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A Study of Cost Accounting Practices

– Through Germany, Japan, and the United States

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Abstract

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Purpose: this thesis aims to describe two most prominent cost accounting systems originated in Germany, Japan, and the U.S. respectively from the background, theoretical and empirical aspects, thereafter through comparison amongst the examined costing systems of the three chosen countries, bring about discussions on cost accounting practices in general as well as the development of cost accounting practices in connection with the influence of national culture.

Methodology

A qualitative research is performed for the purpose of this thesis. The case study strategy is employed to focus on three cases, namely Germany, Japan, and the U.S. for in-depth observation for each case. Thereafter, to derive a discussion of cost accounting practices and national culture's influences on the practices in general. An indirect method is used to collect information on the three cases, where scholarly publications are mostly relied on as source of information.

Theoretical Perspectives

Three frameworks are presented to facilitate technical understanding of costing systems and analysis of the systems' characteristics. They are Bjornenak, T. & Olson, O.'s generic framework for unbundling cost accounting systems; Lall Niagam, BM. & Jain, IC.'s five classifications of total costs; and Fisher, JG. & Krumwiede, K.'s four major costing continuums.

Conclusions

One of the important results of the thesis is that it is difficult to draw lines between cost accounting practices simply by terminology and the practices are constantly developing in response to changes in the context. Further, national culture is observed to be a major determinant for the divergence of cost accounting practices in the three countries.

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It feels like this journey has really come to an end as I am writing this. However, it will always have a special place in my memory.

Xiamen China, 2013-08-15

Chao Su

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“Human beings learn through three ways – imitation, variation, and innovation.”
(Killian, G., 2013)

Chapter I Introduction

1.1 A retrospective

The evolution of cost accounting as a single branch of knowledge can be roughly divided into three eras – the first era from the first appearance until before the industrialization; the second from the industrialization to the twentieth century; and thereafter the third (Antonelli, V. et al., 2009). It can be noticed that the three eras very much coincide with the development of commerce, i.e. the mercantile, the industrial, and the globalized, which is logical as the purpose of cost accounting is to serve the running of business hence it should reflect the major commercial activities of corresponding period.

During the first era, the nomenclature cost accounting might not exist as a clear and well-recognized concept like it is today, the activity could be called by other names, or could be anonymous. The first faint appearance of cost accounting can be traced back to the fourteenth century (Thukaram Rao, ME., 2012; Roger, W. & Holzer, HP., 1990). Italian accounting historian Melis, 1950 argued in his most important book, *Storia della ragioneria (Accounting History)*, that specific accounting instruments were unnecessary to a business so long as it remained in artisanal form. However, when it changed into an organized capitalist form (e.g. the textile sector in the Italian context), new techniques were then needed to account for production costs. Thereby, the development of cost accounting is prompted by the rise of industrial enterprises in the fourteenth and fifteenth centuries. Early examples include the wool business of Florence Medici family keeping four books of entry in 1431: (1) a stock book for recording purchases of wool and other materials; (2) a cash book; (3) a book of income

and outflow; (4) a wage book (Kranowski, N., 1977). With the expansion of the scale of business, mainly in manufacturing activities that small enterprises started to produce trade items such as books, woolens, coins, and wine, an extension in cost accounting was required (Cunagin, C. & Stancil, JL., 1992). In England during the reign of Henry VII (1485-1509), many small workshop owners moved from cities to villages so as to run away from the guilds which regulated the pricing of craftsmen's products. Competition came along with this freedom to set prices, which marked the beginning of an intermediate system between the guilds and the factory and an emerging emphasis on cost control. Workers took raw material home then returned to the owner with finished products in exchange for payment. To control theft of material, owners had to estimate the amount needed for making a particular product, which could be regarded as a rudimentary form of variance analysis. Another example of an attempt to calculate product cost (or *prix de revient* in French) is the Frenchman Christopher Plantin who operated a printing house in Flemish Antwerp in the mid-1500's, keeping separate books of all direct costs for each book edition printed, moreover, accounting for raw materials, work in process and finished goods in his ledger (Kranowski, N., 1977).

The industrialization beginning in the late eighteenth century in England as the Industrial Revolution and later spreading to other parts of the world, led to fundamental changes in agriculture, manufacture, transportation, economic policies and the social structure (Montagna, JA., 1981). The changes in the macro-environment gave rise to new developments in cost accounting as a result of the enormous impact on manufacturing methods and costs (Kranowski, N., 1977; Hume-Schwarz, JA., 2007). The only one work considering the issue of cost in an industrial setting published in Italy before the middle of the nineteenth century was by Moschetti (1610). Within the financial accounting system, Moschetti's work touched upon certain accounts which should be debited specific (direct) costs, for the purpose of determining the profit or loss from the related manufacturing process. It is not until two centuries later, when

industrialization began to make an earnest appearance, that an assortment of cost accounting literature in Italy was produced, e.g. by E. Mondini, E. Lai, A. De Brun, G. Massa, C. Montù, P. Avenati, A. Argenziano, and V. Gitti – G. Massa (Antonelli, V. et al., 2009). Quite a number of French writers have also published a collection of cost accounting literature in French by the end of the nineteenth century. The book *Essai sur la tenue des Livres d'une Manufacture* in 1817 written by a Frenchman Anselme Payen, described a cost system of two sets of records – a journal and ledger “in money” for external transactions, also one “in kind” for raw materials, labor and other inputs for production. By applying rent, depreciation and interest to product cost (*prix de revient*), he has made a step in the treatment of manufacturing overhead. Moreover, the internal movement of product costs from one segment to another in the production cycle was illustrated. Other major work include Godard, Maurice Jeannin, Adolphe Guilbault, F.N.Simon, M.E.Claperon, and Eugene Leautey. Then after the Industrial Revolution, the English and Americans took over the lead in the field, notably with respect of overhead apportionment and standard costing (Roger, W. & Holzer, HP., 1990; Kranowski, N., 1977). First the English and then the American engineers and accountants became conscious of the ‘big picture’ and saw costs flowing through the system represented by the parts and products flowing through the conveyor belt. Building on the works of FW. Cronhelm, Charles Baggage, Henry Metcalfe, Emile Garcke and John Manger Fells; George P. Norton, J. Slater Lewis’s; Alexander Hamilton Church; John Whitmore; Harrington Emerson; G. Charter Harrison; and Stanley Henrici, the application of overhead was substantially advanced and standard costing was firmly established. (Kranowski, N., 1977).

The advancement of means of communication during the twentieth century greatly enhances the possibility to export and re-import theory and practices (Parker, RH. & Yamey, BS., 1994), hence the voice from one original source is able to induce echo on a much larger scale, which is manifested by the growing debates in the research field. One well-known example is the controversial book *Relevance Lost: The Rise and Fall of*

Management Accounting by H. Thomas Johnson and Robert S. Kaplan published in 1987 (Lukka, K., 1993). Through an overview of the evolution of management accounting in American business, Johnson and Kaplan claimed that the development of management accounting has fallen short while innovations in accounting was taking place mostly in financial accounting which is for preparing financial statements imposed by the shareholders of the companies. The emphasis of cost accounting was thus greatly placed on the construction of inventory cost for financial reporting. The obsolescence of current cost accounting at that time resulted in myopic and ineffectual business decisions by managers, hence called for new systems for that would assist managers with making decisions for the long-term interest of business. As a matter of fact, academics such as Joel Dean and William Vatter in the 1950s had recognized the need of managers to understand cost accounting for different purposes in their preliminary edition textbook *Managerial Accounting*. They pointed out that timely information was essential for management and financial statements had a historical perspective, thus recommended separation of cost accounting systems for internal and external users (Kaplan, RS., 1987). Influenced by Dean and Vatter, Charles T. Horngren, published another respected textbook *Cost Accounting: A Managerial Emphasis* in 1962, with an objective to present how the most important role of accounting was as a management tool for better decision-making (Graduate school of Standard business, 2011). Nevertheless, these pioneering attempts did not appear to permeate the practices of businesses, and have only reached other academics in the field (Kaplan, 1984). Moreover, Kaplan, RS. (1984) claimed that cost accounting research was mostly referring to economists and lacked descriptive studies on business practices, hence failed to link with the real world and to take into account of complexities of the environment in which businesses operated. It has been increasingly recognized that cost accounting for external reporting and internal decision-making should be distinguished. Generally accepted accounting principles (GAAP) usually requires full costing which absorbs a portion of the cost centers' work on a job. The definition of full cost varies from country to country as it dictated by

GAAP, but the same notion applies for every jurisdiction that only a lump-sum number of the full cost of all products or services is needed to report “inventory” and “costs of goods sold” (IFAC, 2009). A total number is sufficient for the purpose of external reporting since profitability analysis is done for the entire business as a whole. On the other hand, for internal decision making divisible cost information is needed to figure out cost per unit, because analysis of profitability is performed on each particular product or process or operation (Thukaram Rao, ME., 2012). Decisions such as pricing, introduction or continuance of product lines, outsourcing, capacity planning all rely on the analysis (Taylor, TC., 2000). Therefore, cost accounting is entrusted with the roles of “historian, news agent and prophet”, that it must be capable to deliver past financial transactions, to inform up-to-date business operations, as well as to look forward with knowledge and experience. Since the 1980s, a number of new full-fledged cost accounting systems have emerged to address this more rounded consciousness of cost accounting’s role (Hume-Schwarz, JA., 2007).

1.2 Rational of cost accounting

It might be worthy at this point to take a few minutes to think about a straightforward yet fundamental question, which is usually taken for granted – what is cost accounting for? Hence, why is there a necessity for the development of this branch of knowledge? In the *Encyclopædia Britannica*, Rider defines cost accounting as “a system of accounting designed to show the actual cost of each separate article produced or service rendered” (Rider, F., 1936, p. 332). The process of cost accounting is more clear in Kohler’s definition in *A dictionary for accountants*, where it is “that branch of accounting dealing with the classification, recording, allocation, summarization and reporting of current and prospective costs” (Kohler, EL., 1970, p.128). In other words, cost accounting is a mathematical approximation or economic calculation of resources (including the durables, working time, space, knowledge and ideas) consumed by a cost object during the course of manufacturing products or providing service. The

running of any business essentially constitutes a lot of processes of converting inputs to outputs, a common language is therefore needed to perceive these processes. Since mathematics is a universal means for capturing reality, the resources consumed, although in various forms, are translated into economic resources, that is costs. This translation is appealing for it makes everything incredibly easy and evident, that it can be understood by people all over the world.

Based on this notion, it can be deduced that as long as commercial activity exists (even before the double-entry accounting system was established), there is a need to explicitly record the costs incurred from producing goods or services. Each business might have their own idea to translate the consumed resources into costs, hence their own way to record costs. Especially back in the old days, when firstly, the dispersion of information was not as convenient as it is today, thus others' ideas were not readily available for reference; and secondly, the business environment was not as challenging, hence the information need for decision making was not as demanding. Under this circumstance, a very basic system devised by individual business owner to record costs could suffice the information need, thus there might be no incentive for them to actively search for better alternative system.

The point to be made is, before cost accounting was formerly established as a branch of theory and disseminated, in the light of the shared notion of expressing resources consumed by mathematical approximation, business owners had analogously employed their own cost accounting system. Nevertheless, it is of great importance to bear in mind that, numbers *per se* (the representative) should not be overemphasized, it is what the numbers represent (the underlying reality) that should be of the interest. Despite the simplicity in understanding made possible by numbers, the intricateness of underlying reality should not be forgotten. Failing to comprehend the true cause-effect relationship between the resources consumed by a cost object and the resulting costs is the root of "relevance lost" or deficiency of cost accounting systems.

1.3 What is interesting?

Different countries have their own path in cost accounting practices and have contributed unique innovations of cost accounting systems. As mentioned in the previous section, before dissemination of particular cost accounting systems, such as activity-based costing (ABC), businesses would develop their own system to meet their information needs. Although the individual system might not have a professional label, it is reasonable to infer that they share commonalities because of the universal nature and value of cost information. Diversities would also exist as businesses have specific needs owing to differences in industry, corporate culture, structure, skills and so forth. However, this dispersion imposes a difficult task to trace the development of cost accounting practices.

While it is true to state that each country's path is joining the dots of individual development of practices in the field, this paper is interested in the landmarks on the path. Specifically, a number of prominent cost accounting systems devised locally will be examined in terms of four aspects, which are how it has come about (the background), how it is formed and what it is (the theoretical aspect), as well as how it is used in its home country (the empirical aspect). The subjects of this study are Germany, Japan, and the U.S.. Building on these findings, from which both convergence and divergence can be expected, an analysis will be performed with the aim to capture the idiosyncratic characteristics of each country's landmarks on the development path and herein to discover possible reasons behind. Based on the impression of this study's preliminary research work, rarely have studies on cost accounting systems been organized in a longitudinal manner within a country, in the meantime, a cross-country aspect, with the objective to offer insight of the role of various factors, particularly environmental and social-cultural, in the development path.

Furthermore, through introducing the four aspects, this paper intends to invite one to take one step back and picture the four aspects as a dynamic circle. The 'background' being the cause, the 'how' being the consolidation of idea, the 'what' being the fruit, and finally the application of the fruit. The circle may stop at any point, it may also restart at any point. The whole circle is the creating process, hence one should not focus on a certain part or parts of the process such as the fruit or the application. Keeping a macro and open perspective will empower one to play a part in the creating process rather than simply taking the fruit and munch on it.

This paper seeks to build such a study on the basis of which a scenario is made for one to have a personal reflection on the whole creating process of a cost accounting system. It does not however, claim to provide a concrete basis for ambitious generalization for any kind of theory other than a tentative effort to enhance the understanding of the development scene of cost accounting practices.

1.4 Purpose

The purpose of this paper is to describe two most prominent cost accounting systems originated in Germany, Japan, and the U.S. respectively from the background, theoretical and empirical aspects, thereafter through comparison amongst the examined costing systems of the three chosen countries, bring about discussions on cost accounting practices in general as well as the development of cost accounting practices in connection with the national cultural influence.

1.5 Outline

The paper is structured as follows: Chapter II describes the research approach along with the limitations of the chosen methodology. Chapter III presents three frameworks

to facilitate technical understanding of cost accounting system. Chapter III reviews two most recognized modern cost accounting systems in German, which represent the landmarks in German's cost accounting development. The background of the emergence of each system, a theoretical description of the systems, as well as the empirical application of the system will be covered. Chapter V and VI discuss the same content in Japan and the U.S.. In Chapter VII, an analysis of the peculiar characteristics of the six costing systems in terms of the three frameworks presented in Chapter III, followed by a discussion of cost accounting practice in general; and the second part of this chapter is an analysis of the possible reasons associated with national culture that have resulted in these characteristics, followed by a discussion of cultural influence on cost accounting development on the whole. Finally, this paper ends with some remarks from studying of the topic, along with some suggestions for future research.

Chapter II Methodology

This chapter describes the scope of this paper, the research approach along with the limitations of the chosen methodology.

2.1 The scope

To enable a systematic study, it is necessary to confine the development in a certain manner. Country is chosen as a typical unit for developmental study in general. Firstly, 'develop' is defined in Oxford Dictionary (n.d.) as "grow or cause to grow and become more mature, advanced, or elaborate". Hence, 'development', "the process of developing or being developed" (ibid), can be interpreted as an organization of a series of events which have some sort of connection with one another, that is, this organization has to follow certain logic. Geographical confinement is an easy and clear way to pinpoint single event. Secondly, the power of influence of a single event on the development of any field is limited, usually to geographical sphere, and one should recognize this attribute. If the sphere is too big, for instance the world, it would be too broad; if the sphere is too small, for example a city, there may not be much published information accessible also may not have many interesting findings. Hence, country/nation seems like the most appropriate sphere, which allows generalization within one unit, meantime comparison with other unit.

The three chosen countries – Germany, Japan, and the U.S., share a common ground that they are all developed economies. According to the world bank's ranking of gross domestic product (GDP) 2011, the U.S., Japan, and Germany rank at number 1, number 3, and number 4 respectively at USD 14.991.300 million, USD 5.867.154 million, and 3.600.833 million (The world bank, 2013). The ranking of GDP per capita 2011 shows they are among the top 20 and sit fairly close to each other, at USD 48.112, 45.903, and 44.021 respectively (The world bank, 2013b). The phase of economy development

can be regarded as an inclusive indicator of the industrial activity, market mechanisms, firm structure, as well as technology advancement, which exert the same influence on the nature and development of cost accounting strongly (The Pennsylvania State University, 1999). For instance, when there is intensive competition in the market, the requirements placed on cost information needs hence on the cost accounting system will increase. Besides, the advancement of technology will reduce the cost to collect and process data, thus makes it possible to have a sophisticated cost accounting system (Miami University, 1999; Stefanovic, RJ., 2011; Hopper, T. et al., 2007). Since how these factors would impact the development of cost accounting are nothing new, countries at similar phase of economy development are chosen in order to isolate their influence and gain insights of other idiosyncratic factors. Secondly, developed economy are postulated to have more innovative ideas on cost accounting systems, also have more researchers to study them, thus there will be more information available, especially in English. Thirdly, developed economy might have greater influence on the rest of the world as the less-developed countries would tend to learn from them. In addition, it is appealing to look at countries from different continents for the purpose of a comparison study, thus one country is chosen from Europe, one from Asia, and one from North America. Three countries is believed to be suitable as it enables a comparison study with a decent degree of findings and subsequently a relatively in-depth analysis, whilst not turning into an overly massive project.

