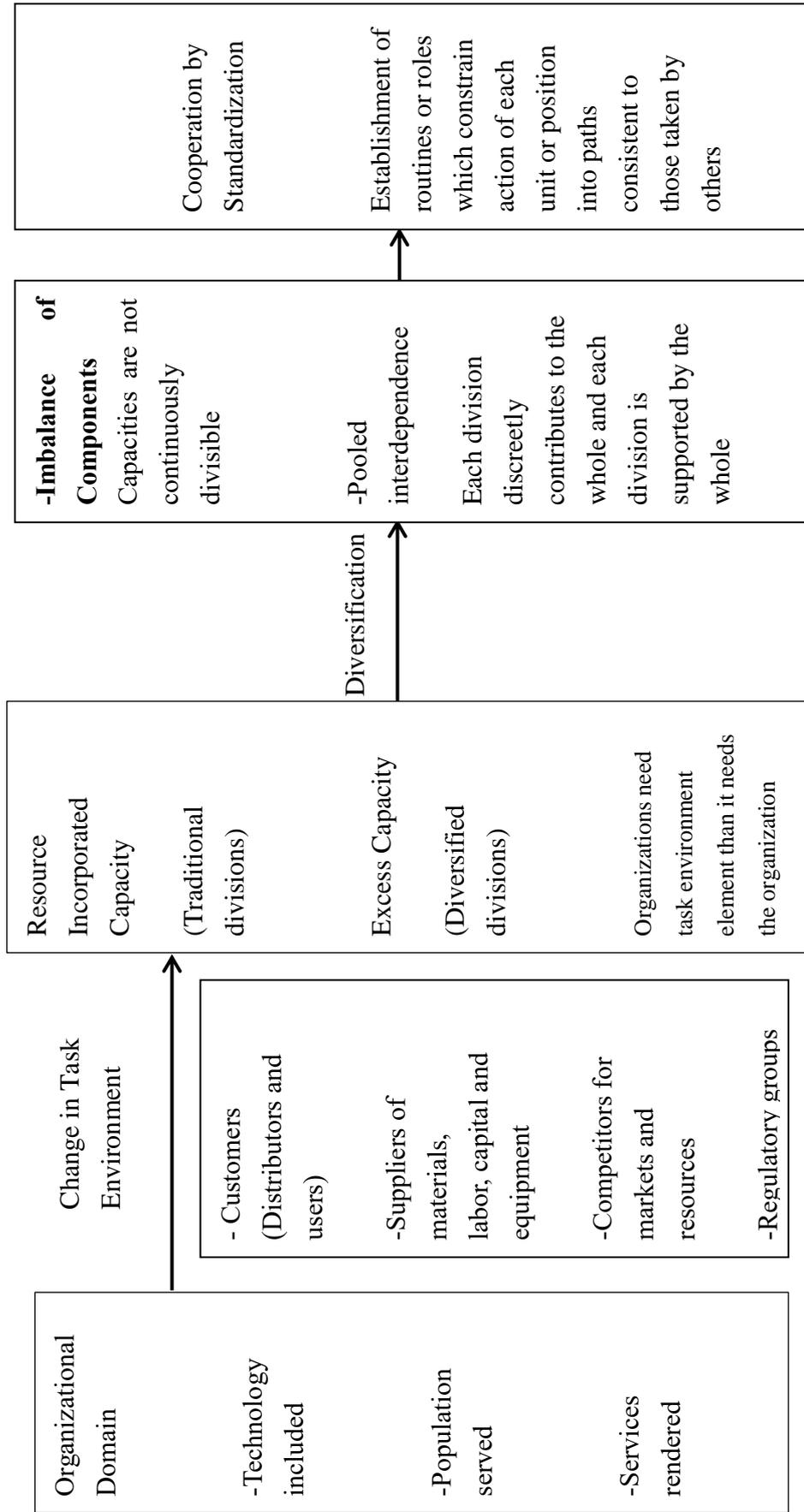


Figure 6 - Based on Thompson administrative theory (Originally developed in 1967)

In the above conceptual framework, the main component would be the *organizational domain*, which, in other words, is described as the functions of an entity or a firm. Firstly, this domain contains ‘technology included,’ which means the available technology in that company. It also serves as their competitive advantage in the industry and relates to the theory of the resource-based view (Wernerfelt, 2016). In other words, based on the technology available to the company, one could assume its core business functions. In any case, if the main technological capacity of the company changes, then this would result in a change in the organization domain of that entity. Secondly, a firm’s existence is also categorized based on the population that the firm serves in the market. In other words, it would be the customers that the firm has captured in its business. Similar to technology included, any change in the type of customers would indicate that there is a change in the organizational domain of the company. In relevance to this study, I would assume that the diversification of the company will result in a change in the consumers that it serves in the market. The last part of the organizational domain would be the services rendered by the firm to the market. It also includes the goods and services offered by a firm to the market. Similar to the first two factors of the organizational domain, any change in the services rendered by the firm will result in changes to the organizational structure. Thereby, this model defines a business organization using the above three

factors of the organizational domain. From another angle, a firm is a pool of resources, where the products manufactured in it explains how they use their resources and what they serve to the market. In many circumstances, what they serve now may also be well different from what they initially served in that industry (Penrose, 1995). Hence, an essential aspect of this definition is to understand that no two firms in the same industry can have the same domain. Using the factors explained about this domain, this research identifies that an organization may depend on specific aspects of the environment it is operating. The structure of its environment and its capacities helps us to identify the dependent factors of an organization.

