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An Assessment of Technological Competencies on Professional Service Firms Business Performance

Sulaiman Ainin, Yusniza Kamarulzaman, Abdul Ghani Farinda

***Abstract*—**This study was initiated with a three prong objective. One, to identify the relationship between Technological Competencies factors (Technical Capability, Firm Innovativeness and E-Business Practices and professional service firms' business performance. To investigate the predictors of professional service firms business performance and finally to evaluate the predictors of business performance according to the type of professional service firms, a survey questionnaire was deployed to collect empirical data. The questionnaire was distributed to the owners of the professional small medium size enterprises services in the Accounting, Legal, Engineering and Architecture sectors. Analysis showed that all three Technology Competency factors have moderate effect on business performance. In addition, the regression models indicate that technical capability is the most highly influential that could determine business performance, followed by e-business practices and firm innovativeness. Subsequently, the main predictor of business performance for all types of firms is Technical capability.

***Keywords*—**technology competency, technology capability, innovativeness, E-business practice

I. Introduction

TECHNOLOGY has been said by many [1], [2], [3] to be an asset for firms to increase its profitability and gain competitive advantage. Technology helps firms to improve their business processes and decrease cost. Therefore, most firms around the world use technology in carrying out their daily business processes and activities. Technology has contributed to the increase of a firm's business performance. Hence, the role of Technological Competency in enabling business performance is an important area that needs to be studied. Although many have discussed the issue, however, most studies done were focused on large firms [4]. In recent years, a number of works have been done analyzing Technological Competency in Small Medium Enterprises (SMEs) [5], [6]. Nevertheless, review of the literature shows little evidence on Technological Competency in the professional services firms such as accounting, legal, engineering and architecture firms.

The concept of Technological Competency has been studied by many however there seem to be lack of a standard instrument of how it should be measured [7]. Rousseva [8] however mentioned that different measures should be used to measure Technological Competency as different firms have different levels of technological adoption. Furthermore, firms vary in size, structure and industry. Hence, different measures are used. This is because business models that are appropriate for large sized firms may not be suitable for SMEs. Kula [4] further elaborate that SMEs usually has less resources comparatively to large firms for technology investment. Subsequently, what is suitable in the manufacturing sector may not necessarily apply to professional service sector. The reason is because this sector faces different opportunities and challenges compared to the SMEs in the manufacturing sector. Professional services firms not only are regulated by the government but have to adhered to regulations and standards of the various governing professional bodies.

Professional services firms such as Accounting, Engineering, Architecture and Legal are on an increase now particularly in Malaysia. The demand for their services has increased tremendously over the years. The main reason for the increase is that, these types of firms are much easier to set up as they only need firm owners' experiences and do not need much tangible resources such as human resources and furniture. Market demand is also another reason for the increase of these professional services firms.

The main aim of this study is to investigate the influences of Technological Competencies factors influence the SME professional service firms' performance. In addressing this issue, the study aims to assess whether Technological Competencies factors [Technical Capability (TC), Firm Innovativeness (FI) and E-Business Practices (EP)] play any significant role in the SMEs business performance. Hence, the research questions of the study are as follows:

RQ1: How well do the Technological Competencies factors (Technical Capability (TC), Firm Innovativeness (FI) and E-Business Practices (EP)) predict Business Performance?
RQ2: What are the predictors of professional service firms Business Performance?

S.Ainin is attached to the Department of Operations and Management Information Systems, Faculty of Business and Accountancy, 50603 Kuala Lumpur, Malaysia. (Phone: 603-79673853, Fax: 603-79673810, e-mail: ainins@um.edu.my).

Y.Kamarulzaman, is a Senior Lecturer in the Department of Marketing in the Faculty of Business and Accountancy, University of Malaya, Malaysia.(e-mail: yusniza@um.edu.my).

A.G. Farinda, is with the Department of Marketing, Faculty of Business and Accountancy, University of Malaya, Malaysia. (e-mail: farinda@um.edu.my).

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RQ3: Do type of firms affect the predictors of professional service firms business performance?