2.2 Method

2.2.1 A qualitative research

This study works with a qualitative research for its objective is to enhance the knowledge of a phenomenon in its natural context, i.e. the development of cost accounting (Byrne, MM.,2001a; Marais, H., 2012). Qualitative research is a descriptive type of research which provides the researcher with what exists through

communicative representations as non-numerical symbolic information, hence facilitate understanding of human beings in their specific social and cultural grounds (Bear-Lehman,J.,2002; Charkhchi, R. et al.,2011; Marais, H., 2012). Qualitative research is an umbrella term for methods which do not fit into the quantitative range. The three typical characteristic qualitative research are: (1) non-proof oriented epistemologies. In other words, the research process does not begin with a preconceived hypothesis of the researcher. Then as information unfolds, inductive reasoning is used to develop hypotheses; (2) the goal is not about generalizability but to comprehend and disclose concept and meaning; (3) the techniques are not related to numbers, rather context rich and holistic materials are delivered (Bear-Lehman,J.,2002; Charkhchi, R. et al.,2011). Thereby, the methods are in general less rigid and formalized, however more comprehensive (Marais, H., 2012).

There are four main research strategies, namely, grounded theory, anthropology, action research, and case study. Case study is opted as the preferable strategy for the purpose for this study. It focuses on one or a few number of cases of a particular phenomenon. The aim of case study is to explore in-depth the connection among phenomena, experiences or processes occurring in a sample, which is usually used when a research has a low control on events and focuses on phenomena in real life. It is an organized research on a set of related events to explain a phenomenon, moreover, a bridge between the theory and real life (Charkhchi, R. et al.,2011). To be specific, the phenomenon of this paper's interest is the development of cost accounting practices both in theoretical and empirical aspects, and three cases to focus upon are Germany, Japan, and the U.S.. When sufficient information is obtained to produce concrete descriptions, i.e. saturation of data collection (Byrne, MM., 2001b), an analysis which seeks to interpret the accidental relationships among the development of cost accounting of the three cases is carried out hence to derive patterns or driving forces behind the phenomenon.

2.2.2. Source of information

There are a number of methods to carry out a development study on cost accounting practices. One can employ an indirect method where information is gathered from available public sources. For instance, a study on a bigger scale can look up the list of the major work published on the topic either compiled by major libraries' holdings or by prior researchers (Antonelli, V. et al., 2009). Or a less painstaking way is to examine different editions of the same cost accounting textbook and find out about the changes in the discussed systems (Andersson, PM., 2013). These two ways might produce similar or different results. Secondly, one can employ a direct method to gather information which is more private and customized. For instance, to observe one or more companies' practice stretching over a long period of time (a couple of decades to a few hundred years) through interviews or surveys with key persons. Or to study the companies' archival accounting records for the changes in cost accounting systems (Antonelli, V. et al., 2009).

Taken into account of the cost and benefit of possible methods as well as constraints on accessibility and time, this study adopts an indirect method which mainly relies upon electronic resources. Even though the internet is a rather new channel to obtain scholarly publications, its influence on the process of scholarly communication is evidently witnessed due to its significant advantages in terms of disseminating information. Firstly, it can be accessed anytime from anywhere at virtually zero cost. Secondly, information can be updated much more quickly than paper format and a wider group is allowed to contribute to the information. Nevertheless, the quality of information should be carefully evaluated (Junni, P.,2007). To mitigate with this problem, scholarly publications are relied upon for this study, including journals on Lund University library databases, google books, as well as reports by well-established organisations in the field such as the International Federation of Accountants (IFAC). A careful check of the authors' credential and reading of relevant reference lists will

further ensure the credibility of the information cited.

2.3 Limitations

It is of paramount importance to acknowledge the limitations because what cannot be achieved complements one's understanding of what is accomplished. This paper can at best open a small window to look into the development of cost accounting by exploring the a number of prominent cost accounting systems that are originated and practiced in each of the three country, it would be misleading to think this study would draw a complete picture of development.

2.3.1 Inherent limitations

There are three inherent limitations of a study of cost accounting development. Firstly, the study of development is equally a study of history, yet the historical process of cost accounting change can be lost due to gaps in documentation, subjective editing by authors, or space constraint. Edwards, JR. & Boyns, T. (2013) quoted Luft (2007 pp.276) on this over-simplification problem in management accounting:

“The more such stories are condensed (as in Johnson & Kaplan, 1987), the more it [sic.] can leave the casual reader with the impression that management accounting responded smoothly to environmental changes in the more distant past, meeting the information needs of management as those needs arose.”

There are two levels of cost accounting systems change, the micro level (individual business or individual scholar) and the macro level, which are highly intertwined. A change at large always has to start by a change at individual, but only one or a few individual changes may not be meaningful in the macro sense. A substantial accumulation of individual changes is required in order to materialize the change at large. Thereby, cost accounting system change can take decades and occur unevenly throughout the economy, especially given that cost accounting systems are not

regulated or not rigidly regulated in general. This paper solely focuses on the several successful changes which have been able to disseminate at a large scale and be kept in academic and practice for a long period. Even though being a part of development, other experiments which might be successful but with less significant effect, or which have failed and forgotten are disregarded. Hence, the information presented in this study is just a tip of the ice berg,

Secondly, there is a need for firms to maintain secrecy of their cost accounting systems from competitors and regulatory bodies. Before 1900's, it was even not common for firms to disclose the systems to their own labors (Hume-Schwarz, JA. ,2007). This need has restrained researchers' ability to learn from the practitioners, which results in imperfect comprehension of two sides of the development. Two key consequences are: (1) the cost accounting systems for study are elected from the known ones, there may well be other well-designed systems that firms have been using, but may not have taken initiative to reveal; (2) researches on the actual practice of cost accounting systems will have to count upon the willingness of businesses to respond, for there are no other sources of information that can be used as reference, hence it is more probable that the observation will be subject to bias.

Thirdly, a cross-country study is always challenged by language barrier. Since both Germany and Japan have their own mother tongue, understanding of their practice is further restricted to publications available in English.

2.3.2 Research limitations

The other four limitations concern the research process. This paper builds on a range of personal opinions of other researchers as scholarly publications are relied upon. Using material that is mostly descriptive in nature will alleviate subjectivity issue. In addition, due to constraints of time and accessibility to material as mentioned in 2.2, valuable insight into this topic might be missed. For instance, there are already plenty

of books published on the concerned topic, such as *Evolution of cost accounting to 1925* by Samuel Paul Garner, *Cost Accounting: Foundations and Evolutions* by Michael R. Kinney and Cecily A. Raiborn, *Accounting Evolution to 1900* by Littleton, AC., *A History of Accounting Thought* by Chatfield, M. (1977) (Antonelli, V., Boyns, T., Cerbioni, F., 2009). Also, full review is not given by google books hence only partial pages could be read for interested books e.g. *A History of Cost and Management Accounting: the British Experience* by Richard Edwards and Trevor Boyns. Thirdly, a number of secondary references such as printed books, conference proceedings, unpublished manuscript, or other academic journals, cannot be checked to their original source, they are however still cited in the paper for the usefulness of the content. Lastly, the timeframe for examining the practices in the three countries are not fixed to be the same, but depends on the need of individual cases and accessible information, thus this is not strictly a cross-sectional study.

Chapter III Framework for cost accounting system

This chapter presents three frameworks to facilitate technical understanding of cost accounting system.

Before going into the development of individual country, it is useful to lay hold of cost accounting systems in a more technical way. Three frameworks will be described in order to facilitate with the understanding.

3.1 Bjornenak, T. & Olson, O.

First of all, a generic framework of management accounting innovations by Bjornenak, T. & Olson, O. (1999) will be introduced (Figure 1). This framework is appropriate as cost accounting system definitely falls under the wing of management accounting innovations, meanwhile enabling a macro perspective. They maintain that there are two major dimensions to management accounting innovations, the scope dimension and the system dimension.

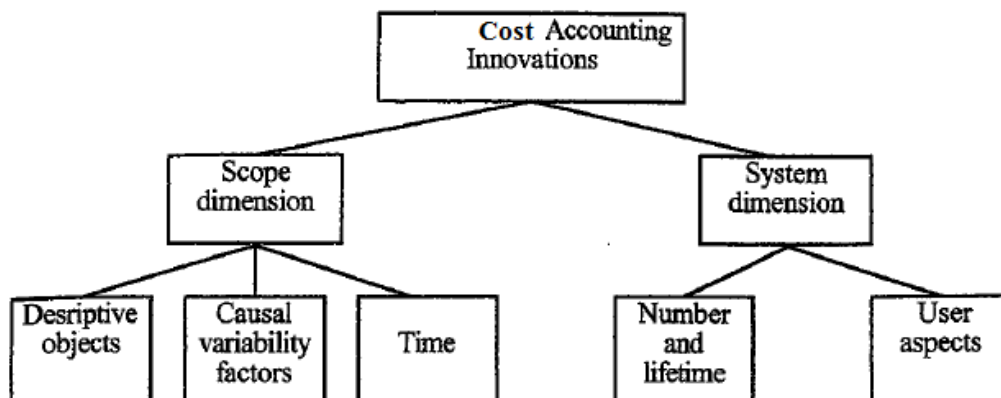


Figure 1: A generic framework for unbundling cost accounting systems

(Source: adapted from Bjornenak, T. & Olson, O., 1999)

The scope dimension has traditionally been the center of attention and it includes three elements. Firstly, the descriptive objects are the objects that a financial or non-

financial measure is desired. Two things that need to be done are the identification of descriptive objects, and of the type of accounting data associated with these objects. Noted that descriptive objects are not equivalent to cost objects, as they encompass other data such as revenue and non-financial. The descriptive objects can be the type of production factor (e.g. labor, material), department/responsibility center, and cost objective (usually products or orders). More objects such as customers, market segments, competitors, and distribution channels have been recognized in modern management accounting systems. Furthermore, more detailed data at the operative level to describe a process have been included in the systems. Secondly, the causal variability factors describe the factors that result in variation in the descriptive objects, hence enable understanding the performance of them. For instance, production volume has been regarded as the foremost factor in conventional systems. Increasingly, in activity-based literature, other factors have been identified such as number of set-ups and machine hours. At first impression, one might deem this concept similar to cost drivers. Again, causal variability factors are more than cost drivers, and comprise a set of different drivers such as initial drivers and resource drivers. This is illustrated in strategic management literature which extends the concept that factors such as scale, scope, plant layout efficiency have an explanatory power of cost variations. Thirdly, the time, which is the choice of time interval that the system covers, is one classical element in accounting. Mostly, management accounting reports have a calendar time perspective due to the influence from financial accounting. Other interval can also be applied, for instance target costing or life-cycle costing following the life-time of product. Hence, accountants may have to work with time interval that is not fixed. The second aspect to the time element is whether the system uses *ex ante* or *ex post* data or both. *Ex ante* is forward looking thus usually employed as a vehicle to motivate improvements, for instance to serve as an estimate for deciding whether to produce a particular product or as a standard against which actual performance is measured. *Ex post* is based on historical observations and generally used as benchmarks, for instance to assess product profitability or worker performance

(Edwards, JR. & Boyns, T., 2013). A tendency in modern cost accounting systems compared to the old systems is to complement *ex post* data with more *ex ante* data.

The system dimension addresses the linkage between the users of the system and its design, where the number and lifetime of the systems, as well as the users influence on the system are explicitly emphasized. To begin with, in some situations, cost accounting systems do not clearly separate the recording, manipulating and reporting of data; besides, the systems are assumed to have a very long lifetime, i.e. they run continuously without any change. This one system for all purpose is questioned by “different systems for different purposes” standpoint. One way to incorporate different systems in the organisation is operating them at different levels, for instance, having local systems responsible for operative processes and strategic systems supporting strategic processes, and coordinating systems in between the two levels. Moreover, special problems arose at a certain point of time may call for a spontaneous approach, where a temporary system is designed to fulfill the information need and aborted when the problem is resolved. This is contrary to the continuous approach, where when the scope of system is altered as a result of new problems, however, the system remains at its new scope even if the corresponding problems have been sorted out. For instance, when ABC was first introduced in Sweden, every big company implemented a project of ABC, but it was only a one-time calculation to open the eyes, then the project was shut down (Andersson, PM., 2013). Secondly, with regards to the users influence on the cost accounting systems, on one end of the spectrum, the systems are used in an abstract sense where the decision making context is assumed to be simple and linear meanwhile the decision makers are rational. On the other end, situational factors are acknowledged which changes the complexity of decision making process, meanwhile the cognitive and social factors of the decision makers are highlighted which changes the rationality assumption. In addition, one system could be designed in a top-down manner with the objective to reduce information asymmetry and expects the periphery to learn from the center, whilst another system

could be designed to justify information needs locally which in fact will broaden the information asymmetry gap yet orient towards organizational learning of which decision making is only one component.

3.2 Lall Niagam, BM. & Jain, IC.

Having gained an impression of one of the generic frameworks, which can be seen as a structure, it is necessary to look at what to fill it with, that is, total costs. Lall Nigam, BM. & Jain, IC. (2001) puts together a framework for classifying total costs by five bases, which are behavioral, functional, responsibility, traceability, relevance to decision-making.

The behavioral classification measures the changes in costs in relation to the changes in level of activity. Three categories are fixed, variable, and semi-variable. Fixed costs are those that remain constant regardless of the volume of output within a certain level. They are also called capacity costs as they denote the productive capacity. Thus when the range of activity expands beyond the peak capacity, the current fixed costs rise to another level, which is termed step costs. A sub-division of fixed costs is committed fixed costs and discretionary fixed costs (also known as programmed/managed fixed costs). The former involve the acquisition and maintenance of the organisation and its long-term assets, e.g. depreciation of equipment, rental of buildings, and key personnel salaries. Whilst the latter can be manipulated by management and adjust to situations, e.g. research and development (R&D), public relations, training initiatives. Secondly, variable costs respond directly to the volume of output at a constant rate, e.g. direct material, sales commission. Thirdly, those activities which require a minimum fee (i.e. the fixed component) plus additional charge for actual usage (i.e. the variable component) incur semi-variable costs (also known as mixed costs), e.g. telephone, repair, electricity charge.

The functional classification is based on the purpose of activities undertaken. It is divided into manufacturing and non-manufacturing categories. Manufacturing costs comprise of every cost in the plant up to the point when goods are finished, i.e. direct material, direct labor, and factory overheads. There are also three types of non-manufacturing costs. Administrative costs relate to organizing and controlling the operations, hence are largely fixed in nature, e.g. key personal and clerical staff salaries, electricity bill and equipment of general office. Marketing costs include selling and distribution. The former are costs spent on creating demand and securing orders, e.g. sales staff's salaries, advertising, market research. Whilst the latter are the costs to move the goods from the plant to customers, e.g. warehouse, vehicles, wages of packers and drivers. Lastly financing costs are paid for raising and using capitals, e.g. loan interest, fees for issuing shares, bonds coupons.

Thirdly, costs are classified in terms of managers' responsibility into controllable and non-controllable categories. Controllable costs are those that managers are capable to exert influence on as well as responsible for. Whereas uncontrollable costs are those that are under the managers' supervision, however, cannot be influenced by their actions. One important notion for this notion of control is the point of reference, and managers should only be held liable for costs that are under his/her control.

The fourth classification is based on the costs' traceability to a specific product, job, or process. Firstly, those that can be conveniently assigned are called direct costs, e.g. material and labor engaged in manufacturing a product. There are also costs that cannot find a single cause which are called indirect costs, e.g. plant manager salary, depreciation of machines and plant.

Lastly, in order to facilitate with management's decision-making, two classifications are made. One is classify the costs against revenue and used to determine income and prepare financial statements, which include product cost and period cost. All the costs

incurred to manufacture the finished product belong to product cost, i.e. direct material and labor, variable factory overheads. Product costs are initially recorded under 'asset', then are transferred to 'cost of goods sold' once the finished products are sold to customers. On the other hand, period costs are immediately expensed as they occur, typically those costs that are fixed in nature, hence show its effect on the income statement of the corresponding accounting period. Another way is to classify costs into relevant and irrelevant costs. Relevant costs are defined as "future incremental costs to be affected by current decisions". Three elements include differential costs, opportunity costs, and out-of-pocket costs. Differential costs are the difference between two alternative courses of action in total costs. Opportunity cost is an abstract cost which represents the benefits given up in favor of an alternative decision. Those expenditures that would vary depending on the decision made are called out-of-pocket costs. One example is the cost of fuel and other upkeep of using trucks should a company decide to replace its own delivery trucks with public carriers. Irrelevant costs are those costs that will not change regardless of the decision made, e.g. sunk costs.

3.3 Fisher, J.G. & Krumwiede, K.

One framework which integrates the structure and the content is provided by Fisher, J.G., and Krumwiede, K. (2012) (Figure 2). Four key questions are asked to guide the design of an appropriate cost system. This can be a good thread for the specific cost accounting systems which will be discussed in Chapter III, V and VI. Figure 2 illustrates a number of common possibilities for the four key questions respectively.

The first question to consider is which costs product cost should consist of. Sitting at one end of the continuum is throughput costing, which comprises direct materials only. When direct labor and variable overhead are added, it becomes variable costing. Full absorption costing (also known as full costing) includes all production-related costs,

that is, direct materials, direct labor, variable and fixed overhead. On top of full costs, life-cycle costing takes into account of nonproduction costs such as research and development, marketing and sales, administration (Fisher, J.G., and Krumwiede, K., 2012).

