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Importance of Intrinsic Motivation for Knowledge Sharing within an R&D Organization

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Abstract

The purpose of this study is to investigate the role of intrinsic motivation of R&D researchers for knowledge sharing within an R&D organization using statistical analysis. We mainly focused on and analyzed individuals who participate in basic or applied research, because study of knowledge sharing should begin with the individual. A questionnaire survey of 398 R&D researchers was conducted in the R&D laboratory of a Japanese Electronics Manufacturing Company. The analysis showed that intrinsic motivation greatly enhanced knowledge contribution as a part of functions for knowledge sharing, more than extrinsic satisfaction of the R&D researchers. From these findings, we inferred an important role of intrinsic motivation in sharing knowledge within an R&D organization.

Keywords: Intrinsic Motivation, Knowledge Contribution, Extrinsic Satisfaction, R&D Organization

1 Introduction

The function and the role of the R&D department in an organization occupy a significant position within technology management, such as in creating innovation and developing new technology both efficiently and effectively, as well as in product development.

Prior research discussed the necessity of knowledge acquisition and knowledge sharing, to enhance profit and capability at the organizational level, ignoring the aspect of individuals providing valuable knowledge to the organization [1][2][3]. Here, many studies have mentioned the importance of enhancing intrinsic mo-

tivation in the R&D organizations [4][5].

We mainly focused on and analyzed individuals who participate in basic or applied research in the corporate laboratory. The purpose of the present study is to investigate the relation between intrinsic motivation and knowledge contribution as a part of functions for knowledge sharing within an R&D organization.

2 Theoretical Background and Hypotheses

2.1 Intrinsic motivation and knowledge contribution

Work motivations are generally divided into two general classifications: intrinsic motivation and extrinsic motivation. Intrinsic motivation is understood as a source of behavior to obtain intrinsic rewards such as a feeling of achievement, self-growth, and fun from work. In other words, it is motivated by the work itself. On the other hand, extrinsic motivation aims for extrinsic rewards, such as money and position from work. In other words, it is motivated by rewards received from outside.

The concept of intrinsic motivation was illustrated in the nineteen-seventies by Deci, a social psychology researcher [6]. According to Deci's theory, intrinsic motivation is enhanced by satisfaction of three basic needs which are autonomy, competence and relatedness [7]. Intrinsic motivation and extrinsic motivation do not co-exist at the same time. Intrinsically-motivated behaviors continue over a long period of time, and strongly relate to creativity [8]. Thus, intrinsic motivation fits the characteristics of R&D activities, which take a lot of time to achieve results.

Knowledge to be shared in an R&D organization must be provided as worthwhile knowl-

edge from R&D researchers, to organizational members [1]. In addition, to provide knowledge to the other R&D members, R&D researchers must possess worthwhile knowledge. When we think of the behavior of knowledge contribution practically, to offer valuable knowledge of R&D researcher's own accord might reduce their competitiveness, because their worthwhile knowledge is a source of strength for competition. If they are motivated extrinsically, they may never offer their own worthwhile knowledge.

Thus, we think that, of the two types of motivation for sharing knowledge with other organization members, intrinsic motivation will be a very important motivation, rather than extrinsic motivation. Therefore, we can expect that knowledge contribution will increase when R&D researchers are motivated intrinsically.

On the other hand, we know that we often and practically use incentives in the firm to satisfy organizational members towards knowledge sharing. We can expect that knowledge contribution will also increase when R&D researchers have extrinsic satisfaction.

2.2 Research hypotheses and structural model

We set the following hypotheses from the discussions above.

Hypothesis 1 (H1)

A higher level of R&D researcher's intrinsic motivation will have a positive effect on knowledge contribution.

Hypothesis 2 (H2)

A higher level of R&D researcher's extrinsic satisfaction will have a positive effect on knowledge contribution.

Based on our theoretical background, we posited a structural model (Figure 1) and used the covariance structure analysis to test the hypotheses. The structural model was constructed by four factors which were intrinsic motivation (IM), extrinsic satisfaction (ES), knowledge contribution (KC) and knowledge possession (KP).

The paths indicate a cause-and-effect relationship in the direction of the path and the two-way path indicates a correlation. In the model, we thought that KP positively caused IM, because according to Deci's theory, KP and satisfying competence need are almost the same

concept [10]. Similarly, we thought that ES positively caused IM, because, according to the prior researches, concept of IM is higher layer than ES [11] [12]. We did not set KP as a cause of KC, because possessing knowledge does not necessarily lead to knowledge contribution.

