

ANALYSIS OF FACTORS INFLUENCING KNOWLEDGE MANAGEMENT PRACTICES IN A MANUFACTURING AND R&D SECTOR

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Abstract - The purpose of this quantitative study is to investigate the factors affecting Knowledge management (KM) practices in a Manufacturing and R &D sector of Kerala. Knowledge management is an integrated approach that allows identifying, capturing, evaluating, retrieving, and sharing all of an enterprise's information assets. The effective study on factors influencing Knowledge management practices in R &D sector is also less researched in South Indian context. The independent variables taken for this research are Organizational culture, Leadership, Information and technology support, Management commitment, T-shaped skills, Trust and collaboration, Training and development, Formalization and Man power availability which is to be measured against the dependent variable knowledge management practices. For this research, Instrumentation limited, Kanjikode (Manufacturing sector) and Fluid Control Research Institute (R&D sector) is taken for investigating the factors affecting Knowledge management (KM) practices. Multiple Regression analysis was done to understand the relationship between Knowledge management Practices and these factors on both the sectors separately based on these levels of managers. Independent sample T-test is conducted between Instrumentation limited Kanjikode and FCRI for factors Organizational culture, Training and development, T shaped skills, Man power availability to check if there is any significant difference between the factors influenced by Manufacturing organization (IL) and R&D organization (FCRI)

Key Words: Organizational Culture, R&D sector, Manufacturing sector, Leadership, Formalization

1. INTRODUCTION

Knowledge management is the discipline that promotes an integrated approach to identify, capture, evaluate and share all of an enterprise's information assets. These assets/information includes different data bases, documents, procedures and previously un-captured or un-detected expertise and experiences of individual workers. Due to the subjective manner of Knowledge Management, there is no standard ways for KM practices. There are many factors affecting Knowledge management (KM) practices in Manufacturing and R&D sectors. However only a very few studies have been conducted with respect to Indian context. In this study the Manufacturing and R&D sectors of two large scale valve companies in Kerala is considered and for the

study, Instrumentation limited, Kanjikode and Fluid Control Research Institute is chosen for investigating the factors affecting Knowledge management (KM) practices. Organizational culture, leadership, Information and technology support, Management commitment, T-shaped skills, Trust and collaboration, Training and development, Formalization, Man power availability are the factors taken for this study.

2. LITERATURE REVIEW

There are many factors affecting Knowledge management (KM) practices in Manufacturing and R&D sectors. However only a very few studies have been conducted with respect to Indian context. Fayiz Dahash Shrafat [1], Examining the factors influencing knowledge management system (KMS) adoption in small and medium enterprises SMEs. The purpose of this study is to advance the understanding of the factors that influence the KMS adoption process among SMEs. Knowledge Management Capabilities, Knowledge Sharing, Organizational Learning, Organizational Culture, IT Capability, Knowledge Management System Adoption are the constructs used for this study. Christina Ling-hsing Chang, Tung-Ching Lin [2], The role of organizational culture in the knowledge management process. The purpose of this paper is to focus on the enhancement of knowledge management (KM) performance and the relationship between organizational culture and KM process intention of individuals because of the diversity of organizational cultures. The survey methodology with questionnaire having 5 point likert scale questions was used to collect the data. Some organizational culture dimensions (results-oriented, tightly controlled and job oriented) indeed have a significant effect on the KM process (creation, storage, transfer and application) intention of the individual. Tereza Raquel Mero [3], Factors influencing knowledge management use in technology enterprises in southern United States. The aim of this research paper is to investigate the factors influencing knowledge management use process in IT enterprises. It presents an analysis of use of information systems by IT managers, IT supervisors and chief information officers. The eight variables used for the study are explicit knowledge, Knowledge systems, supervisor, coworkers, leadership, incentive, perceived usefulness, and user satisfaction. Sattam Allahawiah, Hisham Al-Mobaideen & Kafa al Nawaiseh [4], The Impact of Information Technology on Knowledge Management Processes. The objective is to test the impact of

the use of information technology (hardware, software, security, and Usability) and knowledge management processes in its various dimensions (knowledge creation, knowledge acquisition, organization of knowledge, the knowledge sharing, knowledge implementation) and to provide a conceptual framework on the subject of the use of information technology and knowledge management processes in the Arab Potash Company. Dimensions of the characteristics of information technology were devices, Programs Security and Usability as independent variable. Knowledge management functions were Knowledge creation, knowledge Acquiring, Knowledge Organizing, Knowledge sharing, Knowledge implementation as dependent variable. Descriptive statistic Measures were used to describe the characteristics of the study sample by percentages. Organizational culture, Leadership, Information and technology support, Management commitment, T-shaped skills, Trust and collaboration, Training and development, Formalization and Man power availability are the factors taken for this study. Out of these nine factors, three factors are taken from real time analysis for this study.

