TECHNO ENTREPRENEURSHIP ADOPTION: AN INTENTION BASED ASSESSMENT STUDY OF START-UPS IN THE KINGDOM OF SAUDI ARABIA

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ABSTRACT

Establishment of Start-up firms is providing great solutions to the important problems of unemployment and underutilization of resources across the economies. As such they have assumed a great significance and function in the economic growth policies and strategies of the nations throughout the world. Recognizing this reality, Saudi Arabia has given high priority in their vision 2030 for the development of Start-ups across the Kingdom. However, in today's start up development paradigms, it is not only the establishment of start-ups but the pace of techno adoption of these start-ups that significantly determines their success and sustenance. It is in this context that this paper explores to assess the levels of intention related to technology adoption among the start-ups in the Kingdom of Saudi Arabia. The results of this research are expected to contribute towards the development of a country level start-up techno-entrepreneurship adoption policy framework. For this research, stratified random sampling survey method was used and the data collected was put to different statistical tests like "Descriptive Analysis" like "Correlation" and "Predictive Analysis" like "Ordered Logistic Regression" etc. The results obtained depict that start-ups in Saudi Arabia show a high-level of intention towards technology adoption in their enterprises, as they believe that it enhances the basic start up entrepreneurial process capabilities and efficiencies like business-ideation, concept & prototype development, feasibility analysis etc. However, as per the data results there are certain limitations that come in the way of techno-entrepreneurship integration for the start-ups in Saudi Arabia. Among these limitations "Financial Support" and "Techno skill/expertise" serve as the key constraints. The resultant empirical information will be of high use to enhance a Start-up Techno entrepreneurship adoption modular framework that could facilitate the easy adoption and utilization of technology by the start-ups in the country.

Keywords: Techno Entrepreneurship, Start-Up Firms, Adoption Model, Start-Up Techno-Entrepreneurship Framework, Saudi Vision 2030.

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INTRODUCTION

Techno-entrepreneurship is generally described as the entrepreneurial and intrapreneurial activities of both existing and embryonic companies/organizations functioning in technology-intensive atmospheres. The expert contributors originally discover the fundamentals of this area, obviously defining the parameters of techno-entrepreneurship. Commercialization emphasized on strategies of equilibrium between exploration and exploitation of new competencies, radical innovation, corporate venture, capital investment and the mentoring of high techno entrepreneurs (François, 2009).

The factors derived for adoption in technology in techno-entrepreneurship inferred from the theory of Diffusion of innovations. It is a theory that looks for to explain how, why, and at what pace new ideas and technology propagation. Rogers (2003) claims that diffusion is the process by which an innovation is conveyed over time among the participants in a social system. Moreover the four main rudiments influence the spread of a new idea: the innovation itself, communication channels, time, and a social system. The classifications of adopters are innovators, early adopters, early majority, late majority, and laggards (Rogers, 2003)

The objectives of the paper are:

a) To assess the levels of techno entrepreneurship intentions among the start-ups in Saudi Arabia.

b) To examine the factors responsible for start-up technology adoption and their impact.

c) To contribute towards the development of Start-up Techno entrepreneurship framework in Saudi Arabia.

The scope of the paper is limited to the adoption model of techno-entrepreneurship with respect to availability of finance, availability of skills/expertise, institutional network support and other related factors intrinsically. The paper is organized as Literature Review in section 2. Section 3 reveals about the Methodology of adoption model while section 4 exhibit a preliminary results and discussion of its test survey. Results and discussion section is followed by Conclusion, Acknowledgement and references sections. In our research the main focus was on the importance of technology adoption in techno-entrepreneurship start-ups in Kingdom Saudi Arabia in comparison with variables of business idea generation, prototype development, market feasibility analysis, product process feasibility analysis, financial feasibility analysis, availability of finance, availability of skills/expertise and institutional network support etc.

