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Engineering Leadership

Dr. Jayshree Suresh, Kavitha Sethuraman

SRM University, SRM Nagar
Kattankulathur - 603203
Kancheepuram District, Tamilnadu,
INDIA.

Abstract

Leadership is an art of developing people. Engineering leadership is all about motivating and developing subordinates. A good understanding about subordinates helps to succeed as great leaders. In this regard, this article deals with how a leader can engineer his leadership to develop people. The engineering process has been identified, developed and applied in four stages. (a) In the first stage, the leader uses MBTI tool to analyse preference. (b) Understand the different leadership styles (situational leadership) S1,S2,S3, S4. (c) Understand the appropriate readiness level of the subordinate R1,R2,R3,R4. (d) Apply the appropriate leadership style to be effective leaders. The study applies the engineering leadership process and discusses the results.

Key Words: Engineering Leadership – MBTI – Leadership styles – Readiness level.

1. Introduction

A leader is defined as a person with the responsibility to influence one or more followers and direct them to achieve a set objective. While doing so, the leader has to be aware of the strength of each of his follower and identify the areas for improvement. (Bruce E. Winston and Kathleen Patterson,2006). A leader should be able to change his or her leadership style based on the situation in order to be more effective, focus on supporting the followers and build their trust and respect (Aric Hall, 2007). Literatures have stated that the key elements for a successful organization are leadership style and competency.

2. Effective Leadership

Any organisation to be effective, it is important that they identify and develop talents. A good leader is one who helps employees realise their potential. Servant leadership as a concept focuses on developing people in the areas of task effectiveness, community stewardship, self motivation and future leadership capabilities (Liden et. al, 2008).

A study (Goleman, 2000) reveals that successful leaders do not rely on single leadership style. They change their leadership style based on the need of their subordinates, as their primary responsibility is leading followers for achieving their desired goals (Mosadegh Rad and Yahmohammadian, 2006) which in turn leads to job satisfaction of the followers and improved productivity. Researchers have also emphasized that different leadership styles will impact the job satisfaction of employees (Bogler, 2001, 2002; Heller, 1993; Mckee 1991). Their study found that leadership styles (relationship or task oriented) are associated positively with employee's interest on the Job, leader and organisation (Felfe & Schyns, 2006; Bycio, Hackett & Allen, 1995; Niehoff, Enz & Grover, 1990). Leadership is not one specific style defined and to be followed at all situations to all people. Hence understanding of different leadership styles people (Alan Murray, 2013).

The Situational Leadership theory created by Paul Hersey and Ken Blanchard states that adopting one style of leadership always would not be effective rather leaders should change their leadership style based on the readiness levels of people they lead. This theory would enable leaders to focus more on task or relationship based on the need of people they lead in order to expect and maintain high performance from people (Center for Leadership Studies*,n.d)*

MBTI :

MBTI is a psychological instrument developed by Isabel Briggs Myers and her mother, Katharine Cook Briggs, this has been used by people around the world over 60 years to understand their personality and interests. They created 16 types with the description explaining individual's personality (Joseph, 2009). The report helps to understand the differences of each type. These personality types are exhibited by four letters based on their four preferences namely Extroversion/Introversion **(E/I)**, Sensing/Intuitive **(S/N)**, Thinking/Feeling **(T/F),** Judging/Perceiving **(J/P).** The terms used, have a technical meaning related to MBTI rather than the word by itself (CPP, 2009). This instrument helps to a great extent for leaders in leading virtual teams which indeed has been a great challenge because of less interaction between the leaders and subordinates. A leader has to know his subordinates in order to keep them motivated so as to change his/ or her leadership style for getting the task done and ensuring their subordinates stay motivated. In this regard knowing the MBTI personality type of their subordinates will help the leaders lead effectively (Pearl, 2001). Hence, knowing the MBTI type of a leader is essential for leadership development. Considerable research was done on the self awareness of a leader for enhancing their leadership skills.

Through MBTI, leaders get a chance to assess their preferences that might impact their leadership styles (Kathleen 2009).

The basic premise of Myers and Briggs type indicator (MBTI) is that people have inborn preferences and they "cannot be changed. MBTI is an instrument that helps in effective communication with others. Any information received by people are perceived and acted upon differently. Hence when we try to communicate with people knowing their preferences it helps not only getting the desired output but also will make them feel happy about the information received from us and work delivered.

