MODELLING TECHNOLOGY PROTECTION PERFORMANCE OF STATE UNIVERSITIES IN THE PHILIPPINE PROVINCES

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Abstract

This study is a quantitative study aimed to determine the technology protection performance of state universities specifically in the Philippine provinces. Further, this paper aimed to find out the significance and trends in technology protection using predictive methods such as linear regression and time series projections. A total of 24 state universities were included in the study. The quantitative data came from surveys using the Google Forms and was validated through the data from Intellectual Property Office of the Philippines (IPOPHL) database. Result shows that technology protection performance of state universities in the Philippines proved to be statistically significant (>.05) at p value=0.000). Further, regression models showed a likely decline in the number of technology protection in the province during the past years but spur a significant increase in the last two years. The comparison of the actual and the predicted values of protection performance for the years 2007-2020 show a very optimistic forecasts for the technology protection performance of state universities in the province. The model proposes a total of 2,032 in 2020, a compounded annual growth rate of 17.5% from 355 in 2016. In the light of the findings above and by observing the models presented, it can be concluded that technology protection performance of state universities in the province display an increasing trend prediction, they reflect a significant increase in the number of technology protection. For future research, it would be useful it would be very useful to include technology protection initiatives of all universities in the Philippines including industries to be able to clear picture of the technology protection performance of the country.

Keywords: state universities and colleges, patent, utility model, IP protection intellectual property performance

I. INTRODUCTION

Technology has been a major driving force in economic growth. Both technology innovation and economic growth are mutually reinforcing (Hirono, 1985). It meant that as creation of technology increases so is economic growth and vice versa. Further, the Innovation Strategy adopted by OECD finance ministers emphasized that ability to create and benefit from technology plays a central role in income, employment and quality of life (Elg, 2014). Dahlman (2006) on the other hand, considers technology as an increasingly important element of globalization and of competitiveness for many developing countries. In the Philippines, the key institutions involved in

the creation and protection of technologies derived from researches are R and D laboratories and R and D centers and universities from both public and private entities. This study focuses on the latter.

The contribution of identifying useful output of universities has become a relevant topic in many countries. It is generally acknowledged that the science system has to contribute to economic growth. Over the past few years more attention has been dedicated to the accountability of university research. In this general context, demonstrating usefulness of university research is an area that has aroused some interest and received considerable attention (Meyer, 2003). On the other hand, the rise of university patenting and strengthening of intellectual protection worldwide has spurred new start-ups, scholarly analysis and additional university funding for research. Investigations of university intellectual property have ranged from textual exegesis of matched scientific publications and patents (Myers,1995) to sophisticated econometric analyses of the total factor productivity of university licensing endeavors (Thursby & Thursby, 2002).

Patent data are often used as indicators of university research and development output (Griliches, 1998). Patent documents contain descriptions of scientific and technical concepts as well as practical details of processes and apparatus. It also reflects developments of science and technology. It is widely accepted that patent statistics are a reliable indicator of innovative activity. Therefore, it has become standard practice to use patent statistics for monitoring innovative activities and the development of new technologies.

The World Intellectual Property Office (WIPO) provides reliable statistical country profiles on patent, utility models, trademarks and industrial designs. These statistics also associate intellectual property (IP) activity relative to the countries' economic performance. Among the top performers in IP are the United States, Japan, Korea, China and Germany. However, for the past years the Philippines lagged behind this area although recently IP Filings and economic growth is

