Impact of Intangible Assets on Cash Flows and Operating Efficiency: An Empirical Analysis of Listed Companies of PSX

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Abstract

In the modern business era of competition, companies must find ways to survive in the market and try to maintain an upper hand over competitors. It is evident from the literature that investment in intangible assets is as significant as investment in tangible assets. This study is based on finding the relationship between the intangible assets and cash flows from operating activities and operating efficiency with the control variables of company age and company size by taking the panel data of companies listed on the Pakistan Stock Exchange (PSX) from 2007-2017. STATA software was used to analyze the panel data of selected companies and found that the intangible assets significantly positively impact the operating cash flows. In contrast, intangible assets have a negative impact on the operational efficiency of PSX's non-financial companies. To reap the benefits of intangible assets through improved cash flows, the management of the companies must set policies and procedures to manage the operating expenses.

Keywords: Intangible Assets, Operating Cash Flows, Operating Efficiency, Company Size.

Introduction

Regarding property and assets, the human subconscious thinks about concrete items such as money, land, goods, etc. In today's world, another type of ownership, known as intangible assets, intellectual capital, or intellectual property, which is far more important than tangible assets, is taken into account. Compared with other investments, such investments have unique characteristics, including the fact that they are the direct result of human intellectual work and cannot be destroyed by consumption (Arabi, 2009, p. 39).

To generate company value in the dynamic business arena, Intangible assets are the critical factors for enhancing the financial as well as non-financial outcomes of the company (Chareonsuk & Chansa-gave, 2008; Gamayuni, 2015).

Investment in intangible assets like research and development, quality, advertisement, etc., has a significant positive impact on the company's operating cash flows (Boujelben & Fedhila, 2011).

Cash flow management is essential to operate, and companies must identify the ways to improve; if a company has unrestricted access to external capital – that is, if a company is financially unconstrained- there is no need to safeguard against future investment needs, and corporate liquidity becomes irrelevant. In contrast, when the company faces financing frictions, liquidity management may become a vital issue for company policy (Almeida et al., 2004).

Flignor and Orozco (2006) on the other hand, highlighted the importance of intangible assets in a way that such assets incorporate almost all the areas of the company, from management to development of its products and team functions, e.g., Finance/Accounting, Manufacturing/Operations, Marketing/Administration, creation of intellectual resources like

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research and development. Capasso (2004) presented that intangible assets serve as a medium to attain a competitive edge for the company, such as uniqueness of culture, values, management process, improved cash flows, and specific methods to operate or develop a product/service that make it rigid to competitors for emulate.

In the era of 1978, five percent (5%) of total assets were intangible assets in the company's financial statements; now, they become seventy-eight percent (78%) today, and about fifty to ninety percent of the company's value generation mechanism in today's economy backed by the management of that company's intellectual capital rather than the use and production of material goods (Guthrie & Yongvanich, 2004).

Moreover, managers should be considered to attain the required performance not just for the current state of the company's performance but also concerning its cultural evolution. Rationally, the option of intangible assets to be developed by a company strictly depends on its capability to make a compatible decision with the overall business strategy of the company (Johansson et al., 2001; Skoog, 2003). It is essential to consider what areas the company requires to focus on and what knowledge assets of human resources need to be leveraged within each area (Andreou et al., 2007). Managers must pay more attention to efficiently utilizing intangible assets (Dmitry & Tatiana, 2007).

Dewhirst and Davis (2005) and Gummesson (1994) Companies are in search of ways to make a difference in comparison with rival companies, and all the time, they have tried to search for ways to become prominent in front of consumers apart from the competitors (Letelier, 2003).

Making strong connections among the activities required to operate a company's process, e.g., buying and selling, converting material into products, resellers, communications, and cultural value, can generate handsome financial results for the company (Simatupang & Sridharan, 2002; Walker, 2005). This optimization achievement can provide high financial gains to the stakeholders (Spekman & Carraway, 2006).

Customer and product management interrelationships allow companies to create a competitive edge over their rivals (Galbreath, 2002). Transparent information management with the customer enables a company to gain financial benefits by improving the sales revenue and gaining market share. Specifically, this collaboration between the company and the customer can enable profitable outcomes translated into "market opportunities" via adaptive and flexible promotional support (Tzokas & Saren, 2004).

Research Problem
In the past, the value of a company was somewhat related to the value of its physical capital; to grow bigger, a business had to build new factories roughly in proportion to the increase in its sales. Now, businesses increasingly invest in intangibles (Paul et al., 2000). Hence, there is a dire need in developing countries like Pakistan to study the importance of intangible assets by analyzing their impact on cash flows and operating efficiency, which are the major components to determine the company's performance.

Research Gap
The impact of intangible assets on cash flows and operating efficiency has been explored internationally, but research studies on this topic could not be found in Pakistan. That is why it is the right time to research this area to guide companies about the linkage of Intangible assets, cash flows from operating activities, and operating efficiency to make a decision accordingly.

