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Intellectual Capital in Action: Unleashing Sustainable Growth in Non-Financial Companies of Pakistan

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Abstract: In contemporary competitive markets, firms must have sustainable profits and potential for long-term growth. This research focuses on how intellectual capital efficiency can assist in attaining sustainable growth rate of firms. The research develops a theoretical model that connects components of intellectual capital such as Human, Structural, Relational, Process, and employed capital for corporate sustainable growth in Pakistan's non-financial firms. Six years data of non-financial firms of KSE-100 from the period 2015 to 2020 was collected. Fixed effects panel data regression was used for the testing. The findings of regression output showed strong evidence that two of the intellectual capital components, the Human capital, and Process capital along with basic capital employed measures significantly resulting in the ability to grow sustainably of corporations. However, the results suggested that relational capital is having a weak link with corporate sustainable growth which highlights the doubt that whether Pakistani firms are contributing sufficiently toward the customer, supplier relationships, and marketing. Structural capital is also having a very weak connection with sustainable growth rate. The study conducted adds to the existing literature on intellectual capital and corporate sustainable growth by utilizing more components of IC in the context of Pakistan, a developing economy. Keywords: Intellectual capital efficiency, Corporate sustainable growth, non-financial firms, Human capital, Process capital

1. Introduction

The creation of knowledge is the outcome of increased investment and prominence in science, research, technology, and innovation, as well as the use of computers and the internet to develop, share, and apply knowledge in an increasingly competitive world (Si et al., 2020). Pakistan's innovation and intellectual capital usage abilities are lacking in comparison to other emerging countries, necessitating Pakistani businesses to constantly access the capability of intellectual capital by innovating products, processes, and

management systems. (Fan & Hossain, 2018)Comparing Pakistan's ability to innovate and utilize intellectual capital with its neighbors indicates varied degrees of development. In terms of global innovation indexes, India, Pakistan's closest neighbor, scores higher and has a booming IT sector. Another massive neighbor, China, has made significant investments in R&D, emerging as a global leader in a number of technological fields. Moreover, another neighboring country Iran has made major strides in science and technology (Asiaei, Barani, Bontis, & Arabahmadi, 2020). Despite not being a close neighbor, Bangladesh has made progress in industries like textiles and agriculture (Dhar, Mutalib, & Subhani, 2019).

The way of accomplishing long-term growth determines a company's dynamic trend of development, which not only represents the company's survival and development capacity but also influences its future financial performance. Therefore, in contemporary competitive markets, it is required of firms to have sustainable profits and potential long-term growth (Xu & Wang, 2018). Therefore, to maintain sustainable growth firms should not only focus on the capital employed but also on intellectual capital which is quickly becoming the new norm of dynamic capability. The balance sheet of a company may be used to evaluate all a firm's physical assets.[i]

Rashid et al. (2018) found IC is critical for companies since their human capital (workers) is well-versed with the company, its procedures, their jobs, and the many internal and external circumstances in which the business finds itself. Present knowledge serves as a foundation for future information and capturing and sharing existing workers' knowledge with new hires is a cumulative process for growing the IC base. The assessment of corporate sustainable boom no longer only reflects the historic overall performance of establishments but additionally are expecting the income enlargement of firms within the future. If businesses want to own an efficient performance of sustainable boom, they need to make use of intangible sources (intellectual capital) to hold aggressive gain, and alter the funding in intellectual capital with dynamic adjustments of the internal and external running surroundings (Si et al., 2020).

The past literature has provided some effective models for measuring intellectual capital. For example, (Pulic) has proposed a model in 1998

referred to as the value-added intellectual-coefficient model denoted as (VAIC). It comprises two elements known as capital employed efficiency (CEE) and intellectual capital efficiency (ICE). The efficiency of potential resources of the company concerning value creation is determined by the VAIC framework (Khalique et al., 2019). This framework applies a definite process for the computation of the required coefficients and has commonly been seen in the past literature. However, this model has always been criticised by the previous scholars, for example, the greatest criticism reported for the VAIC model is that the model does not focus on the role served by external relational capital in value creation for the companies (Poh et al., 2018; RASHID et al., 2020)

Ulum and Syam (2017) have modified this model to overcome the issues in their existing model. This framework involves relational capital as a vital tool in creating value for companies (Tarigan et al., 2019). Structural capital in this model is also focused as an individual part of intellectual capital that does not base on human capital (Sharma et al., 2017). Hence, this modified model overcame the deficiencies of the previous VAIC model emphasizing the components that were avoided by the past model. With every passing day, upgrades in technology are forcing firms to work harder towards gaining or continuing to achieve a competitive advantage. It has now become insufficient for an enterprise to assess its performance based on only short-term financial measures. It is inevitable now to be able to evaluate a firm's long-term development potential and operational prospects.