There is a strong relationship between the psychological types and leadership behaviour which was re affirmed by using MBTI for understanding the type preferences and reflections of a leader. The researchers have emphasized that knowledge on MBTI will help leaders to understand the areas to be worked on while paying attention to employees needs and potential development areas. The understanding of four mental processes in Jung Theory gives information on energy, data collection, decision making, and orientation as these are the more critical areas in identifying what is required to make Blanchard's model more relevant (Kathleen, 2009).

Research reveals that effective leaders focus on self awareness, self management and empathy for understanding their own emotions and emotions of others, which in turn would help them in changing their leadership style to appropriate to the current situation and people around.leadership characteristics "were better described as personality traits rather than skills or strategies to be learnt and applied" (Schneider and Burton ,2005). According to Keirsey and Bates , leaders should know their personality for being able to know personality of their subordinates (Keirsey & Bates, 1984).

The 16 MBTI types help the leaders understand their personality types based on extroversion or introversion; sensing or intuition; thinking or feeling and perceiving or judging which would help them to understand their personality and flex their leadership styles appropriate to their subordinates (Myers & McCaulley,1985).

Situational Leadership :

The situational leadership theory developed by Paul Hersey and Ken Blanchard in 1969 proposes that effective leadership depends on the ability of the leader to change his or her behavior to suit the situation. The task and relationship behaviours are called directing and supporting behaviours. Hersey and Blanchard (1977) highlighted four different types of leadership behavior namely - **telling** (S1-high directive, low supportive), **selling** (S2-high directive, high supportive), **participating** (S3-low directive, high supportive), and **delegating** (S4-low directive, low supportive).

Readiness Levels:

The role of a leader is to continuously monitor and acclimatize their leadership behavior to each follower's task maturity (i.e) Readiness Levels like R1,R2,R3 and

R4. R1 being low maturity on performing a task and R4 being high on performing a task (Module 16,Update).According to situational leadership theory, successful leadership lies in choosing an appropriate leadership style based on the readiness level of the followers. The importance of followers in determining the effective leadership style is because it is followers who accept or reject a leader. The term readiness level means the ability and willingness to perform a specific task. The Situational leadership focuses on flexible leaders using appropriate behavioral responses at various situations.(Yaser mansour almansour,2012).

Leadership Styles:
According to (Hal F. Cunnyngham, 2001). leadership style might be appropriate, over leading (subordinates feel leaders are over doing) or under leading (subordinates feel leaders are not giving them the required guidance) to their followers at various readiness levels.

3. Methodology

On the basis of the theoretical understanding, the relationship between the concepts were developed and linkages of MBTI, situational leadership, readiness levels and the appropriate leadership styles were established, A study was done to test the model, There was an instrument build and tested with 313 leaders who were already aware about their MBTI personality type and their leadership styles from Situational Leadership instrument. To establish the relationships, the date were analysed by Multiple regression. The results of the relationship between MBIT and each of the situational leadership and the readiness levels of the study are presented and discussed.

Table 1: Relationship between MBIT and Situational LeadershipMean Values

	S1	**S2**	**S3**	**S4**	**Overall**
E Score	12.86	10.91	10.87	9.5	313
I Score	9.14	11.09	11.13	12.5	313
S Score	16.77	17.26	12.01	8.14	313
N score	9.23	8.74	13.99	17.86	313
F Score	7.2	6.6	16.42	7.23	313
T Score	16.8	17.4	7.58	16.77	313
J Score	12.77	6.7	9.45	10.05	313
P score	8.22	14.3	11.55	10.95	313

The scores obtained using the instrument built for this study was fed in to the SPSS tool for analysis. The results show that more of S1 type leaders have high scores in Extroversion as compared to the S2, S3 and S4 leaders with high scores in Introversion. Among the S and N preferences S1 and S2 types of leaders have scored high on sensing as compared to S3 and S4 type of leaders having high scores in intuition. As far as the F and T preferences are concerned, S1, S2 and S4 style leaders have high scores in Telling as compared to the S4 type of leaders

having high scores in Feeling. The J and P preferences shows that the S1 style of leaders have high scores in Judging as compared to the S2,S3 and S4 type of leaders having high scores in Perceiving.