Furthermore, the organizational domain of a company changes when the *task environment* that it operates changes accordingly. This task environment consists of (1) customers, (2) suppliers of material, labor, capital, and equipment, (3) direct and indirect competitors for markets and resources and, finally the (4) regulatory groups such as government and local authority. It is essential to understand that an organization does not have equal power over all elements of a task environment. In some cases, they may have extensive power over some and very little against the others. Provided that, for example, if the suppliers stop providing raw materials to a firm due to certain constraints, this would directly impact the firm's organizational domain and the same impact applies with all the other

components of the task environment. In order to defend the domain they are operating in, the companies tend to weigh out their power among different elements of the task environment. Hence, environmental uncertainty is an essential variable in determining the diversification strategies of a firm (Bergh & Lawless, 2008). It also needs to be understood that each of the components in the task environment has its organizational domain, which is not a part of this study. Furthermore, factors such as cultural patterns and the existence of the environment beyond the current task environment of a firm can also influence an organization. Subsequently, similar to the organizational domain, task environment is unique to a firm and hardly duplicates among the firms in the same industry.

As a consequence of the change in the task environment, the firm then falls into the situation where it has resource incorporated capacity as well as excess capacity. *Resource incorporated*, as the name suggests, refers to those resources that can only be used in particular businesses and are not flexible to change or adapt to other parts of the business. It is similar to the idea of ‘inherited resources’ such as managerial capacity and technical skills which may not be suitable for expansion of a firms’ product portfolio (Penrose, 1995). In this research, I use this as a construct to define the ‘traditional divisions’ of the Japanese consumer electronics companies. On the other hand, *the excess capacity* shown

in the above conceptual framework represents those resources that are now free or available for use in other divisions because of the change in the task environment. Thus, these resources can be used in the process of diversification and employed in the new business of the company. It is also similar to the idea of economically inalienable resources by Wernerfelt (2016), who states that the excess amount of those resources has the potential use for expansion into new business segments.

Furthermore, as of their current state, the excess resources can be categorized as unproductive (Penrose, 1995) and be used for diversification. Thereby, I use the component of *excess capacity* in this framework to define the ‘diversified divisions’ of the Japanese consumer electronics companies. Among the elements of the task environment, a primary variable that leads to the situation of excess capacity is the fierce competition in that industry. It forces the firms to expand their product portfolio to avoid any future pitfalls for its business (Penrose, 1995). However, it is also vital to ensure that uses of its excess resources allow the firm to reach optimal diversification and extract maximum rent (Montgomery & Wernerfelt, 1988).

The use of the excess capacity for diversification creates a situation where the firm faces, *imbalance of components, and pooled interdependence*. The imbalance of components addresses the problem where the resources brought in from the excess capacity may not

be a perfect match for the diversified divisions. For example, a marketing manager brought in from the excess capacity may not be suitable for the operations of the diversified business. Instead, we could say that the capacities of these resources are not continuously divisible and may suit one job more than the other. However, it is essential to note that when looking at such resources, we need to look at the bigger picture of the organization and not just about the individual resources such as human resources or machinery. This imbalance can occur in both traditional and diversified divisions of the business. Thus, it is crucial for a company to look at how well it could deal with the indivisibility of resources during diversification and how it can optimize those resources (Penrose, 1995). During these situations, we could expect a company to go into a state of *pooled interdependence*. It is a situation where each division might be indirectly supporting the activities of the other and at the same time contributing to the organization as a whole. In relevance to this study, I would expect that either the ‘traditional divisions’ of Japanese electronics maybe supporting the activities of the ‘diversified divisions or vice versa. An assumption made at this part is, that if either of the divisions fails to execute their tasks properly, it may expose a threat to the existence of the entire business.

In order to overcome this issue, a firm may adopt a system known as ‘*cooperation by standardization*,’ during which the firms’ senior management or what we could also

describe as the 'Centre' is responsible for all divisions (Campbell & Goold, 1987). The centre establishes routines which try to restrict the actions of each division or try to make sure that all divisions follow a conventional path in terms of business strategies and resource allocation. During this process of cooperation, a critical factor to keep in mind would be the coordinating costs of the business. These costs apply to both internal and external expansion of the business. A firm may only choose to coordinate if the synergy of such action would override the coordination cost associated with it. Although this paper focuses on financial aspects of such coordination, it also needs to be remembered that resources such as reputation and knowledge acquired by the company are also significant in the process of cooperation among the different divisions (Zhou, 2011)

From the conceptual framework discussed above, this paper mainly focuses on the area of pooled interdependence and cooperation by standardization. It is used to identify the resource re-allocation among the traditional and diversified divisions and how financially interdependent they are during this process.

It leads to the main research question of the study, 'how financially interdependent are the Japanese electronics companies, and how does this relationship affect the future of these companies?'. By substituting financial variables to the above conceptual framework, this study will capture the financial interdependence among the traditional and diversified

divisions of the subject companies.

5. Methodology

5.1 Data selection

Based on the Euromonitor International 2018 reports on the total retail volume of top Japanese consumer electronics and appliances companies, world-renowned and traditional Japanese brands were purposively chosen for this study.

Company Shares of Consumer Electronics in Japan

% Share (NBO) - Retail Volume - 2018

Company	% Share
Apple Japan Inc	26.8
Sharp Corp	8.8
Sony Corp	6.4
Panasonic Corp	4.8
Canon Inc	4.5
Sony Mobile Communications Inc	4.0
Seiko Epson Corp	3.2
Huawei Technologies Japan KK	3.1
Fujitsu Mobile Communications Ltd	2.5
NEC Lenovo Japan Group	2.5
Kyocera Corp	2.0
Samsung Japan Corp	1.8
Toshiba Visual Solutions Corp	1.7
Fujitsu Ltd	1.5
Asus Japan Inc	1.5
Pioneer Corp	1.2
Bose KK	0.9
Toshiba Corp	0.8
LG Electronics Japan Inc	0.8
Others	21.2



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Figure 7 (Euromonitor International, 2018a)

Company Shares of Consumer Appliances in Japan

% Share (NBO) - Retail Volume - 2018

Company	% Share
Panasonic Corp	26.9
Hitachi Appliances Inc	5.9
Sharp Corp	4.9
Zojirushi Corp	3.7
Toshiba Corp	3.6
Tescom Co Ltd	3.5
Mitsubishi Electric Corp	3.3
Kolzumi Corp	3.0
Tiger Corp	2.8
Daikin Industries Ltd	2.3
Procter & Gamble Far East Inc	2.2
Dyson Japan	2.2
Yamazen Corp	1.8
Rinnai Corp	1.8
SEB Japan, Groupe	1.7
Philips Electronics Japan Ltd	1.6
Fuji Industrial Co Ltd	1.1
Johnson Controls - Hitachi Air Conditioning	1.1
Private Label	0.3
...	26.1

Figure 8 (Euromonitor International, 2018b)

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From the above lists, the following companies were used for this study.