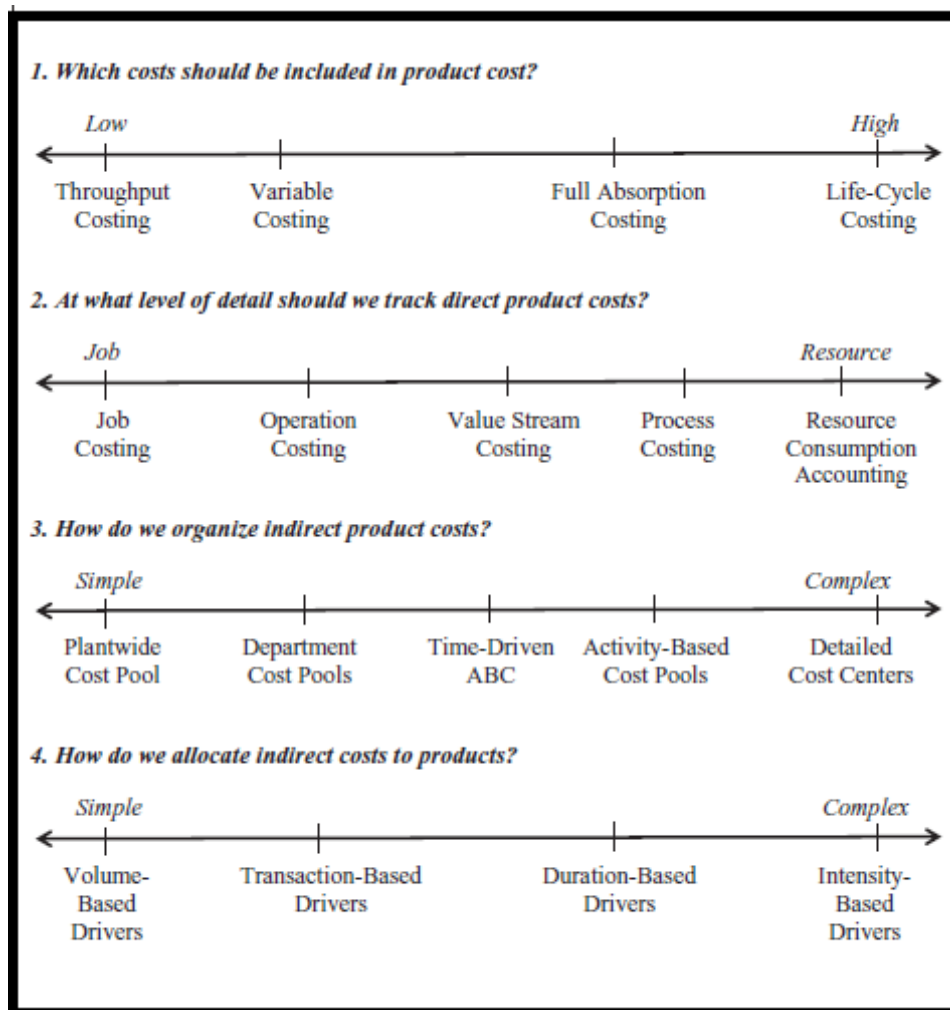


Figure 2: Four major costing continuums
(Source: adapted from Fisher, J.G., and Krumwiede, K., 2012)

After defining what product cost is, the second question to ask is how detail direct product costs should be traced. One extreme of the continuum traces costs is job costing, where unique job or order is separately recorded. Operation costing is a hybrid method combining job costing and process costing, which will be explained soon.

Value stream costing does not trace costs by jobs or processes, but by major flows of value-added activities related to specific cost objects. Process costing traces costs at department level and average them across all units over a period of time. Resource consumption accounting traces costs based on behavior, that is the variable and fixed elements, and then assign them to individual or a large number of resource cost centers (Fisher, J.G., and Krumwiede, K., 2012).

Having dealt with direct costs, the third question is how indirect product costs should be organized, which is a challenging one to answer as these costs cannot be directly allocated to cost objects. Generally, plant-wide and department-based methods have been adopted by most businesses, where all indirect costs are accumulated into one single cost pool and separate cost pool for each department respectively. Since *Relevance lost*, researches have argued that these methods are too aggregated and result in distortion of product costs. Activity-based costing (ABC) is introduced in response to this problem, where indirect costs are first allocated to activity cost pools, then these activity costs are allocated to cost objects by corresponding cost drivers and rates. While ABC in theory would enhance the accuracy of costs, it has been subject to criticism because of its high implementation costs, such as identifying activities and estimation of cost drivers. Time-driven ABC makes an attempt to simplify the ABC process by reducing the estimation needed down to two, which are a capacity cost rate for each department and the typical capacity usage of each type of transaction. Indirect costs are accumulated at department level. At the right end of the continuum is the detailed cost centers method, which traces indirect costs at individual cost center level and by category (such as variable and fixed, supplies, labor) (Fisher, J.G., and Krumwiede, K., 2012).

After classifying indirect costs, the last question is how to identify cost drivers for allocating these costs to cost objects. The complexity of allocation base increases from the left end of continuum to the right end. Volume or units produced, is typically used

when indirect costs are accumulated at plant or department level. As mentioned above, indirect costs are usually not driven by volume, transaction-based cost drivers, such as number of purchase orders and setups, is a common allocation method for ABC. Duration driver, that is, the time required for a transaction, for instance, it might require longer time to complete one set-up transaction than the other for different products. Under TDABC, time is used to allocate indirect costs for all resources within a given department. The most accurate is intensity driver, which inspects and matches the linkage between resources and the activity more carefully. For instance, it subdivides the total set-up time required for one transaction into the time it takes by different personnel (Fisher, J.G., and Krumwiede, K., 2012).

This framework serves as an effective guidance to demonstrate the function of a cost accounting system, and equally the way to design it so as to enable its function. The design of cost accounting systems should be exclusive to specific needs by individual business. Hence the four questions should be considered in the specific context of each individual business, and a customized costing package or cost accounting system should be created out of the answers. The causality relationship between the resource consumed and the cost object becomes more visible as the answers move towards to the right end of the continuums. That is to say, more information is directly extracted from operations, consequently a closer reflection of the underlying reality is achieved. Moreover, it should be stressed that one costing package cannot fulfill all costing information needs. For instance, throughput costing would be proper for inventory control; whilst life-cycle costing may be more accurate for pricing decisions. The benefit of this framework is not in offering a permanent solution, but to point out a direction what problems need to be addressed. Seeing the value of timely and relevant cost information, having an effective cost accounting system is essential for strategic planning. The value increases as the scale and scope of business increase (IFAC, 2009). The story of Nestlé is a clear example. Nestlé was producing 130.000 products and the information from its old cost accounting system showed many new products were

making profits. However, Nestlé's margins were lower than competitors, implying the seemingly profitable products were in fact losing money. A new enterprise resource planning system was installed to help Nestlé to track product costs more accurately. Subsequently, major adjustments in strategic decisions were made and the weaker brands were abandoned. In addition, the renovated system helped Nestlé's CEO to discover that the cost to produce flavored frozen treats in the U.S. was higher than in the Europe because the workers in the U.S. factory were feeding the machines slower. Thanks to this discovery, Nestlé' retrained the workers, which resulted in a thirty-three percent drop in the cost of ice lolly the following year (Fisher, J.G., and Krumwiede, K., 2012).

One is encouraged to bring along the three frameworks described above onto the journey of cost accounting development in the following three chapters, or better still, to come up with his/her own framework, thenceforth ponder over how his/her own understanding of cost accounting practices can be related to the six iconic systems to be discussed.

Chapter III German's path

This chapter reviews two most recognized modern cost accounting systems in German, which are *Grenzplankostenrechnung* (GPK) and *Relative Einzelkosten-und Deckungsbeitragsrechnung* or Riebel's generic direct costing. The background of the emergence of each system, a theoretical description of the systems as well as the empirical application of the system will be covered.

4.1 Background

In the early period of industrialization around the end of nineteenth century, Germany did not dominate any countries in South America, Asia, and Africa as other European powers, hence it was underprivileged in terms of gaining external supply of raw materials. It was obliged to produce synthetic dyes to compete with UK's mushrooming textile industry. Subsequently, German became very advanced in the chemicals sector, and has continued to have a prominent role in the world today (Hutchinson R. & Liao K., 2009). Given the substantial investments in fixed capital demanded by the chemical industry, German cost accounting systems inevitably placed an emphasis on capacity utilization, in other words, the cost of unused capacity represented by under-applied overhead (Hutchinson R. & Liao K., 2009; Keys, DE. & Van Der Merwe, A., 1999).

The prevalent cost accounting system in Germany in the 1950s and 1960s was *Vollkostenrechnung* or full costing, where identifiable costs such as direct material and direct labor are exactly split from overhead. Identifiable costs are assigned to units of output at once, whereas overhead assignment has a dual process – firstly from service cost centers to main cost centers, commonly on a quantity basis; and afterwards from main cost centers to units of output, generally on a value basis. However, it does not distinguish fixed and direct costs. *Vollkostenrechnung* adapts the data which comes from financial accounting into imputed costs and revenues for individual decision-making needs of management (Weber, J. & Weißenberger, BE., 1997). This imputed

cost notion emanated from two German historical context. First, full cost calculation was used in buyer-seller negotiations for prices that profit margins are justified in imputed cost types exceeding cash-based expenses. Secondly, excessive imputed costs aided companies to keep government from their profits during the *Dritte Reich* or the Third Reich at the end of World War II, when government bodies had right to access not only financial accounting information but also management accounting data of companies (Pfaff, D., 1994, cited by Weber, J. & Weißenberger, BE., 1997).

In the 1950s, managerial environment went through considerable transformation, where competition intensified in the market and complication of production technologies grew more and more. Thereby, a financial accounting system which was specifically contingent on government reporting requirements became subject to questioning, and a need for decision-oriented management accounting tools emerged (Weber, J. & Weißenberger, BE., 1997; Sharman, PA., 2003). Two ideas came into play in the development of new cost accounting systems: (1) Only direct costs are attributed to product units in a time frame of twelve months; (2) the profit contribution of each product unit is computed by subtracting direct costs from direct revenues (Weber, J. & Weißenberger, BE., 1997). Building on these ideas, Hans-Georg Plaut, an automotive engineer who was involved with management accounting in the late 1940s, presented a new cost accounting system called Grenzplankostenrechnung (GPK) or flexible standard costing (Weber, J. & Weißenberger, BE., 1997; Sharman, PA., 2003; Friedl G., et al., 2009; Polejewski SA., n.d.). In 1946, Plaut founded his own consulting company in Hanover, which has grown to more than 200 consultants today. He received Honorable Dr. by the University of Saarbruecken in 1985 (Sharman, PA., 2003). Besides Plaut and his fellow consultants' practical efforts to implement GPK in hundreds of organizations, Wolfgang Kilger, an academic, made important contribution in promoting the developing of GPK theory through documenting it in the primary German cost accounting textbook, *Flexible Plankostenrechnung und Deckungsbeitragsrechnung*, whose first edition was published in 1961 (Sharman, PA.,

2003; Friedl G., et al., 2009). GPK has been established as the model for cost accounting in Germany and German-speaking countries (Weber, J. & Weißenberger, BE., 1997; Sharman, PA., 2003; Friedl G., et al., 2009; Polejewski SA., n.d.; Krumwiede, KR., 2005). Around the same period in 1959. Paul Riebel, who had a chemistry and aviation engineering background, proposed a highly sophisticated solution called *Relative Einzelkosten und Deckungsbeitragsrechnung* or Riebel's generic direct costing. (Weber, J. & Weißenberger, BE., 1997; Sharman, PA., 2003). This approach was in response to an accounting problem confronted especially by the chemical industry, i.e. cost allocation to joint products. Although Riebel's approach has been very much debated that it is considered 'exotic' by some academics and almost no company has fully implemented its main elements, all German accounting textbooks have included a detailed description of his approach because of the lessons one can learn from it (Weber, J. & Weißenberger, BE., 1997).

4.2 *Grenzplankostenrechnung* (GPK)

4.2.1 Theoretical aspect

GPK is an approach aiming to control the efficiency in cost centers and is most effectual for routinized and repetitive processes, either manufacturing or services, highly complex products and manufacturing (Krumwiede 2005) (Weber, J. & Weißenberger, BE., 1997; Friedl G., et al., 2009; Sharman, PA., 2003). Plaut's vision was to correct the arbitrary allocation of fixed costs, as well as to deliver superior cost information to facilitate with decision-making (Sharman, PA., 2003). GPK's central features consist of cost-type accounting, cost center accounting, product cost accounting, and contribution margin accounting (Figure 3).

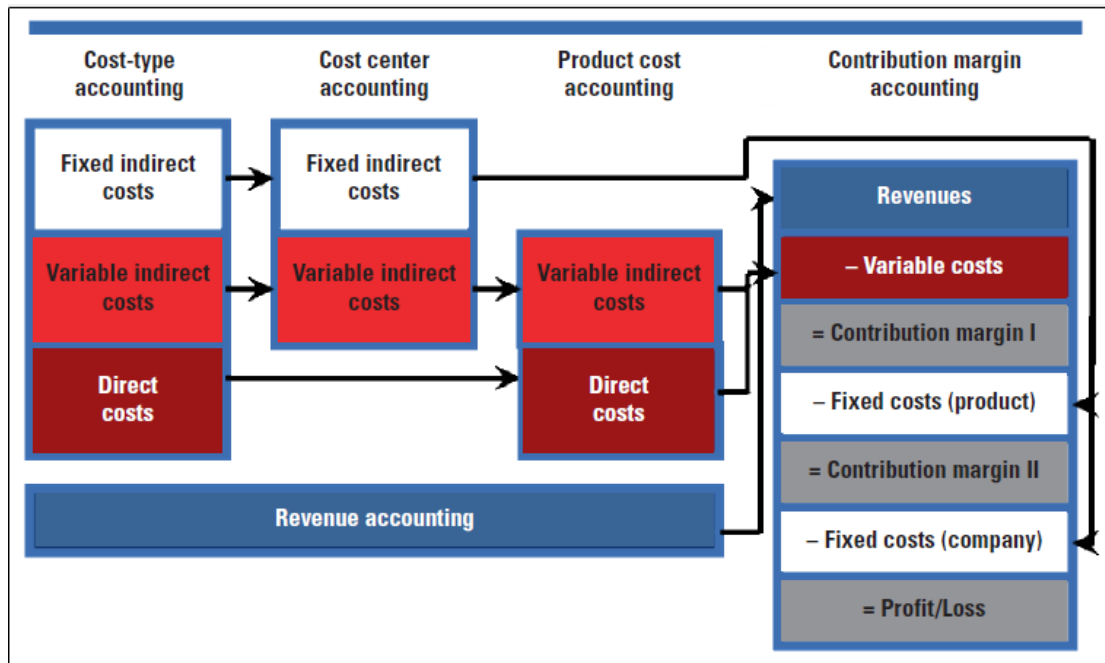


Figure 3: Basic structure of GPK
 (Source: Friedl, G. et al., 2009)

Cost-type accounting literally refers to the classification of different cost, for example materials, depreciation, and interest. Each cost type is further divided into fixed costs and variable indirect costs along with their transfer to cost centers, and direct costs are allocated to cost units. Noted that variable cost is defined as the costs that vary in proportion to the output of cost-center activity, rather than the total quantity of final units produced as it is in usual (Portz, K. & Lere, JC., 2009; Sharman, PA., 2003)

Cost center accounting is a pivotal aspect of GPK. Cost centers are designed based on the principal of responsibility accounting and are the focus for overhead control in GPK. Only one single activity takes place in each center (e.g. a cost center whose operation is to set up machines), hence each center has only one resource cost driver. Moreover, instead of actual capacity which fluctuates from period to period, full/ theoretical capacity is used as the denominator to calculate overhead rates and allocate overhead to cost objects. Thus if production volume demand is under the full capacity, then there will be under-applied overhead shown up on the profit-and-loss statement as a period expense. The central characteristics of a cost center include: (1) costs must be

directly related to the output measure in the cost center, that is, a strong causal relationship between resource usage and cost driver; (2) the output must be repetitive; (3) each cost driver should have homogeneous cost structure/technology/resource type/process; (4) cost center must be manageable in terms of size and geographical location; (5) each cost center should only have one manager, but one manager may be responsible for multiple cost centers; (6) cost drivers must be quantifiable and can be planned, that is, the actual data recording must be viable; (7) a cost center is either primary or support/secondary, the distinction is drawn by whether the cost center has primary control over the costs. Through an extensive transfer pricing system, each primary cost center absorbs respectively fixed and variable costs which were attributed to support cost centers. Thus, GPK cost centers tend to be fairly narrowly focused, and small with only a handful employees, resulting in generally a large number of cost centers in organizations with most having 400 to 2.000. (Sharman, PA., 2003; Portz, K. & Lere, JC., 2009; Keys DE., 1999; Krumwiede, KR., 2005; Friedl, G., et al., 2009)

Next, product cost accounting charges direct costs as well as indirect costs from cost centers to cost objects according to the units of variable costs consumed. Fixed costs are not taken into account in this stage since they are not relevant for short-term decision making, which takes a marginal costing perspective (Sharman, PA., 2003; Hutchinson R. & Liao K., 2009; Friedl G., et al., 2009). One special practice is that labor is often treated as fixed because of German labor laws (Krumwiede, KR., 2005).

Finally, the profit-and-loss statement, which is called contribution margin accounting in GPK, is primarily intended for internal use. It exists in three levels. The simplest one deducts all fixed costs as a lump sum from contribution margin I. At the multistage level, fixed costs are gradually deducted from product types, product groups, or divisions. The most detailed level, called marketing segment accounting, enables a thorough analysis of fixed costs segmented into regions, customer groups, product

groups and other criteria of management interest for operational, tactical, and strategic decisions (Friedl G., et al., 2009; Keys, DE., 1999; Sharman PA., 2003).