Only constant innovation is a way for a company to maintain its exuberance and competitive advantage. Without this innovation factor, an enterprise puts itself at risk of becoming obsolete. Therefore, this sustainable growth or value-creating continuity can be achieved through investments in intangible resources known as intellectual capital to meet effective alterations in internal and external operational conditions.

This study is hoped to assist in identifying if a notable relationship between the efficiency of IC of a firm and its sustainable growth within the non-financial companies exists or not. In developing countries like Pakistan, corporate growth management is a major challenge for a firm's management in today's competitive business environment. The goal of this

study is to determine the empirical link between intellectual capital efficiency and corporate sustainable growth in Pakistani enterprises to examine the impact of human capital, relational capital, structural capital, and process capital on corporate sustainable growth rates.

Chief research questions of the study devised are given below.

- Is there a significant link between M-VAIC and CSG?
- Is there a significant link between the human capital, structural capital, Relational capital, Process capital, and CSG?

2. Theoretical Background

The concept of intellectual capital has developed from the strategic management perspectives such as the resource-based view, which is related to internal resources, and the knowledge-based view which focuses on knowledge (Ulum & Syam, 2017). Before the origin of the resource-based view, it was considered by the professionals that a company can achieve its competitive advantage by bringing changes as per the dynamic changes in the environment within which the organizations are operating respectively (Emadzadeh et al., 2013). This view was previously referred to as the industrial-organizational view. In contrast, the resource-based view is a modern view that is focused on the internal resources being scarce, inimitable, and rare (Xu & Wang, 2018). The notion of the resource-based view was that a company can achieve its competitive advantage over others if its internal resources are managed effectively. Tarigan et al. (2019) noted that the resource-based view does not associate with the establishment of human resources in order to create a competitive margin. Mohammadi et al. (2014) added that this is more rigid since this is more necessary in changes related to the environment. Furthermore, a resource-based view could not extensively focus on intellectual capital and knowledge, instead, it considers it as a generic type of source (Sharma et al., 2017).

To deal with the shortcomings of the resource-based view, another key concept is developed that is referred to as the knowledge-based view which sees knowledge as a key resource for creating a competitive advantage. Poh et al. (2018) mentioned that the knowledge-based view suggests that the right management of knowledge builds intellectual capital that is significant for the company. In relation to it, this is noted that a company can create a

competitive advantage when its knowledge and intellectual capital are managed effectively. Since every organization competes to maximize its revenues by using its resources in an appropriate manner. The resource-based view suggests that the companies view their resources on the basis of tangible and intangible assets in order to gain a competitive advantage. Provided with the scarcity related to tangible resources, RASHID et al. (2020) stated that achieving competitive advantage among others needs extensive focus on intangible resources. Another theory that supports the importance of intellectual capital is stakeholder theory. This theory suggests that it is not only mandatory for a firm to oblige the immediate shareholders only, rather it is accountable for any group or individual who is affected or can impact the enterprise e-g customers, suppliers, communities or environment as a whole etc. (Kamath, 2014).

Insert Figure 1

3. Literature Review

3.1 Concept of Intellectual capital

A generally approved explanation of intellectual capital is complex to state and it becomes even more challenging to represent a typically implemented typology for intellectual capital due to the fact that this notion is still in the emerging stage of its development (Kwarbai & Akinpelu, 2016). Basically, intellectual consists of the funds or stocks of knowledge, competencies, intangible capabilities, resources, and assets that allow the basic business processes development within the organisation (ul Rehman & Jalil, 2021; Yaseen et al., 2016).

Competitive advantage can be attained in a highly dynamic and competitive business market by incorporating Intellectual capital. Thus, many researchers have conceptualised and suggested that the aim of intellectual capital is to create value for the business (Smriti & Das, 2017). The general components of intellectual capital include structural, relational, and human capitals. Within this model, human capital is related to the individual competencies and knowledge stock in relation to the company delegated by the employees working in it, relational capital notifies the link among external and internal stakeholders (Avci & Nassar, 2017).

S Mohammad (2021) highlighted that structural capital shows the skills underlined in the business operations. Morris (2015) mentioned that a high focus is given on the knowledge and skills of employees instead of the physical or tangible resources of the organization. It is due to the fact that employee skills, competencies, intellect, and individual knowledge would determine the way company's physical resources can be used effectively in order to attain company goals. It is also supported by (Avci & Nassar, 2017) that the employee's own skills and knowledge are the key source to create value. Therefore, it can be evaluated that cost on employees can be considered as investments instead of cost as it increases and sustain business value in the long-run.

3.2 Components of Modified-VAIC^{TM}

Modified intellectual capital is fundamentally based on three key components that are structural capital, relational capital, and human capital (Poh et al., 2018). According to Tarigan et al. (2019), human capital mainly links to experience, knowledge, intellectual agility, qualification, proactivity, intuition, innovative style, skills, and capabilities of the employees. Sharma et al. (2017) reviewed it as a multidimensional process, which might involve constructive habit development, education, health, the advantage of more social interaction, and training.

