IMPACT OF SOLAR TECHNOLOGY ADOPTION ON ENTREPRENEURIAL FIRM PERFORMANCE: AN EMPIRICAL STUDY

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ABSTRACT

The need of creating and maintaining rural entrepreneurs and their performance is recognised by organizations and individuals who support rural development as a strategy and implementation intervention that could hasten the rural development process. The impact of solar technology adoption on the performance of entrepreneurship is thus the special subject of this research.

Key Words: Solar Technology, Entrepreneurial Firm Performance, Impact, India

1. FIRM PERFORMANCE

What are we tracking here? What is a company? While we gladly defer to the research on firm theory on this specific issue (Nightingale 2008),[1] It serves as a crucial springboard for our consideration of firm performance. There is a significant disparity between what businesses do (create and market products/services) and what we, as researchers, see and observe. When all other conditions are equal, quantitative research at the organizational level is likely to engage in activities in the factors that affect how well or poorly a firm performs in comparison to other firms. The metrics we use to gauge performance, however, may not be the same as those that matter to entrepreneurs. For example, a scholar might decide to look at employment creation, whereas an entrepreneur would be looking to increase profits instead. As a result, we must be mindful that businesses, like the tale of the blind men and the elephant, appear significantly differently when viewed through the eyes of various metrics.

2. MEASURES OF FIRM PERFORMANCE

We will go over a few of the metrics that researchers use to assess firm performance in this part, along with their respective merits and disadvantages.

2.1 Employment

A common control that serves as a fundamental indicator of a company's size is the number of employees. It is also rather common to find measures of job growth, either by themselves or in support of other metrics like high-growth enterprises. One prevalent misconception is that economists and decision-makers prefer using employment growth as a statistic when examining job creation. Entrepreneurs, on the other hand, very unlikely to assert job growth as a sign of success because it increases staff costs and results in (as one entrepreneur put it) “just more mouths to feed.” This demonstrates the earlier argument on the many measurements and assessments produced by the company and emphasises the connection between metrics. For

[1] Nightingale, P. (2008). Meta-paradigm change and the theory of the firm. Industrial and Corporate Change, 17(3), 533–583.

instance, there are conflicting results in the literature on the timing of growth on the importance of job growth. Employment expansion generally leads to increased sales and profits (Coad and Rao 2009;[2] Coad 2010;[3] Coad et al. 2014[4]). However, being one of the final stages in the growth process, job expansion frequently lags behind in high-growing businesses (Coad et al. 2017).

2.2 Turnover

According to the caricature shown above, if employment growth is preferred by academics and policymakers, sales (and associated metrics) are more prevalent in management literature because this element represents an increase in sales and better gauges a firm's performance than its size. According to the theory on firm growth, employment expansion often follows turnover growth for most businesses, but for high-growth businesses, the reverse may be true.

2.3 Profits/Profitability

Profits are a crucial indicator of a company's profitability since they are a clear indicator of its capacity to recognise entrepreneurial opportunity. Both Chandler et al. (2009)[5] and Coad et al. (2017)[6] These authors emphasise how crucial it is to pinpoint earnings in order to spur future growth. Profits can be measured in a variety of methods, including directly from financial statements and through financial ratios that are frequently used in financial literature. Although these latter sections are less frequently used—typically because there aren't as much data—they do occasionally emerge in the literature.

2.4 Productivity

Productivity is a key indicator of a company's (in)efficiency in employing production elements when it is examined at the firm level. Productivity can refer to the value contributed per person or per hour of labour, for example, or less frequently, the value added per unit of fixed capital stock. The value of a product is directly related to the sort of technology it uses, which is typically labor- or capital-intensive technology. Firm-level total factor productivity is a crucial productivity indicator (TFP) (Gal 2013).[7] Note that when output is unavailable, deflated firm sales may be used as a substitute; however, the quality of this substitute will be greatly determined by the characteristics of the deflator and, consequently, the homogenization of the produced good. (Melitz 2000).[8] The size of the businesses, which captures rising return to scale, process, as well as entrepreneurial orientation, are significant predictors of productivity.