The paper proceeds with the literature review that briefly describes technological usage and its impact. Technological Competency factors together with business performance will be explained. Next, the methodology adopted is presented followed by data analysis and findings that illustrates the relationship between Technological Competency and business performance. Finally, the implications of the findings are discussed and future research is proposed.

II. LITERATURE REVIEW

A. Technology Usage and Its Impact

Firms invest in technology for several reasons. Lester [6] listed four reasons why firms decide to invest in technology. The reasons are the perceived cost savings and income generation benefits, external pressure from rivals, suppliers and buyers; organizational readiness; and perceived ease of use. Most firms use technology for their survival and success. Larger firms tend to invest heavily in technology whereas small and medium sized may have less financial resources to do so. Nevertheless, almost all types of firms use technology to automate their business processes and to improve information gathering, access and quality [9]. Technology also provides firms access to external knowledge and financial resources, create trust and legitimacy through widespread information dissemination and create social network ties [10].

The level of technology usage may differ between firms. Most firms however, would have applications such as payroll, human resource information system, sales and purchase systems etc. Bigger firms may also implement more complex and sophisticated applications such as enterprise resource planning and customer relationship management systems. In addition, in the current global environment many firms use the internet technology to conduct part of their daily business.

B. Technological Competency

With the different levels of technological adoption among firms subsequently will lead to different Technological Competencies. The definition of Technological Competency differs between authors. Bharadwaj [11] defines Technological Competency as the ability of a firm to organize other resources using their own existing technology resources. Perhaps a more recent definition by Jiao [12] is more comprehensive. They viewed Technological Competency as 'enterprise formation, transfer and deployment of enterprise technological resources in order to combine with other resources, support and improve other uniqueness functions that are competent at strength and skill, creating the latent potential for maintaining continuous competitive advantage'.

Technological Competency has been hypothesized by many to be a key element in firm's performance. Technological Competency is achieved when firms are able to utilize equipment and technological information efficiently [13]. With Technological Competency firms can grow faster than the others and thereby increase their market share and business performance. The next question that perhaps arises is what constitutes Technological Competency.

A review of the literature illustrates that there have been many studies that proposed how Technological Competency should be measured. Feeney [14] identified nine core technological competencies; leadership, business system thinking, relationship building, architecture planning, making technology work, informed buying, contract facilitation, contract monitoring and vendor development. Huang [15] and Jiao [12] look at Technological Competency from the firm's technological infrastructure, technology enabled intangible resources and human technological resources, while Mei [16] measured Technological Competency based on technology development capability, new product development capability and manufacturing process. Review of the literature illustrates that the constructs studied by Zhang [7] and Zhang [5] to be a more comprehensive one. They studied six main Technological Competency model and finalized a model whereby Technological Competency can be measured using technological architecture, technological infrastructure, human resources technology, technology relationship resource. According to them, technological architecture is the high level map of information and technology requirements of the entire firm and the clarity and organizational consensus around technology, data and process standards. Technological human resource is the valuable human asset that can be used to consistently solve business problems and address business opportunities through technology. Technological infrastructure is the shared resource that data and applications access through communication networks for organizational use while technological relationship resource is the valuable relationship between technology and business units.

C. Technical Capability (TC)

Firms can increase their technical capability, thus enhancing their ownership advantages by acquiring new technology [17]. Technical capability cannot be acquired easily as it takes time. It varies between industries, for example the industrial sector the factor of technical capability would include production engineering and manufacture of capital goods [18]. Services sector may look at technical support and quality of service as their technical capability. With the technical capability, firms can grow faster and thereby increase their market share and business performance.

D. Firm innovativeness (FI)

Wealth can be gained through the process of innovation for business firms [19]. Innovation focuses on the way a business firm search for their opportunities, strategic planning and the extend they do research and development in order to be competitive [20], [21], [22]. Lin [20] states that, it is easier for SMEs than big corporations to indulge into innovation as SMEs can make fast decision due to less bureaucracy and are usually more flexible or accommodating in accepting changes. Nowadays, most innovation practices go beyond technical innovation and it may include innovation in leadership,

empowerment, culture, technology, learning, structure and management [23]. SMEs need to have interest to innovate in order to gain competitive advantage and to achieve successful business performance.

