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Data Warehouse Implementation Success Factors and the Impact of Leadership and Personality on the Relationship between Success Factors

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Abstract: Literature suggests that various implementation factors play critical roles in the success of an information system implementation. However, there is little empirical research about the implementation of data warehouse projects. A data warehouse system has unique characteristics that may impact the importance of factors that apply to it, in terms of organization culture, technical tools, management support, user involvement, quality of data sources, self-efficacy, knowledge sharing and clear objective, scope and goals. In addition, the leadership of a team manager and the personality of team members also affect success. A project is an on-going process, and it is hardly possible for one person to process all relevant disciplinary knowledge and single-handedly integrate it successfully. Team members must work together effectively to produce successful data warehouse systems. This study explores a model of a data warehousing success in Thailand, the effect of a project manager's leadership style and the team members' personality types affecting the factors. The data for analysis has been gathered from a sample of 164 data warehouse project members, namely, the project manager and team member. A simplified classification based on the DISC model is used to categorize personality types. The results from a regression analysis of the data identified a significant correlation between all factors and the success of the data warehouse system's implementation. In addition, the difference in leadership style affected the quality of data sources related to success and clear objective, scope and goals related to success. On the other hand, a difference in the personality of team members affected user involvement related to the success and knowledge sharing in relation to overall success.

Key words: data warehouse; success factors; leadership; personality
JEL code: M15

1. Introduction

The data warehouse system has become one of the most important applications of database technology today. Most large companies have established data warehouse systems as a component of their information systems landscape. However, implementing a data warehouse is an expensive and risky undertaking. One of the most important issues in implementing a data warehouse system is determining the success factors that are crucial for efficient implementation and not only success factors but team members also have an impact on its success. In the data warehouse system project's team, we can categorize members into project manager and operator teams. Both success factors and team members are considered to play important roles in contributing to the success or failure of project implementation.

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2. Literature Review

To develop the research model, IT implementation, infrastructure, the data warehouse system, and success literatures were reviewed to identify factors that potentially affect the success of data warehouse implementation.

2.1 Implementation Success Factors

In an early review of the literature, many researchers identified their own lists of success factors. For example Watson and Harley (1997) identified eight success factors and Vatanasombut and Grey (1999) provide 51 success factors that may be classified into 12 categories. Based on the context of Thailand, a selection of eight critical success factors are shown below:

2.1.1 Organization Culture

Zhanga et al. (2005) revealed that adapting implementation to the prevailing cultural style was one important cause of project implementation failure. The first is organization resistance, basically driven by the fear of losing their jobs, by replacing labour-intensive production with automated production or replacing technologically incompetent employees with savvy ones, after implementing the new technology. The second is organization politics, control processes and activities in the enterprise affecting the success of DW implementation. The policies provide detailed information about how the alignment (between data warehouse and legislation) can be established to achieve the long-term objectives (AbuAli & Abu-Addose, 2010; Wixom & Watson, 2001; Mukherjee and D'Souza, 2003).

2.1.2 Technical Tools

Technical tools are used in carrying out a project. These resources influence the effectiveness and efficiency of the data warehouse project's team to actualize the needs and requirements of the organization. In other hands, for the end-user, tools provide the greatest flexibility in the choice of access methods and strategies. The friendliness, easiness and flexibility of user interface tools lead to reduce the resistance from end users to new information technology and increases adaptability.

2.1.3 Management Support

Many studies have stressed the importance of management support as a necessary ingredient for successful DW implementation. The commitment and sponsorship of top management is the most important criteria for assessment. This is because having strong management backing will help overcome shortcomings elsewhere in the project. Top management support can play a useful role in settling disputes and in providing clear direction. With management support, the project can secure required capital, human support, and availability and coordination of other related internal resources in the adoption and development process.

2.1.4 User Involvement

User involvement has a direct influence on successful implementation of information technology. Better user participation increases the probability of managing the user's expectations and satisfying user requirements. The selection and inclusion of fit users in the project team is an important mission. Sufficient user involvement reduces resistance from end users to use newer information technology.