2.5 R&D/Innovation

Since there are many connections between the literatures on entrepreneurship and innovation, there are many investigations in the literature on entrepreneurship that concentrate on the

[2] Coad, A. and Rao, R. (2009). Firm growth and R&D expenditure. Economics of Innovation and New Technology, 19(2), 127–145.
[3] Coad, A. (2010). Exploring the processes of firm growth: Evidence from a vector autoregression. Industrial and Corporate Change, 19(6), 1677–1703.
[4] Coad, A., Daunfeldt, S.O., Holzl, W., Johansson, D. and Nightingale, P. (2014). High-growth firms: Introduction to the special issue. Industrial and Corporate Change, 23(1), 91–112.
[5] Chandler, G.N., McKelvie, A. and Davidsson, P. (2009). Asset specificity and behavioral uncertainty as moderators of the sales growth: Employment growth relationship in emerging ventures. Journal of Business Venturing, 24(4), 373–387.
[6] Coad, A., Siepel, J. and Cowling, M. (2017). Growth processes of high-growth firms as a four-dimensional chicken and egg. Industrial and Corporate Change, 26(4), 537–554.
[7] Gal, P. (2013). Measuring Total Factor Productivity at the Firm Level using OECD-ORBIS, OECD Economics Department Working Papers, No. 1049, OECD Publishing, Paris.
[8] Melitz, M.J. (2000). Estimating Firm-level Productivity in Differentiated Product: Industries, Harvard, mimeo.

inventive activities of businesses. Because studies of innovation are restricted to inputs like research and development (R&D), staff, or financial resources, intermediate outputs like patents, and outputs like sales of new items, innovation is a tough concept to quantify (Hopkins and Siepel 2013). [9] Because of this, a large portion of entrepreneurship literature that uses innovation indicators will either rely on metrics that are readily available, like R&D or patents, or on metrics derived from survey instruments, like the Community Innovation Assessments in Europe, like the percentage of revenue that comes from newly released products.

2.6 Firm survival

One way to gauge a company's capacity to compete is to look at how long it has been operating on a crowded market. As a result, the company's ability to survive is a performance indicator. The survival approach to business success, however, has a number of drawbacks. Calculating the amount of time (often measured in years/months) between a firm entering the market and leaving it requires the ability to measure survivability. Defining “entry” and “exit” raises the first set of problems. A new firm's introduction into a market for a product symbolises one reality, while an old firm's entry represents another. It's not always accurate to equate leaving with failing or becoming bankrupt. The activity may stop for a variety of other, more spectacular or favourable varying reasons to business (for example it could be due to the death/retirement of the enterpreneur). Business shutdown is not always the result of a firm leaving. The commercial activity may actually be competitive and quickly supplanted by another company (Parker 2009, chapter 14).[10]

3. RESEARCH OBJECTIVE

Here the main focus was on investigating the Entrepreneurial Firm Performance. The following 10 Key Performance Indicators (KPIs) were identified in this regard.

1. Sales
2. Overall Profitability
3. Business Growth
4. Service Quality
5. Level of Customer Satisfaction
6. Level of Employee Satisfaction
7. Product Innovation Status
8. Process Innovation status
9. Product Quality

4. MATERIAL AND METHODS

The primary data collected focused on entrepreneurs, the primary data source was a questionnaire survey that collected quantitative data. The majorities of the respondents were in high positions within their firms and had extensive expertise in India's SETs sector.

The Snowball Procedure was adopted to collect samples for this research (which can be defined as a non-probability sampling technique in which current study subjects recruit future study subjects from among the existing study subjects) is a non-probability sampling technique in

[9] Hopkins, M.M. and Siepel, J. (2013). Just how difficult can it be counting up R&D funding for emerging technologies (and is tech mining with proxy measures going to be any better)? Technology Analysis & Strategic Management, 25(6), 655–685.
[10] Parker, S. (2009). The Economics of Entrepreneurship. Cambridge: Cambridge University Press.

which existing study subjects recruit future study subjects from among the existing study subjects. (Katz, 2006)

4.1 Sample size

50 respondents who were engaged in the solar technology based business activities in National Capital Region of Delhi were engaged in this study to collect the required information.

4.2 Questionnaire Survey

Structured questionnaires were sent to the respondents as a method for gathering the relevant information. A pilot study was done in May 2022, and based on the information gathered, essential changes were made in order to better suit the research's aim. These structured questionnaires were provided to all respondents, and they included all parts of the research objectives set forth for this study.

5. DESCRIPTIVE STATISTICS

5.1 Regression Analysis

This table contains the Cox & Snell R Square and Nagelkerke R Square values, which are both methods of calculating the explained variation. The explained variation in the dependent variable based on our model ranges from 66.0% to 65.0%. The R Square value in this model is .666, any value above .500 is considered good enough under this model to proceed for further analysis.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.816[a]	**.666**	.658	.16747

a. Predictors: (Constant), Entrepreneurial Firm Performance in relation to entrepreneurs engaged in solar technology in the agriculture sector

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.821	9	2.425	86.446	**.000**[b]
	Residual	10.939	390	.028		
	Total	32.760	399			

a. Dependent Variable: B_Firm_Performance_1

b. Predictors: (Constant), Entrepreneurial Firm Performance in relation to entrepreneurs engaged in solar technology in the agriculture sector

The Hosmer-Lemeshow tests the null hypothesis that predictions made by the model fit perfectly with observed group memberships. A chi-square statistic is computed comparing the observed frequencies with those expected under the linear model. A non-significant chi-square (21.821) indicates that the data fit the model well, as could be seen in the above table.