The sphere of knowledge of a firm might be expanded with fewer efforts through effective social interaction. Preserving human capital is generally a difficult task for an organisation as the workforce's knowledge, skills, and competencies go with them when they leave an organisation (Hifza et al., 2020; Ulum & Syam, 2017).This can be analysed that human capital serves as a substantial component of intellectual capital and supports the

organisation in strategic development and innovation that indicates its significance in business productivity (Xu & Wang, 2018). However, Mohammadi et al. (2014)suggest that companies might attempt to preserve the human capital by providing vocational benefits, bonuses, and lucrative salaries. In the context of Pakistan, the country is positioned at 152 among 189 countries as per the human development index with a 0.56 value that comes at a lower level (UNDP, 2019). This data reflects the low-level investment in the human capital component of Pakistan that is one of the significant components of intellectual capital as discussed above.

According to De Luca et al. (2020) structural capital comprises of innovation capital and process capital. The process comprises of techniques, equipment, and systems of the company (Emadzadeh et al., 2013). Sharma et al. (2017) highlighted that overall structural capital can be secured by different strategies for example trade secrets, patent registrations, brands, trademarks, and copyrights. Besides that, relational capital links to the competencies and knowledge achieved by interconnection not just with customers yet also the other stakeholders such as the government, partners, competitors, and suppliers of the organisation (RASHID et al., 2020). Relational capital comprises external and customer capital (Hifza et al., 2020).Customer capital is dependent on the way organisation deals with relations by satisfying the demands of the customers (Mukherjee & Sen, 2019).

Another necessary element is capital employed that has been researched with respect to the financial capabilities of the companies as the literature shows capital employee, also denoted as CE can be explained as a book value allocated to average company assets (Xu & Wang, 2018). There is another concept of capital employed efficiency that is defined by the value created by the capital employed. All these capitals used by the organisations eventually working towards the overall business performance through their appropriate allocation that enable sustainable business growth (Xu et al., 2021a).

3.3 Corporate sustainable growth

The concept of sustainable organisational growth has a multifaceted meaning and use. Though, from a financial view, sustainable business growth means steady and persistent development, which can be sustained

in terms of profits for future growth and development (Tarigan et al., 2019). Corporate sustainability initially gained importance by the theory proposed by Higgins in which the utilisation of sustainable development rate model was examined in defining practical strength for new businesses (Fonseka et al., 2012). The notion of corporate sustainable development rate expresses which sales growth is persistent with the ground realities of the organisation and about its financial market position (Nguyen, 2016).

In particular, the rate of corporate sustainable aims to define the highest level of yearly growth and development in terms of sales percentage that an organisation can endure without allocating any other equity or reformulating its financial guidelines. Past studies such (Khalique et al., 2019; Ozkan et al., 2017; Poh et al., 2018) indicated that the intellectual capital of a company has a positive impact on its sustainable competitive advantages. The importance of the company's intellectual components has been identified as the key actors in attaining a sustainable competitive margin and serve as major elements for business performance and value creation of an advanced knowledge-based economy. Moreover, this might also validate the reason for market return to be greater than the book value (Tarigan et al., 2019).

Organisations are experiencing challenges to sustain competitiveness, survival, and growth in the market as they are mostly based on their employee skills and competencies for new ideas and innovation to build a competitive advantage for the company (Setyawati et al., 2019). It is possibly dealt with by the concept of intellectual capital that companies achieve sustainable competitive advantage by implementing four key attributes as proposed by Barney in 1991 including value, rarity, imitability, and organisational support particularly in the dynamic knowledge-based economy (Hifza et al., 2020). Hence, this is considered potentially as the knowledge resources, which organisations use as a key component of their competitive factor to add value in the specified market. Competitive advantage, in the long run, exists as the competitors are incapable of adopting or formulating the strategies to create business value on the basis of the four major attributes of this resource-based model. Thus, it can be evaluated that a company can create a resilient and sustainable market position by considering these four attributes and increase its organisational survival through sustainable growth (Pal & Soriya, 2012).

Different researches have been performed to evaluate the relationship of intellectual capital with organizational performance and productivity through the lens of financial aspects using secondary and primary sources. A study conducted by Mohammadi et al. (2014) examined different aspects regarding intellectual capital and their connection to the financial condition of the company. In this research, the authors have taken 14 different latent variables and data was collected by survey questionnaire administered to 79 participants. The findings of the study showed that relational capital has a high impact on the company's financial performance, which is followed by the strong impact of the other two components that are structural and human capital.