As aforementioned, Plaut and his colleagues disseminated GPK by helping organizations with the implementation. In the beginning, tailored and stand-alone software was developed for each individual client, which was an inefficient process. Eventually, organizations started to communicate with each other and created user groups to share software, which resulted in many problems due to lack of disciplined introduction and inconsistent applications. Such issues urged Plaut to develop a standard system. In the mid-1980s, he contacted the German integrated systems supplier SAP to build his approach into their cost accounting systems. SAP worked with Plaut consultants and some of the reputable academics in Europe and incorporated Plaut's solution into the 'controlling' module, which is able to extract operational and financial information from other modules (Sharman, PA., 2003). This integrated information systems based on SAP's sophisticated software is key to make the implementation of GPK pragmatic through low maintenance cost and validation of all information at the source. Necessary cost information are available online and real-time. For instance, a single point of data entry updates both 'controlling' and 'financial accounting' modules so that the reconciliation between different modules are assured. In addition, financial reporting is supported yet not at the expense of the needs on managerial accounting. For instance, marketing expenses can be included in product costs, meanwhile it can be marked excluded for inventory valuation, hence only the selected costs will be reflected in the inventory on balance sheet (Keys DE., 1999).

4.2.2 Empirical aspect

As mentioned in the beginning of this chapter, GPK is the standard for cost accounting practice in German-speaking countries. Many organizations have used GPK for more than sixty years (Sharman PA. 2004). German managers are generally very satisfied the information provided by GPK (Krumwiede, KR. ,2005; Friedl, G., et al., 2009; Sharman

PA. 2004). When controllers were asked what would happen GPK was aborted tomorrow, their answer was “nothing for a year, and then we lost control.” (Sharman PA., 2004).

GPK was initially employed by manufacturing organizations, but was seldom applied by service organizations. *Deutsche Bundespost* or German Post Office embarked on an implementation in 1985, whose success marked a breakthrough. Afterwards, GPK branched out to several service sectors and has been proved to be beneficial to the organizations, such as *Deutsche Bank* and *Post Bank* in the financial sector; *Deutsche Bahn* or German Railway and *Lufthansa* in the transportation sector; *Ruhr Gas* in the utilities sector; *Deutsche Telekom* in the telecommunication sector; *Universitätsklinik Heidelberg* and *Stuttgart Krankenhauser* in the healthcare sector, and so forth (Sharman, PA. 2004).

Krumwiede, KR. (2005) visited eleven large multinational organizations (Beiersdorf AG, Ciba Specialty Chemicals, DaimlerChrysler AG, Deutsche Telekom, HeidelbergCement AG, Heidelberger Druckmaschinen, Magna Steyr, Porsche AG, Rasselstein GmbH, Schering AG, Stihl AG&Co) in German-speaking countries (German, Switzerland, Austria). He learnt that seven of them use cost systems which adhere to all the GPK criteria while the other four use a scaled-down GPK to adapt to their needs (Appendix 1). An inherent assumption of detailed cost systems is prevalent amongst the accountants and various benefits including make-vs.-buy analysis, capacity decisions, cost control, transparent cost information, sales and production planning are reported by them. Rasselstein GmbH, who produces tinplate for packaging, has a planning and analytical process for 8.000 products, yet they are highly confident in managing the costs. A claim was made by Ralf Damitz “there is no cost we can’t influence. Who and how it can be influenced has been identified.” However, this level of confidence comes with a price that five people have to do the GPK variance analysis monthly and modify the cost center rates annually. Moreover, there is a lot of unusable data in the

controlling department. DaimlerChrysler AG, who manufactures automobile, is an interesting case where Daimler has a long tradition of using GPK but the Chrysler side does not use it because of different culture (Krumwiede, KR., 2005). Daimler's typical plant has 2.000 to 2.5000 cost centers, and GPK information is used to influence many processes. For instance, designers are motivated to take cost into account to change their designs. Porsche AG, who is also an automobile maker, is in a special situation that it makes much less cars than other automobile makers, hence there are not many unit to share fixed costs. Reinhold Feghelm maintained that "GPK is an internal instrument intended to make sure we make our cost targets." Magna Steyr, who does engineering and assembly for automobile manufacturers, has 455 cost centers even though 80% of its work is outsourced. The accountants state what they have profited most from GPK is it helps management to direct cost reduction efforts.

Friedl G., et al. (2009) conducted a survey on cost accounting practices of 250 largest German companies in terms of annual revenues including BMW, DaimlerChrysler, Deutsche Telekom, Lufthansa and Allianz. The result showed that 14% controllers specified the application of a full GPK, however, a very different answer is obtained when the actual practices rather than terminology are examined, that is, cost accounting systems with essential GPK features including cost-type accounting, cost center accounting, product cost accounting and marginal contribution accounting. 98% in the sample use cost-type accounting, and 786 cost types on average are found ranging from 19 to 3.760. Secondly, 98% of the respondents have cost centers ranging from 20 to 100.000 with 90% having 3.000 or less. On average, each cost center have 13 employees. 96% in the sample compare the budgeted and actual costs at the cost center level. Thirdly, 53% of the responding organizations make comparisons of budgeted and actual costs at product level and 36% make distinction between fixed and variable costs for every product. Lastly, 69% practice contribution margin analysis. 24% use the most simple level, 51% use the multistage to evaluate fixed costs on different layers, and 11% use the most complex level where fixed costs are assigned to

different objects like customers. In addition, IT support plays a vital role in application of cost accounting systems in Germany. 100% use standard software, among which 80% use SAP ERP, and 47% use SAP BW (business information warehouse).

4.3 *Relative Einzelkosten-und Deckungsbeitragsrechnung* or Riebel's generic direct costing

4.3.1 Theoretical aspect

As a result of Riebel's (1994c, cited in Weber, J. & Weißenberger, BE., 1997) study of joint production that any assignment to separate units of output is discretionary, he inferred that an adequate cost accounting system for joint product costs must be a contribution costing technique. Thereafter, Riebel constructed two conditions compulsory for any decision-oriented cost accounting systemst: (1) the hard data for independent cost measurement must be cash-based; (2) the structure of the system must be as flexible to facilitate with any management decisions. The two principal features of *Relative Einzelkosten-und Deckungsbeitragsrechnung* are summarized in Figure 4 and explained in the following texts.

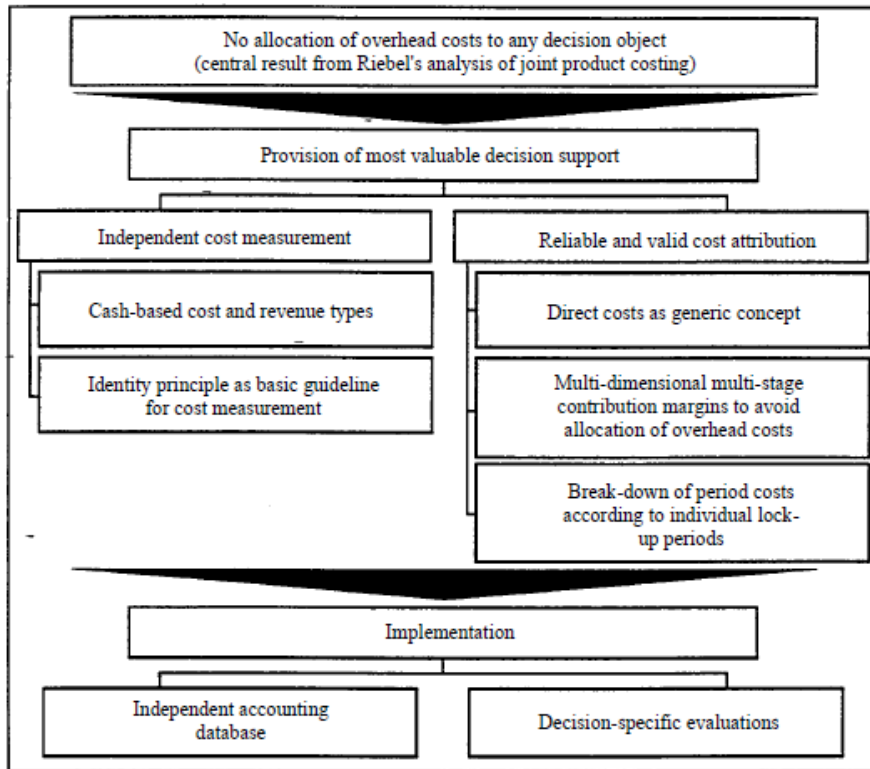


Figure 4: Central features of Riebel's approach
(Source: Weber, J. & Weißenberger, BE., 1997)

The first feature is Independent cost measurement. Costs are stated by Riebel (1994a, cited in Weber, J. & Weißenberger, BE., 1997) as cash expenses arising from a specific decision, and revenues as positive decision-consequences measured by cash values. This statement rejects the concept of imputed cost types which were predominant at that period and is characterized by "identify principle" where costs are only assigned to a decision object they can specifically relate to. Moreover, all costs that are related to the given decision are aggregated. Hence, finding out elementary decisions is the starting line for cost measurement. For instance, maintenance costs are identified with the decision to have a production cost center, instead of the decision to produce one unit of output. This idea is able to circumvent the assignment of overhead, however in order for each cost to be directly pinpointed to a specific decision, numerous decisions have to be defined. In addition, as a sequence of decisions may be prompted by an elementary decision, additional costs incurred have to trace this sequence for their

corresponding decisions.

The second feature is reliable and valid cost attribution. Riebel (1959, cited in Weber, J. & Weißenberger, BE., 1997) treated direct cost as a generic concept instead of tracing it to specific output eliminates overhead allocation problem, however, various aspects of complexity are brought about regarding the identification of decision objects. Building a hierarchy of decision objects is used to alleviate this problem. For instance, a hierarchy for research and development cost may include product, product group, as well as the whole organization. If the costs can be related to the decision to carry out a research project for the single product, then they are assigned to the underlying product. If the costs are aggregated and can only be related to product group wide or companywide decisions, then they are assigned to higher level of the hierarchy. Similar idea is applied on breaking down period costs in terms of lock-up periods. Period costs are the aggregated costs incurred to assure production capacity, e.g. administrative service. For instance, a labor contract with 6-month notice has a lock-up period of 6 months, then the costs are considered as direct period costs if the time horizon of the related decision is longer than 6 months, otherwise, they are treated as period overhead.

In order to achieve the two features, Riebel (1994a, cited in Weber, J. & Weißenberger, BE., 1997) suggested a two-part implementation. Firstly, a purpose-neutral database which keep records of costs and revenues along with all relevant managerial decisions needs to be established. Secondly, this database is used to assess a specific problem e.g. make-vs.-buy and to support decision making.

4.3.2 Empirical aspect

Riebel's identity principle assumes a rational decision-maker who would possess perfect *ex ante* knowledge of the sequence ensuing the elementary decision, i.e. to isolate the sequences and place them in order. The second assumption is that all the

cost and revenues must be completely clear concerning their attribution to the decision sequence, which can only be realized in an Arrow-Debreu-world. Furthermore, the purpose-neutral accounting database has considerable obstacles to implement in practice. One can imagine the amount of work and process involved to keep track of every possible decision which have cost implications even in a very simple and stable managerial environment. Therefore, Riebel's approach is merely a theoretical concept and that is why it lacks empirical evidence. Nevertheless, analysis of this concept offers a fresh perspective of the strengths and weaknesses of other existing cost accounting systems, hence there is some warrant its presence in academic discussion even though its application in real-world situations is to fail (Weber, J. & Weißenberger, BE., 1997).

Chapter V Japan's path

This chapter reviews two most recognized modern cost accounting systems in Japan, which are *Mehrstufige sortenkalkulation* or *lot costing* and *Genka kikaku* or *target costing*. The background of the emergence of each system, a theoretical description of the systems as well as the empirical application of the system will be covered.

5.1 Background

Historically, costing in Japan received much Western input, that it was influenced by Germany and U.K. before the World War II, and later by the U.S.. One might be surprised as Japanese costing appears very individual from other parts of the world, but this is explained by the transformation of the Western impulse by Japanese society over time (Monden, Y. and Sakurai, M., 1989, cited in McMann PJ., & Nanni, AJ., 1995; Yoshikawa, T., 2001).

Seizou genkakeisan junsoku or the Product Cost Accounting rule was promulgated in November 1937 as part of the national program to rationalize Japanese industries. This is the first standard in Japan with the objective to disperse and enhance cost accounting knowledge, even though it is not compulsory. The Sino-Japanese War happened in the same year led to the Army setting up of its own cost accounting rules in 1939 and followed by the Navy in 1940, in order to control the prices of munitions. Having multiple sets of rules subsequently created difficulty for the munition industry as well as national commodity price controls. The government then established the Manufacturing Industry Cost Accounting Guideline in April 1942 as the uniform rule for price control and efficiency management during the World War II (Yoshikawa, T., 2001).

When the war ended, Japan's economy was in turmoil. Japanese businesses suffered

from the struggle between capital and labor, coalitions of politicians, and the pursuing of mercantilist protectionist economic policies (Hopper, T. et al., 1999) As a result of the government's endeavor to increase productivity, a project to develop modern cost accounting standard was initiated by the Business Accounting Deliberation Committee of the Ministry of Finance (the successor of the Business Accounting Standard Committee of the Economic Stabilization Board) on 16 November 1950, and was completed 8 November 1962. The project comprises of three central properties. (1) To introduce the best practices which are intended to be a basic structure of an accounting system. This is based on contemporary generally accepted cost accounting practices through learning from Germany, U.K., U.S. and other countries systems as well as from Japanese manufacturing organizations' practices e.g. Mitsubishi Electric, Fuji Textile. (2) Although being voluntary, the compliance of the standard is socially binding for Japanese organizations. However, practices are diverse under the standard varying with industry, organization size, and business condition (Yoshikawa, T., 2001). Special cost accounting procedures manuals and handbooks, which were based on the standard, were issued by some of the industries, e.g. the military industry (Defense Equipment Society, 1989, cited in Yoshikawa, T., 2001). (3) Five purposes of cost accounting were stated: setting prices; preparing financial statements; managing cost; budgeting; setting basic plans and making decisions (Yoshikawa, T., 2001).

Between 1950 and 1980, a variety of management accounting techniques were developed by Japanese organizations in response to the dominating Western big businesses (McMann PJ. & Nanni, AJ., 1995). It is important to make a clarification of some of the well-known Japanese management accounting practices at this point, as those that are broader managerial practices are not the focus of this paper. Just in Time (JIT) is an inventory system resulting out of the close cooperative relationship between many Japanese manufacturers and their suppliers. (Wijewardena, H. & Zoysa, AD., 1999; Amasaka, K., 2009). Total Quality Management and Total Quality Control are two management technology principles of Toyota Motor Corporation's distinctive

Toyota Production System (Mehri, D., 2006). While these practices do have a substantial impact on cost, referring again to Kohler(1970)'s definition of cost accounting, they do not directly deal with the classification, recording, allocation, summarization and reporting of costs. One prevalent conventional costing system in Japan is the *mehrstufige sortenkalkulation* or the lot-costing system. This paper is not able to provide a description of its exact origin due to restricted information, but according to Accounting Study Office of Kobe University (1984, cited in Yoshikawa, T., 1994), it probably originates from Germany. Another approach called *genka kikaku* or target costing, although does not precisely fit into the picture as it does not explicitly have an exclusive way to classify, record, and allocate costs; besides, it is an extremely broad approach which is used for many management purposes, given that it has converted the role of cost from the outcome of production to the input of production, is therefore relevant for this paper's discussion (Cooper, R. & Slagmulder, R., 1999).

5.2 *Mehrstufige sortenkalkulation* or lot costing

5.2.1 Theoretical aspect

Lot costing is a variation of process costing. Its prevalence is mainly because of Japanese manufacturers' predisposition with designing economic production systems. They are reluctant to invest in individual production lines for every single product hence production processes have to be shared. The consequential cost allocations creates complexity for cost accounting. Lot-costing is thus adopted since it well serves this multi-facets processes required to achieve the manufacturers' principal goal, i.e. production flexibility I. It is mostly used in food, chemical, automobile, electronics industries (Yoshikawa, T., 2001).

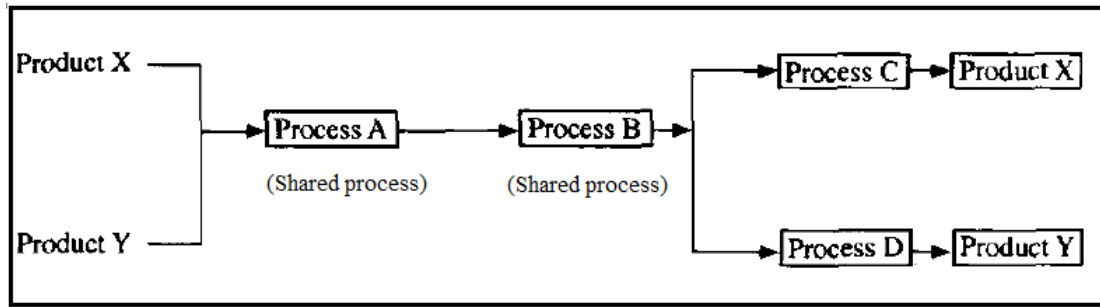


Figure 5: Lot-costing system
 (Source: adapted from Yoshikawa, T., 2001)

As illustrated in Figure 5, product X goes through processes A, B and C. Hence, its cost comprises of the direct cost of process C, on top of its share of the costs of the common processes A and B. Two main features of lot costing is the maintenance of cost accounting records and process costing for multiple processes (Ibid).

Firstly, cost accounting data is recorded in a different manner. Material cost including the actual price of material along with purchase expenditure such as freight, insurance, duty, and purchase commission, is directly absorbed by products. Direct labor plus manufacturing overhead are assigned on the basis of *kousuu* rate, which is a measurement of resource consumption expressed in physical terms (Yoshikawa, T., 1994). To be specific, *Kousuu* is the representation of a set of conversion activities performed measured against the working hours (direct or indirect labor time and machine time,) required to manufacture one product unit or to complete one job (Yoshikawa, T., 1994; Yoshikawa, T., 2001). An example of *kousuu* for labor costs is illustrated in Figure 6. It is segregated into the value-added component, i.e. “basic working hours” and the non-value-added component, i.e. ‘production support hours’. “Basic working hours” is further divided into “net working hours”, and “incidental working hours”, while “production support hours” is further divided into “incidental working hours”, “set-up hours”, “artificial delay hours”, and “waiting hours”. These subdivisions are again decomposed into a detailed range of activities as outlined in the “catalogue” column.