3. RESEARCH METHODOLOGY

The research phase starts with literature review and objective formulation. The Objectives of this study are to identify the factors affecting knowledge management practices in a manufacturing and R&D sector from literature and real time analysis, to use an instrument to assess how far these factors are prevalent and to analysis the data with the instrument, to establish a relationship between the identified factors and Knowledge management practices for Low level and Middle level managers of manufacturing sector (IL), to establish a relationship between the identified factors and Knowledge management practices for Low level and Middle level managers of R&D sector (FCRI), to find if there is any significant difference between factors affecting Knowledge management practices in manufacturing and R&D sector. Data is collected from respondents through questionnaire survey. A five-point Likert scale is used for questionnaire and the choices range from Strongly Agree to Strongly Disagree so the survey maker can get a holistic view of people's opinions. For the study, the data's of 100 respondents from Instrumentation limited Kanjikode is taken out of which 73 respondents are of low level managers (Supervisors & JEs) and 27 respondents are of Middle level managers (Engineers and Area managers). IL is a large scale control valve manufacturing industry in India. The data's of 45 respondents from Fluid Control Research Institute are taken out of which 16 respondents are of low level managers (Jr. research engineers and Jr. technical officers) and 29 respondents are of middle level managers (Research engineers and Managers/Officers). IBM-SPSS software was used to collect and tabulate the data gathered. Reliability test is done on the data gathered in order to check how closely related number of items are as a group, and it examines the internal evenness of the questionnaire. In order to classify a given set of constructs into factors loadings and to authenticate the results factor analysis is conducted. Multiple Regression

Analysis (MRA) is usually used to assess the interaction or relationship of a dependent variable with two or more independent variables. Independent sample T test is also used to compare the means of two different sets of data.

4. ANALYSIS AND FINDINGS

4.1 Reliability test

Reliability refers to the consistency of a measure. It is defined as extend to which a variable or a set of variables is consistent in what it is intended to measure. The closer a reliability coefficient alpha (α) is to 1.00, greater the internal consistency of items being assessed. In reliability analysis values above 0.7 are usually adequate and good. In this case for all factors, the reliability obtained is above 0.7 which means that the data is adequate. Some of the values obtained is also above 0.8 which ensures high reliability.

Table -1: Reliability analysis of factors

FACTORS	CRONBACH'S ALPHA	NO OF ITEMS
ORGANIZATIONAL CULTURE	0.795	5
LEADERSHIP	0.725	4
IT SUPPORT	0.896	5
MANAGEMENT COMMITMENT	0.793	4
T -SHAPED SKILLS	0.744	5
TRUST AND COLLABORATION	0.828	6
TRAINING AND DEVELOPMENT	0.903	7
FORMALIZATION	0.731	4
MAN POWER AVAILIBITY	0.769	5
KNOWLEDGE MANAGEMENT PRACTICES	0.935	17

4.2 Factor Analysis

Factor analysis is used for reduction of data and data summarization. Instead, the whole set of interdependent relationship among variables are examined factor analysis facilitate us the group of variables (most common with each other) to study and describe variability among the observed and correlated variables in terms of lower number of unobserved variables called 'Factors'. In order to examine the adequacy of sample Kaiser-Meyer-Olkin test was used. Values greater than 0.6 indicates the factor loading is useful within

the data. Also, to check that the variables are related or not Bartlett's Test of Sphericity was used. Values smaller than 0.05 indicates that factor analysis is useful. For Organizational culture, KMO value was obtained as 0.792. It is a rule of thumb that KMO test value greater than 0.6 is generally acceptable and specifies that factor analysis might be useful. Bartlett's Test of Sphericity gave a significance of 0.000. A value lesser than 0.05 is generally acceptable and indicates the usefulness of the data. For leadership, KMO value was obtained as 0.723. For IT support it was obtained as 0.861. For Management commitment, T-shaped skills, Trust and collaboration, Training and development, Formalization and Man power availability a value of above 0.6 was obtained which had a good sample adequacy.