E. E- Business Practices (EP)

The Internet is a platform that allows firms to adapt to the needs of customers in order to reduce transaction costs [24]. The Internet also allows faster business expansion from local market to global market compared to traditional media, such as newspapers, radio and TV. Traditional businesses embrace the online business environment because they want to expand their access to the market, alleviate their capacity constraints, capitalize on emerging market opportunities and serve as a catalyst for organization transformation [25]. Online business offers the potential to provide business opportunities to new audiences and offers the opportunity to fundamentally transform the business approach and delivery, and the competitive landscape. Therefore, more and more firms have their own websites, sell and buy and interact with their customers online. Larger firms would have their own portals and online sales and marketing modules whereas smaller firms may just have their own websites.

F. Business Performance

Studies on the growth and performance of firms have come to contrasting conclusions and findings, even on the same explanatory variables applied [26]. The success and performance of a business can be measured in various ways. Among the selected variables are sales growth, profitability, total assets, return on investment, sales volume, turnover, market value, earning per share, and return on investment, composite performance indicator, and international involvement. Regardless of what measure is used, in all cases the literature has strongly endorsed the use of multiple performance indicators [27], [28]. Nevertheless, there is no 'one best way' of measuring growth and performance of a firm, as firm growth is fundamentally a multidimensional rather than a one-dimensional phenomenon [29].

Most authors studied Technological Competency in relation to firm's performance. Zhang [7] studied Born Global Firms while Huang et al. analyzed firms listed in the Taiwan stock market. Love's [30] study showed that there was no positive relationship between Technological Competency and firm's business performance while other researchers showed that Technological Competency positively affects a firm's business performance [7], [31]. There are also studies that showed no relationship between Technological Competency and firm's performance [9]. Nakata [32] found that Technological Competency may have indirect impact on business performance through customer orientation.

From the above literature, this study proposes a set of research objectives as follows:

- To identify the relationship between Technological Competencies factors (Technical Capability (TC), Firm Innovativeness (FI) and E-Business Practices (EP)) and professional service firms business performance.
- To investigate the predictors of professional service firms business performance.
- To evaluate the predictors of business performance according to the type of professional service firms.

II. CONCEPTUAL MODEL

Fig. 1 displays the conceptual model adopted in this study. It shows the relationships between Technical Capability (TC), Firm Innovativeness (FI), E-Business Practices (EP) and Business Performance (BP) of SMEs based on the literature presented in earlier part. Business Performance is treated as an exogenous variable, whereas TC, FI, EP are considered as endogenous variables.

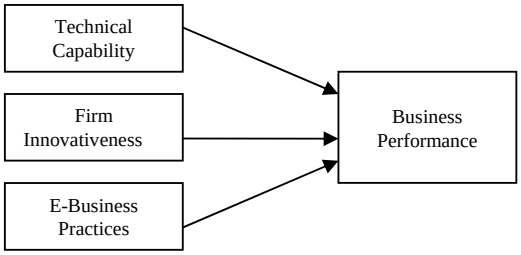

Fig. 1: A Conceptual Model of Relationship among Variables

III. METHODOLOGY

This study employed quantitative research design. A questionnaire was developed based on a thorough review of related literature as well as findings of preliminary qualitative study conducted in the initial stage. Manipulation checks were conducted to ensure the reliability and validity of scales. Technical Capability (TC) was measured using 4-item scale, Firm Innovativeness (FI) was represented by 4-item scale, E-Business Practices (EP) measured by 5-item scale and finally SMEs Business Performance (BP) was measured with 8-item scale, using 5-point Likert-type.

The sample population in this study comprised of professional services of SME owners who were located all over Malaysia including Sabah and Sarawak. Probability sampling takes place when the probability of the selection of each respondent is known, and, therefore, statistical inferences on the chosen sample of SMEs in professional services can be made. The selected respondents from the industry's database could represent the total population of SMEs in different type of professional service firms, and this approach also permits generalizations.

