

Strategic Thinking Ability of Scientists in the Indian Agricultural Research and Education System

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Abstract- A study on the strategic thinking ability among 432 scientist respondents of National Agricultural Research and Education System (NARES) in India indicated that only 29 (6.7%) have the ability to think strategically. Of all the behavioral and environmental independent variables considered for the study, only three variables viz., creativity, communication skills and climate for innovation have association with the strategic thinking capacity at 5% significance level. Four other behavioral and personal variables viz., effective leadership trait, achievement motive, indulgence in office politics and experience were found to have association with strategic thinking at 10% significance. All other independent variables found to have no association with the strategic thinking capacity of the respondents. Among all the independent variables only indulgence in office politics, existence of climate for innovation and total service experience have been found to significantly influence the ability to think strategic.

Keywords- Strategic Thinking, Agricultural Research, Education System, Communication Skills.

I. INTRODUCTION

Strategic thinking is the ability to imagine the future accurately and develop suitable responses to deal with it successfully. It is, an extremely effective and valuable tool, is a process that defines the manner in which people think about, assess, view, and create the future for themselves and others. Strategic thinking includes strategic analysis, strategic planning, organization and control and even strategic leadership. Therefore, strategic thinking basically covers all those attributes which can be labeled “strategic” [1]. Strategic thinking is necessary to arrive at decisions not only related to one’s work but also to personal life. Strategic thinking involves identifying different ways for people to attain their chosen objectives and determining what actions are needed to get them into the position [2]. For example, in business, strategic thinking helps managers review

policy issues, perform long term planning, set goals and determine priorities, and identify potential risks and opportunities. It also has role in creating wealth in organizations [3]. In research institutions, strategic thinking helps research managers in creating useful inventions and discoveries to develop appropriate technology

It is a general observation that organizations rely on either the emergence of strategic thinkers within the organizations or poaching proven strategic thinkers from other successful organizations [4]. The importance of strategic thinking for business and research organizations to succeed is well established [5, 6, 7, 8, 9]. Lack of strategic thinking among senior managers has been identified as a major shortcoming in organizations [10].

Studies have been conducted to see the impact of organizational practices that encourage strategic thinking [11]. Beside business organizations, strategic thinking also plays an important role in governing bodies [12]. Similarly, strategic thinking is also necessary in research organizations and academic institutions to achieve their listed goals and attain excellence. As in the case of business organizations, the success of a research organization also depends upon its chief executive officer called research managers, who, in most of the cases, are the researchers with some good research experience behind them. Such good researchers, when they become research managers, are a loss to research work but not always a gain to research management positions. It is therefore important to assess the leadership capabilities of those who wish to move in, or have already moved into leadership positions. Their capacity to think strategically decides the fate of the research and there by the institution itself. The objective of this study is to investigate the characteristic of ‘strategic thinking’ among the research and academic professionals working at various research institutes under Indian Council of Agricultural Research (ICAR) and Agricultural Universities (AUs) in India which constitutes National

Agricultural Research and Education System (NARES) and to identify the factors influencing their strategic thinking.

II. DATA AND METHODOLOGY

This study is based on the research and academic professionals engaged in the National Agricultural Research and Education System (NARES) in India. NARES comprises the research institutes under ICAR and AUs catering to the needs of the farming community through research, education and extension. The respondents included the research and academic professionals working in different capacities viz., scientists/assistant professors, senior scientists/associate professors, principal scientists/professors, heads of the divisions, project directors/coordinators, zonal directors, deans, assistant/deputy director generals, vice chancellors and other similar research management professionals.

A total of 432 filled in questionnaires have been used for the study. The *ex-post facto* research design was used, as it deals with the events which have already happened, and the researcher does not have any control over the study variables. The inference about the relationships among independent and dependent variables are made without the direct involvement of the study due to continuous variation in the independent and dependent variables.