4.3 Multiple Regression Analysis

Multiple Regression Analysis (MRA) is usually used to assess the interaction or relationship of a dependent variable with two or more independent variables. It is more commonly done as a part of hypothesis testing. The independent variables are the nine factors which is measured against the dependent variable KM Practices in this study. MRA checks for relationship and quantifies the extent to which the variables are related to the help of significance values and coefficient. Multiple linear regression analysis makes several key assumptions:

1. Linearity: There must be a linear relationship between the outcome variable and the independent variables. Scatterplots can show if there is a linear or curvilinear relationship.
2. Normality: MRA assumes that the residuals are normally distributed.
3. No Multi collinearity: MRA assumes that the independent variables are not highly correlated with each other. This multi collinearity assumption is tested using Variance Inflation Factor (VIF) values. The VIF values of all factors lied in between the acceptable range of 1-10.
4. Homoscedasticity-This assumption states that the variance of error terms are similar across the values of the independent variables

All the above conditions was satisfied and multiple regression analysis can be performed.

Below table 2 shows the significance value for low level & middle level managers of IL.

Table -2: Multiple Regression Analysis Summary of IL

FACTORS	SIG VALUE- LOW LEVEL MANAGERS OF IL	SIG VALUE- MIDDLE LEVEL MANAGERS OF IL
ORGANIZATIONAL CULTURE	0.774	.703

LEADERSHIP	0.033	.445
IT SUPPORT	0.456	.962
MANAGEMENT COMMITMENT	0.252	.250
T -SHAPED SKILLS	0.005	.186
TRUST AND COLLABORATION	0.198	.880
TRAINING AND DEVELOPMENT	0.000	.019
FORMALIZATION	0.614	.162
MAN POWER AVAILABILITY	0.008	.787
KNOWLEDGE MANAGEMENT PRACTICES	0.005	.186

As stated by Cohen (1988), R2 value amid 1.0 and 5.9 percent is considered as small, amid 5.9 and 13.8 percent is medium and higher than 13.8 percent is large. It is found that the coefficient of determination (R2) is 0.811, which signifies that 81.1 percentage of performance can be described by the nine independent variables. Out of these nine factors it can be seen that Leadership, Training and development, T shaped skills and Formalization have a significance value (P) of less than 0.05 which concludes that these factors significantly influences KM Practices for Low level managers in IL. The coefficient of determination (R2) is 0.825 for middle level managers which signifies that 82.5 percentage of performance can be described by the nine independent variables.

Out of these nine factors it can be seen that only the factor Training and development have a significance value (P) of less than 0.05 which concludes that this factors significantly influences KM Practices for middle level managers in IL.

Table -3: Multiple Regression Analysis Summary of FCRI

FACTORS	SIG VALUE- LOW LEVEL MANAGERS OF FCRI	SIG VALUE- MIDDLE LEVEL MANAGERS OF FCRI
ORGANIZATIONAL CULTURE	.927	.863
LEADERSHIP	.041	.752
IT SUPPORT	.343	.179

MANAGEMENT COMMITMENT	.709	.399
T-SHAPED SKILLS	.215	.104
TRUST AND COLLABORATION	.629	.244
TRAINING AND DEVELOPMENT	.724	.040
FORMALIZATION	.193	.025
MAN POWER AVAILIBITY	.567	.590
KNOWLEDGE MANAGEMENT PRACTICES	.927	.863

The coefficient of determination (R^2) obtained from analysis is 0.923, which signifies that 92.3 percentage of performance can be described by the nine independent variables. Out of these nine factors it can be seen that only the factor Leadership have a significance value (P) of less than 0.05 which concludes that this factors significantly influences KM Practices for low level managers in FCRI. The other 8 factors does not influence KM practices. The coefficient of determination (R^2) for middle level managers of FCRI is 0.846, which signifies that 84.6 percentage of performance can be described by the nine independent variables. Out of these nine factors it can be seen that the factors Training and development and Formalization have a significance value (P) of less than 0.05 which concludes that these factors significantly influences KM Practices for middle level managers in FCRI. The other 7 factors does not influence KM practices.