2.1.5 Quality of Data Sources

The quality of the decisions that are facilitated by a data warehouse is only as good as the quality of the data contained in the data warehouse. This data must be accurate, consistent, and complete. If the data is incomplete or incorrect then so will be the results of any analysis performed upon it.

Data sources and their governance policies should be identified clearly, especially in large data warehouse initiatives, where the data is extracted from many data sources. The quality of an organization's present data is another important aspect, which affects the system initiatives. Data in a data warehouse often comes from diverse and heterogeneous sources. So the need for data standards can result in easier data handling, fewer problems and eventually a more successful system.

2.1.6 Self-efficacy

Because the data that is stored in the data warehouse is semi-structured data, self-efficacy of top management is very important for using the data warehouse efficiently. For the project team members, self-efficacy to work and solve problems during implementation should be most helpful for the success of implementation.

2.1.7 Knowledge Sharing

The complexity of a data warehouse and a decision support system calls for intensive interactions among project team members and the system users. All these interactions involve constant knowledge creating, sharing, extraction, preservation, and learning among members. It is therefore necessary to use a well-structured knowledge management mechanism to support these interactions and reduce the impact of the 'brain drain' caused by the exit of team members.

2.1.8 Clear Objective, Scope and Goals

Building a data warehouse symbolizes a massive investment of resources and effort. So, it is necessary to define clearly the scope, goals and priorities of the overall project before any step is to be undertaken. The needs and benefits of the implementation are sometimes driven by competition and the need to gain an advantage in the market. Another reason for a business-driven approach to implementation of a data warehouse is the acquisition of other organizations that enlarge the original organization. It can sometimes be beneficial to implement a DW in order to create more oversight. Inaccurate definition of the project's priority goal and scope may cause bottlenecks and shortage in project resources resulting in delays in the project's schedule and processes.

2.2 Behavioural Theory

Recent research suggests that the data warehouse project's team (both the project manager and operator teams) affect an implementation success (Ward et al., 2005).

Project managers are considered to play an important role in securing the co-operation of diverse operation groups (Koh et al., 2000; Willcocks & Sykes, 2000). Empirical studies suggest that communication during the initial phase of a project, in order to establish a consensus about the investment objectives and achievable benefits is a valuable precursor to stakeholders agreeing how implementation will proceed (Markus et al., 2000). However, these are little researches that explore how leadership and personality type interests contribute to the success or failure of project implementation.

2.2.1 Leadership

Leadership is critical to any group environment. Several studies have highlighted the essential leadership qualities and skills required by IS project managers to ensure success, such as the ability to manage people, stress, emotions, bureaucracy, and communication. Charismatic leadership behaviours are identified as among the most critical leadership behaviours in terms of satisfaction. Behavioural theorists believe that we can categorize leadership styles into people-oriented and task-oriented styles following the Leader Behaviour Description Questionnaire (LBDQ) developed by Ohio State University.

2.2.2 Personality

The DISC model is attributed to Dr William Moulton Marston, whose book *Emotions of Normal People*

(1928) first explained the model using the DISC terminology, and which also provided the descriptive words on which the commonly used DISC personality assessment systems were built. Marston didn't create an assessment tool. This was done initially by researchers at the University of Minnesota, in 1972 according to Inscape. Inscape and others have continued to develop, test and validate DISC assessment systems, which are marketed with gusto to the corporate and organizational development communities. The meaning of the DISC is shown in Table 1.