Work/support	Type of hours	Catalogue
Basic working hours (Value added 65%)	Net working hours	Machine loading and unloading Operating machines Washing products Measuring products
	Incidental working hours (A)	Adjusting machine tolerances Dressing and arranging products Walking between processes Disposing shavings
Production support hours (Non-value added 35%)	Incidental working hours (B)	Checking machines Check blueprints Change tooling Watching machines
	Set-up hours	Machine set-up
	Artificial delay hours	Employee training Idle time Employee fatigue Personal issues
	Waiting hours	Waiting for materials and parts Machine breakdowns Machine maintenance

Figure 6: The structure of *kousuu* for labor costs
(Source: Yoshikawa, T., 1994)

Kousuu essentially makes the underlying patterns of resource consumption visible by means of decomposing resource elements, thus provides the basis to investigate operational performance. It is multiplied by the charge rate e.g. average wage and average depreciation, to get the expected product cost. An interesting fact to know is that, as dictated by Japanese culture, the wages are not based on the type of work but on the age of employees. Hence the average wage is the average for each type of work or for the entire plant. On a monthly basis, the expected costs are computed and compared with actual costs. Any differences are recorded in separate cost variance accounts, which are written off at year end. Additionally, cost accountants make prediction of the *kousuu* every month, which is assessed against the actual *kousuu*, and any differences are examined for improvement. One can suppose that not only the cost figures but more importantly the *kousuu* are reported to management. (Yoshikawa, T., 1994; Yoshikawa, T., 2001).

Secondly, there are two different types of process costing to handle multiple processes – the cumulative/pyramid and non-cumulative/non-pyramid. In cumulative costing, costs of a supplying process are re-assigned to the receiving process, hence work-in-process costs are accumulated and the full production cost is the cost in the final process. On the other hand, costs of each “work-in-process account” are allocated from each account directly to the “finished-goods account” in non-cumulative costing. The former approach has been more commonly adopted in Japan with a usage rate of approximately 90%, for it is viewed more suitable for Japanese teamwork philosophy to focus on the whole organization. In contrast, the latter approach is more convenient to trace particular costs back to individual processes and draw attention to corresponding individuals or small groups (Yoshikawa, T., 1994).

5.2.2 Empirical aspect

There is a dearth of empirical information of lot-costing system in English. One possible reason might be lot costing has properties of both process costing and standard costing (i.e. variance accounts). Additionally, the prominent idea of *kousuu*, manifests traces of activity-based costing, given that a full set of *kousuu* reveals all of the conversion and support activities undertaken, where the cost pools can be based on production processes, work cells, machine and service functions (Yoshikawa, T. et al., 2002). Therefore, lot-costing has not been studied as a distinctive system. It is notable that *kousuu* is fundamental to all of the cost management approaches in Japanese organizations, where continuous efforts are aimed at lowering the number or level of *kousuu* (Yoshikawa, T., 1994).

5.3 *Genka kikaku* or target costing

5.3.1 Theoretical aspect

In the 1960s, Japanese industrial world embraced the “customer-orientation” ideology, which motivated organizations to shift from “product-out” to “market-in” focus. Under this ideology, market research, product planning, research and development, designing are believed to be paramount to high quality attainment, whereas manufacturing, packaging, storage, logistics processes are reckoned secondary. Out of this context, target costing emerged (Ito, Y., 1995).

Some authors attributed the origin of target costing’s key concept to the German automobile manufacturer Volkswagen Beetle in the 1930s as well as the U.S. automobile manufacturer Ford and General Electric Company during World War II (Rösler, F., 1996, cited in Feil, P. et al., 2004; Monden, Y. & Hamada, K., 1991). At Volkswagen, technical solutions were accommodated so that the price goal of DM990 can be achieved. Americans developed a concept to maximize desirable product attributes and minimize product costs at the same time, which was later known as “value engineering”. This technique was imported into Japan to sustain a superior position in the fierce competition (Ibid). In the 1960s, value engineering was merged with the thought to influence at the earliest point as possible in the product life cycle (Buggert, W. & Wielpütz, A, 1995, cited in Feil, P. et al., 2004). In 1963, Toyota became the first adopter of this concept and it was practiced as *genka kikaku* or target costing. For years it has been kept in the closet and was not discussed in Japanese literature until 1978 (Tani, T. et al., 1996, cited in Feil, P. et al., 2004; McMann, PJ. & Nanni, AJ, 1995). During the 1980s, its application grew slowly and was fairly confined, for instance to a small number of products and parts; to the purchasing departments only; or the implementation of merely few of its components. Three events in the early 1990s gave great impetus to the evolvement of target costing. (1) The crushing of

economy in 1990 and 1991 forced organizations to reduce cost to meet customers' price expectations. (2) The severe appreciation of Japanese Yen against the U.S. dollar began in 1993 placed Japanese manufacturers in a disadvantaged position in the international market. (3) The economic downturn brought about by financial crisis put further pressure on organizations to eliminate excessive costs in order to survive. The former two events led to expansion and extension of the application of target costing, while the third event resulted in changes mainly in IT improvement because the amount of data needed for accurate cost estimations has upsurged and manual database was no longer adequate (Feil, P. et al., 2004). As piecemeal practices by organizations were incorporated into target costing, gradually it developed into a comprehensive approach which connects and coordinates marketing, research & development, engineering, production, and accounting departments as well as customers and suppliers, with the objective to minimize product life-cycle costs hence maximize long-term profitability (Feil, P. et al., 2004; Hamood, HH., 2011; Sakurai, M., 1989, cited in Feil, P. et al., 2004; Kato, Y. et al., 1995, cited in Moisello, AM., 2012).

After having an overview of target costing's evolvement, a close look of what it is will be presented. Its basic idea lies in a retrograde yet highly disciplined process to determine product unit cost at the planning and design stage, for 70% to 80% of costs were immutable after this point (Feil, P. et al., 2004; Cooper, R. & Slagmulder, R., 1999). To be specific, the organization starts from customers' requirements of product and consent to pay for it rather than following the conventional cost-plus pricing strategy (Cooper, R. & Slagmulder, R., 1999). Mostly the unit cost include direct materials, purchased parts, labor and processing, overheads, depreciation, development, trial production, and logistics (Yoshikawa, T. et al., 2002). Three central features of target costing are "market-driven costing", "product-level target costing", and "component-level target costing" (Figure 7).

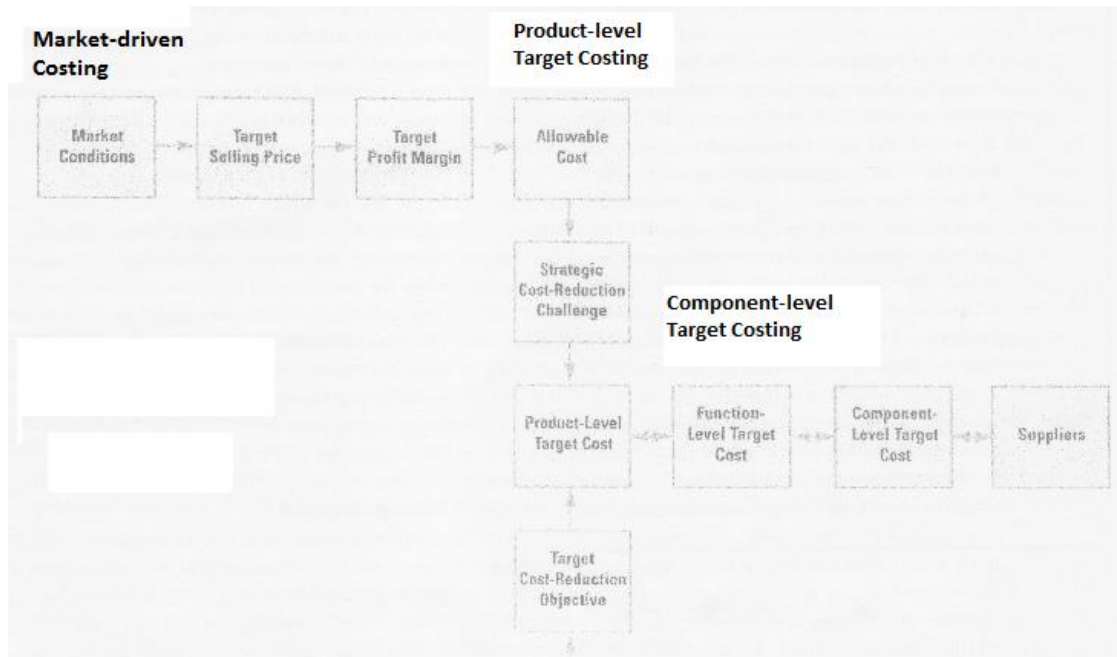


Figure 7: The target costing process
 (Source: Cooper, R. & Slagmulder, R., 1999)

Firstly, market-driven costing can be broken into five steps. (1) Establishing the organization’s long-term sales and profit objective through a thorough plan of each product’s profit contribution over its life cycle to this overall objective. (2) Structuring the product line, i.e. determine the product mix, through in-depth analysis of market preference in a dynamic sense (Feil, P. et al., 2004; Cooper, R. & Slagmulder, R., 1999). Market assessment, customer surveys, focus group interviews can be used to collect information. (3) Setting target selling price which would represents the market demand as well as the organization’s and competitors’ strategies. The perceived value of product to customers, market conditions, competitive offerings, and so forth should be taken into account. (4) Establishing target profit margin with the objective to attain the organizations’ long-term profit target. A realistic and life-cycle (i.e. all costs incurred over the product’s life need to be covered) view should be kept in mind . (5) Computing allowable cost which is simply the difference between selling price and profit margin. However, this is not a guaranteed cost, and adjustments are made subsequently in the target cost according to actual experience (Ax, C., et al., 2008;

Cooper, R. & Slagmulder, R., 1999).

In the second part, a feasible product-level target cost is arrived at, where the organization's internal cost-increasing and -decreasing factors such as design and production capabilities as well as suppliers are considered. Firstly, a cost-reduction objective is derived by deducting the allowable cost from the current cost, where the current cost is the sum of current manufacturing costs of each main function of the proposed product. Then the attainable part of the cost-reduction objective is isolated, i.e. the target cost-reduction objective, is subtracted from the current to get the target cost. This is a very interactive process among engineers, designers, and suppliers. Trade-offs among cost, quality, and functionality usually have to be made with help from using tools like quality function deployment, value engineering, and concurrent engineering. Secondly, the unachievable of the cost-reduction objective, i.e. the strategic cost-reduction challenge, indicates the deficit in competitive efficiency. In general, this number will be small. It is justified by giving the organization some room to breathe while efforts will be continuously made to bring it down to zero (Ibid).

Lastly, the established target cost is decomposed via a function or component method in order to transfer cost targets internally. In the former method, major functions are identified and held responsible for the assigned target costs before they are transmitted to respective parts within each function. The second method first assigns target costs according to blocks of components and then to their subassemblies and parts. Another critical channel to transfer cost targets is the sourcing of components, hence a close partnership with major suppliers and effective supplier management are crucial to success (Everaert et al., 2006, cited in Ax, Christian et al., 2008; Cooper, R. & Slagmulder, R., 1999).

Different approaches for target costing process are presented in literature (Cooper, R. & Chew, WB., 1996; Feil, P. et al., 2004; Moisello, AM., 2012; Monden, Y. &

Hamada, K., 1991; Hamood, HH. et al., 2011; Hiromoto, T., 1988; Yoshikawa, T. et al., 2002), the key thing to know is it starts with the question “what should the product cost be?” (Feil, P. et al., 2004). Thereby, the unit cost is pre-determined from the future market price and all processes throughout the product’s life cycle revolve around the cost, rather than being a secondary product of cost accounting. As aforementioned, the full-fledged target costing did not come from an existing theory but was gradually improved by autonomous of organizations, variations are expected as long as the principle is preserved.

5.3.2 Empirical aspect

A case study was commenced by Tani et al. (1994), who are part of the Management Accounting Research Group at Kobe University in 1990 to investigate target costing management practices of organizations listed on Tokyo Stock Exchange. Various sectors were included in the sample, e.g. the assembly industries especially machinery, electronics, and automobile, also process industries such as textile and chemicals. Out of 180 respondents, 60.6% had applied target costing on different scale, i.e. organization-wide, divisional-level, or project-level, where the usage rates are higher in the assembly industries (Appendix 2). The design, accounting, and product planning departments were the top 3 initiators in installing target costing (). 33.9% of the respondents implemented target costing at product planning stage, 58.7% at development, and 7.3% at design. Moreover, among the 4 objectives of adopting target costing (i.e. cost reduction, satisfying customer needs, quality, timely introduction of new products), cost reduction regarded the most important both when it was first implemented and at the time of survey, while more importance was attached to timely introduction (Appendix 4).

Wijewardena, H. & Zoysa, AD. (1999) mailed a questionnaire to 1.000 largest manufacturing organizations in terms of total assets in 1997 with the purpose to investigate management accounting practices. The survey reveals that target costing

is extensively applied by Japanese manufactures. Out of 210 respondents, the product designer accounts for the highest participation (69%) in new product cost estimation, followed by accountant (46%), production manager (44%), and purchasing manager (23%). The widespread of target costing coincides with the high usage rate of actual costing system (48%) in Japan, compared to standard costing (31%), absorption costing (27%), and variable costing (20%) out of 217 respondents.

Kato, Y. (1993, cited in Hamood, HH. et al., 2011) indicated that approximately 80% of Japanese assembly organizations used target costing. Since the article is not accessible, the detailed survey cannot be studied. A research by Hopper, T. et al. (1999) to examine whether cost management systems in Japanese small and medium sized organizations differed from the large ones, revealed that 2 out of the 10 manufacturers used target costing, 1 used value engineering, 5 used cost tables, and 1 used life-cycle costing. Since value engineering, cost tables, and life-cycle costing are all features of target costing, it could be the case that these organizations were using partial target costing system.

On a more individual level, Daihatsu Motor Company, the oldest Japanese automobile maker installed target costing not long after affiliating with Toyota. A typical target costing process of 3 years before the new model moves to the production stage involves the functional departments' submission of desirable features and specifications, cost estimation of development order, calculation of "accumulated cost" by each department (i.e. current cost), establishment of target cost by management, engineers' working with relevant participants (e.g. purchasing, shop-floor supervisors, suppliers) followed by variance calculations, value engineering analysis, and redesign until the target cost is achieved. In production, the target cost is not the final goal, a cost-reduction rate is set every month, and the actual cost at the end of this year turns into the basis for further tightening in the following year, thus a dynamic operates as long as the model is being produced (Hiromoto, T., 1988).

Olympus Optical Company implemented target costing in 1987 because of its loss since the mid-1980s. Before then, Olympus did have cost targets, however, the management had not convey a clear signal of their imperative. It was common for product managers to incorporate “nice-to-have” but not “need-to-have” features, hence 80% of proposed models failed the hurdle. These proposals then went under a review to see whether the additional features are worthy to increase the target, or they are returned for redesign. It was also learnt that costs associated with new technology could drop sharply with innovative manufacturing programs, for instance, a decrease in the number of parts in the shutter unit of one class of compact cameras from 105 to 56 had led to 58% reduction of production costs. Considerable efforts were made and by 1990, Olympus managed to reduce its production costs by about 35% over the production life time of new models (Cooper, R. & Slagmulder, R., 1999).

Chapter VI U.S.'s path

This chapter reviews two most recognized modern cost accounting systems in the U.S., which are standard costing and activity-based costing (ABC). The background of the emergence of each system, a theoretical description of the systems as well as the empirical application of the system will be covered.

6.1 Background

Historical documentation on the origins of cost accounting in the U.S. is very much absent owing to a fire at the National Association of Accountants' head office in 1984, which destroyed many one and only files (Cunagin, C. & Stancil, JL, 2012). As Vangermeerach, R. (1986, cited in Cunagin, C. & Stancil, JL, 2012) pointed out, many cost accountants feel disconnected from the past.

Most of early U.S. businesses were small and family business. The entrepreneurs were often in possess of unique technical skills and were activity involved in every key aspect of businesses, yet seldom were exposed to formal business administration knowledge. Detailed cost recording for decision-making began to emerge in large enterprises with complex processes like textile, mining, and arms-making in New England in the early nineteen century. However, no certain examples of using pre-determined norm-based standards during this century were found in extant documentations (Fleischman, RK. & Tyson, TN., 1996; Chandler, AD. 1977; both cited in Fleischman, RK. & Tyson, TN., 1998; Brown, JK., 1992). Several authors (Miller, P. & O'Leary, T., 1987; Hopper, TM. & Armstrong, P., 1991; Tyson, TN. 1993; all cited in Fleischman, RK. & Tyson TH., 1998) attributed the beginning of applying standard costs for control to the enterprise first using scientific management between the late 1800s and early 1900s. Fleischman, RK. & Tyson TH. (1998) agree that these procedures were not practiced before the scientific age for they were irrelevant, overly costly, or conflicting with social values.

To complement, Chatfield, M. (1974, cited in King, DL. et al., 2009) maintains that neither accountants nor industrialists showed interest in identifying and classifying costs before 1885 and American cost accounting practices prior to this were nearly the same as Italian bookkeeping in the 1400s. Little information about costing methods was printed in order to preclude competitors' exploiting of these practices. Fleischman, RK. & Parker, LD (1990, cited in King, DL. et al., 2009) feel that manufacturing costs were detached from financial reporting and were not used properly as a management control instrument. Established cost accounting principles did not exist until the emergence of "scientific management" or "managerialism".