LITERATURE REVIEW

The project under reference aims to work in the direction and contribute towards the Saudi Arabian Vision 2030, *"Focus on innovation in advanced technologies and entrepreneurship"* (Vision 2030, 2016). According to (Aderemi et al., 2008), technological entrepreneurship is concerned with utilization of the knowledge of science and technology currently available so as to meet market needs, thereby making the country in question more productive and more competitive internationally. Furthermore, TE involves a process of industrial innovation, technology transfer and the commercialization of innovative ideas. According to Schumpeter (1975), technology entrepreneurship is concerned with the process whereby successful *'new combinations'*-which are new products, processes, organizations, markets and sources of inputs- are introduced, leading to new economic activities termed *'creative destruction'*. It is also refer to the style of business leadership that involves identifying high-potential, technology-intensive commercial opportunities, gathering resources such as talent

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and capital, and managing rapid growth and significant risk using principled decision-making skills (Dorf & Byers, 2007). The benefits inherent in science and technology would remain unrealised until such is transformed to products and services through innovation and diffusion. Start-up firms which start as small-and-medium sized enterprises are considered to be the driving force of the economy, both in developing and developed countries. However, without proper business strategy, creativity, innovation and support, new start-up companies often fail to survive in the highly competitive market. Hence, start-up techno entrepreneurship support is considered as one of the important support mechanisms for start-up enterprises (Munkongsujarit, 2016).

Facilitation and providing support to the existing and would be start-ups on different fronts such as financial, technical, promotional remains the main strategic economic growth and development focus of the economies across the globe (Maryeni et al., 2012). As such, in this background and in line with Saudi Arabia Vision 2030, boosting the small businesses and productive families' small and medium-sized enterprises (SMEs) are among the most important agents of economic growth; they create jobs, support innovation and boost exports. SMEs in the Kingdom are not yet major contributors to GDP, especially when compared to advanced economies. Therefore, there is need to create suitable job opportunities for the citizens by supporting SME entrepreneurship, privatization and investments in new industries (Vision 2030, 2016). This proposed project which will begin with establishment of a scientific theoretical framework and in the second stage of the project, this framework will be then modelled into a scientifically workable 'Saudi Arabia Start-up Techno entrepreneurship support Model'.

Furthermore, the methodical analysis of the supplementary references given at the references column clearly provides the element of genesis's in support of our argument that there is a pressing need for the design and development of the *'Saudi Arabia Start-up Techno entrepreneurship support Model'*. As such, this forms a main proposition of the project, especially for the achievement of the Saudi Arabia Vision 2030.

SAMPLE, MEASUREMENTS AND METHOD

The data used in this study were obtained from the existing and potential starts-up in the Eastern province of Saudi Arabia between January and February, 2018. The survey sampled 250 Start-up out of which 159 successfully filled and returned the survey instrument. This corresponds to a response rate of 64%. The sampling techniques involve both purposive and random techniques whereby the newly established firms are purposively selected in the first instance and then the instrument was randomly issued to them. Although one of the objectives of this study is to develop a techno-entrepreneurship framework for the start-ups, but this paper concentrates only on constraints and the outputs of technology adoption of start-ups.

In order to capture the constraints and outputs of technology adoption (TA), certain variables were used to proxy the outputs and the constraints of technology adoption. The variables used and the measurements are:

i. **Level of technology adoption by the firm in the last 3 years (Y):** This is the extent at which the firm has incorporated technology to its business in the last 3 years. This is measure in 5 likert scale from *'very low extent'* to *'very high extent'*.

ii. **TA assists in product and service development (X_1):** This is the extent at which start-up firm has used technology to develop a new product/process or improved on the existing product/process. This is measure in 5 likert scale from *'very low extent'* to *'very high extent'*.

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iii. **TA facilitates market feasibility analysis for start-ups (X_2):** This is the extent at which technology adoption has assisted the start-up firm to determine the depth and condition of a particular market where it operates and its ability to support a particular development. This is measure in 5 likert scale from *'very low extent'* to *'very high extent'*.

iv. **TA facilitates financial feasibility (X_3):** This is the extent at which technology adoption has enabled a start-up firm to determine the financial implications of starting and running a project. This is measure in 5 likert scale from *'very low extent'* to *'very high extent'*.

v. **TA facilitates generation of business ideas (X_4):** This measures in 5 likert scales the extent at which TA has enabled the start-up firm to generate great business ideas.

vi. **Level of importance given to TA (X_5):** This measures the degree of importance given to TA in 5 likert scales.

vii. **Skills/expertise constraint (C_1):** This measures the extent at which skills/expertise constraint inhibit TA.

viii. **Institutional network support constraint (C_2):** This measures the institutional constraints that can inhibit TA ranging from both government and private supports.

ix. **Financial constraint (C_3)**: This measures the extent at which financial constraint inhibit TA.