The study was conducted in between June and July 2008. The questionnaire was mailed to 2000 addresses of SME registered professional service owners in Malaysia. Of the 2000 posted questionnaires, 357 questionnaires were returned. Four responses were eliminated before data coding because they were partially completed. After eliminating the unusable responses, 353 responses were coded for data analysis,

resulting in a response rate of 18% which is comparable with past studies that applied the same research approach [33].

The collected data was analyzed in a few stages. In the first stage descriptive statistics were employed to describe the demographic variables of the owner and company background that made up the sample of professional services of SMEs. In the second stage, the descriptive statistics of the measurement scales for all variables used in the study were reported. The third stage presents an assessment of the reliability and validity of the research measurement. The results of multiple-regression analyses based on the conceptual framework are also presented.

IV. PROFILE OF THE RESPONDENTS

The profile of the professional services of SMEs is shown in Table 1. In general, most of the SMEs were relatively new in business, with 43% of them established after 2001, which means that the companies were less than ten years old. Companies that have been in the business relatively long enough are only 5% of the sample. These are the companies that have survived for the past 28 years. Most of the companies were initiated and set up by the owners themselves (91%) and only a few of the SMEs were taken over from family members. As expected, the number of employees working for the SMEs was relatively small. Nearly 88% of the SMEs employed less than 20 people, while only 11% of the SMEs have between 20 to 50 employees. The distribution of sample companies is almost equal among law, architecture, engineering and accounting.

TABLE I
PROFILE OF RESPONDENTS

Profile	Characteristics	Freq. (n=353)	%
Year of establishment	Before 1970	4	1.1
	1971 to 1980	15	4.2
	1981 to 1990	37	10.5
	1991 to 2000	130	36.8
	After 2001	150	42.5
	Not disclosed	17	4.8
Company origin	Own set up	320	90.7
	Taken over from others	22	6.2
	Taken over from family business	2	0.6
	Others	5	1.4
	Not disclosed	4	1.1
No. of current employees	Less than 5	138	39.1
	5 to 19	171	48.4
	20 to 50	38	10.8
	51 and above	5	1.4
	Not disclosed	1	0.3
Nature of business	Legal	92	26.1
	Architecture	79	22.4
	Engineering	102	28.9
	Accounting	77	21.8
	Others	3	0.8
Company status	Sole proprietor	204	57.8
	Partnership	111	31.4
	Limited company	29	8.2
	Others	3	0.8
	Not disclosed	6	1.7
Net-profit (2006/2007)	Less than 50,000	132	37.4
	50,001 to 100,000	95	26.9
	100,001 to 150,000	48	13.6
	150,001 to 200,000	16	4.5
	200,001 and above	49	13.9
	Not disclosed	13	3.7
Start-up capital	Less than 100,000	305	86.4
	100,001 to 200,000	33	9.3
	200,001 to 300,000	5	1.4
	300,001 and above	5	1.4
	Not disclosed	5	1.4
Source of capital	Personal Saving	312	88.4
	Loans from friends	42	11.9
	Banks Loans/ Facilities	49	13.9
	Government loan	1	0.3
	Government grant	1	0.3
	Other sources	10	2.8

As most of the SMEs were initiated by the owners, it is no surprise that the ownership of the SMEs was mostly sole proprietorship (58%), while 31% of the SMEs ownership was shared with others. It shows that the motivation to start a business comes from the entrepreneurs themselves. The net profit of the SMEs was mostly less than RM50, 000 (37%) and another 27% of the SMEs claimed of getting a higher net profit between RM50, 000 to RM100, 000. Furthermore, 14% of the SMEs claimed that their net profit was more than RM200, 000. It means that the distribution of the net profit was positively skewed with most of the companies' net profit on the lower range of the distribution, while only a few companies have substantially higher profits than the others. Consistent with the net profit figures, the SMEs start-up capital was low. Most of them had a start-up capital of less than RM100, 000 (86%), while less than 5% of the SMEs had at least RM200, 000 start-up capital. The low start-up capital is fairly plausible as the source of capital for the SMEs was mainly from the owners' personal savings (88%). Less than 1% of the SMEs received government loans or grants.