1. Hitachi Limited (TYO: 6501)
2. Panasonic Corporation (TYO:6752)
3. Sharp Corporation (TYO:6753)
4. Sony Corporation (TYO:6758)
5. Toshiba Corporation (TYO:6502)

Although Fujitsu Limited (TYO: 6702) was initially selected for this study, due to lack of data and inconstancy of financial reporting during the period of this study, the company was taken off from this research.

Data from fiscal year (FY) 2009 to 2018 was observed and analyzed for this research.

Some of the main economic events that affected Japan such as, impact of Lehman shock, Tsunami devastation, contraction of economic growth during in late 2012 due to Eurozone crisis, hosting Olympics 2020 in Japan, increase in consumption tax from 5% to 8% in 2014 and economic recovery from recession in early 2015 (BBC, 2019; Japan Today, 2019) adds more value to this study time period.

5.2 Diversification criteria

5.2.1 Segment reporting

In order to identify the unrelated diversification segments (divisions) for the subject companies, it is necessary to first look at their current accounting standards and segment reporting. Following are the companies reporting standards during the study period

1. Hitachi Limited - U.S GAAP² till FY2013 and IFRS³ from FY2014
2. Panasonic Corporation - U.S GAAP till 2016 and IFRS from FY2017
3. Sharp Corporation - Japanese GAAP (JGAAP)
4. Sony Corporation – U.S GAAP
5. Toshiba Corporation – U.S GAAP

Following is a brief notion of how operating segment reporting is conducted under each of the accounting standards

U.S GAAP – According to Accounting Standards Codification (ASC) 280, an entity must disclose its reportable segments, its difference in products and services, geographic areas of operations, and about the regulatory environments. If there is any, an entity must also disclose relevant information on operating activities, forecasts, and any plans for that

² United States Generally Accepted Accounting Principles

³ International Financial Reporting Standards

segment.

As for information on profit and loss about a segment, some of the items it must disclose are the revenues from external customers, intersegment sales, interest revenue and expense, depreciation and amortization and any usual items according to ASC 225-20-45-16.

As for asset information, some of the items the company must disclose are the amount of investment in equity method investee, total expenditures on long term assets and financial instruments (Ernst & Young, 2016a). The above items are not the entire disclosure requirement of ASC 280; hence, these are excerpts chosen for the purpose of this study.

IFRS – According to IFRS 8, an entity must disclose information about product and services, geographical area, and its primary customers (Deloitte, 2019). As for profit and loss and assets, there is no significant difference compared to the disclosure requirements of U.S GAAP⁴.

JGAAP – As this accounting standard is closely associated with IFRS, the companies disclose segment product information, geographic activity, capital investment and all

⁴ Please note that the phrase ‘significant difference’ here refers in relation to the required information needed for this study. If the entire accounting standard is fully reviewed, we may find considerable differences among both standards.

other disclosure information similar to that of IFRS (Ernst & Young, 2016b).

Using the above disclosure information, I could gather relevant information regarding each division of the business for the study period and have built a comprehensive dataset for further analysis in this research.

5.2.2 Herfindahl-Hirschman Index (HHI)

Before moving on to identifying the unrelated diversification divisions of the subject companies, HHI which was initially a measure used to study concentration in a market (Hirschman, 1964), is now used in this study to identify the general trend of diversification based on their operating segment reporting. The formula used to identify the level of sales concentration is as follows.

$$H_t = \sum_{j \in J_t} S_{jt}^2$$

J is the set of segments in year t , and S is the percentage of segment sales to total sales of the company. The following table shows the HHI for all the subject companies

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Hitachi	0.175	0.185	0.188	0.096	0.102	0.103	0.115	0.118	0.123	0.139
Panasonic	0.264	0.296	0.308	0.282	0.232	0.143	0.140	0.211	0.166	0.241
Sharp	0.272	0.290	0.287	0.296	0.291	0.257	0.206	0.197	0.168	0.177
Sony	0.480	0.493	0.300	0.252	0.299	0.122	0.119	0.128	0.124	0.128
Toshiba	0.284	0.285	0.291	0.295	0.280	0.286	0.209	0.212	0.246	0.264

Table 1 : HHI of subject companies

When interpreting the results of the above table, values closer to zero shows higher diversification and vice versa. By looking at the subject companies, it is clear that the general trend among the companies is more towards diversification during the last decade.

Meaning that they have identified more segments for their products and the percentage of segment sales to the total sales is progressively scattered. Among those companies, Sony has been an active participant in diverting its business operations.

5.2.3 Unrelated diversification

Having described the companies segment reporting measures and the general trend of diversification using HHI in the earlier sections, this section illustrates the measure used to identify the unrelated diversification divisions of the company. In this case, unrelated diversification is a situation where firms have decided to do business in entirely unrelated business compared to their core segment and allow their cash flow to move into different divisions based on the financial judgment made by the company (Rowe & Wright, 1997).

In this research, I identify the diversified divisions using deviations of companies segments from their primary industry with the North American Industry Classification System (NAICS). Reason for using NAICS instead of Standard Industry Classification (SIC) codes is because NAICS identification uses a product-oriented structure based on the company's main economic activity, compared to SIC using a market-oriented approach (NAICS Association, 2018). Hence, NAICS substantiates the purpose of this research. Following table shows the primary industry classification of the subject companies.