Table 2: MBTI and Situational Leadership (S1)

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.143	.391		-2.921	.004
	E I computed value	.011	.003	.182	3.661	.000
	SN computed value	.019	.004	.263	5.316	.000
	TF computed value	.023	.003	.337	6.820	.000
	JP computed value	.010	.003	.176	3.533	.000

Dependent Variable: S1 STYLE
F= 60.802; R Square = .441

The results show a high beta value of 0.23 for TF variable and high T value of 6.820. It appears that the S1 type of leaders which is a dependant variable here have high score in TF preferences of their MBTI type (i.e) Most of the S1 leaders from the sample used here have significant scores among these two preferences. Hence knowing their MBTI preferences will help them to influence their subordinates based on their readiness levels (R1, R2, R3 or R4). For example: if their subordinates are at Readiness level one, they would need more of a directive style (T) of leadership that is more of task oriented than being supportive and encouraging (F) so if the leader's MBTI preference is F instead of T the leaders have to flex a bit and give more directions and task oriented for effective leadership. Having detailed out about the highest beta value of TF variable the other three variables (EI, SN, and JP) have also shown that there is significance.

Table 3: MBTI and Situational Leadership (S2)

		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.001	.325		3.081	.002
	E I computed value	.001	.002	.022	.425	.671
	SN computed value	.018	.003	.306	5.945	.000
	TF computed value	.013	.003	.228	4.425	.000
	JP computed value	-.012	.002	-.249	-4.800	.000

Dependent Variable: S2 STYLE
F= 78.374; R Square = .504

The above results show a high beta value of 0.18 for SN variable and high T value of 5.945. It appears that the S2 type of leaders which is a dependant variable here have high score in SN preferences of their MBTI type (i.e) Most of the S2 leaders from the sample used here have significant scores among these two preferences. Hence knowing their MBTI preferences will help them to influence their subordinates based on their readiness levels (R1, R2, R3 or R4). For example: if their subordinates are at Readiness level one, they would need more of a directive style (S) of leadership than explaining them the big picture (N) so if the leader's MBTI preference is N instead of S the leaders have to flex a bit and give more directions for effective leadership. Having detailed out about the highest beta value of SN variable the other two variables (TF and JP) have also shown that there is significance.

Table 4: MBTI and Situational Leadership (S3)

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.792	.333		26.440	.000
	E I computed value	-.005	.002	-.077	-2.066	.040
	SN computed value	-.011	.003	-.134	-3.624	.000
	TF computed value	-.060	.003	-.752	-20.369	.000
	JP computed value	-.002	.003	-.027	-.713	.476

Dependent Variable: S3 STYLE
F= 56.438; R Square = .423

The results show a high beta value of 0.60 for TF variable and high T value of -20.369. It appears that the S3 type of leaders which is a dependant variable here have high score in TF preferences of their MBTI type (i.e) Most of the S3 leaders from the sample used here have significant scores among these two preferences. Hence knowing their MBTI preferences will help them to influence their subordinates based on their readiness levels (R1, R2, R3 or R4). For example: if their subordinates are at Readiness level one, they would need more of a directive style (T) of leadership that is more of task oriented than being supportive and encouraging (F) so if the leader's MBTI preference is F instead of T the leaders have to flex a bit and give more directions and task oriented for effective leadership. Having detailed out about the highest beta value of TF variable the other variable SN have also shown that there is significance.

Table 5: MBTI and Situational Leadership (S4)

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.350	.349		9.599	.000
	E I computed value	-.007	.003	-.122	-2.531	.012
	SN computed value	-.026	.003	-.385	-8.040	.000
	TF computed value	.023	.003	.366	7.645	.000
	JP computed value	.003	.003	.057	1.188	.236

Dependent Variable: S4 STYLE
F= 57.705; R Square = .428

The results show a high beta value of 0.26 for SN variable and high T value of 8.040. It appears that the S4 type of leaders which is a dependant variable here have high score in TF preferences of their MBTI type (i.e) Most of the S4 leaders from the sample used here have significant scores among these two preferences. Hence knowing their MBTI preferences will help them to influence their subordinates based on their readiness levels (R1, R2, R3 or R4). For example: if their subordinates are at Readiness level one, they would need more of a directive style (T) of leadership that is more of task oriented than being supportive and encouraging (F) so if the leader's MBTI preference is F instead of T the leaders have to flex a bit and give more directions and task oriented for effective leadership. Having detailed out about the highest beta value of TF variable similar to S3 leadership style the other variable SN have also shown that there is significance.