Another research conducted by Emadzadeh et al. (2013) applied the balanced scorecard method to measure intellectual capital and its significance in the firm performance. The results of this study gave an idea that intellectual had a significant impact on sustainable corporate performance. Furthermore, intellectual capital was also seen to influence internal growth, learning, customers, and processes. In addition to it, few research scholars have collected secondary data for measuring intellectual capital for example (Fijałkowska, 2014; Pal & Soriya, 2012). These research studies are conducted in both financial and non-financial companies. For instance, Ulum and Syam (2017) determined the relationship between intellectual capital and organizational financial performance of the banking sector in Indonesia. The quantitative analysis of intellectual capital was performed by using the VAIC framework. The results showed a positive and moderate relationship between intellectual capital and banking performance. Moreover, the author has used a survey questionnaire as a research instrument in order to collect primary data from the professionals working in the banking sector, which was then compared and contrasted with the VAIC model. The findings of this research indicated that the application of the VAIC framework provided a much stronger impact of intellectual capital on companies' financial performance as compared to the survey method.

Similarly, another study conducted by Mukherjee and Sen (2019) in India based on analyzing the effect of intellectual capital and the related components on sustainable development of the Indian companies. Moreover, the author also focused on examining the highest influential

intellectual capital component that has a greater impact on sustainable growth as compared to others. The results of this research were also based on measuring intellectual capital by using a modified version of the VAIC model that indicated a positive effect on firms' sustainable growth. Notably, the findings of this research also demonstrate that every explanatory variable including process capital, innovation capital, relational capital, and physical capital give a significant impact in explaining sustainable corporate growth.

Apart from it, some other significant literature studies have shown a notable relationship between the organisational intellectual capital and its performance. For example, Asiaei and Jusoh (2015) aims to view intellectual capital through a multi-dimensional view and its effect on business performance. The authors found that business culture serves a key role in building structural and human capital, however, trust is also a key factor among the different other intellectual capital. Similarly, Sarwar et al. (2016) also examined the role of human capital and practices in the performance of construction firms of Pakistan in which the authors noted that human capital along with human resource practices increase overall company performance. In the similar context, Tran and Vo (2020) explored the links between efficiencies of human capital and organisational performance over different industries in the potential emerging market. The results of this study showed that banking industry does not possess the greater human capital level accumulation as indicated previously.

4. Research Methodology

Annual financial reports of non-financial companies (KSE-100 index) were used to extract secondary data. For this purpose, companies' annual reports were downloaded from their official websites as well as PSX data portal was utilized. Data collected comprised of a six-year period from 2015 to 2020. After excluding financial firms and firms with insufficient data, final sample is based on 72 companies and 432 observations of a balanced panel data was collected. The analysis is performed through Stata14 and SPSS software. Pooled Ordinary Least Square (OLS) regression model is used to depicts the variables used in this study as this methodology is more appropriate to determine the impact of intellectual capital efficiency on corporate sustainability Tran and Vo (2020).

Insert Figure 2

4.2 Hypothesis Formulation

1. Ho_1: M-VAIC has no significant effect on CSG.

    H_1: M-VAIC has a significant effect on CSG.

2. Ho_2: Capital employed efficiency has no significant effect on CSG.

    H_2: Capital employed efficiency has a significant effect on CSG.

3. Ho_3: Human capital has no significant effect on CSG.

    H_3: Human capital has significant effect on CSG.

4. Ho_4: Structural capital has no significant effect on CSG.

    H_4: Structural capital has significant effect on CSG.

5. Ho_5: Relational Capital has no significant effect on CSG.

    H_5: Relational Capital has significant effect on CSG.

6. Ho_6: There is a significant effect of Process Capital on CSG.

    H_6: There is no significant effect of Process Capital on CSG.

4.3 Operationalization
4.3.1 Dependent Variable

Corporate sustainable growth will be our dependent variable in this respective study. Corporate sustainability may be measured in a variety of

ways. Though Van Horne and Higgins' sustainable growth rate model is generally recognized and utilized in the previous researches(Xu & Wang, 2018) . This study will be employing Van Horne and Wachowicsz 's steady state model. The equation will be as follows;

$$SGR_{i,t} = \frac{(P \times A \times T \times R)_{i,t}}{(1 - P \times A \times T \times R)_{i,t}} \qquad (1)$$

where SGR is corporate sustainable growth, $_{i,t}$ are company and year, P is profit margin, A is equal to asset turnover ratio , T is equity multiplier and R is retention rate (Xu et al., 2021b).

4.3.2 Independent Variables

In this study, Modified-VAIC as a whole (comprising of Capital Employed efficiency plus Intellectual capital efficiency) and Individual components of ICE which are HCE, SCE, RCE, and PCE are the independent variables. VAIC is produced from accounting data relating to financial statements such as the company's balance sheet and the statement of income. VA (Value Added) is the value created by the firm's resources and can computed as follows (Nimtrakoon, 2015).

$$VA_{i,t} = OUT_{i,t} - IN_{i,t} \qquad (2)$$

Here OUT is the total revenue created by a specific firm in year t. IN refers to all the expense cost occurred to create the revenue minus the employee expense.

