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International Conference on Accounting Studies (ICAS) 2017
18-20 September 2017, Putrajaya, Malaysia

Value Added Intellectual Coefficient (VAIC): Revisiting the Basic of the Model

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Abstract

The Value Added Intellectual Coefficient (VAIC) model has been widely used as an IC measurement tool as found in the literature. However, it is subject to critical review recently. This study attempts to examine the basic aspect of the VAIC model. This is achieved by a detail examination of the formula and assumption used in measuring the sub-elements of the model, i.e. value added, human capital, structural capital and tangible capital. The study found that the measurement of value added and human capital are justifiable. However, the measurement of structural capital and tangible capital are questionable. This study may contribute in the discussion of the validity of VAIC model as an IC measurement tool.

Keywords: Intellectual capital measurement, VAIC model

1. INTRODUCTION

Intellectual capital (IC) is considered as a crucial resource in the knowledge based economy. Therefore, the management are very keen to measure IC so that they can manage this resource effectively. One of the IC measurement model found in the literature is the Value Added Intellectual Coefficient (VAIC) model developed by Ante Pulic (1998). The VAIC model measures the efficiency of IC resources: namely human capital and structural capital, and tangible capital. The VAIC model has received increasing attention in recent years because of the ease and ready availability of data acquisition from the financial statements and the ease of calculation (Firer & Williams, 2003). Besides, it makes possible the comparison of IC across firms using the standardized method.

Despite the advantages and popularity of the VAIC model, it has been subject to critical review recently. The VAIC model is claimed to have mistaken the concept of IC, especially the concept of structural capital (Iazzolino & Laise, 2013; Stahle, Stahle, & Aho, 2011). Besides, the inconsistency of the results found from most empirical studies indicate that the VAIC model might not measure IC efficiency consistently (Stahle, et al., 2011).

The objective of this paper is to examine the basic aspect of the VAIC model. This is achieved through a detail examination of the formula and assumption used in the measurement of the sub-elements in the VAIC model. It is expected that a better understanding of the mechanics and interpretation of the model can be achieved from this study. Besides, this study is carried out to accept a call for more critical research in IC studies since previous empirical studies which used the VAIC model are lacking in evaluating the model critically (Dumay & Garanina,

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2013). The paper will be organized as follows: Section 2 discussed about the basic of the VAIC model. Section 3 discussed the critical review of the sub-elements of the VAIC model. Section 4 presented conclusion of the study.

2. THE BASIC OF THE VAIC MODEL

The VAIC model is developed on the basis of determining the value creation ability of a firm from intellectual ability and tangible resources. The VAIC model uses standardized data from financial statements to infer the value of IC indirectly (Williams, 2001). The VAIC model addresses two problems: lack of a direct measure and lack of a basis for comparison.

The VAIC model measures the IC value indirectly by calculating aggregate IC efficiency (VAIC) via three elements: human capital efficiency (VAHU), structural capital efficiency (VAST), and tangible capital efficiency (VATA). The elements represent indexes of the efficiency in utilizing human capital, structural capital and tangible capital in the value creation process. The higher the VAIC value, the better the utilization of the IC resources (Pulic, 1998, 2000). VAIC is formulated as follows:

Aggregate IC efficiency (VAIC) = Human capital efficiency (VAHU) + Structural capital efficiency (VAST) + Tangible capital efficiency (VATA) (1)

The paragraphs below explain the steps to calculating each element of VAIC.

In the VAIC model, all three elements, VAHU, VAST and VATA, depend on the amount of value added. Value added is defined as firms' economic value creation resulting from the utilization of resources in business activity (Pulic, 1998). It represents the result from the sale of output after deducting the operating costs involved in the production of that output, except for employee cost. According to Pulic, employee cost is not treated as part of operating cost involved in producing output, but rather as an investment in human capital resource (Pulic, 1998, 2000). Therefore, employee cost is added back to operating expense. The following formula is used to calculate value added:

Value added = Output – Input
= Revenue – (Cost of goods sold + Operating expense – Employee cost) (2)