In view of the objectives set for the investigation, the study variable, strategic thinking, is considered as the dependent variable. As the ability to think strategically is thought to be a learned behavior rather than an inherited factor and its learning process may be affected by the independent variable. Therefore, the independent personal and environmental variables such as working position in the organization, age, gender, educational qualification, discipline group (field of specialization), total service experience, major activity, period of technical training undergone and period of management training undergone which are expected to have some bearing on the learning process were identified for inclusion in the study as factors which may affect the strategic thinking capacity. In addition to these, some personal or behavioral variables or factors like leadership effectiveness [13], propensity to take risks [14], readiness to leadership role [14], assertiveness [14], achievement motive [14], indulgence in office politics [14], respondent's interest to impress his manager [14], creativity [14], whether the respondent has a working climate for innovation [15], and respondent's communication skills [16] are also considered in the study. These factors are measured using the instrument developed by authors mentioned above.

The respondents were briefed about the study, its purpose and objectives by a letter or by personal interaction with project team members as the case may be and were supplied with questionnaires. The questionnaire on strategic thinking consisted of ten statements and the respondents were asked to indicate their strength of agreement among the alternatives viz., strongly disagree, disagree, neutral, agree and strongly agree. Each alternative had a numerical value associated with it ranging from 1 to 5 based on the statement. Based on the total score from all the ten statements, the respondent is classified regarding his/her strategic thinking ability as in table I.

Score	Category
> 41	Thinks strategically
20 - 41	Neutral / Detached
< 20	Emphasis on now and short term

TABLE I. CLASSIFICATION OF RESPONDENTS BASED ON SCORE

The instrument / questionnaire was scored with the help of the key and the data thus obtained for the dependent variable was coded, tabulated and analyzed using simple tabular analysis with frequencies and percentages using Microsoft Excel. As the response variable is of ordinal type with three categories, the independent variables were also converted into nominal (gender and discipline group) and ordinal (position, age, educational qualification, total experience, number of days of technical trainings and management trainings). Table II briefly describes all the variables considered in the study. Since our response variable was of ordinal type with three categories: thinks strategically, neutral/ detached and emphasis on now, the independent variables were also converted into either nominal (organization, gender, discipline group, activity) or ordinal (educational qualification, age, experience, position) variables. The association between the dependent variable and independent variables was studied using the Fisher's Exact test and the Multinomial Logistic Regression Analysis [17, 18]. The SAS 9.3 statistical analyses software was employed for these analyses.

Variable	Description
Risk Taker	Entrepreneurial leadership style have strong achievement motive and sensible risk taking.
Readiness for the leadership role	The ease with which a person can take up the leadership roles of figurehead, spokesperson, negotiator, coach, team builder, team player, technical problem solver and entrepreneur in an organization.
Effective leadership	Effective leaders adapt to the situation
Assertiveness	It refers to being forthright in expressing demands, opinions, feelings and attitudes
Achievement Motivation	Ability to put in strong effort in achieving work goals.
Indulgence in Office Politics	Ability to engage in political behavior so as to manipulate others for personal advantage in office.
Working to impress manager	Ability to show behavior directed at enhancing one's image by drawing attention to oneself.
Creativity	Having knowledge, intellectual abilities, good personality and acceptable social habits and good upbringing resulting in an ability to find a better way of solving problems.
Existence of Climate for innovation	A climate conducive to creative problem solving.
Communication skills	Effective communication occurs when there is common understanding of meaning and intent.

TABLE II. A BRIEF DESCRIPTION OF THE VARIABLES UNDER CONSIDERATION

III. RESULTS AND DISCUSSION

The study involved a total number of 432 research and academic professionals of ICAR research institutes and AUs. The information on the sample composition (Table III) shows that out of 432 respondents, most of the respondents were male (89.4%), aged between 40 to 60 years (67.6%), working in ICAR research institutes (55.8%) in senior scientific positions (40.8%), having doctoral degree (82.6%), belonging to the commodity production stream (38.0%), with more than 20 years of experience (57.4%), majorly involved in research activities (52.2%) and have undergone less than 30 days of technical & management training (52.1% & 76.6%, respectively).

Similarly, the table IV shows that out of 432 respondents, most were risk avoiders (98.6%), moderately ready to take up leadership role (90.7%) and are moderately effective at leadership (57.9%), non-assertive (50.7), moderately achievement motivated (53.5%), with average involvement in office politics (50.0%), moderately working to impress their manager (53.0%), moderately creative (64.5%), working under average climate for innovation (41.0%) and with very effective communication skills (68.8%).

