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A study to determine the impact of transformational leadership on patents in start-up companies in Bangalore city

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Abstract
In today's Volatile, Uncertain, Complex, and Ambiguous (VUCA) world, ability of businesses to sustain revenues, profits, and market share depends solely on how innovative the businesses are. Another key factor that is forcing the hands of businesses to toe the innovation line is the fierce competition that exists in most industries across the world. Increased competition means that consumers have a wide choice of products and services to choose from. Also, consumer behaviour across industries has seen tremendous change, with consumers demanding better quality products and services at affordable prices. To add to this, product life cycles are shrinking and the rate at which technologies are becoming obsolete is also increasing alarmingly. In such a scenario, for businesses to survive, they need to build core competencies, which in turn deliver a competitive advantage over their competitors. Hence, innovation has become the mantra and foundation on which successful companies are built.

This is where Indian businesses find themselves lacking. According to the Global Innovation Index rankings for 2021 released by the World Intellectual Property Organisation in September 2021, India's ranking is 46. According to the International Intellectual Property Index report released by the US Chamber of Commerce Global Innovation Policy Centre (GIPC) in March 2021, India has been ranked 40th amongst 53 global economies.

The lack of focus on research & development, innovation, and patents could be one of the factors for the high rate of failure (more than 90%) amongst start-ups in India.

Alongside the above, leadership skills too could be having an impact on whether or not start-up ventures in India in general and Bangalore City in particular are able to sustain themselves in the long run with respect to being innovative and having patents. This research paper tries to examine the relationship between leadership and patents. A survey was conducted wherein a questionnaire comprising demographic questions and questions pertaining to the leadership style of the founders of start-ups companied was sent to 476 founders in Bangalore City and the responses were analysed using Regression Analysis and Anova. In addition, the hypothesis was tested using the t-test. The analysis of the results and the testing of the hypothesis did not point towards a positive correlation between Transformational Leadership and patents.

Keywords: entrepreneurship, start-ups, leadership, transformational leadership, patents

1. Introduction
"I see start-ups, technology and innovation as exciting and effective instruments for India's transformation" – Shri Narendra Modi, Honourable Prime Minister of India.

Transformational Leadership is a relatively new approach to leadership and has been one of the current and most popular approaches to leadership since the 1980s. This approach is an integral part of the *New Leadership* paradigm, which gives more attention to the charismatic and affective elements of leadership. Transformational Leadership aims to change and transform people and deals with emotions, values, ethics, standards, and long term goals. This leadership approach includes making an assessment of the follower's motives, satisfying their needs, and treating them as full human beings. Transformational Leadership is all about the leader influencing the follower to achieve more than what is expected from them by making use of charismatic and visionary leadership (Peter G. Northouse, 2012) [3].

A patent is an intellectual property right relating to inventions and is the grant of exclusive right, for limited period, provided by the Government to the patent holder, in exchange of full disclosure of his invention, for excluding others from making, using, selling, importing the patented product or process producing that product for those purposes.

Buoyed by the interest shown by entrepreneurs to get on to the start-up bandwagon and by the worldwide attention the country was receiving in the start-up world, the Government of India, in February 2016, announced the Start-up India policy for nurturing and promoting start-ups in the country.

"Start-up India is a flagship initiative of the Government of India, intended to build a strong ecosystem for nurturing innovation and start-ups in the country that will drive sustainable economic growth and generate large scale employment opportunities. The Government, through this initiative aims to empower start-ups to grow through innovation and design" (Start-up India Action Plan, January 2016) [4]

Since Bangalore has been in the forefront of the entrepreneurial revolution that is sweeping the country, the Government of Karnataka, in April 2016, announced the Karnataka Start-up Policy 2015-2020.

"Bengaluru-Karnataka Innovation Ecosystem has catalysed, and scaled start-ups at an unprecedented pace. This nurturing ecosystem has steadily given birth to numerous Unicorns and is now evidencing signs of logarithmic growth" (Dr. C. N. Ashwath Narayan, Minister for Science & Technology, Higher Education, IT & BT, Government of Karnataka)

Whilst research studies have been done on Transformational Leadership and Patents separately, the review of literature has shown that hardly any studies have been done to study the correlation between the two.