Company name	Primary industry NAICS Code	Code details
Hitachi	334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing
Panasonic	334310	Audio and Video Equipment Manufacturing
Sharp	335220	Major Household Appliance Manufacturing
Sony	334310	Audio and Video Equipment Manufacturing
Toshiba	334310	Audio and Video Equipment Manufacturing

Table 2 Source (Business Insight, 2018)

Using the Gale Business Insight global database, I have been able to classify the primary industries for the subject companies. Using this as a guideline, I have developed the traditional divisions and diversified divisions for all these companies. Hence, any product

or service segment that is related to the primary industry of the business is classified

‘traditional divisions,’ and any product or service that is entirely unrelated to the primary

NAICS code of the company will be ‘diversified divisions.’

Following tables show the classification used during this research to identify both traditional and diversified divisions of the subject companies

Hitachi

Traditional divisions	Diversified divisions
Power Systems	Information & Telecommunication Systems
Social Infrastructure	Financial Services
Construction Machinery	
High Functional Materials & Components	
Automotive Systems	
Components & Devices	

Table 3 Source: Annual Securities Report

Based on segment information of Hitachi, Information and Telecommunication systems are a mainly service-oriented business of the company where it focuses on providing services from consulting to system integration. ‘Hitachi Capital’ which is as part of the financial services of Hitachi, was turned into an equity method associate in October 2016. However, the company still reported financial information regarding this company in its FY 2018 Annual Securities Report. Thus, for consistency purposes of this research, it was

still considered as a diversified unit of Hitachi Limited.

Panasonic

Traditional divisions	Diversified divisions
Appliances	Eco-solutions
Connected Solutions (former AVC networks)	Automotive & Industrial systems

Table 4 Source: Annual Securities Report

Panasonic has established its footprints into completely unrelated businesses during the last decade. The eco-solutions division focuses on lighting, ecology systems, and housing systems with ‘PanaHome’ being an essential business to Panasonic. At the same time, their Automotive & Industrial systems focus more on B to B approach with manufacturing batteries for automotive, energy, and industrial businesses.

Sharp

Traditional divisions	Diversified divisions
Smart Homes	Smart Business Solutions
Advance Display Systems	IoT Electronic Devices

Table 5 Source: Annual Securities Report

Smart homes division still provides their traditional household appliances while its advance display systems is focusing mainly on LCD. On the other hand, its smart business solutions are focusing on a B to B approach with products such as POS systems and multi-function printers. Its IoT electronic devices division focuses on sensor modules, laser diodes, and automotive cameras.

Sony

Traditional divisions	Diversified divisions
Game & Network Services	Semiconductors
Music	Financial Services
Pictures	
Home Entertainment & Sound	
Imaging Products & Solutions	
Mobile Communications	

Table 6

For this research and because of the close relation between electronics, music, and pictures, the segment classification for this will be traditional. Although game & network services division is racing into cloud services and software business, their primary revenue is still on PlayStations. Thus, it is under traditional divisions. On the other hand, Sony is moving into industrial business on semiconductors, especially with complementary metal oxide semiconductor and largescale integration systems which is categorized here as diversified division. One other notable unrelated diversification of Sony during the recent past was its entry into financial services. They are providing insurance, savings, and loan schemes through Sony Life, Sony Assurance, and Sony Bank.

Toshiba

Traditional divisions	Diversified divisions
Infrastructure Systems & Solutions	Energy Systems & Solutions
Retail & Printing Solutions	Industrial ICT Solutions
Storage & Electronic Devices Solutions	

Table 7

Infrastructure systems can be considered as quasi-diversified as they work on water

supply and sewage systems, environmental systems, and road systems. However, they still maintain the routes of heavy machinery in this segment by manufacturing electrical machinery, escalators and, transport equipment. Thus, it is classified under the traditional divisions. On the other hand, one of the prominent diversification of Toshiba is going into the energy sector. They have heavily invested in thermal, hydroelectric, and nuclear power generation. ICT solutions is still a very young division, and it focuses on cloud solutions.

In addition to using NAICS code for identifying the traditional and diversified divisions, the corporate history all subject companies were studied carefully to avoid any subjective categorization.

5.3 Research Design

As evident with in-depth financial statement examination of subject companies, this research uses firm-specific analysis to capture its variables. I use correlation matrix and multiple regression analysis to identify the significance of variables between traditional and diversified divisions.

As for the research design explained above, the dependent variables are from the traditional division. It captures the impact the diversified unit variables have on specific

financial measures of the traditional divisions. The variables used are R&D Expenses (R&D), Capital Investment (CAPINV), and Number of Employees (NOEMP). As there are multiple dependent variables, regression analysis is conducted three times for each subject company.

The independent variables are from the diversified divisions. It includes Net Sales (NETSALES), Operating Income (OPINCOME), and Return on Assets (ROA). These are mainly performance variables and is used to identify the level of dependence on the traditional divisions' variables.