VAHU is an index that measures the value added created by every dollar spent on employees. It is an indicator of the contribution made by human capital in creating value for the firm. VAHU is calculated as:

VAHU = Value added / Human capital (3)
where:
Human capital = Employee cost (3a)

VAST is an index that measures the value created by employing the structural capital in a firm. In this model, structural capital is the remainder left after deducting human capital from value added (Pulic, 2000). This is based on the assumption that human capital and structural capital are inversely related with respect to value creation. VAST is calculated as follows:

VAST = Structural capital / Value added (4)
where:
Structural capital = Value added - Human capital (4a)

VATA is an index that measures the value added created by the use of one unit of tangible capital. The role of tangible capital in creating value should not be ignored when measuring the overall IC efficiency since some IC is embedded in tangible capital (Lev, 2001). VATA is calculated as follows:

VATA = Value added / Tangible capital (5)
where:
Tangible capital = Total assets (5a)

3. CRITICAL REVIEW OF THE SUB-ELEMENTS OF THE VAIC MODEL

In this section, the basic of the VAIC model is discussed critically by focusing on the formula used to calculate the elements of VAHU, VAST and VATA in the VAIC model. This is achieved by reviewing the measurement of the sub-elements, i.e. value added, human capital, structural capital and tangible Capital.

3.1 Value added

According to Pulic (2000), value added (VA) is defined as value creation from business activity which resulted from the sale of output and after deducting all cost involved in the production of output. By referring to Equation (2) above, it shows that the employee cost has been excluded from the VA on the basis that employee cost is a capital and not part of operating expense (Pulic, 2000). Therefore, employee cost is added back to the operating expense because operating expense usually has already included employee cost. Thus, VA is actually similar to Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA), and before Employee Cost (EBITDA+E) from the accounting perspective.

Pulic's justification treated employee cost as a capital resource. This is contradicting to the accounting concept which does not allow capitalization of employee cost, as stated in Statement of Financial Accounting Standards 142 and International Accounting Standards 38 (Financial Accounting Standards Board [FASB], 2001; International Accounting Standards Board [IASB], 2001). However, none of the mechanics in the VAIC model shows that employee cost has been treated as such (Iazzolino & Laise, 2013). Another possible justification for the exclusion of the employee cost from the VA calculation is to avoid the dependency of VA and HU in the VAHU formula, as shown in Equation (3) above. If VA does not exclude HU in its formula, then numerator (i.e. VA) is always dependent on the denominator (i.e. Employee cost).

Despite the treatment of employee cost in the formula, the VA formulation does reflect the value creation of a company and it is used consistently as a deflator in the VAIC formula.

3.2 Human Capital

Human capital (HU) is one of the key resources recognized in a knowledge-based firm. It is undeniable that the implicit knowledge which resides within employees contributes to the value creation of a firm (Edvinsson & Malone, 1997). Therefore, the cost incurred in return for employees' knowledge is considered as a suitable proxy for the cost of human capital (Pulic, 2000). Therefore, HU is measured from the amount spent on employees such as salary and wages, compensation, remuneration, pensions and other benefits paid to employees, as shown in Equation (3a) above.

In the financial statement, data on employee cost can be retrieved from the Statement of Comprehensive Income. However, not all companies disclosed details information about the employee cost. Some companies shown employee cost as part of operating cost, and not as a separate item. This may limit the availability of the data and impede the measurement of human capital.

3.3 Structural Capital

In IC literature, structural capital (ST) is another key IC resource that contributes to creation of VA besides HU. ST refers to the explicit knowledge that resides in the manual, process, system, or database within the firm (Bontis, 2001; Edvinsson & Malone, 1997). For example, knowledge management system, secret formula or recipe, new discovery or innovation of product or process, database of customers, and best management practices guideline. Therefore, ST is one of the IC resources that can be utilized to create VA.

In the VAIC model, ST is not directly derived from the cost to develop, maintain and use of the explicit knowledge. In reality, it is difficult to identify such cost specifically. Therefore, Pulic (2000) proposed an indirect measurement of ST by looking at the association between HU and ST. The author claimed that, based on 'previous empirical evidence', it is verified that there is an inverse relationship between HU and ST for a given VA (Pulic, 2000). Unfortunately, no citation was given by the author. Based on this intuition, the author expressed ST as the difference between VA and HU, as shown in mathematical equation (4a) above.