Research Objectives

The purpose of conducting this study is:

- To empirically analyze the impact of intangible assets on cash flows from operating activities and operating efficiency of PSX-listed companies.
- To determine the nature of the relationship between Intangible assets, cash flows from operating activities, and operating efficiency.
- To determine the significance of the relationship of Intangible assets with cash flows from operating activities and operating efficiency.

Review of Literature

It is evident that experience helps in capturing a way to solve the upcoming real business situations; a researcher with a similar sort of thought researched the transformation of business knowledge into intangible assets by exploring the knowledge valuation; the researcher concluded that businesses are chasing "knowledge" and adopting "knowledge" solutions, with not a clue as to whether the knowledge they are chasing or using to solve business problems is achieving the outcome towards which they are driving. In simple words, the straight standard is not available to monitor and track that the long-term goals will be achieved. There are success stories in leveraging knowledge, but the businesses in the knowledge era truly institutionalized to identify, capture, and leverage knowledge to adequately manage and control the intangible assets that contribute seventy percent of the value of a business (Green, 2006).

Another similar study relating to intangible assets and company management perspective concerns formulating and implementing intangible assets valuation in standard business terms to identify or recognize intangible assets in the business spectrum. The research answered, "What is an intangible asset, and how does it affect the business's bottom line?" Why is the valuation of intangible assets required, whether the motive is tax, planning for the company, or settlement of the dispute? It is essential to consider the nature of the intangible asset undervaluation. Moreover, intangible assets are not added to the company's management approach. Many companies don't identify or search for ways to increase the profit generated from intangible assets or other benefits of a centralized intangible asset management scheme. The first and most essential factors for valuing intangible assets are their identification and representation (Green, 2007).

A unique sort of research to determine the role of intangible assets and expenditures in the search for shareholder value was conducted by a researcher from the United States of America (USA) in 2007. Considering the limitation of traditional financial performance measures, the researcher assessed the impact of intangible assets and expenditure on the direct measure of the company's shareholders' accountability and adjusted holding period returns. The researcher took a sample of six hundred and fifty-seven actively traded manufacturing companies, collected data from the annual reports for 1997-2002, and applied the T-test regression analysis. Then, the results indicated that advertising, goodwill, and research and development do not significantly impact shareholder value, as measured by holding period returns. Instead, only intangible assets other than goodwill, which include the value of patents, copyrights, licenses, and trademarks, positively impact shareholder value (Heiens et al., 2007).

Research regarding the enhancing role of intangible assets of the brand is conducted in the United Kingdom with the object of explaining that the human representatives of the brand (brand relationship representatives) are significant supporters in attaining efficient supply chain synchronization through the exchange of information on product availability and pro-active promotions between the brand and resellers in business to business markets, and therefore

ultimately an impact in achieving customers satisfactory deliverables. The research was mainly based on the interrelation of psychology, marketing, and operational management theories. The researcher found that the brand representative, connected to the reseller for generating satisfaction, becomes a motivating element. These outcomes are practical and synchronized supply chain processes for the company (Gupta et al., 2008).

To know about the Investment in Intangible assets comparatively between the two countries, the United States and Japan, a researcher from Japan in 2009 conducted this study by taking the data from the Japanese Economic Database and the United States to perform the ratio analysis and the sensitivity analysis. They concluded that the ratio of intangible investment in Japan has risen during the last 20 years and now stands at 11.1 %, which is lower than the ratio projected for the United States in the early 2000s. The ratio of intangibles to tangible investment in Japan is also lower than the equivalent values estimated for the United States (Fukao et al., 2009).

Based upon the concept of operating efficiency, a researcher studied the railway operating efficiency of European countries, specifically concerning the reforms undertaken by these countries for the railways. For the analysis, 1995 to 2001 was a sample period because this was the time frame in which these countries underwent significant reforms and measured the efficiency by Multi-directional Efficiency Analysis, which enabled the researcher to probe into how railways reforms affected the inefficiencies of the specific cost drivers. The researcher concluded that the main reform initiatives generally uplift technical efficiency but potentially differently for different cost drivers. Specifically, the researcher provided empirical evidence that accounting separation is essential for improving the efficiency in using material and staff costs. In contrast, other reforms only influenced one of these factors (Mette et al., 2009).

A study relating to the operating efficiency of the financial sector used a bootstrapped Data Envelopment Analysis (DEA)--based procedure to pre-calculate and pre-evaluate the short-run operating efficiency gains of a potential bank's merger and acquisition (M&A). For empirical analysis, the research applied the DEA technique on 45 banks M&A in the Greek banking industry from 2007 to 11. The outcomes indicated that a year before and a year after the start of the Greek fiscal crisis, the majority of the potential M&A of the banks underlined for analysis needed to create short-term operating efficiency profits. Adding that, the outcomes for 2011 showed the major M&A of the bank's ways toward short-term operating efficiency profits. Finally, the experimental outcomes backed the notion that a merger and acquisition among efficient banks does not assure an efficient M&A of the bank (Halkos & Tzeremes, 2013).

