4. Empirical Analysis of the Effect of Incentives and Culture on Knowledge Sharing

The goal of the empirical analysis in this chapter is to test the propositions that are related to the effect of incentives and culture on knowledge sharing. We investigate the knowledge sharing behavior as it is recorded in the log of a multinational knowledge management system, with approximately 18,000 users in 59 countries. Such an extensive study of actual knowledge sharing behavior has, to the best of our knowledge, not been conducted before.

4.1. Empirical Research Method

4.1.1. Data

We shall use actual transaction data from a global knowledge management system. This system, from an international company, has 17,944 registered users in fifty-nine countries. The knowledge-sharing activities are recorded over a period of two years. Of the registered users, 4,316 actively published something by uploading documents, asking or answering questions or rating other contributions.

The knowledge management system has an incentive system. It is based on a bonus point scheme similar to frequent flyer plans. Users that contribute to the system get bonus points which they can later exchange into products. The amount of points for publishing a document is six times higher than for answering a question. Contributors obtain extra points if their contribution is rated as good by others. The amount of extra points depends on the level of this rating. The reviewer also gets points for feedback.

From the 59 countries we only analyze those where Hofstede has reported culture dimensions (cf. Section 3.5) and that have 15 or more employees. These 36 countries still cover 16,489 employees, which means 92% of all countries. These employees published 17,735 documents and asked 1,512 questions in the time analyzed.

Table 4.1.: Descriptive Statistics and Correlations of Variables

Variable	Mean	SD	1	2	3	4	5
1. Average Knowledge Sharing	152	119					
2. Incentive Intensity	1.22	2.06	0.54**				
3. Individualism Index	50.6	24.8	-0.33*	-0.39*			
4. Power Distance Index	55.9	22.0	0.56**	0.48**	-0.71**		
5. Uncertainty Avoidance Index	60.8	23.7	-0.18	-0.21	-0.20	0.17	

N = 36, * p < 0.05, ** p < 0.01

4.1.2. Measures

Out of the transaction data we extract three main metrics: (1) the culture of the employee, (2) the knowledge-sharing activity and (3) the Incentive Intensity.

1. **Culture:** From the location of the employee, we infer Hofstede's cultural dimensions. We omit factors like individual values, origin or professional culture because no such data was available.

2. **Average Knowledge Sharing:** The knowledge-sharing activities of a person can be measured by the total bonus points obtained in the incentive system because this is directly related to the various publishing activities. Then we can calculate the average knowledge sharing per employee for each country.

3. **Incentive Intensity:** As already mentioned, the bonus points of the incentive system can be exchanged for goods. In all countries, the same amount of bonus points is required to get certain products. Firstly, we estimate the dollar value of a bonus point. We do this by searching for the market prices of the goods that can be exchanged for the bonus points and then we consider the number of points you need to get this good. The idea behind the Incentive Intensity is now that one dollar has more value for a person who earns $10,000 than for a person who earns $100,000. So the motivational power of an incentive is dependent on the income of the employee. We did not try to get the individual income of each participant because of concerns about privacy. As a rough approximation of individual income, we used the per capita Gross Domestic Product (GDP) of the country. The Incentive Intensity is then calculated by dividing the value of a bonus point by the per capita GDP.
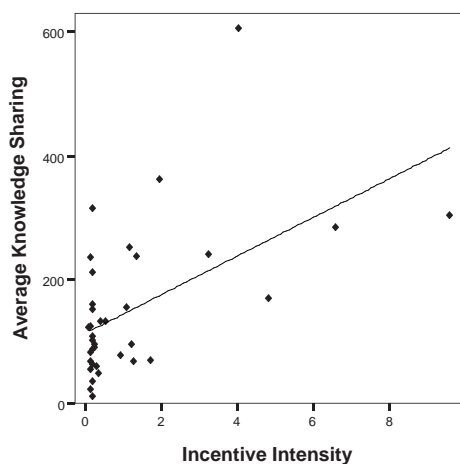
Figure 4.1.: Scatter Plot of Knowledge Sharing and Incentive Intensity (r = 0.54, p < 0.01)

4.2. Hypotheses

In this chapter we shall test selected propositions from the previous chapter that deal with the effect of incentives and culture on knowledge sharing. It was not possible to test every proposition of the previous chapter because the field data that we use here did not provide enough data for that.