The regression equations are as follows: -

$$R\&D_i = \beta_1 NETSALES_1 + \beta_2 OPINCOME_2 + \beta_3 ROA_3 + \varepsilon_i$$

$$CAPINV_i = \beta_1 NETSALES_1 + \beta_2 OPINCOME_2 + \beta_3 ROA_3 + \varepsilon_i$$

$$NOEMP_i = \beta_1 NETSALES_1 + \beta_2 OPINCOME_2 + \beta_3 ROA_3 + \varepsilon_i$$

6. Hypothesis

Deciding on the right amount of R&D spending for different divisions is an essential task for senior management. Firms tend to use different approaches such as different financial models, business strategy allocations, bubble diagrams, scoring models, and checklists when allocating R&D funds for its divisions (Cooper et al., 2001). In some cases, evaluation of divisional managers was conducted using the Return on Investment (ROI), which is a short term evaluation tool. In order to achieve higher ROI, the managers tend to reduce the expenses of their divisions and thereby increase profit and eventually the ROI. A significant component that is reduced to attain this short term objective is cutting down on the company's R&D expenses and bet heavily on products and services that are not part of their core business. At different occasions, the relationship between diversification and R&D is negative and vice versa (Baysinger & Hoskisson, 1989; Pandya & Rao, 1998); hence I hypothesize that,

H1: Relationship between diversified division performance and R&D expenditure on traditional division is negative

Usually, investment ideas and requests take place from within the divisions, but the final decision regarding the sanction of such investments lies with the corporate management

(Campbell & Goold, 1987; Lang & Stulz, 1994). When making decisions regarding investments in segments, firms tend to look at their divisions from a comparable prospective and avoid investments on those divisions that are relatively unprofitable (Penrose, 1995). On a micro level, Jaeger & Baliga, (1985) suggest that divisional managers usually tend to neglect the prospect of capital investments in the short run so that they could achieve their higher goals of ROI with a small amount of investment. This view is also supported by the paper of Baysinger & Hoskisson (1989), who states that managers avoid additional market expenditures and new investments on diversified firms. Such that, the managers of traditional divisions are expected to take this stance to increase their performance indicators regardless of the availability of potential in that segment. Even if the personal motives of divisional managers are ignored, we could still say that continuous new investments on certain divisions of the company will reduce the firm's ability to support all of its division at a particular time (Penrose, 1995). However, there have also been cases where the investments on segments depend on its own cash flow than on the cash flow of the other segments (Shin & Stulz, 1998). Hence, I hypothesize that;

H2: Relationship between diversified divisions performance and capital investment on traditional divisions is negative

In many businesses the resources are usually allocated to the competitive divisions and are centralized so that the allocation of human resources, capital investment, and restructuring could lead to minimizing imbalance of components (Campbell & Goold, 1987; Thompson et al., 2003; Wernerfelt, 2016). It is true when it comes to a situation where a firm has the opportunity to increase its productivity and managerial scope in a diversified business area, compared to the volatile demand for its existing products (Penrose, 1995). The above explains my current proposition regarding traditional and diversified divisions. Looking at this resource re-allocation from a financial performance perspective, for those firms going into unrelated diversification, the managers tend to use output control methods (performance-based remuneration and results conditions) which is preceded by financial controls when allocating subordinates for work (Rowe & Wright, 1997). It shows that the number of employees may be re-allocated for different divisions during diversification. Hence I hypothesize that

H3: Relationship between diversified divisions performance and number of employees of traditional divisions is negative

Based on the above propositions, I have constructed the following hypothesis diagram to operationalize this study.

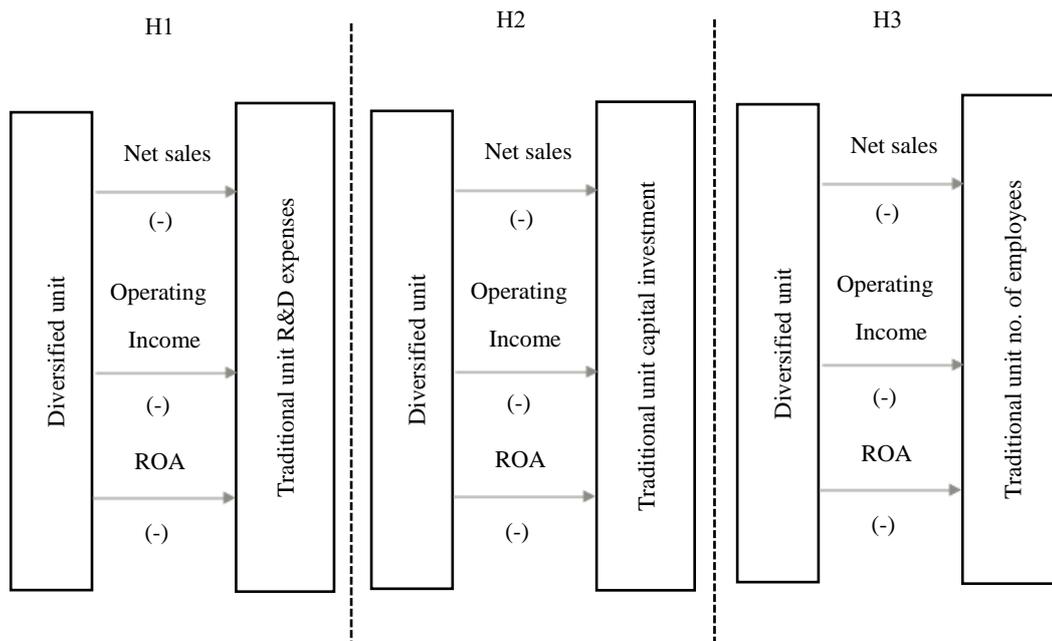


Figure 9: Hypothesis Diagram

Using the above hypothesis diagram, I examine the relationship between traditional and diversified divisions of the subject companies and try to establish their relationship in terms of financial interdependence.

7. Results and Discussion

In this section, I will discuss the Pearson (2-tailed) correlation matrix and multiple regression results of each company to gain a complete understanding of the company structure and the interrelationship between the divisions.