Literature indicates that companies now understand the importance of intangible assets for gaining and maintaining a competitive edge, and several companies who invested in intangible assets have gained many benefits; for the support of the above statements, the researcher utilized the data from the Philippines stock exchange public listed companies from the period 2010 to 2013, out of the sample 264 only the 140 companies shown intangible assets in its financial statements. The ordinary least square OLS cross-section regression method and panel regression were used to generate results to build an opinion, which showed that intangible assets significantly impact the cash flows by 91.07%. The Z-Score test is also used to determine the impact of intangible assets in different sectors, which results in the impact of intangible assets being significantly different across multiple sectors (Mendoza, 2017).

Data and Methodology
Data Nature and Sources
In order to precede the empirical analysis, panel data, which is usually derived from observations over several period, is used in this study. In econometrics and statistics, panel data refers to multi-dimensional data that generally involves measurements over some time.

The panel data contain the number of researcher's observations about different phenomena which were obtained about an entity, unit, or group for several years; for instance, the panel may follow a given sample of a data set of individuals for a specific period and obtained information or observations on each unit in the sample.

The next step involves two types of data. The data in the shape of numbers is termed quantitative data, which contains information about the quantities that can be stored in the form of numbers, e.g., the weight of a person, the number of road accidents, the shoe size, and the age.

The data that contains information about the qualities is termed qualitative data, for instance, information that cannot be stored in numerical terms; examples of qualitative data include grace, the color of eyes, beauty, etc.

Hence, using quantitative rather than qualitative data to determine the impact of intangible assets on operating cash flows and operating efficiency was indispensable while taking the company size and age as control variables. Moreover, for this data collection, several secondary sources are used to obtain such quantitative data, i.e.,

- Data from the annual reports of the companies
- Financial statement analysis of the non-financial sector by the State Bank of Pakistan
- The Pakistan Stock Exchange's official website
- The "khistocks.com" is a website operated and maintained by Pakistan's Popular English Newspaper, *the Tribune.*

Population and Sample
The population is coined as all the observations under study from which a sample is drawn; for instance, objects, measurements, events, and people are termed the population in statistics. Aggregate observation of subjects grouped concerning specific characteristics is named population in statistics.

The tiny population representative drawn from the same population based on a specific statistical tool is a sample. The outcomes and the decisions made based on the sample are considered about the entire population. The sample is a valuable tool through which the researcher can develop hypotheses about the vast population set just through the sample. In statistical terminology, the population and the sample are represented with specific signs, such as the population is represented with the capital "N." On the other hand, the sample is represented by a small "n."

Hence, in this research study, the companies listed on the Pakistan Stock Exchange are taken as a population, and the non-financial sector companies are used to collect the quantitative data for 2007-2017. 574 Companies in 35 sectors are listed on the Pakistan Stock Exchange (PSX), out of which 446 Companies in 29 Sectors are Non-Financial. Moreover, these Non-Financial listed Companies are considered for the sample of study and are further scrutinized as per the following criteria:

· Only the companies that remained listed throughout the study period 2007-2017 are included in the sample to form balanced panel data.

· The companies which do not have complete data are also excluded.

Seventy-five companies in the non-financial sector of the Pakistan Stock Exchange (PSX) met the above-stated criteria for 2007-2017. Hence, for 11 years, companies' data developed 825 observations for penal data analysis.

Variables of the Study

A variable is any feature, quantity, or number that can be counted or determined in statistical analysis. The data item is another name of the variable, e.g., age, sex, profit of the business, birth rate of a country, number of students in a class, eye color, etc., are all variables. In context with the research topic, the five variables are used in different capacities, i.e., independent, dependent, and control. The detail of each sort of Variable is explained below with the caption:

Independent Variable

The predictor variable is the other name of the independent variable, which is the variable manipulated in the research study to observe the influence on other variables (s) of the study named the dependent variable. So, this section entails the information about the variable that causes the impact on other variables of this study.

Intangible Assets

Intangible assets (non-monetary assets that cannot be seen, touched, or physically measured, such as brands, patents, software, etc.) have become an essential source of the company's' differentiation and competitiveness (Lev, 2001). Unlike what is occurring with tangible assets (for which the property rights are clear), most intangible assets-oriented companies cannot completely exclude other companies (the rivals) from taking some of the gains of their intangible assets' investments without showing the costs of creating them. The primary reason for the non-recognition of intangible assets in the financial statements is the lack of an efficient control mechanism. This situation leads to the critical potential influential point of information irregularity and agency costs attached to such types of assets (Dixit, 1988).