The main methods used in this study are correlation analysis and logistic regression. Correlation is basically used to measure the extent and direction of relationship among certain variables. In order to know whether some of the variables considered in this study are correlated with technology adoption in start-up firm, correlation analysis was conducted. Logistic regression was used to establish the likelihood of certain variables in constraining technology adoption. Specifically ordered logistic regression was used, as the dependent variable is in categorically ordered form (Brooks, 2008; Akinwale & Surujlal, 2017; Akinwale et al., 2018), that is from *'very low extent'* to *'very high extent'*.

DISCUSSION OF RESULTS

Table 1 reveals that 13.2%, 30.2% and 41.5% of the respondents ranked their level of technology adoption very high, high and medium respectively whereas 5.1% ranked it low. Moreso, Table 1 shows 24.5% and 41.5% gave very high and high level of importance to technology adoption. These results indicate that though 66% of the start-up firms sampled are in the category of those that gave high level of importance to technology adoption but an approximately 43% of them actually ranked their adoption high. More than 50% of the respondents are within medium and low level category of technology adoption.

Table 2 shows the results of the correlation matrix between *levels of technology adoption (Y)* and other variables, namely: *TA assists in product and service development (X_1), TA facilitates market feasibility analysis for start-ups (X_2), TA facilitates financial feasibility (X_3), TA facilitates generation of business ideas (X_4) and Level of importance given to TA (X_5).* The results disclose that technology adoption (Y) is positively related to all the other 5 variables with correlation coefficient values of 0.38, 0.52, 0.42, 0.38 and 0.31 for on X_1, X_2, X_3, X_4 and X_5 respectively, and all the variables are averagely correlated with technology adoption. Meanwhile, technology adoption by start-up firms (Y) has significant impact on X_2, X_3, X_4 and X_5 at 10% level of significant. The Cronbach alpha value of the six variables is 0.75 which is acceptable in measuring the internal consistency of the variables in the model. These are in line with our expectations except the insignificant impact of technology adoption on product and service development (X_1). The impact of technology adoption on *market feasibility* seems to be the strongest, followed by *financial feasibility*, *generation of business ideas* and the *level of*

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importance given to TA respectively. This implies that technology adoption enables the start-up firms in Saudi Arabia to critically scanned their market environment, financially planned for a project, creatively generating new business ideas and proactively given importance to technology. Financial feasibility is also positively and significantly correlated with all the other variables except with generation of business ideas (X_4), and this is expected since ideas generation goes beyond financial matters.

Table 1
START-UP FIRMS' LEVEL OF TECHNOLOGY ADOPTION AND LEVEL OF IMPORTANCE GIVEN TO TECHNOLOGY ADOPTION

Description	Extent	%
Level of Technology Adoption in Start-up firms	Very high	13.2
	High	30.2
	Medium	41.5
	Low	1.3
	Very low	3.8
Level of importance given to Technology Adoption	Very high	24.5
	High	41.5
	Medium	13.2
	Low	13.2
	Very low	7.5

Table 2
CORRELATION MATRIX OF TECHNOLOGY ADOPTION WITH OUTPUT VARIABLES

S	Variables	1	2	3	4	5	6
1	Technology Adoption (Y)	1	-	-	-	-	-
2	TA assists in product and service development (X_1)	0.38	1	-	-	-	-
3	TA facilitates market feasibility analysis for start-ups (X_2)	0.52**	0.46	1	-	-	-
4	TA facilitates financial feasibility (X_3)	0.42**	0.39**	0.47*	1	-	-
5	TA facilitates generation of business ideas (X_4)	0.38**	0.3	0.23	-0.01	1	-
6	Level of importance given to TA (X_5)	0.31*	0.29	-0.04	0.33**	-0.02*	1

Source: Authors' own work; TA: Technology Adoption; *p<0.10; **p<0.05; ***p<0.