First of all we want to test the predicted positive effect of incentives from Proposition 14 (p. 88). Out of the proposition we derive the following hypotheses with the use of the measures.

Hypothesis 1. *The higher the Incentives Intensity in a country, the higher the average knowledge sharing of the country.*

The next three hypotheses are directly derived from Propositions 17, 18, and 19 (see page 103).

Hypothesis 2. *The higher the Individualism Index of a country, the lower the average knowledge sharing of the country.*

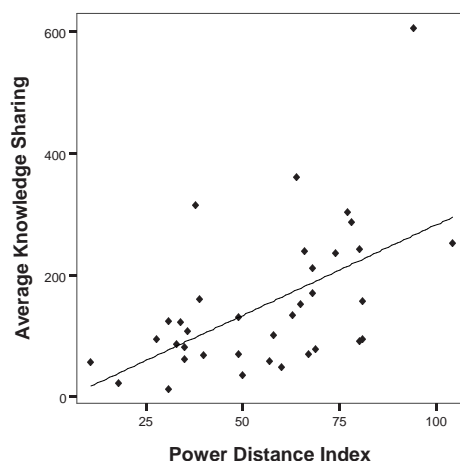**Hypothesis 3.** *The higher the Power Distance Index of a country, the higher the average knowledge sharing of the country.*

Figure 4.2.: Scatter Plot of Knowledge Sharing and Power Distance (r = 0.56, p < 0.01)

Hypothesis 4. *The higher the Uncertainty Avoidance Index of a country, the lower the average knowledge sharing of the country.*

4.3. Results

The descriptive statistic in Table 4.1 shows that average per capita knowledge sharing has a high standard deviation and therefore varies greatly between countries. Because Incentive Intensity is proportional to the inverse of the GDP, Incentive Intensity also has a high standard deviation. The correlation analysis reveals that all variables except for the Uncertainty Avoidance Index are significantly correlated. The highest correlation is between knowledge sharing and the Power Distance Index (0.56), and between knowledge sharing and the Incentive Intensity (0.54). A significant but minor negative correlation exists between knowledge sharing and the Individualism Index (-0.33). These results confirm our expectations from our theoretical discussion. Scatter plots that show the relationship between knowledge sharing and Incentive Intensity, Power Distance Index, and Individualism Index are shown in Figures 4.1, 4.2, and 4.3, respectively.
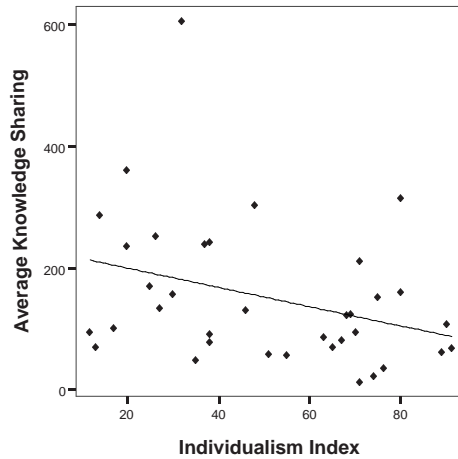
Figure 4.3.: Scatter Plot of Knowledge Sharing and Individualism Index (r = -0.33, p < 0.05)

Hofstede [92, p. 165] had mentioned a positive correlation between the GDP and the Individualism Index, which means that richer countries are more individualistic. He also discovered a negative correlation between the GDP and the Power Distance that means poorer countries are more autocratic. In our case this leads to correlations between the Incentive Intensity and the IDV as well as the PDI. There is also a negative correlation between Individualism and Power Distance that is also plausible according to the definitions of both.