The intangible assets of each company are measured by their absolute value in the respective statement of financial position (Longathan & Chandran, 2013). However, the natural logarithm (N-log) of the rupee value of intangible assets in the financial statements is used in this study.

Dependent Variables

This section entails information about the variables affected by the other variables, named independent Variables and Intangible Assets for this study.

Operating Cash Flows

> "Cash flows from operating activities come from the principal revenue-producing activities of the entity. On the other hand, cash flows from investing activities entail the acquisition and disposal of long-term assets and other investments not included in the cash account of the entity. Lastly, cash flows from financing activities result in changes in the entity's size and composition of the contributed equity and borrowings" (Mendoza, 2017).

So, in the present study, the first dependent Variable is cash from operating activities, and the carrying value of the operating cash flows in the annual reports is used for the analysis (Mendoza, 2017).

Operating Efficiency
The second dependent Variable is the Company's operating efficiency, which is measured through the proxy based on the study (Bhullar, 2017). ROCE (Return on Capital Employed) represents the efficiency of the Company in terms of profitability, expressing its operating profit as a percentage of capital employed; ROCE = Operating profit / Capital employed.

Control Variables
This section entails information about the variables based on the study (Poorzamani & Khademi, 2014) and (OSAGIE, 2016), which are used to control in order to show the generic impact of the independent variable upon the dependent variables, which are narrated below as captioned:

Company Size (CS)
We usually use criteria such as the natural logarithm of total assets and sales to measure company size. In this study, we have used the natural logarithm of sales of the Company. (Jafari, Gord & Beerhouse, 2014) Conducted a study in which they showed that size was positively and significantly related to cash flows. This can be justified because large-sized companies tend to have more cash flows from their operations due to increased sales. Such companies may also invest in intangible assets and other long-term assets that can impact the company's investing cash flows. Finally, the companies operating at large scale may likely raise funds for the business to achieve higher growth and increase sales by expanding its business base, which can affect the cash flows from financing activities.

Company Age (CAGE)
Adelegan (2009) submitted in her study that older companies tend to rely more on internal funds to finance their company investment than the newer companies, maintaining that the effect of financial factors on investment varies across companies according to their industrial characteristics. For measuring the company Age, the latest number of Annual General Meetings (AGM) is considered for this study.

Research Framework
Jensen and Meckling (1976) explain that an *agency relationship* is defined as:

> "A contract in which one or more people (the principal) hire another person (the agent) to perform some services and then delegate decision-making authority to that agent."

In this respect, an agency relationship exists between the shareholders and managers. Managers, being the agents of the shareholders, must make decisions that benefit the shareholders in the shape of increased company value and invest in such assets that can generate more benefits for the company. Hence, this study will guide management on the significance of intangible assets in generating cash flows and operating efficiency for a company.
This study prompts the provisions of International Accounting Standards (IAS) Number 38, which defines an *intangible asset* as:

"an identifiable, non-monetary asset without physical substance"
(Ernst & Young, 2013).

In addition, it advocates that an asset is a business resource that fulfills two attributes: control and economic benefits. Respectively, it can be understood that these are the assets that the Company owned and controlled as the result of its past economic operations and has an entitlement to benefit from them. In addition, an intangible asset is recognizable, which means it:

"is capable of being separated or divided from the entity and
sold, transferred, licensed, rented or exchanged"- (Melville, 2014).

IAS 29 defines monetary items as

"money held and items to be received or paid in money."

Specifically, monetary items are units of currency held, assets to be received, and liabilities to be paid in a fixed or determinable number of currency units. Thus, intangible assets are non-monetary.
Profit-oriented companies have a common interest in how intangible assets can contribute to financial benefits and add value to the company. Financial benefits range from favorable cash flows and improved EPS (Earning per Share) to profit margins and value of the shares, etc.
This study is based on the operating cash flows of business Companies. It takes one of three components of cash flows as explained by the IAS International Accounting Standard number 07 statement of cash flows. Major revenue-generating activities are termed operating cash flows; investing activities are termed buying and selling long-term assets, and cash flows from the activities relating to the size of the Company are termed financing activities.

Conceptual Framework

Figure 1 conceptual framework
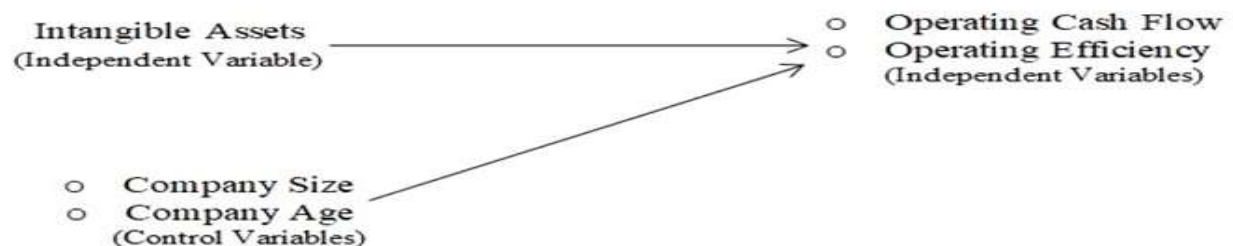
Based upon above framework, the following equations have been constructed in order to explain the relationship of intangible assets, company size and company age with the cash flows and the operating efficiency.
Operating Cash Flows = f (Intangible Assets, CSIZE, CAGE)
Operating Efficiency = f (Intangible Assets, CSIZE, CAGE)