4.4 Independent sample t test

Independent Samples T-Test is done to relate the means of two unrelated data's, unrelated in such a way that the data are obtained from two diverse populations. Here Independent sample T-test is used to relate the mean of Manufacturing organization(IL) and R&D organization(FCRI) which are presumed as two unrelated samples. First test is to check if there is any significant difference between the factor organizational culture influenced by Manufacturing organization (IL) and R&D organization (FCRI). Levene's test examines the equality of variance in SPSS Software and got a significance of 0.002 which is less than 0.05 which suggested that there is a significant difference between the factor organizational culture adopted by manufacturing organization (IL) and R&D organization (FCRI). For the next factor training and development a significance of 0.013 is obtained which is less than 0.05 which concludes that there is a significant difference between the factor Training and development adopted by Manufacturing organization (IL) and R&D organization (FCRI). Similarly for the factor T shaped Skill P value obtained was 0.028 which is less than 0.05 and hence proved that there is a significant difference

between the factor T Shaped skills adopted by Manufacturing organization (IL) and R&D organization (FCRI). But for the factor Man Power Availability the significance value obtained was 0.402 which is greater than 0.05. So it concludes that there is no significant difference between the factor Man Power Availability adopted by Manufacturing organization (IL) and R&D organization (FCRI).

5. CONCLUSIONS

This study identifies nine factors that influences Knowledge management practices in manufacturing and R&D sectors through widespread and methodical literature review as well as by real time analysis. The nine factors taken are Organizational culture, Leadership, Information and technology support, Management commitment, T-shaped skills, Trust and collaboration, Training and development, Formalization and Man power availability. A questionnaire survey was conducted among 140 employees out of which 100 was from Instrumentation limited Kanjikode and 45 responses was from Fluid Control Research Institute. Based on the objectives of the research and the collected data, a series of analysis techniques were employed to reach a conclusion on the effect of these identified factors on Knowledge management practices of low level managers and middle level managers of these industries. A comparison test was also made among these two industries with 4 selected factor to check where these factors significantly differ from each other or not. It was found that Leadership, Training and development, T shaped skills and Formalization have a significance value (P) of less than 0.05 which indicated that these factors significantly influences KM Practices for Low level managers in IL. Training and development was found to be the critical factor out of these 4 factors that influences KM practices for Low level managers of IL. This is because the company is providing On-job training and job rotation to supervisors and JEs where the employees are truly satisfied. The factor Training and development have a significance value (P) of less than 0.05 which concludes that this factors significantly influences KM Practices for middle level managers in IL. This is because there are on -job training programs and seminars held quarterly in IL which helps employees gain knowledge hence the factor Training and development have impact on KM Practices for managers as well. Leadership have a significance value (P) of less than 0.05 which concludes that this factors significantly influences KM Practices for low level managers in FCRI. Leadership is an important factor that influences that KM Practices for the Low level managers because in FCRI, the managers/Engineers provide a frequent feedback about the task done by juniors. The feedbacks provided are both in Formal and Informal means and the employees feel comfortable coming to their manager with questions and concerns. Factors Training and development and Formalization have a significance value (P) of less than 0.05 which concludes that these factors significantly influences KM Practices for middle level managers in FCRI. This is because FCRI provides in hand training and educational

courses to enhance their Knowledge. They offer various advanced Technical Training programs under Indian Technical and Economic Cooperation (ITEC) and many instructors from different country provide training to these employees. Also every rules and regulations are formalized and the company have manuals and handbooks on which skills and job roles of specific employees are recorded.

There was a significant difference between the factor organizational culture adopted by manufacturing organization (IL) and R&D organization (FCRI). This is because the manufacturing industry (IL) favors Competitive culture (competition driven performance) while the Research sector (FCRI) favors Collaborative culture.

There was also a significant difference between the factor Training and development adopted by Manufacturing organization (IL) and R&D organization (FCRI). In manufacturing sector(IL) on job technical training and job rotation is provide but in case of FCRI, they are provided with more of educational training programs, courses, seminars, workshops etc. So the training procedure varies in both the type of industries.

A significant difference between the factor T Shaped skills adopted by Manufacturing organization (IL) and R&D organization (FCRI) was found. This is because research industries require analytical skills like analysis of information from different sources, critical thinking etc. while in manufacturing sector same process is repeated which requires technical skills of employees in particular area for manufacturing processes. But there is no significant difference between the factor Man Power Availability adopted by Manufacturing organization (IL) and R&D organization (FCRI). This is because Man power have equal significance in both sectors for knowledge sharing. The increase in work force leads to more Knowledge management practices.

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