In this context, this research paper tries to examine the importance of Transformational Leadership in determining its impact on invention and patents.

2. Review of Literature

Northouse (2012) [3] argues that even after a century of research on Leadership, in the twenty first century, there is still no agreement on a common definition of Leadership. But, for the sake of convenience he defines leadership as *"Leadership is a process whereby an individual influences a group of individuals to achieve a common goal"*

Analysing the challenges faced by entrepreneurs and the policy of the Government of India to promote innovation, Ravindra Abhyankar (2014) [6] lists the challenges faced by entrepreneurs as: fragmented policy and policy implementation, inadequate funding of research & development, difficult and lengthy funding procedures, Angel/VC/Seed funding, weak linkages between stakeholders, non-conducive education system, poor infrastructure facilities in rural areas, risk aversion among entrepreneurs, and inadequate protection of Intellectual Property Rights. He opines that the Government of India, by responding to the challenges, came up with the "The Science, Technology and Innovation Policy 2013" which focuses on funding research, strengthening the linkages between stakeholders, promotion of science, sharing of risks by the Government, protection of Intellectual Property Rights, innovation value chain, and participation in global research & development infrastructure

Steve Blank (2013) [7], in an article "Why the lean start-up changes everything?", highlights the high failure rate of start-ups (75%) and talks about a new concept known as "lean start-up" which reduces the risk of failure of start-ups considerably. He defines a lean start-up as: experimenting with product design as opposed to elaborate planning, relying on valuable feedback from customers instead on intuition, and adapting iterative product design as opposed to traditional design. He encourages entrepreneurs to come up with a minimum product that is viable and being able to pivot the design based on customer feedback. According to Mr. Blank, the three principles of lean start-ups are: coming up with a hypotheses instead of elaborate planning & research, testing the hypotheses with customers, and adapting the principles of agile development which enables the entrepreneur to iteratively & incrementally develop the product

Business Line, in May 2017 reported that 90% of start-ups in India fail within 5 years and their report was based on a study conducted by IBM Institute for Business Value (IBV) and the reasons for the failure of the start-ups were: lack of innovation, not being able to access skilled workforce, not having adequate funding, not having access to formal mentoring, and poor business ethics. The report encourages entrepreneurs to focus on solving the problems faced by society in the areas of healthcare, sanitation, education, transportation, and alternative energy management. The report highlights the need for investments in deep technology and in products which can be scaled on a global basis

Angelo Mastrangelo, in his article "The answer to fixing our economy" advocates that entrepreneurial leaders are the solution to revive economies and not entrepreneurs and start-ups. He says that good entrepreneurial leaders focus on the needs and wants of the consumer, while at the same time generating business selflessly and not selfishly. He further says that entrepreneurial leadership is very critical to all forms of organizations and at all stages of their development (Business Journal News Network, March 2016) [9].

In an article "What the best transformational leaders do?", Scott D. Anthony et al argue that transformational leaders are "insider outsiders", pursue two separate strategies at the same time, use cultural change to drive engagement, communicate very powerful narratives about the future, and are able to develop a roadmap to handle disruptions even before disruption happens. They postulate that transformation is not just about bringing about change in an organisation's cost structure and digitising processes but about following a phase wise strategy to strengthen and reposition current businesses while at the same time formulating strategies to achieve growth in new ways (Harvard Business Review, May 2017)

3 Objectives of the Study

- To get an understanding of the start-up situation in Bangalore City
- To understand Transformational Leadership
- To determine the impact of Transformational Leadership on patents in start-up companies in Bangalore City.

4. Research Methodology

The research paper is based on descriptive and exploratory study and the sample size taken is 476 from amongst the founders of start-up companies in Bangalore City. The sampling method chosen is Probability Sampling and the Sampling Technique used is Simple Random Sampling. Primary data was collected via a questionnaire comprising 15 questions pertaining to the demography of the respondents and 45 questions to ascertain the style of leadership (Multifactor Leadership Questionnaire) of the

respondents was circulated to the respondents and the responses were analyzed using Regression Analysis and Factor Analysis. The hypothesis was tested using independent t-test. The Multifactor Leadership Questionnaire (MLQ), also known as Form 5X-Short, evaluates three different leadership styles: Transformational, Transactional, and Passive-Avoidant. The Multifactor Leadership Questionnaire has 45 items which are rated on a 5-point behavioural scale. The instrument has been extensively researched and validated. It has been used in thousands of research papers, doctoral dissertations, and master's theses. Secondary data was collected from published sources, journals, and websites.