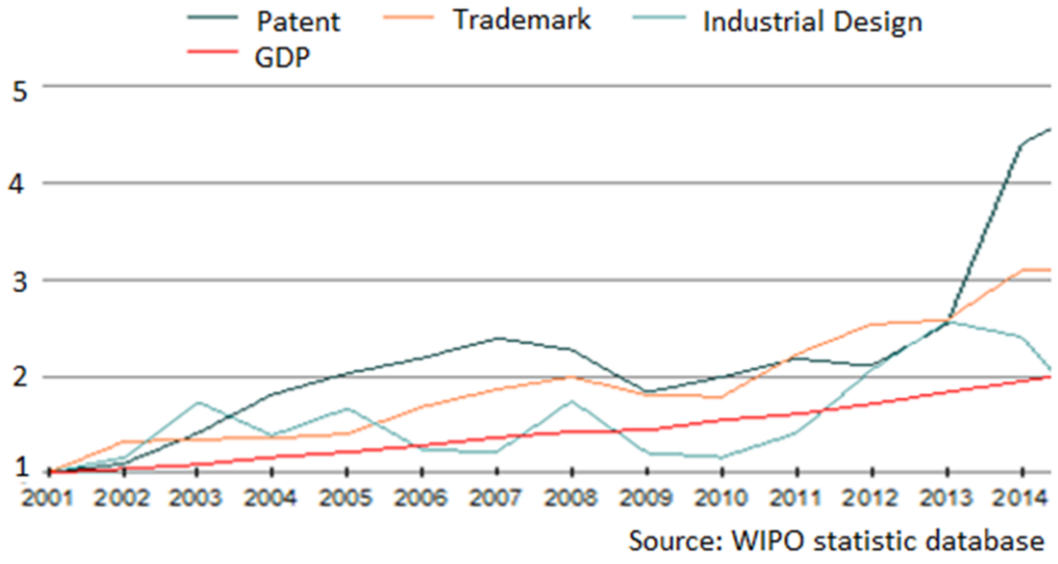

Figure 1. IP Filings and Economic Growth of the Philippines

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improving as shown in Figure 1. For 2015, Philippines ranked 53 in patent filings, ranked 56 in patent grants, ranked 46 in utility model applications and ranked 51 in PCT national phase entry out of 186 countries.

II. METHODOLOGY

Quantitative procedures were used to gather pertinent data on the technology protection performance on the Philippine provinces. The inventors/ makers from different universities in the Philippine provinces were the respondents of the study. A total of twenty-four (24) universities were included in the study. These universities were chosen due to their performance in protecting their technologies by either patents or utility models. The quantitative data came from surveys using the Google Forms and was validated through the data from Intellectual Property Office of the Philippines (IPOPHL) database. Google Forms is part of Google Drive for creating surveys, tests, or web input forms. It allows anyone to create an easy to use web form, tie to a spreadsheet where you can track and post it on the web.

The frequency count and ranking was used to determine the number of technologies protected by universities in the provinces. Universities in the Philippine Metropolis such universities located in Metro Manila, Metro Cebu and Davao City were not included in the study.

Linear Regression Model and Time Series projections on the basis of linear models for technology protection performance of universities in the provinces were used in the analysis of data. The characteristics of the time series of data are an important factor when determining the relative performance of the various prediction methods (Meade, 2000).

The assumptions of this study are the following 1) the historical yearly patent registration from the Intellectual Property Office of the Philippines (IPOPHL) reflect changes in the real values during these period of time and 2) keeping all other factors constant, all registered applications whether patent or utility model are assigned a magnitude of 1.

III. RESULTS AND DISCUSSIONS

The main objective of this paper is to find the significance and trends of technology protection performance of the state universities in the Philippine provinces. Table 1 shows the parameter of model ARIMA (0,0,0) which contain the following information: R=.288, R square=0.83 and Adjusted R square=0.78. Seventy-eight percent (78%) of the variance is explained by the predictor. The R Square in a multiple regression represents explained variance that can be contributed to all the predictor in a progression. In other words, 78% of the variability of the response data is explained by the model.

Results further show that the technology protection performance of state universities in the Philippines proved to be statistically significant (>.05) at p value=0.000. The performance, therefore, of the state universities in the Philippines in terms of technology protection has a significant contribution in the technology protection landscape of the Philippines.

Figure 1 reflects the graph showing the ARIMA model of the technology protection performance of state universities in the province. ARIMA stands for Autoregressive Integrated Moving Average models. It is a forecasting technique that projects the future values of a series based entirely on its own inertia. (www.forecastingsolutions.com). The ARIMA modelling approach expresses a variable as a weighted average of its own past values. The model is in most cases a combination of an autoregressive (AR) part and a moving average (MA) part. Suppose Vt is modelled

Table 1. Parameters of Model ARIMA (0, 0, 0)

Model	Number of Predictors	Model Fit statistics	Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	Statistics	DF	Sig.	
Year-Model_1	1	.768	.	0	.000	0