The regression test is used to determine statistical significance for each of the independent variables. The statistical significance of the test is found in the “Sig.” column. From these results one can see that Sales (p = .016), Profits (p = .000), Service Quality (p = .025), Customer Satisfaction (p = .000), Product Innovation (p = .000) and Product Quality (p = .000) added significantly to the model/prediction, but Business Growth (p = .980), Employee Satisfaction (p = .057) and Process Innovation (p = .508), did not add significantly to the model.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.472	.057		-8.323	.000
	Do you agree that your Sales have grown after the adoption of solar technology based products in your enterprise?	.029	.012	.111	2.423	**.016**
	Do you agree that your Profits have grown after the adoption of solar technology based products in your enterprise?	.085	.013	.308	6.588	**.000**
	Do you agree that your Business has grown rapidly after the adoption of solar technology based products in your enterprise?	.000	.012	.001	.026	.980
	Do you agree that your Service Quality has improved after the adoption of solar technology based products in your enterprise?	.019	.008	.080	2.253	**.025**
	Do you agree that the overall Customer Satisfaction has increased after the adoption of solar technology based products in your enterprise?	.103	.013	.383	7.834	**.000**

Do you agree that the overall Employee Satisfaction has increased after the adoption of solar technology based products in your enterprise?	-.019	.010	-.083	-1.910	.057
Do you agree that your business has witnessed greater Product Innovation after the adoption of solar technology based products in your enterprise?	.066	.009	.292	7.103	**.000**
Do you agree that your business has witnessed greater Process Innovation after the adoption of solar technology based products in your enterprise?	.007	.010	.028	.662	.508
Do you agree that your business has witnessed greater Product Quality after the adoption of solar technology based products in your enterprise?	.033	.009	.130	3.573	**.000**

a. Dependent Variable: B_Firm_Performance_1

6. KEY FINDINGS

Therefore the following are the **significant factors**, as examined through the regression analysis, which significantly impact the firm performance in the solar technology sector.

Sales (p = .016)	The results here suggest that involvement in the solar technology based products and processes have made significant positive impact on the firm performance in terms of its sales (factor significant at .005 levels).
Profits (p = .000)	The results indicate a positive impact on the profitability of the firms engaged in the solar technology, thereby improving firm's performance (factor significant at .005 levels) therefore.
Service Quality (p = .025)	The results here suggest that firms engaged in solar technology based businesses have been largely successful in improving their product

	quality, thereby improving their overall firm performance in this regard (factor significant at .005 levels).
Customer Satisfaction (p = .000)	The firms have been largely successful in improving the overall customer satisfaction in this sector, as evidenced from the results (factor significant at .005 levels).
Product Innovation (p = .000)	The results here suggest that the firms engaged in the solar technology have largely improved their product innovation methodology, thereby improving their firm performance (factor significant at .005 levels).
Product Quality (p = .000)	The results indicate that there is significant improvement in the product quality of the firms engaged in the solar technology sector which helped them to improve their firm performance in this sector (factor significant at .005 levels).

The following are the factors, which **do not significantly impact the firm performance** in the solar technology sector.

Business Growth (p = .980)	The results indicate a non-significant impact on the business growth attributes in this sector (factor non-significant at .005 levels).
Employee Satisfaction (p = .057)	The results suggest a non-significant impact on the employee satisfaction amongst the firms engaged in this sector (factor non-significant at .005 levels).
Process Innovation (p = .508)	Process innovation process does not seem to be positively impacted here, as indicated by the results (factor non-significant at .005 levels).

7. CONCLUSION

Involvement in the solar technology based products and processes have made significant positive impact on the firm performance in terms of its sales. There is a positive impact on the profitability of the firms engaged in the solar technology, thereby improving firm's performance. The firms engaged in solar technology based businesses have been largely successful in improving their product quality, thereby improving their overall firm performance in this regard. The firms have been largely successful in improving the overall customer satisfaction in this sector. The firms have largely improved their product innovation methodology, thereby improving their firm performance. There is significant improvement in the product quality of the firms engaged in the solar technology sector which helped them to improve their firm performance in this sector. Business Growth has shown to be a non-significant force on the business growth along with Employee Satisfaction and Process Innovation.

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