The formulation of ST as expressed in Equation (4a) is problematic in some aspects. One of the problems is the dependency of ST on VA and HU. ST will always depend on the value of VA and HU. This will create problem

in formulating and interpreting the VAST ratio. Another problem is the mechanical interpretation of ST. The results of the expanding Equation (4a) by substituting Equation (2) into (4a) will give the following:

$$\begin{aligned} ST &= VA - HU && (4a) \\ &= [\text{Revenue} - (\text{COGS} + \text{Operating expense} - \text{Employee cost})] - \text{Employee cost} \\ &= \text{Revenue} - (\text{COGS} + \text{Operating expense}) && (6) \end{aligned}$$

This shows that ST is equivalent to Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA). From financial reporting view, ST does not represent the cost of an IC resource, but merely an operating profit expression. This is opposing the concept of ST in IC literature which conceptualizes ST as an IC resource as proposed by Edvinsson and Malone (1997).

As an alternative, it is proposed to measure ST directly. The cost incurred to develop, maintain and use the explicit knowledge can be a suitable proxy for the cost of ST. For example, R&D expense, advertising expense, software development cost, cost to develop intellectual property, etc. The data on these types of cost may (or may not) be available as a separate line item in the Statement of Comprehensive Income.

Another problem is the interpretation of a negative ST value. ST value will be negative when VA is smaller than HU (i.e. VA<HU). Negative ST does not mean a negative cost of ST, but it indicates the inability of a firm to pay for HU cost from the VA generated and thus reflects a loss operating firm. This problem can be exaggerated when a negative ST is divided by a negative VA and thus produce a positive VAST ratio (i.e. VAST = $\frac{-ve\ ST}{-ve\ VA} > 0$). This positive VAST ratio should not be interpreted the same way as the positive VAST that may resulted from positive ST and VA (i.e. VAST = $\frac{+ve\ ST}{+ve\ VA} > 0$). This will lead to a misinterpretation of the structural capital efficiency. To avoid the confusion, it is proposed that only VA>0 will be considered for data analysis in any empirical studies related to the VAIC model.

3.4 Tangible Capital (TA)

It is argued that some elements of IC are embedded in the physical and tangible capital (Lev, 2001). For example, the knowledge management system implanted in a desktop computer in the office, or an automated manufacturing system embedded in a machine at the factory. Therefore, the contribution of the IC element from these tangible capitals should not be ignored in adding the value to firms. Therefore, total assets are included in the formula as proxy for IC component in the tangible capital, as shown in Equation (5a).

However, it is argued that not all tangible capital has IC elements. Most tangible capital served it services in assisting the normal business activity. It is not fair to include the total cost of tangible capital as part of IC. Unless the firms can separate the cost of IC elements from the overall cost of tangible capital, this separate component of TA can be included as part of IC element. It is suggested that the cost of intangible asset reported in the Statement of Financial Position could be a better proxy for this component, such as the cost of patent, trademark, copyright, license, trade secret, etc.

4. CONCLUSION

This paper attempts to examine the basic aspects of the VAIC model through a detail insight of the formula and assumption used in measuring the sub-elements of value added, human capital, structural capital and tangible capital. It is found that the measurement of value added and human capital sub-element are justifiable using this model. However, the measurement for structural capital and tangible capital sub-elements are debatable and controversial. This will lead to difficulty in making meaningful interpretation about the relation between human capital efficiency (VAHU), structural capital efficiency (VAST), tangible capital efficiency (VATA), and finally the aggregate IC efficiency (VAIC). It is proposed in this study that the measurement of ST and TA can be improved by replacing it with more appropriate proxies so that it is parallel with the theory in IC literature. This study may contribute to the discussion of validating the results of previous studies which had used the VAIC model in measuring IC. However, this paper is limited to merely theoretical discussion. A further empirical study using the suggested proxies for structural capital and tangible capital shall be carried out to support the view in this study.

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