On the other hand, costing practices were much more sophisticated in the U.S. Army than in businesses for it was imperative to maximize the effectiveness of resources through cost management (King, DL. et al., 2009). In 1817, the father of the U.S. Military Academy at West Point, Colonel Sylvanus Thayer, introduced a new managerialism and restructured West Point. Honorable conduct was stressed and learning was broadened into new scientific, mathematical and engineering themes, amongst which engineering was set the groundwork of curriculum to meet the young nation's demand for engineers. Simultaneously, a new accountability system including frequent reports and examinations was initiated with the objective to enhance academic standards (United States Military Academy West Point, n.d.). Consequently, a generalized accountability system was developed by these graduates who learnt at school the power of productivity and cost reduction. This system later contributed to accounting practices during the Civil War in terms of the identifying, classifying and managing of costs. In the early days, most of them were appointed as managers to military institutions such as the Springfield Armory, which was regarded to have the most advanced accounting procedure and control system (Chandler, AD., 1977, cited in King, DL. et al., 2009). Hoskin, K. and Macve, R. (1988, cited in Fleischman, RK. & Tyson, TN., 1998) indicates that the seed of standard costing can be found at the Armory in the 1830s and 1840s. Extensive cost data was collected for setting accurate

product price, which were compared against private contractors' bids by the War Department (Fleischman, RK. & Tyson, TN., 1990, cited in King, DL. et al., 2009). Secondly, as each soldier was held accountable for the arms given to them, a detailed "list of prices of the components parts of the musket" derived from unit of production was issued in case of careless loss or damage (Hoskin, K. & Macve, R., 1988, cited in King, DL. et al., 2009). They claimed that West Point graduates were the forerunners of managerialism when Civil War ended in 1865. The ex-service officers, who were probably some of the best educated particularly in engineering and managerial accounting, brought the new concepts to organizations they worked for.

The phenomenon of standard costing has been widely discussed since its appearance. Beginning in the 1950s, the focus in research was shifted to costs for decision-making relevance (Horngren, CT., 1989). Questions on the behavioral presumptions of standards were brought up by academic accountants. In the early 1980s, standard costing were heavily criticized by both in and out of accounting for being the enemy of competitiveness and short of strategic emphasis agitated by U.S.'s deterioration of its supremacy in the world market during this period (Fleischman, RK. & Tyson, TN., 1998). Johnson, HT. & Kaplan, RS. introduced activity-based costing to resolve the deficiencies of standard costing system *Relevance Lost: The Rise and Fall of Management Accounting* (Johnson, HT. & Kaplan, RS., 1987.). This approach attracted tremendous attention at its debut and has been very much debated since then.

6.2 Standard costing

6.2.1 Theoretical aspect

Standard costing was essentially the brainchild of the engineering societies during the age of scientific management. It was initially centered on the time-and-motion studies to conjecture labor standards for scientific analysis of the differences

between standard and actual costs for labor control (Fleischman, RK. & Tyson TH., 1998). The using of standard costs for the purpose of control is a big leap in the development of accounting, as Fleischman, RK. et al. (1995, p.162, cited in Fleischman, RK. & Tyson TH., 1998) maintained that “the use of accounting numbers for human accountability provides the factual foundation that will determine how far each of these positions [the Marxian/labor process and Foucauldian schools] can be rationally sustained”. In the mid-1880s, the engineering community wrote journals to urge managers to implement innovative administrative technique. For instance, Metcalfe, H. (1885, cited in Fleischman, RK. & Tyson TH., 1998) and Towne, HR. (1885) indicated that role of removing waste and inefficiency in greater profitability, with respect to labor and materials. A set of principles were subsequently recommended by Taylor, FW. (1911, cited in Fleischman, RK. & Tyson TH., 1998), which are “identification of best practice, differential piece rates, functional foremen and scientifically derived norm-based costs”. One can notice that these principles were explicitly closely associated with the concept of standard costing.

Over the course of time, its dimension has broadened from labor control and a modern standard costing system keeps the costs of production at standard (Figure 8) (Caplan, D., n.d.; Hansen, DR., et al., 2009; Vanderbeck, EJ., 2013). Chartered Institute of Management Accountants terminology defines ‘standard’ as “benchmark measurement of resource usage or revenue or profit generation, set in defined conditions” (Joyce, J., n.d.).

	Manufacturing Costs		
	Direct Materials	Direct Labor	Overhead
Actual costing system	Actual	Actual	Actual
Normal costing system	Actual	Actual	Budgeted
Standard costing system	Standard	Standard	Standard

Figure 8: Cost assignment approaches
(Source: Hansen, DR., et al., 2009)

Three steps to perform this approach are (1) computing the standard cost for a given input simply by standard price \times standard quantity. The challenge lies in the articulation of price and quantity standards, i.e. to specify how much is allowed for paying the input to be used and how much of the input is allowed per unit of output. The standards are derived from historical experience, engineering studies, and operating personnel. Standards can be based on as ideal or currently attainable performance. The ideal standards can only be realized under perfect operation and maximum efficiency, while certain degree of reality such as occasional interruptions, machine failure, faulty skills, and material defects, is taken into account in the currently attainable standards. The underlying standard unit cost is typically broken down in standard cost sheet. It can be observed from the example of a standard cost sheet in Figure 9 that standard unit cost comprises of three

Description	Standard Price		Standard Usage		Standard Cost	Subtotal
Direct materials:						
Yogurt	\$0.020	\times	25 oz.	=	\$0.50	
Strawberries	0.010	\times	10 oz.	=	0.10	
Milk	0.015	\times	8 oz.	=	0.12	
Whipped cream	0.025	\times	4 oz.	=	0.10	
Gelatin	0.010	\times	1 oz.	=	0.01	
Container	0.030	\times	1	=	0.03	
Total direct materials						\$0.86
Direct labor:						
Machine operators	8.00	\times	0.01 hr.	=	\$0.08	
Total direct labor						0.08
Overhead:						
Variable overhead	6.00	\times	0.01 hr.	=	\$0.06	
Fixed overhead	20.00	\times	0.01 hr.	=	0.20	
Total overhead						0.26
Total standard unit cost						<u>\$1.20</u>

Figure 9: Standard cost sheet for deluxe strawberry frozen yoghurt
(Source: Hansen, DR., et al., 2009)

components: direct materials, direct labor, and factory overhead. The first two components are straightforward, where the standard cost is computed by (purchase price \times material quantity), and (labor rate \times labor hours) respectively. Overhead is

classified into variable and fixed, where gas, electricity and water used in producing related activities are included in variable overhead, and salaries, depreciation, taxes and insurance are included in fixed overhead. An important remark is, direct labor hour is the only cost driver for both overheads and these overheads are not segregated from other lines of production. (2) Inventories (from work-in-process to finished goods to cost of goods sold) are initially recorded at standard cost, then when actual costs become available, the material, labor, and overhead variances between the actual and standard costs are entered in every associated account to restate their balance from standard to actual. The variance is simply the difference between (actual price per unit of the input \times actual quantity of input used) and (standard unit price of an input \times standard quantity of inputs allowed for the actual output). (3) Variances are decomposed in terms of price/spending and usage/efficiency, where price variance is computed by (actual unit price - standard unit price) \times the number of inputs used, and usage variance is computed by (actual quantity of inputs - standard quantity of inputs) \times standard unit price of the input. These variances are analyzed to gain insight of business performance for the corresponding period, and direct management's efforts on aspects pertaining cost control and production efficiency (Hansen, DR., et al., 2009; Vanderbeck, EJ., 2013).

6.2.2 Empirical aspect

Unexpectedly, key word search of "standard costing", "standard costs", "standard costing usage/adoption", and "standard costing survey/study" did not come up with many useful results on how it has been practiced by organizations in the U.S. in the past seven decades. More such recent studies are done in another Anglo-American country – the U.K. (Whittle, N.,2000; Garg, A. et al., 2003; Guilding, C., et al., 1998; Lyall, D., & Graham, C., 1993) a prominent contributor to standard costing and a popular subject for research (Fleischman, RK. & Tyson TH., 1998; Fleischman, RK. et al., 2008; Kranowski, N., 1977)

Before 1920, a limited number of U.S. organizations have applied this cost accounting system with labor standards and variance analysis. Nelson, D. (1979, cited in Fleischman, RK. & Tyson TH., 1998) found only 46 industrial organizations in literature of Taylorism between 1901 and 1917, and he supposed that cost keeping was merely an accompanying part of the planning department in those organizations. Oakes, LS. & Miraniti, PJ. (1996) credited much of standard costing's fame to Louis Dembitz Brandeis' proponent. Its application was discouraged by resistance from managers and workers despite its high acceptance in theory for its effectiveness to control waste/cost (Fleischman, RK. & Tyson TH., 1998; Fleischman, RK. et al., 2008).

Standard costing suffered further setback during the World War II (1939 – 1945) due to government's insistence on actual costs, as well as high turnover, lack of engineers for time-motion study, rapidly changing conditions etc. The National Association of Cost Accountants (1947, cited in Fleischman, RK. et al., 2008) indicated four explanations for this backsliding phenomenon.

In the aftermath of WWII, standard costing was on the upslope again. In 1947, a series of time-motion studies written by practitioners from heavy industry emerged, such as Pawling, JD. (1947, cited in Fleischman, RK. et al., 2008) of the Federal Telephone and Radio Corporation; Leavitt, RW. (1948, cited in Fleischman, RK. et al., 2008) Of Ford; and Barranger JJ. (1948, cited in Fleischman, RK. et al., 2008) of Bendix. Moreover, from 1946 to 1952, a flood of publications in the National Association of Cost Accountants Bulletin disclosed the proliferation of standard costing's adoption in large manufacturers. Linnenkohl, KE. (1949, p.725, cited in Fleischman, RK. et al., 2008) observed the whole flour-milling industry and described that "many of the most successful mills in the country have, therefore, adopted various forms of budget and budgetary control using the standard costing method". In 1948, the Committee of Research of the National Association of Cost Accountants (1948a, 1948b, 1948c, 1948d,

1948e) published five reports on field studies of 72 largest and capital-intensive American manufacturers and obtained a result of 65 out of 72 organizations adopted standard costing. The report suggested standards were set in terms of “attainable good performance” with no great difference from actual costs, hence would be proper for both cost control and inventory costing in financial reporting.

Only three studies were found on recent standard costing implementation. A survey performed during the 1980s and 1990s revealed that standard costing systems were predominant in U.S. manufacturers, with an adoption rate of 85% (Hornngren, C. et al., 1997, cited in Cemkut, BA. et al., 2013). A paper based on extant survey findings on U.S. management accounting practices by Shields, MD. et al. (1991) presented that Inoue, S. (1988) found 70% U.S. organization used standard costs compared with the usage rate of 27% for actual costs; whilst Howell, R. et al. (1987) found that 73% U.S. organizations used standards costs compared with the usage rate of 27% for actual costs. It further disclosed a tendency of relying standard costs on the past supported by Rayburn, F. & Stewart, A. (1981) who found 4.4% was based on ideal level, 54.3% on currently attainable level and 41.4% on average past performance; as well as Chiu, J. & Lee, Y. (1980) who found 7.6% was based on ideal level, 50.3% on expected actual and 42.2% on average past performance. Another survey conducted by Krumwiede, K. (2007) in 2006 on 130 U.S. organizations showed that 73% of the 93 manufacturing organizations used standard costs for most costing purposes, while the usage rate for the 37 non-manufacturing organizations was 54%.

6.3 Activity-based costing (ABC)

6.3.1 Theoretical aspect

Although early concepts of costing systems based on activities and processes were manifest in the General Electric in the 1960s (McConville, DJ., 1993, cited in Marjanovic,

v. et al., 2011), it did not become recognized as a theoretically structured concept until the 1980s. As technology and competition had caused organizations to shift towards automation and to offer a greater range of variety and features, their cost structure have changed as well that direct labor content has declined and overhead has escalated (Johnson, HT.& Kaplan, RS., 1987; Kaplan, RS. & Anderson, SR, 2007; Ahmed, Z. et al., 2011).). Based on the perception that “today’s management accounting information...is too late, too aggregated, and too distorted to be relevant for managers’ planning and control decisions...management accounting reports are of little help to operating managers as they attempt to reduce costs and improve productivity.”, ABC was formally proposed by H. Thomas Johnson & Robert S. Kaplan as a remedy to this loss of relevance (Johnson, HT. & Kaplan, RS., 1987, p.1). Interestingly, Johnson made a diverged opinion on his theory few years later. In 1991 he wrote an article *Relevance Lost: after Five Years* and stated that the problem of management accounting after WWII was not caused by inadequate information, but on obsessive exploitation of the information to control operations (cited in 岡野浩, n.d., translated by Su, Chao). One year later, in another article *It’s time to stop overselling activity-based concepts*, he argued that while ABC’s virtue on economizing on an activity driver definitely has helped many organizations to cut costs, however it merely aims at reducing costs through pruning activities and not at enhancing customers’ satisfaction and processes flexibility where true competitiveness lie. Thereby, steps should be taken to reduce lead-time and variation from processes rather than wasting time designing ABC systems to locate “hidden profits” on products that would not sell well in the first place (Price, JS. 2001). Further comments were given in a book he wrote in the same year *Relevance Regained: From Top-Down Control to Bottom-Up Empowerment* (Johnson, HT., 1992). On the other hand, Kaplan, joint by Robin Cooper, continued to promote ABC through the ‘Harvard network’. In addition, the ‘Computer-Aided Manufacturing, International (CAM-I) (later entitled ‘Consortium for Advanced Manufacturing International) was another important network which sponsored ABC (Hopper, T. et al., 2007).

ABC is interpreted by academics and practitioners as a normative costing system (Geri, N. & Ronen, B., 2005). Its prominent distinction to other conventional costing systems is the way to assign overheads. The underlying notion is that almost all of activities in an organization take place to support production of goods or delivery of services. Precisely speaking, it is these activities that consume resources and create costs, while cost objects including products, services, and customers consume activities (Figure 10).

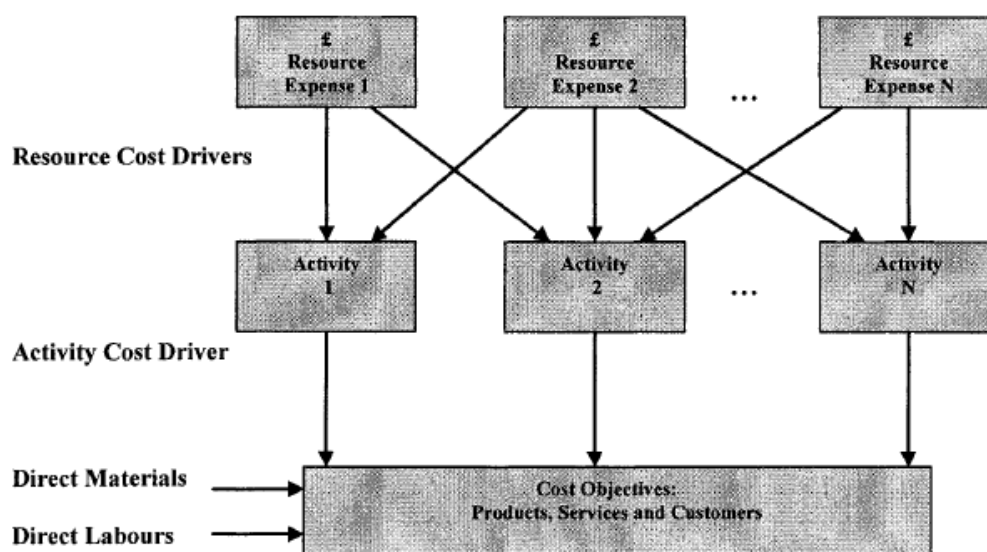


Figure 10: ABC system
(Source: Kaplan RS. & Cooper R., 1988, p.83)

Hence, ABC keeps track of these cost-contributing activities and uses them as mediator for allocation to individual product or product families. (Kaplan, RS. & Cooper, R., 1988; Ahmed, A. et al., 2011; Marjanovic, V., 2011). By demarcating the causes behind overhead, i.e. shared resources, an accurate picture of costs is drawn and cost subsidizing effect is moderated, thereby allow analysis of the true profitability of each product (Khataie, A. et al., 2010; Rezaie, K., 2008).

Hopper, T. et al. (2007) described four steps involved in order to realize this underlying notion. (1) Identifying activities performed in the organization usually by means of

interview. (2) Costing activities based on its consumption of resources. Similarly, employees are surveyed to estimate the time spent on each activity. Costs are accumulated on either unit level, batch level, product level, or production sustaining level, which constitutes different cost pools. (3) Choosing a set of diversified cost drivers to ascertain a direct linkage between resources and the final product, e.g. floor space, number of set-ups, number of orders, size and weight, complexity, and number of inspections, movements (Polejewski, SA., n.d.; CARDOŞ, IR. et al. 2012). (4) Allocating costs of activities to every single product via appropriate cost driver rates. Final product costs are then computed by adding up the costs of all the associated activities.

Given the magnitude of such program, especially the first two steps which are the most arduous tasks, Kaplan, RS. & Cooper, R. (1988) suggested that emphasis should be placed on: (1) resources that are expensive; (2) resources whose consumption radically fluctuate by product or product families; (3) resources whose consumption patterns that are uncorrelated with conventional cost drivers such as direct labor, machine hour, and direct material .