A number of constraints have been identified in the literatures that impair technology adoption in various start-up firms in different countries. Table 3 presents an ordered logit regression results for technology adoption (*Y*) as dependent variable and the explanatory variables (C_n) which are the constraints of adopting technology among the start-up firms in Saudi Arabia. The ordered logit regression results in Table 3 shows that *Skills/expertise constraint (C_1), Institutional network support constraint (C_2)* and *Financial constraint (C_3)* have positive coefficients of 0.04, 0.02 and 0.34 respectively. These positive coefficients correspond to the odd-ratio of 1.04, 1.02 and 1.40 for C_1, C_2 *and* C_3 respectively, indicating that skills/expertise, institutional network support and financial constraints have great likelihood of hampering technology adoption. Meanwhile, financial constraints has the greatest likelihood of impairing technology adoption, followed by skills/expertise and institutional network support respectively.

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Furthermore, while financial constraint and skills/expertise constraint were significant at 5% level of significance, institutional network support was not significant at 5%. The insignificant level of institutional network support might be as a result of the low level perception of the start-up firms of getting any support from government and other private institutions. This implies that financial capabilities and skills/expertise are highly recognized by the start-up firms as major obstacles preventing them from adopting technology. Though institutional network support is also recognized to be an important constraint since its odd-ratio is above 1, but it is not statistically significant as its P-value is above 5%. Pseudo R-squared of 0.32 showed that the classical is moderately fit.

Table 3
ORDERED LOGIT REGRESSION RESULTS FOR THE CONSTRAINTS OF TECHNOLOGY ADOPTION FOR START-UP FIRMS

Explanatory Variables	B	Prob (p-value)	Odd-ratio (Exp(B))
Skills/ expertise constraint (C_1)	0.04	0.02	1.04
Institutional network support constraint (C_2)	0.02	0.13	1.02
Financial constraint (C_3)	0.34	0.01	1.4
Pseudo R-squared	0.32		
Prob(LR statistic)	0.01		
Sample	159		
Source: Authors' own work.			

It is therefore imperative for the government to create an enabling environment for the start-up firms to commence and operate their businesses successfully through appropriate adoption of technology. In order to ameliorate the effect of the constraint factors, government should provide financial support such as entrepreneurship fund for start-up firms, low or no interest yielding loans for the start-ups, incubation centres, research and innovation fund among others. There is also need for government to encourage educational institutions at various levels to train Citizens for entrepreneurship, so that people can develop the requisite skills/expertise needed to successfully start and operate a firm. More so, continuous training of entrepreneur in their chosen businesses should also be fostered. Furthermore, institutional network support from both government and various stakeholders in the country is equally very important for the start-up firms. This should be encouraged on the platform of national innovation system (NIS) where all stakeholders contribute to technology adoption (Edquist, 1997; Freeman, 1997; 1987; Nelson & Kim, 1993; Lundvall, 1992; Akinwale & Surujlal, 2017; Olaopa et al., 2018). These stakeholders include education sector which act as knowledge base for the start-up firms, financial sector which provides fund for the start-up firms, private institutions which also provide the relevant information and support for the start-up firms and the government which provide the adequate policies needed to drive the entire system towards supporting start-up firms. The NIS concept emphasises the interaction of actors involved in innovation and investigates how these interactions can foster technology adoption, firm's profitability and economic development (Etzkowitz, 1998; Mytelka, 2000; Akinwale, 2017; Akinwale et al., 2018).

CONCLUSION

The research analysis clearly shows that the awareness about the techno entrepreneurship adoption among the start-ups across different sectors in Saudi Arabia is very significant.

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Approximately 67% of the start-up firms opined that technology adoption is important for the start-ups, this clearly depicts that the respondents put high value to the technology adoption. However, the data results also indicate that the level of technology adoption is still not at full spectrum as only 43% of the respondents claim that they give high priority to the adoption of technology in their start-up firms. Additionally, 42% of respondents ranked their intention level of techno adoption as medium. They are of the opinion that this can actually be pushed up to the rank of high if appropriate policies and supports are created in the ecosystem. This study also validates the important role of the government in enabling the friendly techno entrepreneurship ecosystem framework support for the start-up techno integration. This can be achieved within the preview of national innovation system (NIS) whereby all stakeholders synergize to contribute to appropriate adoption of technology by the start-up firms. The areas of further study include exploring the factors that influence technology adoption by the start-up firms and development of the techno-entrepreneurship model frameworks.

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