Variable	Category	Frequency	Percentage
Organization	ICAR	191	44.2
	AUs	241	55.8
Gender	Male	386	89.4
	Female	46	10.6
Educational Qualification	Post-graduate	75	17.4
	Doctorate	357	82.6
Discipline	Crop improvement	64	14.8
	Crop production	164	38.0
	Crop protection	57	13.2
	Social science	53	12.3
	Basic sciences	94	21.8
Age	<40 years	131	30.3
	40-60 years	292	67.6
	>60 years	9	2.1
Total service Experience	<10 years	103	23.8
	10-20 years	81	18.8
	>20 years	248	57.4
Position	RMP	122	28.2
	Scientist	134	31.0
	Senior Scientist	176	40.8
Activity	Administration	64	17.6
	Extension	11	3.0
	Research	190	52.2
	Teaching	98	26.9
	Training	1	0.3
No. of technical training days	<30 days	225	52.1
	31-90 days	113	26.2
	91-180 days	45	10.4
	>180 days	49	11.3
No. of management training days	<30 days	331	76.6
	31-90 days	48	11.1
	91-180 days	30	6.9
	>180 days	23	5.4

TABLE III. SPREAD OF RESPONDENTS AMONG DIFFERENT CATEGORIES OF VARIABLES

Variable	Category	Frequency	Percentage
Risk Taker	Heavy risk taker	0	0
	Sensible risk taker	6	1.4
	Risk avoider	426	98.6
Readiness for the leadership role	High readiness	26	6.0
	Moderate readiness	392	90.7
	Some uneasiness with leadership role	13	3.0
	Low readiness	1	0.2
Effective leadership	Highly effective	50	11.6
	Moderately effective	250	57.9
	Less effective	132	30.6
Assertiveness	Aggressive	2	0.5
	Assertive	211	48.9
	Non assertive	219	50.7
Achievement Motivation	High achievement motive	198	45.8
	Moderate achievement motive	231	53.5
	Low achievement motive	3	0.7
Indulgence in Office Politics	Below average tendency to play office politics	47	10.9
	Average	216	50.0
	Above average	169	39.1
Working to impress manager	Diligently	1	0.2
	Moderately	229	53.0
	Not enough effort	202	46.8
Creativity	Creative Leader	17	3.9
	Moderately	278	64.5

	Intellectual conformist	137	31.7
Existence of Climate for innovation	Encourages innovation	143	33.1
	Average climate for innovation	177	41.0
	Inhibits innovation	112	25.9
	Very effective	297	68.8
Communication skills	Effective	122	28.2
	Ineffective	13	3.0

TABLE IV. SPREAD OF RESPONDENTS AMONG DIFFERENT CATEGORIES OF VARIABLES

From the instrument, it was found that out of 432 respondents, only 29 respondents (6.7%) thought strategically whereas the remaining 403 respondents found to be neutral/detached. None of the respondents found to be emphasizing on now and short term.

Among the 29 strategic thinkers, 96.6% of them were risk avoiders, 82.8% were only moderately ready to take leadership role, 55.2% were moderately effective leaders, almost equally distributed among both ICAR and AUs (48.3% & 51.7%, respectively), 93.1% were at least doctorates, 37.9% belong to the crop production group, 62.1% were assertive, 65.5% were high achievement motive, 55.2% shown above average indulgence in politics, 62.1% were moderately working to impress their managers, 65.6% were moderately creative, 10.5% were working in climate that encourages innovation, 93.1% had very effective communication skills, 65.5% fell in the age category of 41-60 years, 44.8% experience had an experience of >20 years, 41.4% were in senior scientific positions, 40.9% involved in teaching activity and 44.8% had <30 days technical and management training.

But, it needs to be noted that, the majority of the respondents fall in these categories of variables as it is evident from the tables 3&4. Hence it is appropriate to look at the proportions of the strategic thinkers in each category. For example, if we look at strategic thinkers with the variable 'readiness to take up leadership responsibility', though 82.8% of the strategic thinkers were moderately ready to take leadership, only 6.1% of those who were moderately ready for leadership role were strategic thinkers whereas 15.38% of those who had some uneasiness with leadership role found to be strategic thinkers. Similarly, a proportionately more strategic thinkers were found among sensible risk takers, highly effective leaders, doctorates and post-doctorates, assertive people, highly achievement motivated, those with above average involvement in office politics, working to moderately impress the managers, creative, under climate that encourages innovation, very effective communication, < 40 years old, having 11-20 years of experience, working in research management positions, >180 days of technical training and 90-180 days of management training. Almost equal

proportions of strategic thinkers were found among gender and subject disciplines.