Table 1 DISC Model

D	I	S	C
Dominance	Influence	Steadiness	Compliance
Decisive, dominant, self-assured, forceful, task-orientated, instigates, leads and directs	Motivates others via influence and persuasion, good communication skills, presents well, friendly, affable, inspires others, intuitive, gregarious, friendly	Reliable, dependable, process-orientated, listener, friendly, trustworthy, solid, ethical, finishes what others start and leave, methodical, decides according to process	Painstaking, investigative, curious, decides using facts and figures, correct, checker, detailed
Motivated by responsibility and achievement	Motivated by recognition and personal approval	Motivated by time, space and continuity to do things properly	Motivated by attention to detail, perfection and truth
Strong focus on task and forceful style can upset people	Emphasis on image can neglect substance	Dependence on process can become resistance	Need for perfection can delay or obstruct
Fears failure and loss of power	Fears rejection and loss of reputation	Fears insecurity and change	Fears inaccuracy and unpredictability

3. The Methodology and Model

The survey research was conducted with the data warehouse project's members in two major areas—the project manager and the operation team. Judgment sampling was used to select the respondents. The questionnaire was measured by two instruments; the five-point Likert type scale for the critical success factors and the DISC instrument for personality type. The respondent profile is shown in Table 2.

Table 2 Respondent Profile

Characteristic	Frequency	Percent
1. Position		
Project manager	34	20.7
Operation team	130	79.3
Total	164	100
2. Leadership style of PM		
Task-Oriented	1	61
People-Oriented	64	39
Total	164	100
3. Personality type		
D - style	35	21.3
I - style	39	23.8
S - style	54	32.9
C - style	36	22
Total	164	100

4. The Findings

In this research, there are three steps of data analysis as shown below.

Step 1: Regression analysis for finding the relationship between factors and implementation success.

The findings showed that all of the success factors from this research (e.g., organization culture, technical tools, management support, user involvement, quality of data sources, self-efficacy, knowledge sharing and clear objective, scope and goals) also affect the success of a data warehouse implementation (Tables 3 and 4).

Table 3 Regression Analysis Model Summary

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	103.969	8	12.996	34.124	0.000(a)
Residual	59.031	155	0.381		
Total	163	163			

Note: R = 0.799, R^2 = 0.619.

Table 4 Regression Analysis for the Implementation Success Factors

Factors	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
	B	Beta		
(Constant)	-3.27E-16		0	1.000
Self-efficacy	0.186	0.186	3.853	0.000
User involvement	0.340	0.340	7.025	0.000
Knowledge sharing	0.433	0.433	8.963	0.000
Management Support	0.263	0.263	5.436	0.000
Data Quality	0.206	0.206	4.267	0.000
Tool	0.140	0.140	2.886	0.004
Org. Culture	0.139	0.139	2.867	0.005
Clear Objective	0.387	0.387	8.010	0.000

Note: Dependent Variable: Implementation success.

Table 3 shows that the model is statistically significant (Sig. = 0.000). The R-squared is 0.619, meaning that approximately 62% of the variability of implementation success is accounted for by the variables in the model. The output from this regression analysis (Table 4) shows that all variables are statistically significant (Sig. > 0.05). The coefficients for each of the variables are positive which would indicate that larger variables are related to larger data warehouse implementation success. The knowledge sharing variable is highly related to implementation success (b = 0.433), the clear objective variable is second (b = 0.387), and the user involvement variable is third (b = 0.340).

Step 2: Univariate Analysis of Variance to test difference of Leadership style to critical success factors

From Table 5, only the quality variable was significant (Sig. = 0.004) but the clear obj. variable was nearly significant (Sig. = 0.052), suggesting there are differences between leadership style. So, looking at Table 6, the effect of PMStyle = 1 to quality variable (b = -0.305, Sig. = 0.004) is significant and its coefficient is negative indicating that a task-oriented style has less effect to the quality of data sources than a people-oriented style. On the other hand, the effect of PMStyle = 1 to Clear_Obj variable (b = 0.198, Sig. = 0.052) indicates that a task-oriented style has more affect on the quality of data sources than a people-oriented style.

Table 5 Leadership Style

Source	Mean Square	F	Sig.
Corrected Model	6.918	19.441	0.000
Intercept	0.261	0.733	0.393
PMStyle * Self	0.255	0.717	0.398
PMStyle * Knowledge	0.553	1.555	0.214
PMStyle * Involve	0.041	0.114	0.736
PMStyle * Mng_Support	1.053	2.959	0.088
PMStyle * Quality	3.041	8.546	0.004
PMStyle * Tool	0.001	0.004	0.950
PMStyle * Org_Culture	0.141	0.396	0.530
PMStyle * Clear_Obj	1.361	3.823	0.052

Note: $R^2 = 0.679$ (Adjusted $R^2 = 0.644$).