Table 4.2 shows the results of the stepwise regression analysis. Only Power Distance and Incentive Intensity dominate the regression model. All other variables did not contribute significantly to the model explanation. The R^2 indicates that 41% of variance in knowledge sharing can be explained by the model.

Table 4.3 shows the partial correlation coefficient between Average Knowledge Sharing and the other variables when controlling all remaining variables. Only Power Distance and Incentive Intensity have a significant effect on Average Knowledge Sharing.

Table 4.2.: Forward Stepwise Regression Analysis of Average Knowledge Sharing

exogenous Variable	Coefficient	Standard Error	Beta	t-statistic (df=33)	P
Constant	11.449	44.649		0.256	0.799
Power Distance Index	2.062	0.821	0.384	2.511	0.017
Incentive Intensity	20.574	8.801	0.357	2.338	0.026

N = 36, Regression characteristics: $R^2 = 0.41$, Adjusted $R^2 = 0,37$; F(2, 33) = 11,30 (p<0,000); DW = 1,45

Table 4.3.: Partial Correlation Coefficient of Average Knowledge Sharing

Variable	Coefficient	P	Controlling for
Power Distance Index (PDI)	0.43	0.013	II, IDV, UAI
Incentive Intensity (II)	0.31	0.075	PDI, IDV, UAI
Individualism Index (IDV)	0.12	0.502	PDI, II, UAI
Uncertainty Avoidance Index (UAI)	-0.20	0.255	PDI, II, IDV

N = 36

4.4. Discussion

The field data confirm Hypotheses 1 (positive effect of incentives) and 3 (positive effect of Power Distance). Even if motivational crowding-out has occurred, the total effect of incentives is still positive. The data gives only weak support to Hypothesis 2 (negative effect of individualism). There was no significant confirmation of Hypothesis 4 (negative effect of uncertainty avoidance).

However, there are some limitations to our study: It relies on the cultural dimensions of Hofstede, which have some limitations. First of all Hofstede's study was conducted between 1967 and 1973 [91]. So the question arises as to whether these scores are still valid, though Hofstede claims the relative position between the countries will remain comparable even if the scores shift. Another limiting factor is that Hofstede's research population consisted only of employees from one company (IBM). However, there have been more than 60 empirical replications recorded [183]. The results showed that the differences predicted by Hofstede's dimension were largely confirmed and that there are remarkably few deviations [183].

The field data design gives a realistic picture of the behavior in a real system but does not allow us to control possible critical variables as would be the case in an experimental environment.

4.5. Summary

To the best of our knowledge, a field study on the actual knowledge-sharing activities in a real knowledge management system such as ours has not yet been conducted. This kind of study produces more realistic results than an experimental study and provides deeper insights than case studies.

However, further studies in other companies and other contexts are necessary to verify our findings. One alternative empirical design could be to measure the values (i.e. cultural scores) of each employee directly by using a survey method, which is very costly, but possible. In this case it would also be possible to examine the organizational culture. Moreover, directly changing the value of the incentives would be a useful guide to further test the incentive effect for knowledge sharing.

There are several implications from our study that could be useful for international firms which try to do knowledge sharing. First of all, even if the impact of incentive systems is twofold, we argue that the relative price effect dominates the crowding-out effect and hence the total effect of incentives on knowledge sharing is positive. However, this is sensitive to the level of intrinsically-motivated knowledge sharing in a company. Secondly, in an international organization, considering the type of cultures prevalent in subsidiaries is of great benefit. In countries with higher individualism, voluntary knowledge sharing is harder to achieve and other auxiliary activities like incentive systems are recommended. In societies with a higher Power Distance, knowledge sharing can be enhanced if knowledge sharing is made prominent and the appropriate rewards of knowledge sharing are therefore reputation and status.