

Factors Affecting Startup Innovation and Growth

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Abstract—Increased in number of start-ups has been identified to be a reason for high innovative countries. The objective of this research is to dive into factors that influence innovation in start-ups and innovation's effect on the general survival of start-ups; with particular focus on industrialized economies. By using three different models, namely, the pooled model, fixed effect model and the random model, including further analysis by performing the Hausman test, indicated points such as financing having a greater influence on innovation.

Index Terms—innovation, startup, market openness, demographic, government policies, financial

I. INTRODUCTION

Businesses are a vital component of every economy. They create jobs and reduce the burden on many households. The number of launched Start-ups is very high and the number of start-ups that don't survive is highly correlated. Factors such as environment, social, technological, and political factors are known to be the most common factors that lead to the failure of most start-ups. Others such as knowledge in the particular area of start-up, leadership skills, financing, marketing, and promotion are also major factors which affect the start-up performance.

The objective of this research is to dive into the demographic factors that influence innovation in start-ups and innovation's effect on the general survival of start-up's.

Start-up failure and success depend on a countless number of factors. Literature has identified one major point which affects start-up in their product design, marketing, innovation, and strategies. Financing has been identified as a major factor in the success of most start-ups. Due to the market crash of 2008, it has been difficult for start-ups to come up with financing which intends has affected start-up innovation. The seepage of the credit crunch into the commercial market cut off funding as well as led to the decline of net investment [1]. The focus is particularly on the demographical factors that affect innovation in start-ups. Most start-ups fail not because they lack financing but because they do not have the foresight and good R&D team. It has been identified that financing is highly correlated with good innovation. Many companies were not able to survive because they could not keep up with the innovation cap in the market. Innovation can be seen as a survival technique. In 1955,

Fortune Magazine listed the 500 largest companies in a list that's become synonymous with success. 60 years later, only 71 of those companies still remain.

Companies such as Yahoo, Blackberry, Myspace, Border books and the entire publishing industry are almost forgotten, but in the early 2000s, these were what the company's others looked up to.

In 2005, Yahoo owned 21% of the online advertising market, number 1 among all players. Yet today, they're struggling maintain their number 4 position behind Google, Facebook and Microsoft. Blackberry in the early 2000 held about 50% of the mobile phone market in the world but after the release of Apple's iPhone [2] they lost their market position totally because they did not understand the market shift and also the nature of the high-tech market. This in turn caused a decrease in cash and short-term investments by almost \$500 million.

II. LITERATURE

Innovation is a strong pillar to the success of every start-up known in the world, Business that are not able to invest in research and development dies in the striving market. The capital cycle has become the main feature of the innovative market, as indicated by [2]-[5]. [6] indicated that the market plays a vital role in the financing and financing also has a strong linkage with innovation. Financing hinders innovation in small scale enterprises in Europe [7]-[9] indicated that strong financial support for start-ups can trade off high-level risks. Many business failures are mostly attributed to lack of financing, internal market dynamics and lack of innovations. There is a concern over declining innovation in small and medium-sized enterprises, most particularly in the case of family businesses [10]. The research indicated the inefficient realization of innovative practice by families businesses due to funding in R&D. which means that if enough financing allocated to such business it will increase their survival and innovativeness. The gap between innovation and financing seems too difficult to close as noted by [11]-[14]. A study by [15] which employed regression analysis discovered that the financial crisis led to a 20% decrease in the average amount of funds raised per funding round, hence venture capital investment. Hence, causing a funding gap and an unhealthy VC market with a low level of financing of technological development and innovation. Source of funding of innovative activity becomes the order of the day since there would not be innovation without research.

[16] asserted that, New Technology Ventures (NTVs) have positive effects on employment and could rejuvenate industries with disruptive technologies. In identifying the success factors of such startups using Pearson correlation to analyse , the authors came to a conclusion that ; (1) supply chain integration; (2) market scope; (3) firm age; (4) size of founding team; (5) financial resources; (6) founders' marketing experience; (7) founders' industry experience; and (8) existence of patent protection are crucial to start-up success.

From the above mentioned observations, we came up with these set of hypotheses:

- H1: Financing is a strong pillar through which innovation thrives.

Financing has been identified to have a strong correlation with innovation and the success of most startups.

Financial means and investments, whether from non-governmental financial support, R&D investments or governmental support, are crucial to survival in the business ecosystem. [17] indicated that more financial resources improve performance. A study [18] on Venture-Capital Financing and the

Growth of Startup Firms concluded that, the presence of venture capital is related to faster firm growth, that financing events affect the growth path of start-ups and that support for past growth being a predictor of future growth. Hence the proposition that financial resource, amidst other pertinent factors, is a key to start-up growth.