Hypothesis for the Study
Based on the literature, main hypothesizes of the study are as under;
H_01: There is no significant relationship between intangible assets and operating cash flows of listed companies of PSX

$H_0 2$: There is no significant relationship between intangible assets and operating efficiency of listed companies of PSX

Econometric Model
Panel data includes different effects like panel data can be Ordinary Least Square (OLS), or may include Random Effect Model (REM) or Fixed Effects Model (FEM). To decide between OLS and FEM, redundant fixed effect test has been used and for choosing between REM and OLS, Lagrange multiplier test has been applied, whereas to decide whether to use FEM or REM, Hausman test (1978) has been employed. For the purposes of the statistical analysis the Statistical Software STATA has been used. Following are the regression equations made for this purpose:

$CFO_{it} = \beta 0i + \beta 1 IA_{it} + \beta 2 CSIZE_{it} + \beta 3 CAGE_{it} + \varepsilon_{it}$ ....   (1)

$OE_{it} = \beta 0i + \beta 1 IA_{it} + \beta 2 CSIZE_{it} + \beta 3 CAGE_{it} + \varepsilon_{itss}$ ....   (2)

Expected Signs

Independent/Control Variables	Measurement	Expected Sign
Intangible Assets	Natural Log of Absolute Rupee Value given in Financial Statements.	-/+
Company Size	Natural Log of Sales	-/+
Company Age	No. of Annual General Meeting	-/+

Results and Discussion
Descriptive Statistic
The descriptive statistic is used in the analysis to depict quantitative information about the data like the maximum/minimum value, the standard deviation of the data, number of observations used in the data and the mean values etc. relating to each variable of the study in order to provide at a glance information. Hence, the descriptive statistic for this is presented as under:

Table 1 Descriptive Statistic

Variable	Obs	Mean	Std. Dev.	Min	Max
OCF	825	3369132	1.23e+07	-6.24e+07	1.86e+08
OE	825	0.4228905	1.126395	-1.822173	17.34531
LnIA	825	9.861661	2.895511	3.044522	18.37107
CompanySize	825	16.17598	1.650689	10.37308	20.89523
CompanyAge	825	33.93333	17.17653	1	85

In these results there are 825 observations, the non-financial listed companies on Pakistan Stock Exchange for the period 2007-2017 are used for analysis. The average value of the variable LnIA, company size and the company age are 9.87, 16.18 and 33.94 respectively with the standard deviation of 2.90, 1.66 and the 17.18. The minimum value of LnIA is 3.04, company size 10.37 and the company age is 1. Here a company's minimum age 1 means that the first annual general meeting of such company was held in 2007. The maximum value for these variables is LnIA is 18.37, company size 20.9 and the company age is 85. As well as other variables of the study are concerned the operating cash flows has an average of 3,369,132 as the carrying value of operating cash flows in the financial statement is taken, while the 1.23e+07 standard deviation and the

minimum value of operating cash flows a company hold in the sample is -6.24e+07 and the maximum is 1.86e+08. The operating efficiency's average value is 0.43 showing the performance of all companies averagely with the standard deviation of 1.13 and the minimum a company have the operating efficiency is -1.82 while the maximum of this figure is 17.35.

Correlation Analysis

Correlation analysis is a method of statistical evaluation used to study the strength of a relationship between two, numerically measured, variables e.g. Intangible assets, operating cash flows and operating efficiency in case of this study. This particular type of analysis is useful when a researcher wants to establish if there are possible connections between variables. In other words, technique that can show whether and how strongly pairs of variables are related is termed as correlation and the results of the correlation among the variable of the study intangible assets, operating cash flows and operating efficiency are presented below:

Table 2 Correlation Analysis

	OCF	OE	LnIA	CompanySize	CompanyAge
OCF	1.0000				
OE	0.0278	1.0000			
LnIA	0.3857	-0.0067	1.0000		
CompanySize	0.3293	0.1242	0.3489	1.0000	
CompanyAge	-0.0479	0.0161	-0.1244	0.1233	1.0000

The value of co-efficient of correlation between intangible assets and operating cash flows is 0.3857 which is positive meaning that the association between intangible assets and operating cash flows is positive. On the other hand, the co-efficient of correlation between the intangible assets and the operating efficiency is -0.0067 which is negative that means that the relationship between the intangible assets and the operating efficiency is negative. As well as the other variable of the study company size and operating cash flows is concerned having the value of co-efficient 0.3293 which is positive showing positive relationship and correlation with the operating efficiency is 0.1242 which also depicting the same positive relationship. Last but not least, the variable company age with the operating cash flows and operating efficiency's co-efficient is -0.0479 and 0.0161 respectively which showing the negative relationship of company age with the operating cash flows and positive relationship with the operating efficiency.