Table 6 Leadership Style

Parameter	B	Std. Error	t	Sig.
[PMStyle=1] * Quality	-0.305	0.104	-2.923	0.004
[PMStyle=2] * Quality	0(b)	.	.	.
[PMStyle=1] * Clear_Obj	0.198	0.101	1.955	0.052
[PMStyle=2] * Clear_Obj	0(b)	.	.	.

Note: PMStyle 1 = Task-Oriented, 2 = People-Oriented.

Step 3: Univariate Analysis of Variance to test difference of Personality type to critical success factors.

In Table 7, findings show that personality type has affects only user involvement and knowledge sharing (Sig. = 0.040, 0.041), suggesting there are differences between personality type.

Table 7 Personality Style

Source	Mean Square	F	Sig.
Corrected Model	3.353	9.400	0.000
Intercept	0.031	0.088	0.768
DISC * Self	0.309	0.866	0.461
DISC * Involve	1.014	2.844	0.040
DISC * Knowledge	1.013	2.841	0.041
DISC * Mng_Support	0.251	0.703	0.552
DISC * Quality	0.079	0.221	0.882
DISC * Tool	0.448	1.255	0.293
DISC * Org_Culture	0.207	0.579	0.630
DISC * Clear_Obj	0.574	1.608	0.191

Note: R2 = 0.720 (Adjusted R2 = 0643).

Interpreting Table 8, only the D-style has positive effect on the relation between user involvement and success (b = 0.421, Sig. = 0.005), while other styles (I, S and C) have no effect. The relationship between knowledge sharing and success has two personality styles involved. I-style (b = 0.519, Sig. = 0.008) and S-style (b = 0.438, Sig. = 0.033) have positive effect on the relation between user involvement and success.

Table 8 Personality Style

Parameter	B	Std. Error	t	Sig.
[DISC=1] * Involve	0.421	0.146	2.881	0.005
[DISC=2] * Involve	0.193	0.152	1.268	0.207
[DISC=3] * Involve	0.127	0.136	0.935	0.352
[DISC=4] * Involve	0(b)	.	.	.
[DISC=1] * Knowledge	0.29	0.204	1.424	0.157
[DISC=2] * Knowledge	0.519	0.193	2.693	0.008
[DISC=3] * Knowledge	0.438	0.203	2.16	0.033
[DISC=4] * Knowledge	0(b)	.	.	.

Note: DISC 1 = D, 2 = I, 3 = S, 4 = C.

5. Summary and Conclusions

This study examined the factors that affect data warehousing success by using a research model that was developed from IT implementation and data warehousing literature. The findings suggest that all implementation factors affect the success of a data warehouse. In addition, this study offers important insights into the influence of leadership style and personality type composition on data warehouse implementation success. The result is shown in Table 9.

Table 9 Research Summary

Factors	Affect to Success	Project Manager		Team's Personality Type			
		Task	People	D	I	S	C
Organization culture (O)	effect	-	-	-	-	-	-
Technical tools (T)	effect	-	-	-	-	-	-
Management support (M)	effect	-	-	-	-	-	-
User involvement (U)***	effect	-	-	more	less	less	less
Self-efficacy (S)	effect	-	-	-	-	-	-
Knowledge sharing (K)*	effect	-	-	less	most	more	less
Clear objective, scope and goals (C)**	effect	more	less	-	-	-	-
Quality of data sources (Q)	effect	less	more	-	-	-	-

Note: * Knowledge sharing (K) has the most affect to success; ** Clear objective, scope and goals (C) is the second-rank that impact to success; *** User involvement (U) is the third-rank that impact to success.

In summary, the result from this study not only shows data warehouse critical success factors but also serves as a reminder to people who are responsible in recruitment to consider carefully the leadership style and personality type in determining team composition.

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