Moreover, the equation for our model will be;

$$M - VAIC_{i,t} = CEE_{i,t} + ICE_{i,t} \qquad (3)$$

$$CEE_{i,t} = \frac{VA_{i,t}}{CE_{i,t}} \qquad (4)$$

Equation 4 shows the Capital employed efficiency. $CE_{i,t}$ represents the Capital Employed by a certain business at the conclusion of t periods (i.e., Total Assets less Current Liabilities).

$$ICE_{i,t} = HCE_{i,t} + SCE_{i,t} + RCE_{i,t} + +PCE_{i,t} \qquad (5)$$

$$HCE_{i,t} = \frac{VA_{i,t}}{HC_{i,t}} \qquad (6)$$

Where $HC_{i,t}$ are employee benefit expenses in year t.

$$SCE_{i,t} = \frac{SC_{i,t}}{VA_{i,t}} \qquad (7)$$

Structural capital (SC) is what's left over after subtracting VA and HC in Pulic's model. As HC's creating value increases, so, SC's generation value declines.

$$RCE_{i,t} = \frac{RC_{i,t}}{VA_{i,t}} \qquad (8)$$

Sales expenditures serve as a proxy for relational capital, or RC for short.

$$PCE_{i,t} = SCE_{i,t} - RCE_{i,t} \qquad (9)$$

SCE is the Structural Capital Efficiency (i.e., SC / VA; where SC = VA-C) and PCE is the Process Capital Efficiency.

4.3.3 Control Variables

This study, following previous researches uses the natural logarithm of total assets as a control variable for enterprise size, using the following calculation:

$$SIZE_{i,t} = ln(Total\ assets) \tag{10}$$

Leverage (LEV) variance will have a significant impact on a company's success. So, leverage will be used as a control variable in this investigation.

4.4 Econometric Equations

$$SGR_{i,t} = \beta_1 + \beta_2 MVAIC_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 LEV_{i,t} + \varepsilon_{i,t} \qquad \text{(Model 1)}$$

$$SGR_{i,t} = \beta_1 + \beta_2 CEE_{i,t} + \beta_3 HCE_{i,t} + \beta_4 SCE_{i,t} + \beta_5 RCE_{i,t} + \beta_6 PCE_{i,t} + \beta_7 SIZE_{i,t}$$
$$+ \beta_8 LEV_{i,t} + \varepsilon_{i,t} \qquad \text{(Model 2)}$$

Model (1) investigates the influence on corporate sustainable growth (SGR) of Modified- VAIC as a whole whereas Model (2) further explores the particular impact on corporate sustainable growth of intellectual capital components.

5. Results
5.1 Descriptive Statistics

Insert Table 1

The table above presents descriptive statistics of selected variables employed in the research. Sustainable Growth rate has a mean value of 24% in non-financial firms of KSE-100 index. M-VAIC has a mean value of 5.452, a maximum of 38.806 and a low of -46.182. The negative M-VAIC score indicates that the investment in processing Intellectual capital is more than its contribution to the firm's value generation process. The mean value of HCE, 4.034, is greater than the other IC components, implying that HCE is the primary driver of creating value among the IC components. It's worth noticing that PCE has the lowest mean value of the IC components, at 0.2, implying that it doesn't contribute to

the firm's value creation process. LEV has a mean score of 0.53, indicating that non-financial enterprises in Pakistan have a low-geared capital structure. Furthermore, the average SIZE value is 17.415, implying that non-financial enterprises in Pakistan are well-established and evolved on average.

The length or lack of symmetry within the distribution pattern is being represented by the skewness value while the distribution curve's peak or height is displayed by the kurtosis value. In the ideal instance, the skewness and kurtosis value shall be zero of a bell-shaped curve. SGR, HCE, RCE, SIZE, and LEV all depict skewness values greater than zero, suggesting positively skewed distributions, but M-VAIC, CEE, SCE, and PCE are showing skewness values < zero, indicating negatively skewed distributions. On the other hand, all of the variables have kurtosis values more than zero, indicating that these are significantly peaked, with more data values concentrated near distribution center.

5.2 Correlation Analysis

Insert Table 2

For the purpose of determining link between two variables, correlation analysis is a statistical method used in research. This analysis aids in comprehending the strength of the linear relationship. Coefficients of Correlation range between -1 and 1. Two variables tend to move in tandem when a positive correlation coefficient exists. A positive correlation coefficient indicates that the two variables tend to move in tandem. The greater the coefficient, the more powerful the relationship, while a negative correlation coefficient suggests that they tend to move in opposite directions: observations with high values for one variable are likely to have low values for the other.

The results show that the explanatory variable M-VAIC is having positive relationship with the dependent variable SGR with a coefficient value of 0.139. the relationship of HCE and PCE with dependent variable is also positive which may imply that by increasing investment in human capital and process capital, a firm's sustainable growth rate may show positive

results. The correlation coefficient of CEE (-0.043) shows that there is negative and weak relationship with the dependent variable. The negative sign may indicate that increase in SGR may not always mean that it is attributable to the physical capital employed in a firm, it can be due to other factors. Finally, we need to keep in mind that correlation does not suggest causality.

