7. Description and Operationalization of Variables

7.1. Dependent Variables:

Measures of organizational performance have been taken as dependent variables for regression equation. In accordance with the existing research studies on VAIC™, three measures of firm performance have been considered to facilitate cross-sectional as well as longitudinal study. These are:-

1. **Return on Assets (ROA)** (Chang and Hsieh, 2011; Clarke et al., 2011; Firer and Williams, 2003; Gan and Saleh, 2008; Ghosh and Mondal, 2009; Junior et al., 2010; Kamath, 2008; Mehralian et al., 2012; Morariu, 2014; Pal and Soriya, 2012; Phusavat et al., 2011; Shiu, 2006)

2. **Return on Equity (ROE)** (Chang and Hsieh, 2011; Chen et al., 2005; Clarke et al., 2011; Gruian, 2011; Maditinos et al., 2011; Pal and Soriya, 2012; Phusavat, et al., 2011; Tan et al., 2007)

3. **Return on Sales (ROS)** (Hoskisson et al., 1993; Palich et al., 2000; Tallman and Li, 1996).

The three dependent variables have been estimated as:-

i. **ROA** – Net Income divided by Average Total Assets  
   
   (15)

ii. **ROE** – Net Income divided by Average Equity of Shareholders  
   
   (16)

iii. **ROS** – Calculated as EBITDA divided by Net Sales  
   
   (17)

Here, EBITDA is the operating profit and is an acronym for Earnings before Interest, Taxes, Depreciation and Amortization. To compute ROA, the predominant practice is to use Total Assets (TA) as the denominator. However, since the net income is a flow measure and TA is a static quantity, use of average total asset is preferable and is consistent with the matching principle of Accounting (Jewell and Mankin, 2011).
7.2. **Independent Variables:-**

Following measures of Intellectual and Physical Capital are the independent variables:

1. For VAICT™
   i. HCE
   ii. SCE
   iii. CEE

2. For E-VAIC
   i. HCEVA
   ii. SCEVA
   iii. RCEVA
   iv. CEEVA

7.3. **Control Variables:-**

Most of the past studies interlinking IC and firm performance have controlled for firm size, leverage and industry (Abidin et al., 2009; Clarke, et al., 2011; Firer and Stainbank, 2003; Zéghal and Maaloul, 2010;). However, in this study no control variables are being used for following reasons:-

1. This dissertation work has been conducted separately on three industries. Hence, the issues related with inter-sectoral differences do not arise.

2. The firms selected herein are of comparable size. For example, in IT sector, only large Software firms have been selected as sample. This takes care of scale-related concerns.

3. All the variables used in the regression equations are in the form of ratios. This further reduces the need for incorporating control variables in the model.

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7.4. Making the Variables Operational:

For empirical investigation of the hypotheses, regression equation has been applied on the proposed model (E-VAIC) as well as the VAIC™ model. The equations used for testing the hypotheses H1a, H1b and H1c are:

\[
\text{Performance (ROA; ROE; ROS)} = \alpha_i + \beta_i (\text{Intellectual Capital Efficiency}) + \varepsilon_i \\
(i = 1, 2, 3)
\]

Where, ‘i’ stands for performance parameter

The second set of hypotheses (H2a, H2b and H2c) study the effect of Physical capital efficiency of performance of firms. Therefore, the resulting regression equations are:

\[
\text{Performance (ROA; ROE; ROS)} = \alpha_i + \beta_i (\text{Physical Capital Efficiency}) + \varepsilon_i \\
(i = 1, 2, 3)
\]

For measuring the impact of efficiencies of components of Intellectual Capital on the performance of firms in India, the E-VAIC model has been used. Corresponding regression equations for hypotheses H3, H4 and H5 shall be:

\[
\text{Performance (ROA; ROE; ROS)} = \alpha_i + \beta_i (\text{HCEVA}) + \varepsilon_i \\
(i = 1, 2, 3)
\]

The regression equations used for the hypotheses H6 through H8 are:

\[
\text{Performance (ROA; ROE; ROS)} = \alpha_i + \beta_i (\text{SCEVA}) + \varepsilon_i \\
(i = 1, 2, 3)
\]

In order to address the hypotheses H9, H10 and H11, these equations have been applied:

\[
\text{Performance (ROA; ROE; ROS)} = \alpha_i + \beta_i (\text{RCEVA}) + \varepsilon_i \\
(i = 1, 2, 3)
\]
To address the research hypotheses H12a, H12b and H12c, a comparative analysis between the proposed model (E-VAIC) and VAICTM has been done. The resultant regression equation is:

\[
\text{Performance (ROA; ROE; ROS)} = \alpha_{(i,j)} + \beta_{(i)} (E-VAIC) + \beta_{(j)} (VAICTM) + \varepsilon_{(i,j)} \quad (23)
\]

\[
(i = 1, 2, 3; j = 1, 2, 3)
\]

Where, ‘i’ stands for E-VAIC; ‘j’ stands for VAICTM

Generally speaking,  
\[
\alpha = \text{Intercept or constant term}
\]
\[
\beta = \text{Regression coefficient of the independent variables}
\]
\[
\varepsilon = \text{Residual or error term}
\]