Table 6: MBIT and Readiness level 1

Model					T	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.232	.157		27.007	.000
	E I computed value	-.002	.001	-.062	-1.450	.148
	SN computed value	-.015	.001	-.437	-10.214	.000
	TF computed value	-.016	.001	-.502	-11.730	.000
	JP computed value	.002	.001	.064	1.490	.137

Dependent variable : Readiness level 1(R1)
F= 60.802; R Square = .441

The above table shows the results of multiple regression analysis between the MBTI preferences like EI, SN, TF and JP. The R square value clearly explains

44% of variance associated with Readiness level 1.The F statistics is also highly significant (F=60.802) which confirms that the variables make a meaningful contributions to fit in to the regression model. The two independent variables SN and TF were significantly associated with Readiness level 1.(Kavitha & Jayshree, 2014)

The most important variable was TF with highest Beta value of .502 and high T value of 11.730 explains that for readiness level 1 the most significant preferences that contributes to be an appropriate leader for R1 is TF preference followed by SN preference as have also shown that there is significance.

Table 7: MBIT and Readiness level 2

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	4.506	.155		29.014	.000
E I computed value	-.004	.001	-.150	-3.702	.000
SN computed value	-.019	.001	-.544	-13.491	.000
TF computed value	-.015	.001	-.446	-11.074	.000
JP computed value	.004	.001	.130	3.207	.001

Dependent variable : Readiness level 2 (R2)
F= 78.374; R Square = .504

The above table shows the results of multiple regression analysis between the MBTI preferences like EI, SN, TF and JP. The R square value clearly explains 50% of variance associated with Readiness level 2.The F statistics is also highly significant (F=78.374) which confirms that the variables make a meaningful contributions to fit in to the regression model. All the four independent variables EI, SN, TF and JP were significantly associated with Readiness level 2.

The most important variable was SN with highest Beta value of .544 and high T value of 13.491 explains that for readiness level 2 the most significant preferences that contributes to be an appropriate leader for R2 is SN preference followed by TF,EI and JP preference as those values have also shown that there is significance.

Table 8: MBIT and Readiness level 3

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.793	.163		4.861	.000
	E I computed value	-.002	.001	-.088	-2.010	.045
	SN computed value	.004	.002	.101	2.332	.020
	TF computed value	.021	.001	.626	14.415	.000
	JP computed value	-.002	.001	-.054	-1.228	.221

Dependeent variable : Readiness level 3 (R3)
F= 56.438; R Square = .423

The above table shows the results of multiple regression analysis between the MBTI preferences like EI, SN, TF and JP. The R square value clearly explains 56% of variance associated with Readiness level 3.The F statistics is also highly significant (F=56.438) which confirms that the variables make a meaningful contributions to fit in to the regression model. The independent variables TF were significantly associated with Readiness level 3.

The most important variable was TF with highest Beta value of .626 and high T value of 14.415 explains that for readiness level 3 the most significant preferences that contributes to be an appropriate leader for R3 is TF.

Table 9: MBIT and Readiness level 4

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.460	.079		18.388	.000
	E I computed value	.002	.001	.159	3.647	.000
	SN computed value	.009	.001	.526	12.148	.000
	TF computed value	-.006	.001	-.356	-8.230	.000
	JP computed value	.000	.001	-.031	-.721	.471

Dependent variable: Readiness level 4 (R4)
F= 57.705; R Square = .428

The above table shows the results of multiple regression analysis between the MBTI preferences like EI, SN, TF and JP. The R square value clearly explains 57% of variance associated with Readiness level 4.The F statistics is also highly significant (F=57.705) which confirms that the variables make a meaningful contributions to fit in to the regression model. The three independent variables EI, SN and TF were significantly associated with Readiness level 4.

The most important variable was SN with highest Beta value of .526 and high T value of 12.148 explains that for readiness level 4 the most significant preferences that contributes to be an appropriate leader for R4 is SN preference followed by TF and EI preference as those values have also shown that there is significance.

4. Conclusions

A leader holds a major responsibility of leading others. This becomes a biggest challenge as the end result or the output depends on the performance of their followers. This research is an attempt to engineer a solution.. From the empirical study it is found that if a leader knows his MBTI personality type along with the situational leadership concept, it will help him to engineer the leadership style according to the various readiness levels of their followers.

The selection of an appropriate leadership style depends on the situation as well as the personalities of leaders. Knowing and understanding the different types of personality preferences of a leader, can form the basis of a leadership style which will result in high probability of success. This will also help the leaders to flex their leadership styles appropriately as and when there is a need.

5. References

[1] Alan Murray (.2013).The Wall Street Journal Guide to Management. Harper Business. Dow Jones & Company, Inc.

[2] Aric Hall. (2007).” Leadership Thought Journal”. Capella University.

[3] Bogler, R. (2001). The influence of leadership style on teacher job satisfaction. Educational Administration Quarterly, Vol. 37, No.5, pp. 662–683.