V. DATA ANALYSIS AND RESULTS

A reliability test was used to assess the internal homogeneity among items in this study. As Sekaran [34] suggested, the *coefficient alpha* is the most popular measure of reliability for a multi-item scale.

TABLE II
RELIABILITY ANALYSIS— TECHNICAL CAPABILITY (TC), FIRM INNOVATIVENESS (FI), E-BUSINESS PRACTICES (EP) and BUSINESS PERFORMANCE (BP)

Constructs	**Coefficient Alpha**
Technical Capability	0.81
Firm Innovativeness	0.79
E-Business Practices	0.84
Business Performance	0.83

The coefficient alpha estimates for the multi-item scales used in this study are presented in Table II. All alpha coefficients for the data exceed the minimum standard for reliability of 0.7 recommended by Nunnally [35] for basic

research. Thus, the results indicated that these multiple measures are highly reliable for the measurement of each construct.

Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. Construct validity assesses the degree to which a measurement represents and logically connects, via the underlying theory, the observed phenomenon to the construct [36]. The relationships between TC, FI and EP and BP were investigated using Pearson Product-moment Correlation coefficient. As shown in Table III, all loadings were significant ($p < .01$), showing evidence of discriminant validity.

TABLE III
MEASURE OF CORRELATION

Constructs	Correlation Among Constructs			
	BP	**TC**	**FI**	**EP**
Business Performance (BP)	1.000			
Technical Capability (TC)	.390	1.000		
Firm Innovativeness (FI)	.335	.458	1.000	
E-Business Practices (EP)	.356	.285	.323	1.000

There were medium, positive, correlation between TC and BP (r=.39, n=324, p<.0005); FI and BP (r=.335, n=322, p<.0005) and EP and BP (r=.356, n=319, p<.0005), with moderate levels of TC, FI and EP being associated with BP of professional service firms. This means that TC, FI and EP of professional service firms had moderate effect on the business performance. Further examination on the multivariate relationship will be presented in the following section.

A. Regression Models

The regression analysis was used in the analysis to further evaluate the relationship of the predictors and business performance of SMEs professional service firms. In the regression analysis, the mean score of business performance measurement was the dependent variable and the mean score of the 3 constructs were the independent variables. The regression analysis using the stepwise was used. In this analysis, the overall model will test all the independent variables.

Table IV depicts the summarized results of the regression analysis, which shows constructs that are statistically significant at the 1% level. The F-value for the model is 31.7, which is statistically significant at the 1% level. The model's R^2 is 0.23, which means that the constructs are able to explain 23% of variation in the model. This is rather small to describe the variance in the model. The coefficient explains the contribution of each construct in the model.

In this study, the Technological Competencies of the professional service firms was measured by Technical Capability (TC), Firm Innovativeness (FI) and E-Business Practices (EP). These constructs were evaluated separately on each model to compare the predictors of business performance by firm type. Architecture firms show the highest percentage of variance explains on business performance at 43.7% followed by Engineering firms, Legal firms and Accounting firms at 29.4%, 22.5% and 13.2% respectively (significant at the 5% level for Accounting firms).

TABLE V
REGRESSION MODELS EVALUATING THE FIRM TYPES AND PREDICTORS OF BUSINESS PERFORMANCE

Model/ Type of Business	Predictors	*R*	R^2	1*		2*		
				β	*Std. Error*	β	*t*	*p*
1/ Legal	Constant	.474	.225	14.150	3.130		4.520	.000
	TC			.624	.245	.282	2.548	.013
	FI			.106	.213	.057	.496	.621
	EP			.307	.116	.280	2.650	.010
2/ Architecture	Constant	.661	.437	-.552	4.153		-.133	.895
	TC			1.254	.393	.381	3.189	.002
	FI			.678	.276	.291	2.459	.017
	EP			.152	.124	.127	1.222	.226
3/ Engineering	Constant	.542	.294	4.385	3.682		1.191	.237
	TC			.874	.281	.304	3.110	.002
	FI			.432	.226	.189	1.912	.059
	EP			.341	.123	.253	2.767	.007
4/ Accounting	Constant	.364*	.132*	16.175	4.321		3.743	.000
	TC			.221	.326	.085	.680	.499
	FI			.156	.256	.077	.609	.544
	EP			.369	.147	.303	2.519	.014