Prior to running regression tests or making assumptions, it is expected that the data obtained would follow a normal distribution and as a result, before estimating anything, the data will be normalized so that statistical techniques can be applied to it (Tsagris & Pandis, 2021).

5.3 Normality Assumption:

Normality is a powerful assumption that implies some interesting theoretical properties. In normality assumption it has to be assured that the dependent variable follows a normal distribution or approximately follows. Initially outliers were detected in the data after plotting graph plot of the dependent variable. The graph box showed that dependent variable was not normally distributed which was not a representative of the naturally occurring phenomenon. A simple outlier removal and squared transformation on the dependent variable of SGR had been conducted. After taking the square of SGR, the graph plots were rerun on the newly generated variable, and it was found out that the dependent variable were still non-normal. Therefore, to reach this assumption, rank transforms were applied which are another type of transform. Following this procedure, different normality tests like histograms, Shapiro wilk and Jarque Bera tests were conducted, and it was found that the dependent variable was approximately normally distributed. The variable was then used for further Panel data regression. It is evident from the results given below.
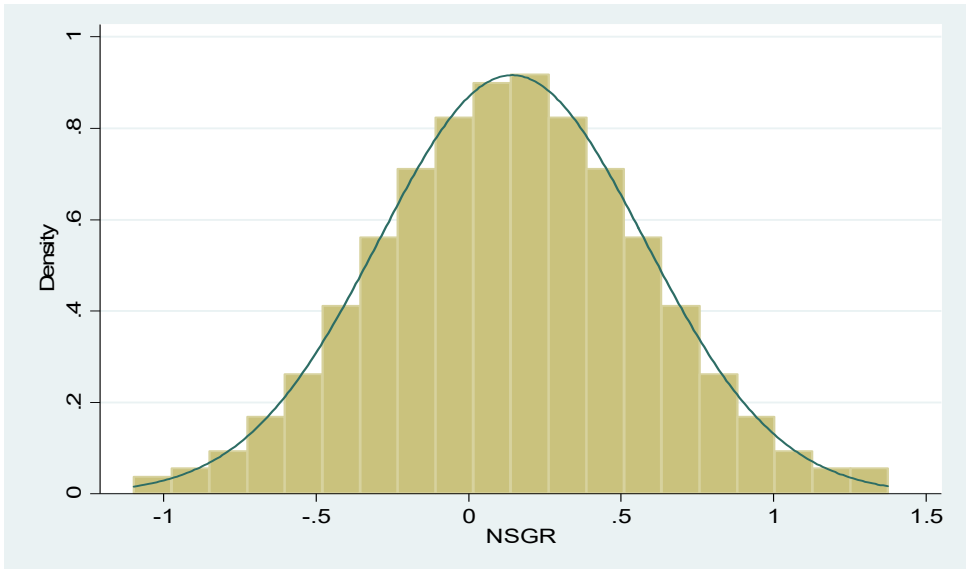
Figure 3, Histogram plot-NSGR

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.  swilk NSGR

                    Shapiro-Wilk W test for normal data

     Variable |       Obs        W         V          z      Prob>z

         NSGR |       432     0.99967     0.097     -5.582    1.00000

. histogram NSGR,normal
(bin=20, start=-1.09711, width=.123634)

. sktest NSGR

                    Skewness/Kurtosis tests for Normality
                                                         ——— joint ———
     Variable |    Obs  Pr(Skewness)  Pr(Kurtosis)  adj chi2(2)   Prob>chi2