6.3.2 Empirical aspect

Despite the superiority of ABC depicted in literature, the adoption rate is not as high as one would expect and conventional costing systems are still seen in the majority of organizations (Salawu, RO. & Ayoola, TJ., 2012; CARDOŞ, IR. Et al. 2012; Roztock, N., et al., n.d.; Kaplan, RS. & Anderson, SR., 2007). One scenario is that organizations which have launched ABC were dissatisfied it (Geri, N. & Ronen, B., 2005). The response from controllers at many U.S. organizations to Sharman, PA. & Vikas, K. (2004)'s question "what would happen if ABC is abandoned tomorrow" is "nothing, we already did!" Thorns, J. & Gurowka, J. (2005) found ABC was viewed as "yesterday's hope." Perhaps a more common observation is the implementation of ABC as a one-time project to analyze the profitability of products and customers and decide the ones to retain or

withdraw (Ness, JA. & Cucuzza, TG., 1995).

Three U.S. questionnaire surveys cited in Tupmongkol, T. (2008) showed that 19% manufacturers were at planning stage to adopt ABC and 11% were using it (Booth, P. & Giacobbe, F., 1997); 36% manufacturers were using ABC (Pohlen, T. & Londe, B., 1998); while 27% of 281 (sample size: 2.250) manufacturing and services organizations were at planning stage, 36% were using it, and 12% had rejected it (Brown, D. et al., 2001). According to Grott, T. (1999, cited in CARDOŞ, IR. Et al. 2012)'s investigation of U.S. organizations, the ABC adoption rate is 17.70% while 58% were under consideration to implement the system. Horngren et al. (2000, cited in CARDOŞ, IR. Et al. 2012) found an adoption rate of 15% to 20% while an equal number were thinking of adopting it. Another four U.S. studies cited in Askarany, D. & Yazdifar, H.(2012) found adoption rates of 11% (Armitage, HM & Nicholson, R., 1993), 28% (Hosseini, A. et al. 1997), 26% (Ittner, CD. et al., 2002), and 21% (Krumwiede, K. & Suessmair, A., 2007). An increasing trend of adoption can be noticed while the overall rate is rather low, especially taken into account the bias in samples with regards to the type and size of respondents. The common technical implementation problem is the time-consuming collecting and processing of data, which makes ABC system expensive to build, complex to maintain, and difficult to adjust (Kaplan, RS. & Anderson, SR., 2007).

A large financial service employed ABC to measure product cost and customer profitability on a monthly basis. 14 employees were exclusively responsible to process data from surveys done on 700 employees' time at more than 100 facilities, and to spend another 30 days in preparing management reports. At the awning maker Hendee Enterprises, 3 days were required by the ABC software to compute costs for 150 activities, 10.000 orders, and 45.000 product items (Kaplan, RS. & Anderson, SR., 2007).

Johnson, HT. & Kaplan, RS (1987) described successful cases of ABC implementation at

manufacturers such as General Motors, General Dynamics, Hewlett-Packard, Martin Marietta Energy Systems. It has also been extended to service industries in hospitals, universities, libraries, banks, and logistics (Tupmongkol, T., 2008; Goldberg, MJ. & Kosinski, L., 2011)(Acton, DD. & Cotton, WDJ., 1997; Rotch, W., 1990, both cited in Tupmongkol, T., 2008) For instance, Ness, JA. (1995) did a case study of the American automobile maker Chrysler and a mid-size water-recycling organization Safety-Kleen to illustrate their detailed implantation process. Chrysler claimed that since its introduction of ABC in 1991, hundreds of millions of dollars have been saved through simplification of product design and elimination of unnecessary activities. The benefits of ABC have far exceeded its costs by 10 to 20 times on average, and even 50 to 100 times at some sites. Safety-Kleen, which also adopted ABC in 1991, estimated 12,7 million dollars in cost savings on top of increased revenue more than 14 times its outlay in ABC through rationalization of operations.

Chapter VII Analysis

This chapter aims to analyze the peculiar characteristics of the six costing systems in terms of the three frameworks presented in Chapter III, followed by a discussion of cost accounting practice in general; and the second part of this chapter is an analysis of the possible reasons associated with national culture that have resulted in these characteristics, followed by a discussion of cultural influence on cost accounting development on the whole.

Having studied two prominent cost accounting systems from each country, this chapter will first reflect the characteristics of these six systems with reference to the three frameworks described back in chapter III where a discussion of cost accounting practices in general follows. Then in the second part, it goes on to dig into the context of national culture for potential reasons of the peculiar cost accounting practices in each country where a discussion of national culture's influence on cost accounting practices on the whole follows.

7.1 Characteristics of the six costing systems

7.1.1 Bjornenak, T. & Olson, O.

Starting from Bjornenak T. & Olson O. (1999), under the scope dimension, firstly, GPK, Riebel's generic direct costing, lot costing, target costing, and ABC manifest the descriptive objects element by making use of not only financial but also a lot more detailed non-financial information other than direct labor and machine hour; whereas standard costing is constrained to a cost object view. Secondly, the casual variability factor element is exhibited to varying degree, where the factors affecting cost or performance of descriptive objects are most explicitly addressed in Riebel's generic direct costing and target costing. The causal relationship then gradually diminish in GPK, ABC, lot costing, and to the least standard costing, which relies on only volume-

related cost driver, i.e. direct labor hour for overhead allocation. Pertaining to the time element, apart from Riebel's generic direct costing and target costing, other approaches follow the calendar time. Besides, the *ex ante* perspective is evident in target costing, i.e. a pre-determined cost, that stretches to multiple processes before production. Although lot costing and standard costing may appear *ex ante*, they are often based on *ex post* data. In contrary, GPK, Riebel's generic direct costing and ABC have an *ex post* perspective based on actual costs.

Under the system dimension, firstly, concerning the number of system in use, GPK and Riebel's generic direct costing are designed to possess the capacity to accommodate both external reporting and internal purposes; whereas organizations might use other systems in combination with lot costing, target costing, standard costing, and ABC to meet different information needs. Secondly, concerning the user of system, GPK, Riebel's generic direct costing, lot costing, target costing, and ABC all attempt to disaggregate cost information, while and target costing emphasizes a learning perspective.

7.1.2 Lall Niagam, BM. & Jain, IC.

The five bases of costs classification, namely behavioral, functional, responsibility, traceability, relevance to decision-making are used in conjunction by the costing systems. The allocation of indirect costs seems to be the attention of every costing system.

The two German systems both have special definition of the cost classification. In GPK, variable costs are designated as those costs that are proportional to changes in each cost center output instead of to volume of total output in a general term, hence all variable costs are direct cost for they can be readily measured against cost center output. Riebel's generic direct costing treats all costs as direct costs in a broader way as all costs are identified with particular decisions they relate to. Moreover, manager's

responsibility is very precise in GPK that the cost centers are small with repetitive output hence directly under their control. Lastly, some of the non-manufacturing costs such as selling and administrative costs are assigned to products or services in German costing systems (Keys, DE.,1999).

Lot costing, standard costing and ABC all account for manufacturing costs only, where all agree on the treatment of direct labor and direct material, they diverge on the way to attribute indirect costs in particular fixed overhead. Standard costing uses the simplest way to assign overhead incurred by cumulative activities based on direct labor. Lot costing uses *kousuu* (decomposition of working hours), to profile overhead related to each identified value and non-value added activities. ABC relates overhead to disaggregate activities through a wider range of cost drivers other than working hours. Target costing is special in its focus on the functional classification that both non-manufacturing and manufacturing are taken into consideration.

7.1.3 Fisher, JG. & Krumwiede, K.

The costing systems answer the four key questions of Fisher, JG. & Krumwiede, K.'s framework in different ways.

Most of the costing systems, i.e. lot costing, standard costing, and ABC, follow a full absorption approach, which is in line with GAAP's requirement to treat non-manufacturing costs as period expenses. GPK can be both variable and full absorption since it is flexible to include costs depending on the decision need. Similarly, Riebel's generic direct costing is capable to take in and out costs as needed. Target costing, evidently adopts a life-cycle approach.

Direct product costs are tracked at the process level for lot costing, standard costing, and ABC. GPK sits on the right end of the spectrum, i.e. resource consumption accounting, which separates fixed and variable costs at cost center level. The way

Riebel's generic direct costing traces direct costs by its own definition, i.e. to the elementary decision related to each costs, is not incorporated in this framework. It is not clear how target costing deals with this problem, as mentioned in Chapter V, it is rather a broad management approach and needs other systems' assistance in terms of classifying, recording and allocating costs.

Regarding the organization and allocation of indirect product cost, standard costing sits on the left end of both the spectrums to use plant-wide or department-based cost pools via volume-based drivers. Lot costing and ABC address this problem by using activity-based cost pools via transaction-based drivers. Detailed cost centers serve as "accounting districts" in GPK to empower precise cause-and-effect relationship between costs and the intensity-based cost drivers (Friedl, G. et al. 2009). The notion of indirect costs do not exist in Riebel's generic direct costing. Again, target costing would depend on its supporting system for the organization and allocation of indirect cost.

7.1.4 Discussion

The analysis of the characteristics of six costing systems offers some insight into cost accounting practices in general. To begin with, one should not be bound by the parlance when presented with a cost accounting system. The right way to approach is to unbundle the system analytically and learn about its characteristics *per se*. Just like some of the surveys which studied organizations' cost accounting practices (e.g. Friedl, G. et al., 2009) have focused on the essential characteristics as opposed to terminology alone. This approach would provide a more accurate perception of the practices. Some organizations might not be aware that they are using the method in a pedagogical sense, nevertheless their self-devised method does correspond to an established costing system after taking a closer look in practice. In contrast, some organizations might claim that they are applying an entitled method, only in a rhetorical manner. Moreover, the features of different costing systems can be merged. For instance,

standards can also be set for activity-based costing in terms of the number of set-ups, the inspection time and so forth, then efficiency of actual performance can be compared against the standards. Hence, the idea of using 'standards' is not completely obsolete, depending on how it is modified to the changes in environment.

Secondly, a datable notion is the dichotomy of financial and non-financial information. As described in Chapter I, cost accounting is an economic calculation of resources consumed by a cost object during the course of manufacturing products or providing service. In other words, it cannot exist without operations and the whole purpose of its existence is to capture the operations in a visible way. It appears faulty to label 'monetary data' as financial information whereas 'operation data' as non-financial information. In actual fact, monetary data is costs incurred from operations and all operations represent resource input that have not yet been translated to costs. Therefore, non-financial and financial information shall be viewed as cause and effect of the same thing, rather than two unrelated ideas. A costing system that overlooks this relationship will sooner or later fail.

Thirdly, the distinction between external reporting and internal management (e.g. decision-making and control) shall be reconsidered. Managers shall be fully conscious of the purpose of a costing system upon adoption. A system for external purpose does not have to be in conflict with one for internal purpose, just like GPK. While it is true that external reporting impose requirements such as using of historical value, capitalizing or expensing certain costs etc., this does not necessarily obstruct the information need of decision-making. Since all information stems from the same operations, it just has to be constructed and arranged in an alternative way to conform to the underlying purpose. After all, both external reporting and internal management are in quest of economic reality, but at different level of details.

7.2 Influence of national culture

Even though the “double-entry” accounting system is used universally, one can agree that the cost accounting practices of the three countries discussed all bear special traits. Incidents in the history (described in the first section of Chapter III, V, and VI) have definitely made their appearance in the path of development, nevertheless, the members of the country, who are the respondents of these incidents as well as the innovators, adapters and the executors of cost accounting practices, play a far more determining role. Culture is acknowledged to have a major influence in shaping the values of its members. One definition of culture is “the integrated sum total of learned behavioral traits that are manifest and shared by member of a society” (Hoebel, A., 1960; cited in Ford, JB. & Honeycutt, ED., 1992), whilst national culture is believed to embody the highest level of cultural aggregation (Ford, JB. & Honeycutt, ED., 1992). In other words, every country has its own culture which permeates all dimensions of life including business activities. As a result, every country has its own approach to components of business organizations, and the practices of cost accounting is not exempted. The following three sections seek to explain the special traits of the costing practices/systems in Germany, Japan, and the U.S. respectively, in connection with potential cultural variables.

7.2.1 Germany

More than 70% of the references found (those published in *Strategic Finance* and *Management Accounting Quarterly*) for GPK owe to the Institute of Management Accountants’ work to bring this knowledge into the English-speaking management accounting realm because of the growing disappointment by U.S. managers in their cost information (Krumwiede, K. & Suessmair, A., 2007; Friedl, G., et al., 2009; Sharman, PA., 2003), and only one article written by two German professor Dr. was found on the other system Riebel’s generic direct costing. Language barrier might be one reason. Additionally, Germans rarely export their costing approach. Academic research in

Germany has been rather self-centered. “Germans usually do not participate in conferences and seminars”, mentioned by Andersson, PM. (2013).

Germans, or in retrospect, the Germanic people, are famous for their precision and prudence. Perhaps any foreigner who has got a German friend/colleague, learnt the German language, used a German design, or been to Germany would share the same view. Intriguingly, this phenomenon is consistent with Germany’s ranking by Hofstede’s taxonomy as a strong uncertainty avoidance country, meaning there is a strong propensity to escape from ambiguity (Hofstede, G., 2001). However, it is difficult to judge whether one has caused the other. For the scope of this paper, the two phenomena will be treated parallel. With a deep appreciation of Germany’s national character, Killian, G. (2013b) pointed out that

“The Germans are idealists. Things are *de facto* ideal, although one cannot find the ideas in the shelves to buy. That is why people spend many arguments for their search of the question of what is truthful and what is connecting the dots regarding the pursuit of truth.”¹

This seriousness to pursue idealism well explains the Germans preoccupation of precision and prudence, in addition to aversion of ambiguity. The mindset has innately penetrated into their cost accounting practices as revealed by the fundamental German cost management principle of “different costs for different purposes” dating back to the 1940s (Kilger, W., 1987, cited in Keys, DE. & Van Der Merwe, A., 1999) as well as the level of sophistication of German cost management systems.

A clear division is drawn between financial accounting and management accounting, i.e. external reporting does not overrule the information needs for internal use. The management accounting function is known in German as “controlling” (Krumwiede, K., 2008; Sharman, PA. & Vikas, K., 2004). Many German-speaking countries have

¹ “Best writers and philosophers according to the national character I find are Goethe, Schiller, Hegel, Schelling, Fichte, Novalis, Schopenhauer for the Germans. Please also listen to the composers such as Bach, Mozart, Schubert, Mendelssohn, Brahms, Bruckner, Wagner, Schoenberg, Webern etc.” (Killian, G.,2013b).

separate departments in charge of financial accounting and for “controlling” (Sharman, PA., 2003). German organizations and academics’ recognition of the importance of “controlling” to the success of performance lead to pursuit of advanced cost accounting approaches. The cost management systems are particularly designed in a way to effectively facilitate management decision making. To illustrate, the contribution margin accounting feature in GPK provides transparent information for operational, tactical, and strategic decisions; and Riebel’s generic direct costing aims to supply reliable and valid information to any managerial decision problem. Many non-Germans are overwhelmed by the tremendous amount of information required by German costing systems. A comment by a German controller who works at an organization which has thousands of cost centers gives a perfect response, “how can you not have this level of detail?” (Krumwiede, K. & Suessmair, A., 2007). In order to ensure the achievement of this level of detail, German organizations always have strong and integrated information systems, i.e. ERP. This supply of a wide array of data makes online, real-time cost control and analysis possible. Another supporting fact to this preoccupation in exactness and accuracy is a strong professional management accounting community in Germany (Sharman, PA., 2004). Moreover, the possibility to emphasize on “controlling” is reinforced by the external environment that German financial accounting is to serve creditors rather than investors, hence less demand is placed on regulatory reporting (Friedl, G. et al., 2009).

Another parallel influence is education, which also determines the characteristic of workforce on average. Young people in Germany undergo apprenticeship to become certified for specific jobs. The certificate is well appreciated with a sense of professional pride implanted. Accordingly, German workers are usually self-motivated and work diligently for the good of the group. There is little need to motivate them through deliberate organizational mechanisms, hence cost management systems do not have to incorporate this “motivating” element into design. Moreover, the majority of German managers come from technical academic background, for instance, more

than 60% of German manufacturers are managed by engineers with Ph. D. Their management skills are generally acquired on the shop floor. Hence, they are more involved with day-to-day operations and are more capable of grasping the importance of operation information to costing. That is why German costing systems make use of a greater deal of non-financial information.

7.2.2 Japan

The “Japanese post-war economic miracle” has stimulated a stream of researches by the West, especially the Americans, on Japanese management accounting as a source of competitive advantage (Shields, MD., et al., 1991; Mehri, D., 2006). One interesting observation is, most of the management practices originate from a single organization Toyota², and Japanese academics seem to be less active in this field.

A very unique context Japanese people have to live with is that Japan is a tiny island with virtually no natural resources (Mehri, D., 2006; Ito, Y.,1995). As a consequence, survival and no “muda” (meaning futility/waste/pointlessness) are essential attitude of this nation (Denshi Jisho, n.d.; Ford, JB. & Honeycutt, ED., 1992). The attitude in turn translates into Japan’s striving of innovation and high quality as well as a market driven philosophy since throwing something in the market which does not cater for the needs of customers would be a waste of resources. Moreover, because Japan is proud of its bloodline as a nation and there are relatively few immigrants to Japan, the cultural heritage remains better intact (Ford, JB. & Honeycutt, ED., 1992). Hence, insight of Japanese cost management practices cannot be gained without deep knowledge of its national culture.