7.1 Hitachi

Correlation Matrix

	NETSALES	OPINCOME	ROA	R&D	CAPINCOME	NOEMP
SALES	1.00					
OPINCOME	.076	1.00				
ROA	-.369	.739*	1.00			
R&D	-.870**	.030	.495	1.00		
CAPINCOME	-.699*	.225	.615	.929**	1.00	
NOEMP	-.603	-.397	-.009	.465	.222	1.00

Table 8 Hitachi correlation Matrix

Regression Results (significant variables only)

Dependent	Independent	P value	Coefficient	R square
R&D	NETSALES	.022	-.720	.803

Table 9 Hitachi multiple regression results

By looking at table 8, we can find that R&D and CAPINCOME of traditional divisions correlate negatively with the NETSALES of the diversified divisions at .001 level. It shows that whenever there is a change in net sales of the company, it has a significant impact on the R&D and CAPINCOME amount of the traditional divisions. Furthermore, with the results of the regression analysis, a reasonable prediction can be made that whenever the NETSALES of the diversified divisions' increases, it negatively impacts on

the R&D of traditional divisions. At the same time, having an R square of .803 shows that 80% of the variation in R&D is with the movement in NETSALES of the diversified divisions.

Further analyzing the financial statements of Hitachi, I could find that despite their increase in total net sales during the past five years at a rate of 2%, R&D investment on its traditional products division reduced from 72% to 69%. On the other hand, R&D investments in diversified divisions increased from 28% to 31%. It is further evident with its deviation on R&D operations since 2011, which focused on improving information technologies segment as well as strengthening its R&D operations abroad (Jiji Press, 2011)

Looking at the mid-term plans of Hitachi 2021(Hitachi, 2019), I could see that their focus is on improving the 'social innovation businesses.' A core part of this business comes from its 'Lumada' concept. It focuses on improving customer solutions using data collected from Hitachi's operational and information technology sources. As for the annual report of Hitachi 2018, they invest approximately 4% of their revenue on social innovation businesses. At the same time, as of 2018, the company's investment on open innovation-related projects was 60% higher compared to its investment in 2015. From this, it is clear that results of this study are in line with the study of (Baysinger &

Hoskisson, 1989), who states that for firms that have gone into unrelated diversification, has relatively less R&D intensity (R&D spending as a percentage of sales). Further, Hitachi's R&D intensity during the past five years has remained at an average of 3.5% compared to its sales growth of 2% annually. It also has to be noted that the financial services segment, which is a diversified division in this research, requires very less R&D investment compared to its other divisions.

As for the results, OPINCOME AND ROA were not significant dependent variables. At the same time, CAPINV and NOEMP models did not also provide any significance to Hitachi.

7.2 Panasonic

Correlation Matrix

	NETSALES	OPINCOME	ROA	R&D	CAPINV	NOEMP
SALES	1.00					
OPINCOME	-.135	1.00				
ROA	-.266	.952**	1.00			
R&D	.570	-.456	-.473	1.00		
CAPINV	-.346	.149	-.015	-.204	1.00	
NOEMP	.382	-.128	-.054	.465	.419	1.00

Table 10 Panasonic correlation matrix

Regression Results (significant variables only)

Dependent	Independent	P value	Coefficient	R square
R&D	NETSALES	.026	-.873	.899
CAPINV	NETSALES	.032	-.718	.690
	OPINCOME	.017	2.679	

Table 11 Panasonic regression results

In the case of Panasonic, there is no significant correlation at .001 or .005 level as for the above correlation matrix. Although OPINCOME and ROA are highly correlated, they are independent variables in this research and thus does not need to be further analyzed. However, the regression results of Panasonic, show that NETSALES of diversified divisions is a significant variable in explaining the R&D and CAPINV of the traditional divisions. However, OPINCOME of diversified divisions is positively significant in explaining the CAPINV of traditional divisions. During the study period, I could observe that, whenever the percentage increase in operating income was more than that of net sales, the capital investment increased. In other words, the excess of operating income was a positive determinant to increase capital investment in Panasonic's traditional divisions.

Currently, Panasonic's R&D intensity is at an average of 6%, which is among the highest in Japanese electronics companies. On that note, even to date, their traditional appliances segment remains as one the most significant revenue contributor to the company at an average of 30% out of the company's total revenue. At the same time, their diversified divisions, which is the automotive & industrial segment, has also been contributing up to 30% of the company's total revenue. Even though their impact on total revenue has been the same, the amount spent on R&D for these segment favors the latter. As for further

analysis on this matter, during the past four years, R&D spending on appliances segment was 22% while it was a staggering 42% for the automotive and industrial segment. It implies the R&D policy of Panasonic. It is clear that the driver of R&D is the net sales company, and in this case, it does not favor their traditional products. The above situation relates to Penrose's (1995) argument that, when making investment decisions, a company tends to do a comparative analysis and allocates its funds to a relatively profitable segment.

In the year 2016, the company made a strategic decision to make a capital investment of 1 trillion yen over four years to improve its business segments. As of 2018 annual statement, the company had made decisions on 85% of these capital investments. Out of that, more than 50% of the allocation is on eco-solutions and automotive & industrial segments. The above includes capital investment in solar cell modules in Tesla, manufacture of lithium-ion cells, and automotive batteries. As for merger and acquisition (M&A) decisions, it is making PanaHome a wholly owned subsidiary, and collaborating with Spanish and German automotive supplier and software developers. The above capital investments can also serve as a means of reducing the initial cost required for firms to engage itself in different product markets (Kawakami & Miyagawa, 2013) as they do not make a bold entry but rather enter as a supplier to that market.

As mentioned in the methodology section for Panasonic on this study, all capital investments and new business ventures of this company are into B to B business. It was evident from the time of President Kazuhiro Tsuga who focused more on the company's B to B business and implied on moving from a highly competitive market to more mediating markets (Dibeyendu, 2013).