The hypothesis chosen for the study is: Transformational Leadership has no impact on patents in start-up ventures in Bangalore City

5. Findings

Table 1: Gender Distribution

Gender	Frequency	Cumulative Frequency
Male	393	393
Female	83	476
Total	476	

This table evaluates the gender of the respondents. Sample size is 476, of which 393 respondents were male and the balance 83 respondents were female.

On asked the question whether their start-ups had patents granted to them, 17% of the respondents replied in the affirmative and the balance 83% replying in the negative.

5.1 Regression Analysis Using SPSS for the variable Patents

Regression Analysis is used to comprehend which among the list of Independent variables are related and have an impact on the dependent variable, and also to explore the various types of relationships. In constrained circumstances, regression analysis may be used to infer causal relationships between the Independent and Dependent Factors. The dependent and independent variables chosen for the purpose of this research are:

Dependent Variable: Patents

Independent variables: Questions 16 to 60 in the Multifactor Leadership Questionnaire (questions pertaining to Transformational Leadership)

Table 2: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.618	.262		6.185	.000
	Q16	.035	.044	.070	.804	.422
	Q17	-.084	.045	-.165	-1.850	.065
	Q18	-.009	.038	-.021	-.231	.817
	Q19	.062	.034	.189	1.816	.070
	Q20	-.034	.043	-.061	-.808	.420
	Q21	-.044	.040	-.109	-1.092	.275
	Q22	-.014	.070	-.017	-.198	.843
	Q23	.000	.058	.000	-.006	.995
	Q24	-.061	.054	-.128	-1.130	.259
	Q25	.062	.037	.184	1.679	.094
	Q26	.037	.037	.089	.983	.326
	Q27	.011	.047	.023	.238	.812
	Q28	-.027	.049	-.053	-.559	.576
	Q29	.058	.087	.120	.665	.506
	Q30	-.040	.037	-.104	-1.073	.284
	Q31	.037	.045	.093	.819	.413
	Q32	.033	.031	.097	1.050	.294
	Q33	.042	.043	.085	.996	.320
	Q34	-.016	.028	-.059	-.572	.568
	Q35	-.032	.030	-.097	-1.081	.280
	Q36	-.024	.035	-.061	-.695	.487
	Q37	-.008	.044	-.023	-.187	.851
	Q38	-.004	.038	-.009	-.104	.917
	Q39	-.025	.035	-.080	-.728	.467
	Q40	.015	.044	.036	.332	.740
	Q41	.050	.058	.115	.868	.386
	Q42	-.053	.032	-.155	-1.682	.093
	Q43	.008	.036	.015	.212	.832
	Q44	.019	.062	.037	.314	.754
	Q45	-.132	.071	-.271	-1.872	.062
	Q46	.064	.066	.119	.963	.336
	Q47	.020	.064	.036	.322	.748
	Q48	.032	.039	.078	.833	.405

	Q49	.018	.057	.037	.314	.753
	Q50	-.027	.066	-.045	-.407	.684
	Q51	.070	.092	.120	.754	.451
	Q52	-.037	.064	-.069	-.577	.564
	Q53	.029	.049	.060	.594	.553
	Q54	.014	.045	.033	.301	.764
	Q55	.074	.051	.148	1.457	.146
	Q56	.002	.064	.004	.037	.970
	Q57	.078	.060	.128	1.295	.196
	Q58	-.093	.062	-.163	-1.503	.134
	Q59	-.016	.064	-.029	-.251	.802
	Q60	-.067	.046	-.120	-1.469	.143
a. Dependent Variable: Q13 (Patents)						

1. B Coefficients: The B Coefficients tell us how many units of Patents increase for a single unit increase in each predictor. Given only the scores on our predictors, we can predict the Patents by computing in the formula:
2. Slope (Y) = mx+b; Meaning= Y= 1.618+ (-0.035 X Q16) + (-0.084 X Q17) …. & so on
3. The Column above mentioned as 'Sig' holds the p-values for our predictors. As a rule in statistics, we always say that a B Coefficient is statistically significant if its p-value is smaller than 0.05. In the above table none of the Variables Coefficients are statistically significant
4. The beta Coefficients allow us to compare the relative strengths of our predictor.
5. The t-Statistic Column is used to check the null hypothesis Vs. alternate