Ford, JB. & Honeycutt, ED. (1992) compiled a decent summary of four fundamental elements of Japanese national culture: (1) process rather than end-result oriented; (2)

² Mehri, D. (2006) has written an insider story of the legendary Toyota Production System, “the darker side of lean”, which might be interesting to read.

community/collectivism is more important than individual; (3) emphasis on hierarchy and status, this is reflected in the wage structure as mentioned in Chapter V; (4) long-term commitment. These elements appear to be coherent with the makeover of target costing in Japan, which was initially used as a conventional engineering-determined cost approach in the U.S. It has turned into a holistic approach looking at a product from its birth to death; a process-focused concept of “building quality in” rather than “inspecting it in”(Sharman, PA. & Vikas, K., 2004); an integrating system bonding the collective effort of the whole value chain including customers, suppliers, and various functions within the organization; as well as a long-term mechanism balancing cost-quality-feature than pursuing cost reduction alone, and working hand in hand with the organization’s strategy, i.e. determining product mix in target costing. The hierarchy element strengthens this long-term mentality as promotion is based on seniority. As stated by Ohmae, K., “there is no fast track for brilliant performers. No one reaches a senior management post before the mid-fifties, and chief executives are typically over 60” (1982, cited in Ford, JB. & Honeycutt, ED., 1992). Employees’ loyalty and dedication to the organization is thus ensured, and the cost of chasing short-term interest is minimized. Thereby, cost management systems can be designed to really tie to the organization long-term success. *Kousuu* in lot costing is another example. The use of direct labor as the main overhead allocation base, i.e. *kousuu*, is still common in Japan despite knowing the inadequate relationship with the highly automate production environment (Wijewardena, H. & Zoysa, AD., 1999). This is an intentional policy to motivate employees to act in harmony with the organization’s long-term goals and think strategically than to achieve the most accurate product costs (Hutchinson, R. & Liao, K., 2009; Feil, P., 2004). In addition, lot costing serves to facilitate Japan’s flexible manufacturing system which recognizes the necessity of customized activities to offer a variety of products quickly so as to fulfill customer satisfaction. These activities usually incur indirect costs and lot costing’s dichotomy of value and non-value added components in conjunction with decomposition of resource elements clearly visualizes the consumption pattern of these activities.

The nature of education is also different in Japan, where accounting is not professionalized (Hutchinson, R. & Liao, K., 2009). Hiramatsu, K.'s (1992) survey revealed the accountants do not have an accounting major in 69.4% of organizations. Management accountants are known as "cost accountants", and are mostly educated and trained through extensive in-house programs especially in large organizations. These organization-specific programs comprises of a basic knowledge of cost accounting to all employees and more advanced coaching to the accounting staff (Wijewardena, H. & Zoysa, AD., 1999). This way of education is closely related to the lifetime employment system in Japan, which is again a result of Japanese genes. New recruits are rotated to different departments and work in each one for 2 or 3 years, hence it might take 10 years before commencement of their specialization. Moreover, accountants are rotated to other functions every 5 to 10 years (Hiramatsu, K.'s, 1992; Yoshikawa, T. et al., 1989). The compressive program promotes integral thinking and understanding of other functions within an organization (Feil, P. et al., 2004). Having everyone learnt basic cost accounting and a cross-functional experience further fortified their practical ability to collaborate in a horizontally integrated team for target costing.

7.2.3 U.S.

A greater amount of references were found for the U.S. chapter. The language, namely English, might be an advantage. Perhaps a more important reason is the Americans greater willingness to publish, as portrayed by Lawrence, FC. & Humphreys, EN. (1947, pp. 29, 35, cited in Fleischman, RK. et al., 2008):

"The Americans are much more inclined to put into writing the results of their labors than we are (referring to the British), and for every one book or other publication on Costing in this country there must be twenty or thirty or more in the United States."

U.S. was founded on the social-political ideals of individualism, as a matter of fact, American individualism was consolidated in American's Declaration of Independence

“we hold these truths to be self-evident that all men are created equal, that they are endowed by their creator with certain unalienable rights, that among these are life, liberty, and the pursuit of happiness” (The library of congress, 1777).”

The spirit of freedom and “American Dream” have become different today where selfishness and short-term gratification are celebrated instead (Jacobo, C., 2012; Andre, C. & Velasquez, M., 1992). Regardless of the true sense of the individualism, i.e. equal rights, it is regarded the number one cultural value of U.S.. Therewith, displaying oneself and making one's own voice heard outright, caring for one's own interest, being result-oriented, greater tolerance for flexibility and uncertainty, as well as having a short-term horizon seem a logic semblance of this superfluous glorification of individuality.

These traits are consistent with the dominance of U.S. literature as well as their actively going to other countries (e.g. Germany and Japan) to pick up practices for quick fix of the problems they encounter. The U.S. way is to make quick decision without real consensus or commitment (Schonberger, RJ., 1982). Even for the made in U.S. approach, according to Eden, Y. & Ronen, B. (2002), the enthusiasm for ABC was largely an outcome of managers' dissatisfaction with traditional costing system hence they rushed to adopting ABC to do something different before ABC's deficiencies appeared. This propensity to look for instance solution is analogous to the pervasiveness of fast food in the U.S. which symbols speed and efficiency. Secondly, despite a more accurate of cause-effect relationship of resource resumption provided by ABC, it centers on the mono activity of cost reduction just like standard costing. The costing systems are designed as a “carrot and stick” mechanism, with the objective to motivate efficiency improvement in a restricted manner and to yield immediate result. Without befitting the bigger picture, both practices are of limited value to the organization's strategy for “carrot and stick” might trigger manipulative behavior at the

expense of the organization's sustainable competitiveness. In addition, this lack of strategic emphasis, in other words, placing individual interest before the collective needs of the organization plus short-sightedness, in combination with U.S. organizations' heavy reliance on external financing, gives rise to the entrenchment of financial accounting and regulatory reporting in the business community, such as Sarbanes-Oxley Act of 2002 and the rule-based GAAP (Sharman, PA. & Vikas, K., 2004; Krumwiede, KR., 2005). Both standard costing and ABC are full absorption costing system which is required by GAAP where low-volume and special products are systematically subsidized by high-volume products. There are no separation of duty between financial and management accounting, and accountants are often overly engaged with external requirements thus many fail to understand the merit of management accounting. Furthermore, U.S. organizations on average are reluctant to invest in more advanced systems to improve cost management capability. A clear quantification of the expected benefits is often demanded for any potential investment, which manifests the result-oriented mindset. However, since the benefits are difficult to measure prior to the implementation, the costing systems are rarely changed and traditional standard costing is still the prevailing system in use (Krumwiede, K. & Suessmair, A., 2007; Van Der Merwe, A., 2004; Sharman, PA., 2003).

With respect to education, in the U.S., there is usually no customs of apprenticeship like Germany or a comprehensive training and rotation program like Japan, most of the accountants are holders of accounting academic qualification (Portz, K. & Lere, JC., 2010). Hence, the workforce lacks specified in-the-house training and an interdisciplinary perspective. Again, the more frequent change of jobs by employees in the U.S., a product of the individualism, appears to be an important explanatory factor of employers' unwillingness to invest in comprehensive training programs. As a consequence, costing systems have to be designed more towards driving employees to work hard, i.e. variances in standard costing, and responsibility is kept within departmental boundaries with less horizontal coordination at various stages.

7.2.4 Discussion

It is interesting to observe that cost accounting practices, as reflected in the characteristics of local costing systems, are a derivative of national culture. One might feel costing systems are simply technical instruments, nevertheless, they come from ideas of people, they are practiced by people, and both out of a context contingent on people. The context is ever-changing, hence people react to adapt to different needs that arise in the environment.

Upon acknowledgement of this, it is not surprising that costing systems become outdated and new costing systems are developed for replacement. The validity of a costing system for a particular period of time is always based on the cost-benefit in a particular context. Hence, more efforts should be directed towards what is to be done in the new context rather than attacking old costing systems which could be perfectly reasonable in the old context. Similarly, ideas shall always be adjusted to suit specific needs, thus blanket adoption of theoretical approach shall be warned against and organizations shall know their needs fully and take useful pieces from the theories (maybe also from multiple approaches) to build their own systems.

Furthermore, people react to changes in different ways depending on their values. Referring back to the quotation on human's learning pattern in the very beginning "human beings learn through three ways – imitation, variation, and innovation." Imitation can be interpreted as complete agreement while innovation can only emerge out of strong disagreement, and variation lies in between. One should still be reminded that innovation builds on what it disagrees for this is a reference point of what it wishes to achieve. Therefore, the more divergent people's values are, the more the reaction will move towards the "innovation" end on the learning spectrum; alternatively, uniformity in values will more likely to lead to an "imitation". For instance, Japanese costing systems embed a more holistic perspective enabled by a collective

and process-oriented mindset; German costing systems are in minute detail and serves purposes of various levels due to their seriousness to pursue idealism; while owing to gratification of individuality, American costing systems are employed as an end in and of itself without integrated into the organization's long-term strategic activity.

This observation of national culture's influence can be extrapolated to business practices in general for business studies belong to social sciences. Contrary to natural science where causal explanation and functional explanation hold water, a scientific approach of analyzing business practices is superficial seeing that the elementary explanation for social sciences should be human intentionality. Management is not an absolute science, but a practicing art (Ghoshal, S., 2005). Therefore, as much as people would like to draw lines and have neat management theories directing practices, it cannot be done when dealing with realities. There is no panacea for problems in all context. Just like different types of soil are home to different plants, different management practices, including cost accounting practices, are gestated in the soil of different cultures. While a plant might flourish in the right soil, it might well wither in the wrong one.

Chapter VIII Conclusion

8.1 Reflection

Cost accounting practices can be dated back as long as commercial activities existed for there is a natural need to account for resources used and evaluate profitability. This need evolves from a vague idea to a single branch of knowledge over the course of time. Scholars and practitioners from business and other disciplines e.g. engineering, continue to contribute to the expansion and refinement of this knowledge. The development of cost accounting practices is being written everyday by businesses all over the world. This paper has attempted to examine the development of cost accounting in three developed countries – Germany, Japan, and the U.S. through research into two prominent costing systems for each country. The six chosen costing systems are *Grenzplankostenrechnung* (GPK) and *Relative Einzelkosten-und Deckungsbeitragsrechnung*/Riebel's generic direct costing for Germany; *Mehrstufige sortenkalkulation*/lot costing and *Genka kikaku*/target costing for Japan; standard costing and activity-based costing (ABC) for the U.S.. Four aspects have been studied for each country: (1) an overall background of cost accounting practices before the systems of this paper's interest came into existence; (2&3) the emergence of the chosen costing systems from the background and what their final forms are from a theoretical aspect; (4) how they are employed in their home countries from an empirical aspect.

From the research findings, the characteristics of the six systems are summarized with reference to three frameworks described earlier in the paper. Several comments on costing accounting practices in general are discussed. Firstly, even though using a terminology is convenient, one shall always study thoroughly the essential characteristics of a costing system and not the terminology alone for real understanding of cost accounting practices. Secondly, one should keep a process-

orientated view about costing systems. Although costing accounting is to classify, record, allocate, summarize and report costs, costs are result of operations, i.e. the process, hence costs are only meaningful when they faithfully capture the underlying operation. That is to say, the dichotomy of financial and non-financial information is not entirely sound, rather, they are different sides of the same reality. Lastly, one shall bear in mind that costing systems can always be adjusted to accommodate different purposes because the information is produced by the same operations, thus the need for external reporting does not have to be complied at the expense of internal management.

In addition, it is observed that cost accounting practices are in essence offshoot of national culture. The practices are developed out of a human context, that is, they are created by people to respond to the needs arisen in the ever-changing environment. Amidst the tides of change, a certain practice becomes obsolete and a new practice comes about. As a result of the degree of differences in people's values, a practice may be an imitation, a variation, or an innovation when compared with another practice. Since culture is accepted as a major determinant in shaping the values of its members and national culture represents the highest level of cultural aggregation, it is expected that cost accounting practices will manifest different traits in countries that differ in their constitution. This phenomena is also applicable to general business practices which is a branch of human intentionality-based social science as opposed to law-based natural science.

A final remark of what is learnt from writing this paper is that cost accounting, or equally management, is an art practiced by people in context. An organization is a social organism, therefore its components and parts shall not be implanted in isolation with others. The proper approach is to start with a macro perspective to know the context and see whether the desired components would fit in the big picture, rather than start with a micro perspective to just take in individual components for their own

value which might result in dyssynergy for the whole organism.

8.2 Suggestions for future research

As mentioned in Chapter II, an alternative way to carry out a study on costing accounting practices is direct method e.g. through customized interviews and surveys. Given that cost accounting is not subject to the same public exposure as financial accounting, and there is a rich variety of practices by businesses other than those already published costing systems especially by scholars, hence one could employ such method to study organizations of interest to bring more private information to light.

Secondly, an encyclopedia of all established cost accounting systems originated and practiced in more countries including less-developed countries would be a constructive work to do, where incidents in their history and national culture's contribution to specific practices can be explored.

Another potential interest is a cross-disciplinary comparison of the cost accounting/management practices in a chosen country with other aspects in life such as architecture, food, literature and so forth, with the objective to further investigate whether national culture will have the same influence on different kinds of practice.

Last but not least, the increasing awareness of corporate social and environmental responsibility is drawing attention to extended systems of accounting where externalities are to be formally accounted for as costs, therefore new costing systems to accommodate such need could be a pioneering research topic.

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Appendix

Appendix 1

German cost accounting criteria by company (Source: Krumwiede, KP., 2005)

Table 1: German Cost Accounting Criteria by Company

GPIC CRITERIA	TYPICAL U.S. FIRM	BEIERSDORF AG	CIBA SPECIALTY CHEMICALS	DAMMLER CHRYSLER AG	DEUTSCHE TELEROM	HEIDELBERG-CEMENT AG	HEIDELBERGER DRUCKMASCHINEN	IMAGNA STEYR	POPSCHKE AG	RASSELSTEIN GmbH	SCHERING AG	STIHL AG & CO.
At least one output measure per resource cost center	No, often one per department	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Separate fixed and proportional costs in relation to output measure by cost center	No, fixed and proportional costs generally are not separated	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No, all fixed-only materials are proportional	Yes
Identification and isolation of the cost of idle capacity (an optional GPIC criteria)	No	Yes, idle capacity is isolated and addressed via variance analysis (fixed cost variance)	Yes, detailed by various subcategories of production resources	Yes	Yes	No	Yes	N/A	No	Yes	Yes	No
Costs from support cost centers are added to primary cost centers while maintaining distinction between fixed/proportional costs	No, but support cost centers often are allocated to operating departments	Yes	Yes, except there is no distinction between fixed/proportional costs	Yes	Unclear, but most support center costs are proportional	Yes	Yes	Yes	Yes	Yes	Yes, except no distinction between fixed/proportional costs	Yes
Use standard price system	Used often	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Many cost centers and a network of cost assignments	No, typically use one to the over-head cost pools	Yes (12)	Yes (thousands)	Yes (2,000-2,500)	Yes (20,000)	Yes (110-130)	Yes (2,000)	Yes	Yes (450)	Yes (400)	Yes (3,500)	Yes (€50)
Variances reported by cost center (an optional GPIC criterion)	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Estimate consumption (total demand) for each cost center	No	Yes, requires standard cost estimations—consumptions by cost center	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GPIC implementation?	No	Simplified	No	Full	Full	No	Full	Full	Full	Full	Simplified	Full
Product	N/A	Skin care products	Specialty chemicals	Cars	Telephone network	Cement	Printing machines	Cars	Cars	Template	Pharmaceuticals	Chain saws
Process	N/A	Continuous	Batch and continuous	Batch	Continuous	Continuous	Job	Batch	Batch	Batch	Continuous	Batch
Product complexity	N/A	Lower	From low to high	High	High	Lower	High	High	High	High	Lower	High
SAP system	Used often	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix 2

Scope of adoption of target costing systems by industry (Source: Tani, T., 1994)

	Used corporate wide	Used in some divisions or departments	Used in some projects	Not used	Total
Food	0 (0.0%)	1 (14.3%)	1 (14.3%)	5 (71.4%)	7
Textiles/apparel	0 (0.0%)	3 (50.0%)	1 (16.7%)	2 (33.3%)	6
Paper and pulp	0 (0.0%)	0 (0.0%)	0 (0.0%)	5 (100.0%)	5
Chemicals	2 (6.3%)	4 (12.5%)	4 (12.5%)	22 (68.7%)	32
Oil, rubber, glass, clay	3 (27.3%)	1 (9.1%)	0 (0.0%)	7 (63.6%)	11
Steel	2 (15.4%)	1 (7.7%)	0 (0.0%)	10 (76.9%)	13
Non-ferrous/fabricated metal	2 (13.3%)	4 (26.7%)	2 (13.3%)	7 (46.7%)	15
Machinery	16 (55.2%)	7 (24.1%)	1 (3.5%)	5 (17.2%)	29
Electrical/electronics	16 (61.5%)	3 (11.5%)	4 (15.4%)	3 (11.5%)	26
Transportation equipment	17 (65.4%)	5 (19.2%)	4 (15.4%)	0 (0.0%)	26
Precision equipment	1 (25.0%)	2 (50.0%)	0 (0.0%)	1 (25.0%)	4
Other manufacturing	0 (0.0%)	2 (33.3%)	0 (0.0%)	4 (66.7%)	6
Total	59 (32.8%)	33 (18.3)	17 (9.4%)	71 (39.4%)	180

Appendix 3

Departments playing the major role in adopting target costing system (Source: Tani, T., 1994)

Accounting	16 (17.6%)
Marketing	5 (5.5%)
Purchasing	5 (5.5%)
Product planning	16 (17.6%)
Development	11 (12.1%)
Design	20 (22.0%)
Production technology	13 (14.3%)
Manufacturing	4 (4.4%)
Instruction from purchaser	1 (1.1%)
Total	91 (100.0%)

Appendix 4

Shifting objectives of target costing system (Source: Tani, T., 1994)

	When installed			At present		
	Average	S.D.	Cases	Average	S.D.	Cases
Cost reduction	6.1942	1.3652	103	6.5577	0.8904	104
Satisfying customers' needs	4.1515	1.7342	99	5.6863	1.5857	102
Quality	4.7200	1.6762	100	5.8416	1.2863	101
Timely introduction of new products	3.817	1.9446	101	5.2222	1.783	100