Correlation co-efficient of InIA, Company Size and Company Age are 0.3489, -0.1244 and 0.1233 which indicates that the strength of association among these variables is low which depicts that there is no problem of either high or perfect multi-collinearity.

Regression Analysis

Results of regression models showing the impact of Intangible Assets on Operating Cash Flows and Operating Efficiency are given in this section in different steps. In the first step, various tests for selection of the appropriate models have been carried out and the results of estimated models are given in the second step.

LR Test (Likelihood Ratio Test)
A statistical test named as likelihood ratio is primarily used for comparison between the two statistical models in order to check the goodness of these models for statistical analysis e.g. a null model against the alternative model. This test is based on likelihood that how many times more likely the data is less than one model than the other. That is why the likelihood (LR test) is used in this study to decide between whether to use Ordinary Least Square (OLS) or Fixed Effect Model (FEM)

Hence, in this test Chi^2 test is used to accept or reject the following hypothesis;

H_0: Ordinary Least Square (OLS) test is appropriate to use in this study.

H_1: Fixed Effect Model (FEM) is appropriate to use in this study.

In order to accept or reject the aforementioned hypothesis chi^2 test statistic value is matched with the table value/critical value. If the statistic value is above the table value, null hypothesis is rejected and vice versa. Alternatively, this decision can also be arrived at by observing the P value of the test statistic. In this case if the P value is less than the level of significance of 5% the null hypothesis is rejected and vice versa.

Table 3 Results of Likelihood Ratio Tests

Model No. 1 Operating Cash Flows (OCF) as Dependent Variable;	
Likelihood-ratio test	LR Chi^2 (74) = 595.38
(Assumption: <u>ols</u> nested in <u>fixed</u>)	Prob > Chi^2 = 0.0000
Model No. 2 Operating Efficiency (OE) as Dependent Variable;	
Likelihood-ratio test	LR Chi^2 (74) = 203.71
(Assumption: <u>ols</u> nested in <u>fixed</u>)	Prob > Chi^2 = 0.0000

As per the review of the results of LR test of the model that includes operating cash flows as dependent variable (DV) it revealed that the P value of Chi^2 is 0.000 which is less than 5% even less than 1% level of significance. So, we reject null hypothesis which states that ordinary least square is appropriate and accept alternative hypothesis which words that Fixed Effect Model (FEM) is suitable and arrived at the conclusion that Fixed Effect Model is better for the analysis of the panel data pertaining to model no. 1 in which dependent variable is operating cash flows.

Whereas, the results of LR test of model no. 2 showed that the p value is lower than 1 percent level of significance so we reject null hypothesis which states that Ordinary Least Square is appropriate and accept alternative hypothesis which words that fixed effect model is appropriate. Therefore, it is concluded that for the estimation of model no. 2 in which operating efficiency has been taken as dependent variable, fixed effect model is better than Ordinary Least Square.

Hausman Test
In order to apply the Hausman test the comparison is required between the Hausman statistic to a critical value obtained from its sampling distribution, and rejecting the null hypothesis of correct specification if the Hausman statistic exceeds its critical value. The large sample distribution of the Hausman statistic is straightforward to derive; a high-level analysis appears below. This distribution simplifies usefully when one of the compared estimators is efficient under the null, as originally proposed by (Hausman, 1978).

Table 4 Results of Hausman Test

Model 1 Operating Cash Flows (OCF) as Dependent Variable

	-Coefficients- (b) Fixed	(B) Random	(b-B) Difference	Sqrt (diag (V_b-V_B)) S. E
LnIA	656221.4	912113.2	-255891.9	141410.2
CompanySize	1177480	1642842	-465361.6	454761.5
CompanyAge	45786.4	-23811.17	69597.57	86062.54

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
$Chi^2(3) = (b-B)`[(V\_b-V\_B)^{(-1)}](b-B) = 3.69$
$Prob > Chi^2 = 0.2967$

Model 2 Operating Efficiency (OE) as Dependent Variable

	-Coefficients- **(b)** **Fixed**	**(B)** **Random**	**(b-B)** **Difference**	**Sqrt (diag (V_b-V_B)) S. E**
LnIA	-0.0312527	-0.0220833	-0.0091694	0.0265102
CompanySize	0.0321942	0.1115725	-0.0793783	0.0728306
CompanyAge	0.0880705	0.0023726	0.0856979	0.012283

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
$Chi^2(3) = (b-B)`[(V\_b-V\_B)^{(-1)}](b-B) = 54.95$
$Prob > Chi^2 = 0.0000$

According to the results of Husman test (HT) of model no.1 the Probability value of Chi^2 is 0.2967 which is more than 5% level of significance and even more than 10% level of significance. Therefore, we cannot reject Null Hypothesis (Random Effect Model is Appropriate) and conclude that Random Effect Model is better for analysis of data for model 1 where the operating cash flows as dependent variable.