- H2: Innovation is influenced to a certain degree by Internal Market Openness:

A theoretical model describing the dependence of innovation activity of enterprises on the degree of competition in the market can also be found in. [19] in his work he established an empirically positive relationship between competition in the market and innovation. Significant is also the effect of economies of scale and greater ability to raise funds for innovative research. [20] argue that general capital market openness might let innovative firms outpace sedate rivals faster, magnifying firm-specific differences in returns. Openness brings competition and ensures the quality of product and services.

- H3: Turnover influence the decision of a corporation to be innovative.

Innovation has a major effect on the turnover and general growth of companies [21]. Research by [22] indicates that product, process, marketing, and organizational are keys to surpassing competitors in the market innovation and that innovativeness levels depend on which strategic orientation is pursued by a firm.

We want to find out if turnover also influences the decision of corporation to invest much in R&D.

III. DATA STRUCTURE & METHODOLOGY

Due to the structure of our data (cross-sectional), we used the Panel Linear Model (PLM). These three estimates were put into consideration in order to determine the factors that influence innovation; *the random effect estimate, the fixed effect estimate and the*

pooled estimate. In order to prove which among the three models best describes the desired result, we used the Hausman Test.

The data is a panel data, the countries which are part are all developed countries and this selection was done looking at the GDP of the various countries. So 13 countries are considered, that is: Belgium, Canada, France, Germany, Italy, Japan, Netherlands, United Kingdom, United States, Switzerland, Sweden, Russia, China. The years selected for the analysis were selected because of the availability of data. Data was selected from the year 2006-2015. Missing data were replaced with the mean.

The data in Table I below describes the factors considered in the data structure and what each factor represent.

TABLE I. SELECTED FACTORS THAT INFLUENCE INNOVATION

Factors	Representation
Turnover	Measures the percentage of Return on Investment over the course of the year
Financing	The availability of financial resources, equity and debts for small and medium enterprises (SMEs) (including grants and subsidies)
Governmental support and policies	The extent to which public policies support entrepreneurship - entrepreneurship as a relevant economic issue
Post education	The extent to which training in creating or managing SMEs is incorporated within the education and training system in higher education such as vocational, college, business schools, etc.
r&d	The extent to which national research and development will lead to new commercial opportunities and is available to SMEs
Internal market openness	The extent to which new firms are free to enter existing markets
Cultural and social norms	The extent to which social and cultural norms encourage or allow actions leading to new business methods or activities that can potentially increase personal wealth and income

IV. ANALYSIS AND RESULTS

Table II represents descriptive statistics of selected factors. The correlation matrix in Table II reveals a strong correlation between Internal Market Openness and Financing; Internal Market Openness and Innovation. But it was evident that Turnover had a very weak correlation with all other factors.

The sub-sections below outline the models employed in testing our hypothesis.

TABLE II. DESCRIPTIVE STATISTICS OF SELECTED FACTORS

	year	Turn over	Finan cing	Government policies	Internal_market_openness	GDP Per capital
Min	2006	-15.3700	2.160	1.920	1.920	32351
1st Qu	2008	-1.1100	2.690	2.683	2.723	36441
Median	2010	0.9700	2.730	2.780	2.750	40592
Mean	2010	0.4816	2.785	2.802	2.797	42054
3rd Qu	2013	3.2500	2.888	2.938	2.865	46011
Std Dev		4.917	0.297	0.311	0.2759363	6729.732
Max	2015	15.7000	3.770	3.960	3.650	62557

A. Model Description

The equation for the fixed effects model becomes:

The above table shows the summary of all the factors which are considered in the research.

Hausman Test

data: $y \sim x$

chisq = 15.477, df = 5, p-value = 0.008507

alternative hypothesis: one model is inconsistent

From the Hausman Test above, the appropriate model to be used is the One Way (individual) effect Within Model (Fixed Model)

B. Final Model

$$r.d = 1.7199e-01*X1 + 5.7325e-02*X2 + 3.4897e-01*X3 + 3.5590e-01*X4 - 1.7438e-02*X4 \\ (7.3691e-02) (7.8335e-02) (8.5494e-02) \\ (8.7421e-02) (5.8830e-03)$$

governmental_support_and_policies	=X1
post_education	=X2
internal_market_openness	=X3
Financing	=X4
Turnover	=X5

V. DISCUSSION

In our study, we analysed certain factors to determine their influence on innovation. The literature brought to light a lot of interesting factors that influence innovation. In Table III, we used R.D as our independent variable. The first hypothesis was satisfied with a very strong t-value, which indicated that financing influences innovations. [10] indicated that family businesses are not innovative because they lack financing. This research finding is concurrent with that of [10]. This means that for a start-up to be innovative, financial support is very relevant and many start-ups exit the market because of bankruptcy. Lack of financing does not help them bring out new innovative products and services. Hence, those companies that have the ability to support research activities tend to be the ones always leading the market. This also makes some companies dominate a given market for a longer period of time. Financial resources can be said to be the pillar behind every successful start-up.