[4] Bogler, R. (2002). Two profiles of schoolteachers: A discriminate analysis of job satisfaction. Teaching and Teacher Education,Vol. 18, No. 6, pp. 665–673.

[5] Bruce E. Winston and Kathleen Patterson.(2006).” An Integrative Definition of Leadership” .International Journal of Leadership Studies, Vol. 1, No. 2 , 2006, pp. 6-66.

[6] Bycio, P., Hackett, R.D., & Allen, J.S. 1995. Further assessments of Bass’s (1985), conceptualization of transactional and transformational leadership. Journal of Applied Psychology, Vol. 80, No. 4, pp. 468–78.

[7] Center for Leadership Studies.*n.d. http://www.mindtools.com/pages/article/newLDR_44.htm.*

[8] CPP. (2009). Myers-Briggs Type Indicator Interpretive Repor*t.* 800-624-1765.effectiveness: a multivariate analysis of observational variables and the MBTI.

[9] Felfe, J. & Schyns, B. (2006). Personality and the perception of transformational leadership: The impact of extraversion,neuroticism, personal need for structure, and occupational self-efficacy. Journal of Applied Social Psychology, Vol. 36, No 3. pp.708–41.

[10] Goleman, D. (2000). Leadership that gets results. Harvard Business Review, March-April, pp.78-90.

[11] Hal, F. Cunnyngham. (2001) , A study of the relationships between personality as indicated by the myers briggs type indicator and leadership strengths and weaknesses as identified by skillscope. University of North Texas. Dissertation report

[12] Heller, H. W. (1993). The relationship between teacher job satisfaction and principal leadership style. Journal of School Leadership, Vol. 3, No. 1, pp. 74–86.

[13] Hersey, P. and Blanchard, K. H. (1977). Management of Organizational Behavior 3rd Edition– Utilizing Human Resources. New Jersey/Prentice Hall.

[14] Joseph D. Tucker. (2009). The correlation between Myers-Briggs type and preparedness for leadership. ProQuest, UMI 3362656, North Central University. Dissertation report

[15] .Kathleen, H. W. (2009). The Myers-Briggs Type Indicator as a Tool for Leadership Development in Management Education Programs: What's Type Got to Do with It?

[16] Transformative Dialogues: Teaching and Learning E Journal, March, Vol.2, No. 3, P. 404. Published by Kwantlen Polytechnic University.

[17] Kavitha, S. , & Jayshree, S. (2014) Effective Leadership Styles, International Business Research, Vol. 7, No. 9, pp. 165 – 172. Canadian Center of Science and Education

[18] Keirsey David, and Bates Marilyn. (1984). "Please understand me: Character and

[19] Temperament Types**., Prometheus Nemesis Book Company Del Mar, CA.**

[20] Liden.R.C, Waynes, S.J, Zhao, H and Henderson, D.(2008). Servant Leadership: development of multidimentional measure and multi- level assessment . The Leadership Quarterly Vol. 19, No. (2) , pp.161-177

[21] McKee, J. G. 1991. Leadership styles of community college presidents and faculty job satisfaction. Community/Junior College Quarterly of Research and Practice, Vol. 15, No. 1, pp. 33-46.

[22] Module 16. (Update).Leadership. http://www.learningdomain.com/ Situational.pdf

[23] Mosadegh Rad, A. M., & Yarmohammadian, M. H. (2006). A study of relationship between managers' leadership style and employees' job ssatisfaction. Leadership in Health Services, Vol. 19, No. 2, pp. 11 – 28..

[24] Myres, Isabel Briggs and Mary H, Mc Caulley. (1985). "Manual: A guide to the development and use of the Myres – Briggs Type Indicatot.Palo Alto, CA : Consulting Psychologist Press.

[25] Niehoff, B. P., Enz, C. A., & Grover, R. A. 1990. The impact of top-management actions on employee attitudes and perceptions.Group & Organization Studies, Vol. 15, No. 3, pp. 337-352.

[26] Pearl Young. (2001).Leadership and the Myers-Briggs Type indicator: Using MBTI in a Team Setting, Effective Communication, News letter, March April, pp.48 - 51

[27] Schneider and Burton.(2005).” An ideal type? The Characteristics of Effective School Principals as Perceived by Aspiring Principals Both from within Education and Those from an Alternate Career Path ”. Management in education, Vol.19, No. 2, pp.6-9.

[28] Yaser mansour almansour.(2012). “The relationship between leadership styles and motivation of managers conceptual framework”. Journal of arts, science & commerce, January,Vol. 3, No. 1, pp. 167 - 174