The results of Husman test (HT) of model no. 2 indicated that the Probability value is less than 1 percent so we reject null hypothesis stating that Random Effect Model is better and accept alternative hypothesis stating that fixed effect model is better. Therefore, we concluded that fixed effect model is better for model no.2 for analysis of our data.

Moreover, the question is that how to decide between using the Ordinary Least Square (OLS) or Random Effect Model (REM) for model no. 1. So, it is decided with the help of Langranger Multiplier test (Stata Guide).

Lagrange Multiplier Test (LM)
A test used for testing the hypotheses towards the standards/parameters in a likelihood way named as Lagrange Multiplier Test (LM). The one or more constraints on the values of parameters are expressed as the hypothesis in this test. To perform an LM test only estimation of the parameters subject to the restrictions is required. This is in contrast with Wald tests, which are based on unrestricted estimates, and likelihood ratio tests which require both restricted and unrestricted estimates. The term "Lagrange Multiplier" widely used test for analysis, named after the

eighteenth-century mathematician Joseph Louis Lagrange. Many of the econometrics problems are solved using the Lagrange Multiplier Test (LM). Moreover, the idea of testing the cost of imposing the restrictions, though basically developed in a likelihood framework, has been extended to other estimation framework, including method of moments and robust estimation.

Table 5 Results of LM Test

OCF [ID, t]   = Xb + u [ID, t] + e [ID,t]

Estimated Results:	Var	Sd = sqrt (Var)
OCF	1.50e+14	1.23e+07
E	6.50e+13	8059662
U	5.92e+13	7691390

Test: Var (u) = 0

Chibar2 (01)	=	874.95
Prob > chibar2	=	0.0000

The probability value of Chi^2 is 0.000 which less than 5% level of significance. Therefore, we rejected the null hypothesis (OLS Model is Appropriate) and accept alternative hypothesis which states that Random Effect Model is better for analysis of data.

After applying the entire test on the panel data from the year 2007-2017 for the 75 companies it is finally concluded that the Fixed Effect Model (FEM) is better for Model no. 2 and the Random Effect Model (REM) is better for model 1. In the next session the results of the study estimated with the aforementioned models are explained:

Table 6 Results of Random Effect Model (REM) for Model 1

OCF	Coef.	Std. Err.	Z	P>|z|	[95% Conf.	Interval]
LnIA	912113.2	208202	4.38	0.000	504044.8	1320182
CompanySize	1642842	427353.9	3.84	0.000	805243.9	2480440
CompanyAge	-23811.17	48354.77	-0.49	0.622	-118584.8	70962.43
_Cons	-3.14e+07	6712958	-4.68	0.000	-4.45e+07	-1.82e+07
Sigma_u	7691389.8					
Sigma_e	8059662.2					
Rho	0.47663197 (Fraction of variance due to u_i)					

Random-effects GLS regression		Number of obs	=	825
Group variable: ID		Number of group	=	75
R-sq: Within = 0.0166		Obs per group: Min	=	11
Between = 0.3117		Avg	=	11.0
Overall = 0.1914		max	=	11
Corr (u_i, x) = 0 (assumed)		Wald Chi^2 (3)	=	42.37
		Prob > Chi^2	=	0.0000

Table 6 indicating the regression results of model 1 in which operating cash flows is regressed on LnIA (natural log of intangible assets) after controlling for the factors Company Size and Company Age by taking the data of 75 non-financial companies for the period 2007-2017.

The results showed that natural logarithm of intangible assets (LnIA) has a highly significant and direct impact on operating cash flows (OCF) as the co-efficient is positive and the p-value is less than 1 percent level of significance. It states that operating cash flows of non-financial companies of Pakistan increases over the years due to increase in investment in intangible assets. As well

company size is concerned, the co-efficient of the company size is positive and the p-value is less than 1 percent level of significance which means that as the company size increases the more the company is able to generate favorable cash flows from its operating activities.

Moreover, the co-efficient of the company age is negative and the p-value is more than 1 percent even more than 10 percent. The results showed that the company age with reference to the operating cash flows (OCF) is insignificant; the age of the company doesn't impact upon the operating cash flows of that company.