TABLE III. ANALYSIS

r.d	Oneway (individual) effect Within Model	Random Effect Model	Pooling Model
(Intercept)		0.31058204*** (0.01198474)	3.0046e-01*** (1.0832e-02)
governmental_policies	0.01091746** (0.00380124)	0.01090914** (0.00362893)	1.0607e-02** (3.6448e-03)
post_education	0.00123711 (0.00387672)	0.00318249 (0.00374367)	9.1690e-03* (3.8721e-03)
internal_market _openness	0.01227183** (0.00439171)	0.01219112** (0.00415338)	1.1548e-02** (4.0613e-03)
Financing	0.01649622*** (0.00410108)	0.01614343*** (0.00405445)	1.4502e-02** (4.5339e-03)
Turnover	-0.00018619 (0.00015877)	-0.00016615 (0.00015795)	-9.5977e-05 (1.8239e-04)
Adj. R-Squared	0.43574	0.51033	0.57373
theta		0.5676	

Results from Table IV supports the hypothesis H1 and H2; financing and international market openness influence start-up innovation. One can observe countries such as Germany, China and Switzerland are highly innovative and the world looks up to them in all sectors of growth. Though market openness is crucial for start-up innovation, a major part of the Sub-Saharan African [23],

South-East Asian and Russian markets are not open to the international market hence there is less competition which in turn birthed decreased innovation.

The second hypothesis; innovation is influenced to a certain degree by internal market openness. This was seen to be positive with the fixed effect model in Table V. Our observation confirms findings by [21], which state that

openness of the market creates competition which in turn makes leaders focus much on innovations. As the market is open, it attracts a lot of participants, which create the atmosphere for innovation and development. When there is no competition, leaders become reluctant with the creativity at their disposal. Like the case of Nokia, because there was high competition in the Smartphone market, those companies that still lived in the past were left behind. Facebook is still Facebook after a decade because they understand the competition and always tries

to kill the competition. An example is Facebook buying WhatsApp because they realized people were switching their attention to WhatsApp at the time of purchase. Openness keeps good leaders on their toes, which arouses their innovative instincts. Competition is good for every economy.

Finally, it was realized that turnover did not have any influence on the innovation of start-ups. Table V summarizes our findings.

TABLE IV. ANALYSIS WITH DUMMIES (MODEL)

r.d	Onaway (individual) effect Within Model	Random Effect Model	Pooling Model
(Intercept)		-1.5396e-01 3.8586e-01	-1.1049e-01 (4.6878e-01)
Governmental policies	1.7199e-01* (7.3691e-02)	1.9298e-01** 7.3328e-02	2.2375e-01** (8.0298e-02)
post_education	5.7325e-02 (7.8335e-02)	1.0251e-01 7.6352e-02	1.9297e-01* (9.5114e-02)
internal_market_ openness	3.4897e-01*** (8.5494e-02)	3.1042e-01*** 8.4832e-02	2.2503e-01* (9.1789e-02)
Financing	3.5590e-01*** (8.7421e-02)	3.0036e-01*** 7.8848e-02	2.3381e-01* (1.1116e-01)
Turnover	-1.7438e-02** (5.8830e-03)	-3.4795e-03 3.0784e-03	-1.0856e-02 (7.6100e-03)
Adj. R-Squared	0.53554	0.53671	0.60847
theta		0.6924	

TABLE V. HYPOTHESIS TEST RESULTS

HYPOTHESIS	STATUS
Financing	Supported By all the models
Post Education	Supported by just Fixed Effect Model
Internal Market Openness	Supported by all with models

VI. CONCLUSION

This study involved the analysis of selected demographical factors in order to prove their influence on innovation using the *random effect estimate*, the *fixed effect estimate* and the *pooled estimate*. Moreover, to verify our estimates, the Hausman test was employed; solidifying the premises that international market openness and financing are crucial factors to start-up innovation.

The next line of research will involve an in-depth analysis of institutional factors and their influence on innovation.

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