         NSGR |    432     0.7730        0.7275         0.20        0.9027
```

Figure 4, Shapiro wilk & SK test

5.4 Multicollinearity Assumption:

According to Giacalone, Panarello, and Mattera (2018) Multicollinearity isn't just present or missing; it's also important to assess its severity, which ranges from no collinearity to perfect collinearity. In real data, some level of multicollinearity is almost always present. Moreover, Multicollinearity can cause a variety of problems, including estimation problems, forecasting problems, and interpretation problems.

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. vif
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Variable	VIF	1/VIF
SIZE	1.03	0.972099
MVAIC	1.03	0.974939
LEV	1.00	0.996728
Mean VIF	1.02	

Figure 5, Variance inflation factor, Model 1

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. vif
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Variable	VIF	1/VIF
SCE	1.37	0.731920
RCE	1.33	0.753784
PCE	1.23	0.811960
HCE	1.12	0.894667
SIZE	1.07	0.934195
CEE	1.03	0.969462
LEV	1.02	0.979389
Mean VIF	1.17	

Figure 6, Variance Inflation Factor, Model 2

The variance inflation factor is used to determine how much the variance of the predicted regression coefficient is inflated when the independent variables are associated. VIF $=1$ denotes that the independent variables are

not connected with one another. The presence of a VIF result larger than 1 implies that the variables are moderately related. Because it discovers heavily related variables, VIF has a challenging value of 5 to 10 (Shrestha, 2020). After removing outliers in two of the explanatory variables (SCE, RCE) in model 2, the (VIF) values were < than 5, all these explanatory variables are hence independent linearly, and therefore multicollinearity is not present in my data set.

5.5 Homoscedasticity Assumption

One of the conditions of regression is that the data set be homoscedastic, which indicates that the variances must be constant, rather than heteroskedastic, which means that the variances are not equal(Yang, Tu, & Chen, 2019). In the estimation of your coefficients, heteroscedasticity does not cause a bias. You cannot, however, estimate the variance-covariance matrix adequately due to heteroscedasticity. As a result, the coefficients' standard errors are erroneous. As a result, no t-statistics or p-values can be computed, and hence no hypothesis testing can be done. Overall, OLS loses its efficiency when heteroscedasticity is present, and it is no longer Best Linear Unbiased Estimator.

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
        Ho: Constant variance
        Variables: fitted values of NSGR

        chi2(1)      =      0.92
        Prob > chi2  =    0.3374
```

Figure 7, Heteroskedasticity test

Based on the results we conclude that the data does not follow heteroskedasticity because the significance value of the Breusch Pagan test is 0.3374, which is greater than 0.05.

5.6 Autocorrelation Assumption

The auto correlation of a variable measures the link between its current and previous values. Ideally, there should be no auto correlation in the data set; however, we reject H0 and conclude that auto correlation exists in the data set as the pvalue of DW test is < than 0.05

To escape from the consequences of serial correlation in our data that include untrustworthy hypothesis testing and t-statistics appearing significant on levels on which they are not in actual led us to use the Prais-winston command to solve this issue. After using this command, the Durbin Watson statistic is transformed to 2.010 which means that there no serial correlation present in our data now and this procedure produced estimators that are approximately as efficient as the best linear unbiased estimators. Moreover, there is no omission of observation.