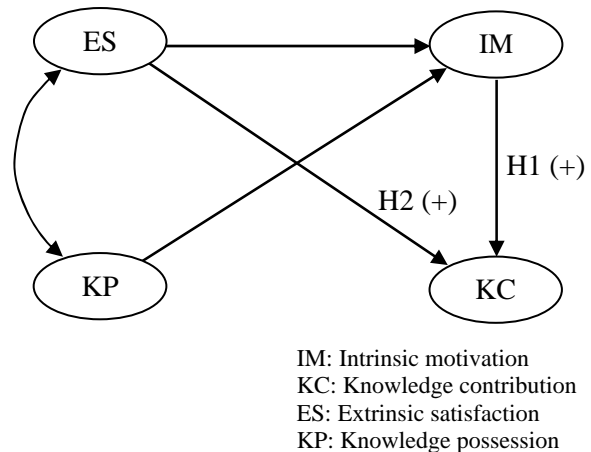


Figure 1. Structural model

3 Data and Measurement

3.1 Data

Data for this study was obtained through a questionnaire survey of R&D researchers in the R&D laboratory of a Japanese Electronics Manufacturing Company in July, 2005. A total of 900 web questionnaires were distributed to R&D researchers. 398 usable responses were received. The average age of the participants was 35.4 years old, and their average tenure with their current company was 9.9 years. Participants with Ph.D. degrees made up 27.9% and Master's-degree holders made up 66.3% of the sample.

3.2 Measurement

The survey instrument measured a number of variables such as intrinsic motivation (IM), extrinsic satisfaction (ES), knowledge contribution (KC) and knowledge possession (KP). All statement-style items were measured on a scale from 1 = do not agree to 5 = completely agree.

Intrinsic motivation was measured by using responses to 5 questions regarding job satisfaction which were based on the Minnesota Satisfaction Questionnaire (MSQ) and Takahashi (2002) [9],

excluding extrinsic satisfaction and motivation. Intrinsic motivation was constructed as being motivated by intrinsic rewards, such as feeling of accomplishment, fun from work, and so on.

Extrinsic satisfaction was measured by using responses to 3 questions regarding job satisfaction which were based on the MSQ.

Knowledge possession was measured by 3 degrees of possession, *i.e.* advanced technical skill, expert knowledge, and excellent knowledge.

Knowledge contribution was measured by asking the respondents with regards to offering knowledge such as original knowledge, know-how and effective expert documents.

4 Results

4.1 Construction of factors

In this research, the central concept of intrinsic motivation (IM), was constructed by confirmatory factor analysis. The 5 items were considered which are: (IM1) getting a feeling of accomplishment from work, (IM2) fitting in one's own skills with work, (IM3) hoping to keep up one's own work, (IM4) accepting more work, and (IM5) trying more difficult work without salary or bonus being increased. The result of the

confirmatory factor analysis only yielded one factor, as we expected, (Eigenvalue = 2.76) over Eigenvalue = 1. The factor had a high internal reliability of 0.79 (Cronbach coefficient).

Other factors were constructed by factor analysis. The varimax solution for each of these factor analyses is presented in Table 1. The factor analysis of nine items reflecting each factor yielded three factors explaining 71.9% of the variance. See Appendix for all items with descriptive statistics. Specially, to test whether knowledge possession (KP) is a plausible factor, we have to consider how the internal validity was performed. We checked KP with validity using multiple-regression analysis and by controlling age. We set that the dependent variable was the number of research articles with peer review system, and independent variable was KP. As a result of the analysis, KP had significant and positive effect on the number of articles. Thus, we concluded that KP had high internal validity.

4.2 Hypotheses tests

Figure 2 presents results from the covariance structure analysis. The model has significant explanatory power.

Table 1. Outcome of Factor Analysis

Factor name	Measurement item	Factor 1 Loadings	Factor 2 Loadings	Factor 3 Loadings
Knowledge possession (KP)				
KP1:	Having excellent knowledge compared with competitors	.840	.134	.039
KP2:	Having expert knowledge within an organization	.846	.199	-.055
KP3:	Having advanced technical skill	.864	.133	.039
Knowledge contribution (KC)				
KC1:	Offering own original knowledge and experience	.104	.849	.116
KC2:	Providing competitive know-how and knowledge	.122	.851	.112
KC3:	Offering expert effective documents and materials	.284	.755	.161
Extrinsic satisfaction (ES)				
ES1:	Not having dissatisfaction with a work position	.010	.115	.806
ES2:	Not having dissatisfaction with a salary	-.043	.081	.852
ES3:	Getting an appropriate salary and a bonus	.061	.150	.789
Eigenvalue		3.23	2.03	1.21
Cumulative percentage [%]		35.9	58.5	71.9
Cronbach coefficient		.829	.801	.764

Note: ES was adapted from MSQ. KC and KP were original items.