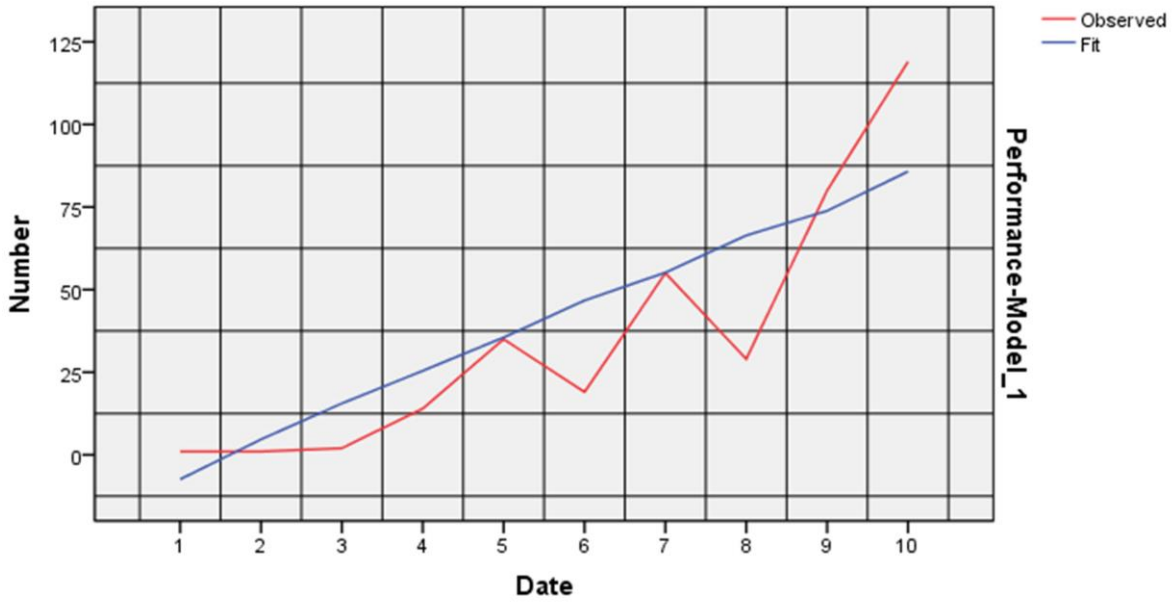

Figure 1. ARIMA model for technology protection performance of state universities in the province

as AR, then it is expressed as Vt=C+ϕ1Vt-1+ϕ2Vt-2+…where C is the constant term while ϕi (i = 1, …, p) are the weights for the autoregressive terms.

The model indicates a likely decline in the number of technology protection in the province during the past years but spur a significant increase in the past two years. This can also be observed when the data is subjected to P-P Plot modelling as shown in Figure 2.

Table 1 shows the fitted values or forecasts for the total technology protection for years 2016-2020 together with their estimates of variances. The forecast depend on the future levels of the independent variables which is the actual total technology protection of state universities in the province from 2007-2016.

Figure 2 shows the comparison of the actual and the predicted values of protection performance for the years 2007-2020. 95% confidence intervals are calculated for each individual forecasted year. The model show a very optimistic forecasts for the technology protection performance of state universities in the province. The model proposes a total of 2,032 in 2020, a compounded annual growth rate of 17.5% from 355 in 2016.

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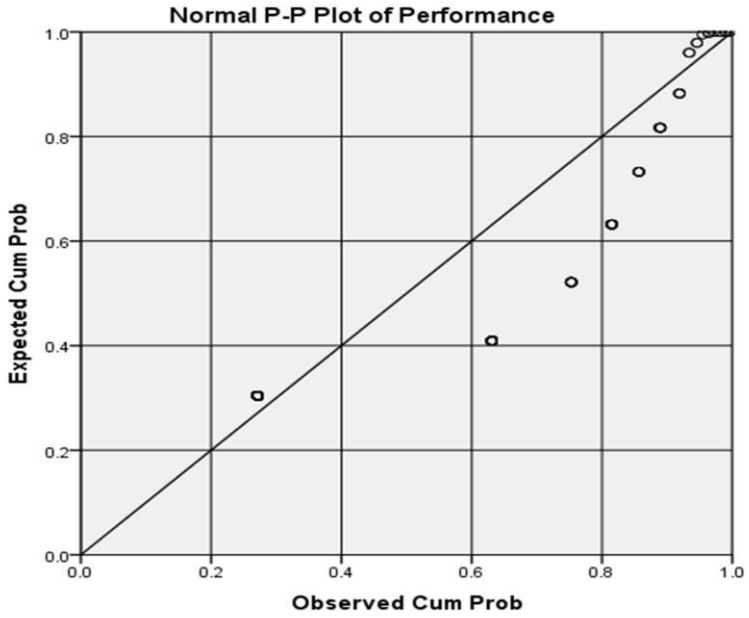

Figure 1. P-P Plot for technology protection performance of state universities in the province

Table 1. Technology protection forecasts by the model

Year	Actual Total Technology Protection	Model forecast	
		Total filing forecasts	Standard error
2016	355	356	16.05
2017		653	32.65
2018		1,028	51.4
2019		1,567	78.35
2020		2,032	101.6

IV. CONCLUSIONS

In the light of the findings above and by observing the models presented, it can be concluded that technology protection performance of state universities in the province display an increasing trend prediction, they reflect a significant increase in the number of technology protection.

In this study, regression model utilizing ARIMA model was developed to investigate the performance of state universities in the Philippine provinces in terms of technology protection. The results show that the performance of these universities has significant contribution to the performance of the Philippines. The models developed shows a potential for describing the long-term trends in technology protection performance. The impact however, on its economic contribution was not considered.

For future research, it would be useful it would be very useful to include technology protection initiatives of all universities in the Philippines including private higher education institutions and industries to be able to clear picture of

the technology protection performance of the country.

Moreover, in this study the number of variables tested in the models were very limited. It would very interesting to include other factors such as R&D funding, IP Funding, IP staff, expertise available and technology generated. This would be an important topic for further research.

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