7.3 Sharp

Correlation Matrix

	NETSALES	OPINCOME	ROA	R&D	CAPINV	NOEMP
SALES	1.00					
OPINCOME	-.193	1.00				
ROA	-.237	.990*	1.00			
R&D	-.759*	-.253	.288	1.00		
CAPINV	-.576	.083	.103	.943**	1.00	
NOEMP	-.256	-.000	.089	.374	.312	1.00

Table 12 Sharp correlation matrix

Regression results (significant variables only)

Dependent	Independent	P value	Coefficient	R square
R&D	NETSALES	.042	-.728	.589

Table 13 Sharp regression results

The correlation matrix of Sharp shows that NETSALES and R&D have a negative correlation at .005 level. Similar to the analysis of preceding companies, NETSALES of the diversified divisions is a strong determinant that relates to the R&D spending of the traditional divisions of Sharp Corporation. Furthermore, R&D and CAPINV of traditional divisions have a positive correlation at .001 level. Although both these variables are

regressands in this research, it shows that most of the CAPINV on traditional divisions relate to the contents of the R&D spending. As for the regression results, NETSALES of diversified divisions once again is a strong predictor of R&D spending in the traditional division. However, as R square is at .589, there could be other independent variables that affect R&D spending for Sharp.

Unlike the other subject companies that obtain a majority of its sales from diversified divisions, in Sharp, 50% of the total revenue still comes from its advance display systems, which is a traditional division. This segment also has seen considerable growth and in FY 2018, with sales growth of 29%, and segment profit also increased ten folds compared to 2017. Despite such triumphs, further analysis of their financial statements shows otherwise for their R&D spending. During the last three years, the average R&D spending on the traditional divisions was 33% of its total spending. However, the R&D spending on the diversified divisions of the company was also 33%. It is even though the YoY sales growth (FY2018) of the diversified divisions, the smart business solution was only 4.2% and IoT segment 18.8%. At the same time, R&D spending on IoT segment increased from 11% to 17% during the last three years. It shows that, despite sales growth in the company's traditional divisions, the company tends to focus its R&D spending on upcoming divisions like IoT, which is a diversified division. An important observation

when analyzing the diversified divisions was that the operating income was volatile for its diversified divisions, but traditional division remained stable. However, it seems that NETSALES is still a significant variable in allocating R&D spending among company divisions compared to operating income. It is a sign that when a company knows that a particular segment is stable for the foreseeable future, the company tends to invest more on the development of upcoming divisions (Cooper et al., 2001). In this case, the divisions with better sales prospects such as IoT. It also implies that in order to maintain the competitive position in the new market, the company needs to invest in R&D and reduce the burden on the initial cost needed for such projects (Kawakami & Miyagawa, 2013).

7.4 Sony

Correlation Matrix

	NETSALES	OPINCOME	ROA	R&D	CAPINV	NOEMP
SALES	1.00					
OPINCOME	.834	1.00				
ROA	.725*	.979*	1.00			
R&D	-.767**	-.503	-.422	1.00		
CAPINV	-.128	-.363	-.385	-.181	1.00	
NOEMP	-.931**	-.750*	-.613	.644*	.250	1.00

Table 14 Sony correlation matrix

Regression results (significant variables only)

Dependent	Independent	P value	Coefficient	R square
R&D	NETSALES	.031	-1.836	.728

Table 15 Sony regression results

In the case of Sony, there is a negative correlation between R&D and NOEMP at .001 level. It is the only company from the subject entities that showed a correlation with NOEMP. From the company data, it is clear that there is a significant drop in the number of employees during the study period. In 2011, their traditional divisions had 149,300 employees, and it dropped to 114,000 by 2018. It is also evident with the rigorous restructuring initiatives by Sony starting in 2012 by then CEO Kazuo Hirai. The company cut around 10,000 jobs in its chemical unit as well as LCD operations in the year 2012 to overcome its massive losses from these segments (Telegraph, 2012; The Nikkei Weekly, 2012). In 2014, the company further cut jobs in its personal computer (PC) and television segments by 1500 in the domestic market and 3000 jobs overseas. At the same time, it also sold its famous VIAO PC business (Business Line, 2014; Jiji Press, 2014; The Japan Times, 2014). In the year 2015, due to a drop in demand for Sony smartphones, the company cut about 1000 jobs in Asia and Europe (Jiji Press, 2015).

On the other hand, in the finance service segment, the number of employees increased from 7200 to 11400 during the study period. However, as this is a correlation between two variables, it may not be possible for us to predict that any change in the diversified divisions' sales may hurt the number of employees of traditional divisions in the future. The analysis of newspaper articles cited above suggests that most of the job cuts were

related to restructuring and does not provide any emphasis on improvement in the sales in their financial segment (diversified division).

By looking at the regression results, similar to the other companies in the study, NETSALES of the diversified division is a significant variable in predicting the R&D spending of the traditional divisions. For Sony, I have identified that Semiconductors and Financial Services as the diversified divisions. As discussed earlier in this research, financial service is a segment that does not require extensive R&D compared to physical components manufacturing divisions such as electronics. Thus, further analyzing the financial statements of Sony shows that R&D spending on Semiconductor segment was on average 27% of their total spending during the past four years and it also remained as the top R&D spending segment during those years. The division that spends most on R&D after the Semiconductor was the Game & Network Services segment. Although this is as a traditional division in this research, their recent efforts on cloud gaming and software development (Digit Fast Track, 2019; ICT Monitor Worldwide, 2019) hints that it is in the transition process to becoming a diversified division of Sony. It is also in line with the study of Pandya & Rao (1998), who states that firms slowly venture on to unrelated diversified segments by injecting more on to their R&D, but it also increases its risk profile which is evident here with cloud computing of Sony business.

7.5 Toshiba

Correlation Matrix

	NETSALES	OPINCOME	ROA	R&D	CAPINV	NOEMP
SALES	1.00					
OPINCOME	.301	1.00				
ROA	.286	.998**	1.00			
R&D	-.276	-.175	-.142	1.00		
CAPINV	-.081	.256	.268	.817**	1.00	
NOEMP	.167	.217	.226	.105	.150	1.00

Table 15 Toshiba correlation matrix

Regression results – No significant variables

From the above table, the only possible explanation would be the correlation between R&D and CAPINV of traditional divisions. As these are dependent variables in this research, the results only imply that CAPINV and R&D moved in the same direction. It could also mean that decisions on R&D investments were profoundly affected by the capital investment decisions of the company.