These results are also compatible with the study of (Alessandro et al., 2014) who stated that the level to invest in intangible assets increases with the firm's size, human capital, and historical intangible asset base. Moreover, there is positive and significant impact of the intangible assets of a company upon it financial performance (Rindu R, Gamayuni, 2015)

R-Square is 19.14 percent which means that out of total variation in Operating Cash Flows 19.14 % variation is explained by LnIA, Company Size and Company Age. P-value of F-statistics is less than 1 percent that showed the overall model of the study is fit and all the three variables i.e. LnIA, Company Size and Company Age have positive effect on Operating Cash flows.

Table 7 Results of Fixed Effect Model (FEM) for Model 2

OE	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
LnIA	-0.0312527	0.0323514	-0.97	0.334	-0.0947632	0.0322577
CompanySize	0.0321942	0.0802153	0.40	0.688	-0.12528	0.1896684
CompanyAge	0.0880705	0.012689	6.94	0.000	0.0631602	0.1129809
_Cons	-2.778206	1.20769	-2.30	0.022	-5.149075	-0.4073358
Sigma_u	1.6143864					
Sigma_e	1.0359863					
rho	0.70831241 (Fraction of variance due to u_i)					

Fixed-effects (within) regression			Number of obs		=	825
Group variable: **ID**			Number of group		=	75
R-sq: Within = 0.0775			**Obs per group:** Min		=	11
Between = 0.0044			Avg		=	11.0
Overall = 0.0004			max		=	11
Corr (u_i, xb) = -0.9409			F(3,747)		=	20.90
			Prob > F		=	0.0000
F test that all u_i =:			F (74, 747) = 2.83		Prob > F = 0.0000	

Table 7 presents information about the regression results of model 2 in which operating efficiency is regressed on LnIA after controlling for the factors of company size and company age by taking the data from 75 non-financial companies from 2007-2017.

The results showed that the natural logarithm of intangible assets (LnIA) had insignificantly affected the operating efficiency as the coefficient is negative and the p-value is more than 10 percent significance level. It means that investment in the intangible assets of non-financial companies in Pakistan has a negative and insignificant impact on the operating efficiency.

The researcher in the present study has also estimated the model showing the impact of Intangible assets on Operating Efficiency (OE) with other methods like the Ordinary Least Square (OLS) method and Random Effect Model (REM) in addition to the selected model of the study that is Fixed Effect Model (FEM) and the results are provided in annexures. The results indicated that the

impact of intangible assets retains its insignificance even when tested with the Random Effect Model (REM) application.

Discussion

Model 1 (Operating Cash Flows as Dependent Variable)

The Random Effect Model (REM) results are reported in table no. 6; the results depicted that Intangible Assets, measured by the natural logarithm of absolute values of Intangible Assets, have a direct and highly positive significant impact on the values of operating cash flows, which means that the cash flows generated by the operations of the business increase due to increase in investment in Intangible Assets.

Hence, the first hypothesis of this study, H01, is rejected, and the researcher concludes that Intangible assets significantly impact operating cash flows. So, the first objective of the present study has been met.

The control variable size of the company has a positive and significant impact on the operating cash flows. As the companies age, they create their place in the competitive market and increase their revenues from the sales volume. Control variable Company age is insignificant; the company's age does not impact the operating cash flows of that company.

Model 2 (Operating Efficiency as Dependent Variable)

The results indicated that the investment in intangible assets has a negative insignificant impact on the operating efficiency in the case of Pakistan. H02: is accepted. It can be justified that the operating efficiency is not purely based upon the single intangible assets. Similarly, control variable Size has an insignificant impact on operating efficiency, while company age has a significant and positive impact on operating efficiency.

So, it is clear that while investing in intangible assets, the companies must manage other internal factors to gain benefits, improved operating cash flows, and efficiency.

Summary/Conclusion

The struggle for survival in the highly competitive environment is a significant issue for modern businesses, and each business is in the quest for a solution to the said issue and the financial benefits that can be gained from the highly competitive and highly potential today's market. The results of this study explain how a barrier can be created to ripen the benefits of competitive advantage with the help of investment in intangible assets.

Existing literature shows handsome work on intangible assets with multiple angles of the company's performance measure factors like investment in the information technology system development enabled the company to produce the product or service in a highly cost-effective way, which leads to a barrier for the rival companies (Kudyba & Vitaliano, 2003).

There is a direct positive impact of intangible assets upon the value creation of the company and the companies' benefits by investing in intangible assets (Volkov & Garanina, 2007).

This study found that intangible assets significantly positively impact the operating cash flows. In contrast, intangible assets have a negative impact on the operating efficiency of PSX's non-financial companies. In order to reap the benefits of intangible assets by way of improved cash flows, the management of the companies is required at the same time to set policies and procedures to manage the operating expenses.

In the end, it is recommended that the management locate the core area within the company, which may be staff training, research and development of products, operational engineering, accounting

and financial policies, marketing and transformation of service or product, etc., that require the investment in intangible assets so that the tangible gain can be achieved.

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