5.2 SPSS Regression Output - Model Summary Table

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.296[a]	.088	-.008	.379
a. Predictors: (Constant), Q60, Q42, Q34, Q20, Q32, Q36, Q18, Q43, Q22, Q17, Q33, Q50, Q27, Q56, Q48, Q16, Q58, Q25, Q35, Q38, Q47, Q26, Q54, Q59, Q37, Q23, Q28, Q57, Q39, Q55, Q30, Q52, Q21, Q19, Q53, Q40, Q44, Q24, Q49, Q31, Q51, Q41, Q46, Q45, Q29				

1. The model above predicts Patents. R denotes the Correlation between the predictors & the observed
2. R Square is simply the square of R, this indicates the proportion of Variance in Patents that can be explained by all our predictors (Independent Variables). R Squared tells the researcher that how many points fall on the regression line.
3. Since, Regression maximizes R Square, this will be somewhat lower for the entire population, a phenomenon known as shrinkage. The Adjusted R Square estimates the population R Square for our model above and thus ensures and gives a more realistic indication of its predictive power.

5.3 Analysis of Variance (ANOVA)

Anova provides the researcher the information about the total variation of the dependent variables to the explained & un-explained portions

Table 4: Anova[b]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	5.956	45	.132	.919	.624[a]
	Residual	61.918	430	.144		
	Total	67.874	475			
a. Predictors: (Constant), Q60, Q42, Q34, Q20, Q32, Q36, Q18, Q43, Q22, Q17, Q33, Q50, Q27, Q56, Q48, Q16, Q58, Q25, Q35, Q38, Q47, Q26, Q54, Q59, Q37, Q23, Q28, Q57, Q39, Q55, Q30, Q52, Q21, Q19, Q53, Q40, Q44, Q24, Q49, Q31, Q51, Q41, Q46, Q45, Q29						
b. Dependent Variable: Q13 (Patents)						

The above ANOVA table denotes that the regression model predicts the dependent variable significantly or not! It is observed from the **"**Regression" row and continue till the "Sig" column, this indicates the statistical significance of the regression model that was run above. Here p value (.624) which is >0.05 and indicates that the overall regression model is not statistically significant and cannot predict the outcome variable which is Patents

5.4 Independent t-test to test the research hypothesis

Null Hypothesis: Transformational Leadership no impact on patents in start-up ventures in Bangalore City

Table 5: Group Statistics

	Q13 (Patents)	N	Mean	Std. Deviation	Std. Error Mean
Q60	Yes	82	3.23	.654	.072
	No	394	3.14	.675	.034

Table 6: Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q60	Equal variances assumed	.176	**.675**	1.130	474	**.259**	.092	.082	-.068	.252
	Equal variances not assumed			1.154	119.801	.251	.092	.080	-.066	.250

Conclusion: from the above Independent t-test, since p > 0.259 (2-tailed test) is greater than our chosen significance level 0.05, the researcher does not reject the Null Hypothesis

6. Suggestions and Conclusion

From the statistical analysis (Regression Analysis and Anova), it is clear that there is no strong statistical correlation between Transformational Leadership and Patents. Further, the independent t-test also confirms that the hypothesis cannot be rejected. Hence the hypothesis "Transformational Leadership no impact on patents in start-up ventures in Bangalore City" is accepted.

However, keeping in mind that the business landscape is extremely competitive and in order to survive in the long run, there is a need for the Government and the start-ups to focus on invention, innovation, and intellectual property. Ways in which this can be achieved are to build a culture of innovation amongst the start-ups, having the right Governmental policies to encourage and nurture innovation, protection of intellectual property, participation in research and development initiatives, having strong tie-ups between the start-ups and related stakeholders like academia, research labs, and Universities.

Further, the study was restricted to Bangalore City alone and hence the results of the study may not be applicable to the entire population of start-ups in the country. Also, the study has examined the impact of Transformational Leadership on patents and there could be other factors influencing patents amongst start-ups. This gives scope for further research in this area.

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