When analyzing the financial statements of the company, although the energy sector was a considerable revenue driver for Toshiba, its significant R&D spending during the past five years was with its devices segment. On average, the company's R&D spending on devices was at 49% during the last five years. It is clear that during the same time, the company's capital investment as a % of sales reduced from 4% to 2.2%. It also validates the study of Shin & Stulz, (1998) who states that sometimes the companies tend to avoid investments on those sectors that could have a better opportunity in future, but decisions

rely on current cash flow state of the respective divisions.

A case specific to Toshiba also would be its accounting scandal in 2015. The profit padding of Toshiba from 2008 to 2014 \$1.2 billion (The Japan Times, 2015) did have an impact on the quality of the data as the reinstatement only took place in 2016 financial statement with a substantial reporting of net loss. In addition to that, the company recorded the losses incurred from its nuclear business with Westinghouse Electric in 2017 (Nikkei Asian Review, 2018), which had a considerable impact on the energy business that saw a decreasing revenue for three consecutive years. The above incidents which had a distortion on the dataset of this company give us an explanation to why there were no significant results related to this company.

As for the above discussions, I could say the following regarding the hypotheses in this study. As for H1, where I expected a negative relationship between the financial performance of the diversified division and R&D of the traditional division, was valid for four out of the five companies in this study. Thus, the alternative hypothesis of H1 is accepted. It would also validate the studies of Baysinger & Hoskisson (1989) and Pandya & Rao (1998) regarding R&D investments in unrelated business segments of a company. It further asserts the cooperation by standardization method (Thompson et al., 2003) used

in the conceptual framework of the study which shows that R&D investments on the traditional divisions depend on the sales of the diversified divisions.

As for H2, regarding the financial performance of the diversified divisions and capital investment of traditional divisions, regression results were only valid for Panasonic Corporation. However, when looking at the correlation matrices, we can find that for Sharp and Toshiba, R&D and CAPINV of their traditional divisions were positively correlated. At the same time, the regression results of Sharp shows that NETSALES of diversified divisions was significant in explaining the movement of R&D. Although this does not make an overall prediction regarding H2, I could state that in terms of financial interdependence, there is a relationship between CAPINV and financial performance of diversified divisions. Thus, the alternative hypothesis of H2 in this study is partly accepted. The discussion of the subject companies also shows that there tends to be a particular form of a centralized control system when allocating funds (Campbell & Goold, 1987; Penrose, 1995) in these companies.

As for H3 about the financial performance of the diversified divisions and the number of employees in traditional divisions, no firms in this study proved to have significant results.

Thus, I could disapprove the alternative hypothesis for this part of the study. One of the main reasons for this is because the reduction in the number of employees was not significant compared to the changes in the sales of the diversified unit for most of the companies. Even in the case of Sony, the job cuts were not mainly related to the sales of the diversified unit, but it was mainly because of the restructuring initiatives by the company (Telegraph, 2012; The Nikkei Weekly, 2012). In addition to that, I can also note that long term employment system in Japan is another factor why diversification and number of employees may not be inversely related (Hanazaki & Development Bank of Japan, 2016). Furthermore, the companies policy of transferring their employees to related firms when downsizing (Kato, 2001) could be another reason that explains the acceptance of the null hypothesis for H3.

Another notable outcome from the regression analysis was that OPINCOME and ROA were not significant in explaining the financial interdependence among divisions in Japanese electronics companies. A possible explanation regarding this can be because profitability measure such as OPINCOME and ROA can be mainly related to shareholder returns during diversification in Japanese companies (David, O'Brien, Yoshikawa, & Delios, 2010) and not for financial interdependence. Throughout the study, NETSALES

was a strong determinant for R&D expenditures; thus it relates closely to the studies that have emphasized on personal motives of managers who look at growth factors such as NETSALES and ROI for determining the R&D expenditures (Pandya & Rao, 1998).

8. Conclusion

This research shows that financial interdependence exists among divisions in Japanese electronics companies. The extent to which they are interdependent mainly takes the form that traditional divisions' R&D investments are dependent on the sales performance of the diversified divisions of the company. As for the direction, they are inversely related, and an increase in net sales of diversified divisions would reduce the amount allocated for R&D in the traditional divisions of the company. Furthermore, this asserts the idea of pooled interdependence used in the conceptual framework of this study (Thompson et al., 2003) which states that, although divisions may not have a direct link with each other, their activities are interdependent at many levels of the organization. Results also show that operating income and ROA of the diversified divisions are not significant variables in explaining the changes in the traditional divisions' investment and human resource decisions. It suggests that more than profitability, growth (sales) is the factor that leads to financial interdependence among divisions in Japanese electronics companies. Thus, cash flow shortage in one segment can severely affect the investment of that division, and internal capital markets do not align its investments across all segments at times of diversification (Shin & Stulz, 1998).

In the future, I could expect that traditional divisions of Japanese electronics will reduce

its operations with the growth of its diversified divisions. However, its traditional divisions will not disappear as there is resource incorporated (Penrose, 1995; Thompson et al., 2003) that are specific to that division, in this case, it would be the employees of that particular division. Hence, this research suggests that cooperation by standardization (Thompson et al., 2003) would be an ideal way to manage the traditional and diversified divisions of the company.

As with all other researches, the limitations of this study are that sample size may be too small to predict the impact on the entire electronics industry of Japan. Although the subject companies comprise of major electronics companies, the discussion in this study may not apply to middle size firms in the industry. Furthermore, this paper has only been using secondary data to assess the research questions. Qualitative measures such as interviews with corporate managers of traditional and diversified divisions could add more value to the discussion done in this study. As for future direction on this area, cross country studies can be conducted, where it could reveal different patterns of financial interdependence. It may help to gain an international perspective on this research area. Studies on mid-size firms may also be an exciting area to explore more about financial interdependence.

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