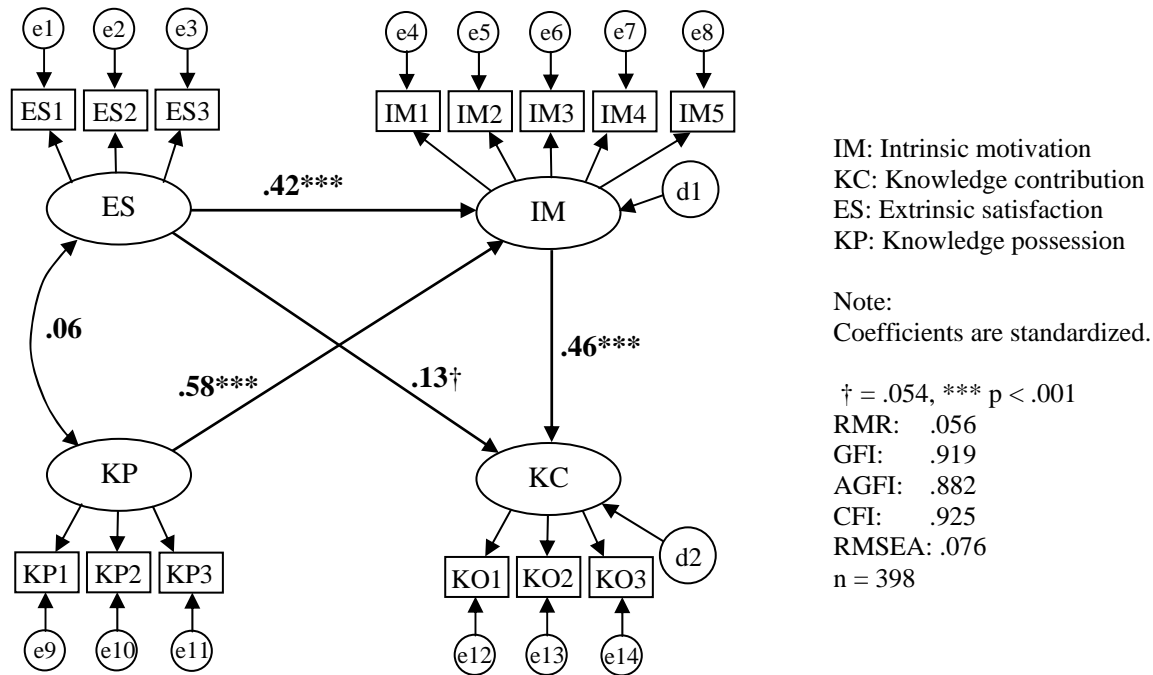


Figure 2. Covariance structure analysis

Knowledge contribution (KC) was significantly and positively affected (0.46, $p < 0.001$) by intrinsic motivation (IM). This provides strong and consistent support for Hypothesis 1.

KC was weakly and positively affected (0.13, $p = 0.054$) by extrinsic satisfaction (ES). This provides weak support for Hypothesis 2.

ES significantly and positively affected IM, and affected by way of IM to KC (indirect effect = 0.195). KP significantly and positively affected IM, and affected by way of IM to KC (indirect effect = 0.230). Correlation between KP and ES was not significant.

5 Discussion

This study examines the relationship between intrinsic motivation and individual knowledge contribution. The results of a hypothesis test suggest that intrinsic motivation spurs knowledge contribution. And, intrinsic motivation mediates the possession of valuable knowledge and extrinsic satisfaction by R&D researchers to contribute to other R&D group members. To provide valuable knowledge to coworkers will be an important activity in creating new ideas, and

enhancing knowledge and organizational capability within an R&D organization. Our results provide an additional theoretical support to empirical findings in the research area of organizational knowledge management.

We considered the direct and strong effect of extrinsic satisfaction on knowledge contribution because incentives for individuals are often used in practice to stimulate knowledge sharing. To the contrary our analysis showed that extrinsic satisfaction had a weak effect on knowledge contribution. To explain this unexpected finding, we should focus on an indirect effect, in which ES significantly and positively affected knowledge contribution through intrinsic motivation. Extrinsic satisfaction had an indirect effect on knowledge contribution.

It can be concluded that empirical suggestion of knowledge contribution within an R&D organization being enhanced by intrinsic motivation has now been verified theoretically by statistical analysis. And, we suggest that intrinsic motivation is more important than extrinsic satisfaction to stimulate sharing and contribution of valuable knowledge.

Finally, we based our study on Deci's theory that intrinsic motivation and extrinsic motivation do not co-exist at the same time. Thus, we did not

measure extrinsic motivation as an important factor, but instead we measured extrinsic satisfaction. So, it is necessary to conduct further research in future, with a focus on extrinsic motivation.

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Appendix: Descriptive statistics

Item	Mean	Standard deviation
IM1	3.87	.861
IM2	3.75	.837
IM3	3.94	.866
IM4	3.51	.930
IM5	3.51	.959
KP1	3.30	.843
KP2	3.46	1.042
KP3	3.60	1.016
KC1	3.89	.892
KC2	3.42	.964
KC3	3.78	.843
ES1	3.65	.940
ES2	3.29	.931
ES2	3.43	.821

Note: n = 398