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.
. estat dwatson

Durbin-Watson d-statistic(  4,    432) =  1.364186


  Durbin-Watson statistic (original)    1.364186
  Durbin-Watson statistic (transformed) 2.010739
```

Figure 8, Serial correlation test

5.7 Regression Analysis

There is no violation of regression assumptions of Normality, Multicollinearity, Heteroscedasticity and Autocorrelation. Before proceeding further, the normality has been achieved because the data was not normal. After achieving the normality, the distribution of data showed homoscedasticity. However, autocorrelation has been removed from the data. Moreover, the results of Hausman specification test aided in the selection of a fixed effects model in a panel data study.

Insert Table 3

When the independent variables are utilized together, the coefficient of determination (R square) denotes the percentage of effect they have on the dependent variable. In this model, R Square=0.405, implying that the link between SGR and M-VAIC accounts for 40.5 percent of the variation in SGR.

As the p-value of explanatory variable M-VAIC is < 0.01, it indicates that it is statistically significant at 1% level of Significance. Further, it can be concluded that Modified Value-added intellectual coefficient has a positive influence on Sustainable Growth Rate (SGR). The control variables SIZE has a positive influence but its relationship is insignificant for this model. Similarly, LEV is insignificant and is negatively influencing SGR.

Insert Table 4

The R- square represents the percentage of effect that the independent variables have on the dependent variable when used together. In this model, R Square= 0.440, implying that the relationship between SGR and Capital Employed Efficiency, Human Capital Efficiency, Structural Capital Efficiency, Relational Capital Efficiency (RCE), and Process Capital Efficiency justifies a 44 percent variation in SGR (PCE).

As p-value of explanatory variables Human Capital (HCE) and Process Capital (PCE) is < than 0.05, it shows that they are significant at 5% level of significance. Moreover, capital employed efficiency (CEE) is significant at 10% level. It can be concluded that HCE and PCE have a positive influence on Sustainable Growth Rate (SGR), while CEE has a negative link with dependent variable SGR. SIZE (Control variable) has a positive influence but its relationship is insignificant for this model. Similarly, LEV is insignificant and is negatively influencing SGR.

6. Discussion

The goal of this research was to explore the link between intellectual capital efficiency and corporate sustainable growth of firms in the presence of control factors. The discussion that follows is based on the results of the Panel regression. It has been widely obtained in our findings that the

combined effect or connection of capital employed and Intellectual capital components (M-VAIC) showed significant effect. Our first Hypothesis was whether M-VAIC has a significant effect on CSG or not. In this study, we tend to accept the alternative hypothesis of H1 where it is stated that there is a significant impact of M-VAIC on corporate sustainable growth. An increase of approximately 2.5% in the sustainable growth rate of firms will be caused by the increase in value added intellectual capital as the findings of table presented shows that the coefficient of M-VAIC is 0.025 As M— VAIC is a combination of CEE and ICE, we can also deduce from these results that physical capital as well intellectual capital proves to be a key driver of sustainable growth of corporations. Thus, this output is accordant with the results found by Xu et al. (2021a) & Tran and Vo (2020).

The second hypothesis stated that capital employed efficiency has a notable effect on CSG. As evident from table the CEE is significant at 10% level. These results support empirical findings of (Mukherjee & Sen, 2019). However, the coefficient value of CEE being negative (-0.03) is not in line with the literature means not enough positive link was found between CEE and its role in CSG of Pakistani companies. The third hypothesis of the study which stated Human capital efficiency (HCE) impacts corporate sustainable growth indeed showed significant results at 1% level of significance. The coefficient of HCE is 0.05 as depicted from the table above, which means that an increase of approximately 5% in the sustainable growth of firms can be observed as the efficiency of Human capital increases. This means that the HCE provides a significant contribution to the long-term growth of Pakistani firms, demonstrating that human resource knowledge, competency, and technical know-how are used effectively and efficiently in Pakistan's top corporations. These findings are greatly supported by many studies like (Saeed et al., 2016; Xu et al., 2021a) etc.

Our fourth and fifth hypothesis was whether SC and RC indicate a significant effect on CSG or not. We tend to accept the null hypothesis of H4 and H5 of this study where it is stated that no significant impact of structural capital and relational capital on corporate sustainable growth exists. In addition to being a labor-intensive economy, as well as lack of investment in R&D due to a lack of finance, a lack of cutting-edge technology and a lack of patent generation are all plausible factors for SCE's

low performance in Pakistani enterprises which is consistent with the results of a neighbouring country. (Fan & Hossain, 2018)

Our last hypothesis of the study stated that process capital's impact on CSG is notable and the results from table are in accordance with it. Therefore, we can reject the null hypothesis and deduce that with a coefficient value of 2%, it positively influences SGR and an increase of approximately 20% in the sustainable growth of firms could be observed as Process capital value increases. It indicates that effective process capital management makes businesses more capable of achieving long-term growth. This result is in line with previous studies like (Kusumawardhani, 2012; Mukherjee & Sen, 2019).

In summation, the data implies that, in addition to physical resources, components of IC– human capital and process capital – play an important role in business long-term success in Pakistan. Furthermore, the R2 value (0.440) in Model 2 is higher than the R2 value (0.405) in Model 1, implying that specific components of IC contribute much more to corporate long-term growth than intellectual capital as a whole. In terms of control variables, no notable relationship among firm size (FS) and Lev was found on corporate sustainable growth in both Model 1 and Model 2. Mukherjee and Sen (2019) also reported similar results for LEV in their study.

7. Conclusion

The results of the research carried out provide evidence that, in context of Pakistan, both Capital employed and IC (as a whole), as well as its components, play a crucial role in the path to CSG. It is important to note, however, that among the components of IC, human capital is the most influential factor in Pakistan's corporate sustainable growth. Taking the findings together, it is possible to conclude that IC and its components do, in fact, help pave the way for corporate sustainable growth in Pakistan.

Hence, this study will assist company owners and directors in thinking about and acting to incorporate IC resources into their businesses and reap the benefits. This research emphasizes the need of policymakers and regulatory agencies developing regulations for measuring and disclosing IC in yearly financial reports as only a handful of top 100 companies disclose

it. In today's active and competitive business environment, corporate growth management is a major challenge for executives, particularly in developing countries like Pakistan. To such an extent, this study presents Pakistani corporate executives with a motto that if IC resources are effectively engaged and taken advantage, the firm's growth and policies can be effectively controlled for future benefits. an ideal level of sustainable growth rate should be the objective as investors are not only interested in the ability to grow of a firm, instead they are more inclined towards whether the growth is sustainable or not.

The limitation of this study includes that another component of intellectual capital known as Innovation Capital was not incorporated in this study as its measurement (I-e R&D cost) was not available for all KSE-100 Index companies. Due to the misinterpretation of numerous meanings of IC and its components, there is still criticism of the Intellectual capital calculation method, as no way of measuring IC has been disclosed by researchers as flawless until now. Future studies should widen the sample base to include all enterprises from all sectors of the KSE because different sector's goal of increasing corporate sustainable growth may comprise of various different methods. E-g tourism companies will be more interested in investing in relational capital while a labor-intensive manufacturing companies would be more interested in employees' benefits (Human capital). This model can be employed cross country with the goal of generalizing the findings of this model. Further research into the relationship between Corporate Sustainable Growth and other dimensions including, Earning Management, Dividend Policy etc. could be conducted. Because the VAIC^{TM} model has been criticized primarily for its measurement of Structural capital efficiency (because to its reliance on HCE), future studies should seek out alternative methods or even design an IC measurement model that can absorb the existing criticism of the VAIC^{TM} model.

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