The association of the study variable 'strategic thinking', with that of the independent variables is tested using Fisher's exact test the results of which are given in table V. The other widely used statistical test for association, the chi-square test was found to be invalid for the data set under study since the frequency count for some of the categories was less than 5 in the contingency tables. The results of the Fisher's exact test indicate that of all the independent variables considered for the study, only three variables viz., creativity, communication skills and climate for innovation have association with the strategic thinking capacity at 5% significance level. Other variables viz., effective leadership trait, achievement motive, indulgence in politics and experience were found to have association with strategic thinking at 10% significance. All other variables found to have no association with the strategic thinking capacity of the respondents.

Variable	Fisher's Exact test statistic	Probability
Risk taking ability	0.287	0.342
Readiness to leadership role	0.023	0.189
Effective leadership	0.003**	0.092
Organization	0.137	0.700
Gender	0.189	0.533
Educational qualification	0.066	0.200
Discipline	0.001	0.960
Assertiveness	0.047	0.285
Achievement motive	0.012**	0.070
Indulgence in office politics	0.003**	0.090
Impress manager	0.088	0.386
Creativity	0.002*	0.026
Existence of Climate for innovation	0.001*	0.035
Communication skills	0.001*	0.011
Age category	0.078	0.829
Total Service Experience	0.003**	0.098
Position	0.010	0.349
Activity	0.001	0.184

Days of technical training	0.004	0.585
Days of management training	0.009	0.618

Notes: *Significant at 5% level ** significant at 10% level

TABLE V. FISHER'S EXACT TEST FOR ASSOCIATION BETWEEN DIFFERENT VARIABLES WITH STRATEGIC THINKING

As the dependent variable under study is of ordinal type with three categories, the multinomial logistic regression analysis was employed to measure the influence of each independent variable on the strategic thinking ability of respondents. But, since there were no respondents falling under the 'emphasis on

Variable	Degrees of freedom	Wald chi-square	p
Ready to leadership role	3	4.682	0.196
Leadership Effectiveness	2	1.452	0.483
Discipline group	4	2.108	0.715
Assertiveness	2	0.035	0.982
Achievement Motivation	2	2.179	0.336
Indulgence in office politics	2	6.632	0.036*
Creativity	2	4.301	0.116
Existence of Climate for innovation	2	6.740	0.034*
Total service Experience	2	7.558	0.022*
Position	2	5.790	0.055
Major activity	4	8.339	0.079
No. of days of technical training	3	3.860	0.276
No. of days of management training	3	1.140	0.767

Notes: *Significant at 5% level

TABLE VI. RESULTS OF BINOMIAL LOGISTIC REGRESSION

IV. CONCLUSION

It is concluded that the study on strategic thinking ability among 432 scientists of National Agricultural Research and Education System (NARES) in India indicated that only 29 (6.7%) have the ability to think strategically. Of all the independent variables considered for the study, only three variables viz., creativity, communication skills and climate for innovation have association with the strategic thinking capacity at 5% significance level. Other variables viz., effective leadership trait, achievement motive, indulgence in office politics and experience were found to have association with strategic thinking at 10% significance. All other variables found to have no association with the strategic thinking capacity of the respondents. Among all the independent variables only indulgence in office politics, climate for innovation and total service experience have significantly influenced the strategic thinking ability. This indicates that there is a great need for a climate favorable for innovation and more years of

now and short term' category, the multinomial regression reduced to binomial logistic regression with the dependent variable taking just two outcomes. To address the problem of

sparse contingency tables, the Firth's bias-correction [19] was employed. The Wald statistic (=33.93 at 33 degrees of freedom, $p=0.42$) indicates that the proportional odds assumption is reasonable. The maximum likelihood estimates of the parameters (table VI) indicated that among all the independent variables only indulgence in politics, climate for innovation and total service experience have influence on the strategic thinking ability at 5% significance level.

experience of the scientists for improving the strategic thinking in the system.

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