***1. Unstandardized Coefficients**
****2. Standardized Coefficients**
significant at p<0.05

The main predictor of Architecture firm's business performance is Technical Capability (TC), which makes the largest contribution (β = .38, p<.05), followed by the Firm Innovativeness (FI) (β =.29, p<.05) while insignificant contribution from the E-Business Performance (EP). As for the Engineering firm's business performance, TC remain the as highest contribution (β = .33, p<.05) followed by the EP (β = .25, p<.05) and no contribution from FI. The similar result found in Legal firms; TC (β = .62, p<.05) and EP (β = .30, p<.05). However, it is found only EP contributing to the business performance of the Accounting firms at (β = .36, p<.05) while TC and FI are insignificant

VI. DISCUSSION AND CONCLUSION

It must be highlighted here that this paper does not assert that the instrument used to measure Technological Competency in this study can be generalised across different industries and countries. Rather this study is using an instrument that is suitable in a particular type of industry i.e. SMEs professional service firms in Malaysia. The role of Technological Competency may differ in different types of industry and countries as mentioned in the earlier section.

The results of the study indicate that Technological Competencies does have a substantial impact on firm

performance. In summary, the overall regression model identifies three significant constructs that are important to ensure the success of SMEs business performance. First, the SMEs should have a strong Technical Capability to effectively manage their business. For example, the SMEs must have an efficient systems and established technology in managing their business process. This factor received the highest unique contribution to the SMEs business performance. Second, the SMEs must have strong capability to introduce innovation from time to time. For example, SMEs must be dynamic and creative in serving the customers. Third, the SMEs must be actively involved in online business, capturing bigger target market worldwide. For example, the SMEs must be able to establish an online presence for their business to generate business opportunities. Finally, the SMEs must be able to adopt the current technology, trend and be innovative in running the business. The SMEs must utilise new technology or systems that can support the quality of their products and services. Subsequently, the result also shows that the nature of business does affect the predictors of SMEs business performance. Architecture firms' performance was influenced on all aspects of Technological Competencies (Technical Capability (TC), Firm Innovativeness (FI) and E-Business Practices (EP)) as compared to other type of businesses. In contrast, accounting firms showed the least involvement in Technological Competencies towards their Business Performance where only E-business Practices (EP) made contribution to the business performance.

In the literature it is found that technological change can influence the productivity of the SMEs and market growth. Although the usefulness of using new technology or advance tools is acknowledged by the SMEs, their resources are limited and they are not able to acquire them and the SMEs have to continue using the old technologies. As new technologies and technology transfers are usually costly in nature, the SMEs should consider pooling their resources. In this case, the related government agencies could play a bigger role in the managing the sharing of the new technology among the SMEs. In addition the agencies could also identify and organise relevant training programmes particularly those related to usage of new technologies.

Since many of the SMEs were already conducting their business online, they should consider using more information and communication technology (ICT). For example implement Intranet, which could be used for communication among the SMEs owners or between the SMEs and the suppliers or vendors. It is suggested that the SMEs should be using an integrated system and not a standalone system or technology. It is because the integrated system should contribute to better performance and greater success of the SMEs. For example, a system that captures sale information should be able to communicate or link with other system such as inventory system or other relevant system that would be able to increase productivity.

SMEs are important to the economy of a nation. Recognising the contribution of SMEs in the economy, many countries have provided some form of assistance and incentives to the SMEs. In general, the role of the government is to provide a continuous supportive and conducive economic environment within the domestic and international context so that the growth of the SMEs can be enhanced and not subdued. It is suggested that the government will continue to provide support and incentives to the SMEs, and that include technological consultancy and tax deduction on new technology.

As mentioned throughout the paper, this study focused on 4 types of professional service firms. Future research in Malaysia or other countries may include other types of professional service firms using the same instrument. Since the present study examined only three Technical Competency factors, future research should include other related factors.

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