

# ***THE IMPORTANCE OF KNOWLEDGE TRANSFER FOR FIRM BEHAVIOR***

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o comportamento da empresa

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**Resumo:** A gestão consciente da transferência de conhecimento na empresa é vital para o seu desempenho e o desenvolvimento da competitividade. Neste artigo, se examina o processo de transferência de conhecimento dentro de uma empresa tradicional, para analisar como o processo de transferência depende de fatores contextuais, como características de emissores e receptores. A análise empírica foi baseada em dados de pesquisa, contendo variáveis sobre comunicação, competência, inovação e cultura. Os dados foram coletados de líderes de grupo ao longo de um período de cinco anos. Os respondentes da pesquisa foram organizados em dois grupos com base em sua posição na produção da empresa, sejam funções de linha de montagem ou funções de suporte. Os entrevistados responderam ao mesmo questionário repetidamente em intervalos de aproximadamente 12 meses. A análise foi baseada em um total de 266 questionários. Um teste t para igualdade de médias foi feito a fim de testar quaisquer diferenças na transferência de conhecimento dentro dos diferentes grupos. Os resultados mostram diferenças significativas no processo de transferência de conhecimento entre trabalhadores em diferentes funções na firma. O nível de educação formal e a configuração estrutural podem explicar algumas das diferenças.

**Palavras-chave:** Transferência de conhecimento. Comunicação. Competência. Inovação. Cultura.

**Abstract:** *Conscious management of the transfer of knowledge in the firm is vital for the firm's situation and development of competitiveness. In this paper, we examine the knowledge transfer process within a traditional firm, to see how the transfer process depend on contextual factors such as characteristics of senders and receivers. Empirical analysis are based on survey data, containing variables on communication, competence, innovation and culture. The survey data were collected from group leaders responsible for different production function over a five-year period, with respondents answering the same questionnaire repeatedly at approximately 12-month intervals. Survey respondents were organized in two groups based on their position in the firms production, either assembly line functions or support functions. The analysis is based on a total of 266 questionnaires. A t-test for equality of means where done in order to test for any differences in knowledge transfer within the different groups. The results show significant differences in the knowledge transfer process between workers in different functions in the firm. Level of formal education and structural configuration can explain some of the differences.*

**Keywords:** *Knowledge transfer. Communication. Competence. Innovation. Culture.*

**Resumen:** *La gestión consciente de la transferencia de conocimiento en la empresa es vital para su desempeño y el desarrollo de la competitividad. En este artículo se examina el proceso de transferencia de conocimiento dentro de una empresa tradicional, con el fin de analizar cómo el proceso de transferencia depende de factores contextuales, como las características de los remitentes y receptores. El análisis empírico se basó en datos de investigación, que contienen variables sobre comunicación, competencia, innovación y cultura. Los datos se recopilaron de los líderes de grupo durante un período de cinco años. Los encuestados se organizaron en dos grupos según su posición en la producción de la empresa, ya sea roles de línea de montaje o roles de apoyo. Los encuestados completaron el mismo cuestionario repetidamente a intervalos de aproximadamente 12 meses. El análisis se basó en un total de 266 cuestionarios. Se realizó una prueba t para la igualdad de medias con el fin de probar las diferencias en la transferencia de conocimientos dentro de los diferentes grupos. Los resultados muestran diferencias significativas en el proceso de transferencia de conocimiento entre trabajadores en diferentes roles en la empresa. El nivel de educación formal y la configuración estructural pueden explicar algunas de las diferencias.*

**Palabras clave:** *Transferencia de conocimiento. Comunicación. Competencia. Innovación. Cultura.*

## **INTRODUCTION**

In this project we take for granted that knowledge represents the foundation of a firm, like resource and knowledge-based schools like Penrose (1995), Wernerfelt (1984), Barney (1991) and others, therefore the explorations of how knowledge is transferred within the firm becomes central. Knowledge transfers have been researched for decades and at the organizational level previous research have demonstrated that outcomes like improved organizational performance and innovativeness are significantly and positively correlated with knowledge transfer (Van Wijk et al., 2008). Ultimately, the competitiveness of the firm is also dependent upon the effectiveness of knowledge transfer (see e.g. Argote et al., 2000).

Birkinshaw (2001) and Meritum (2002) argue that the firm improves in competitiveness enabling its ability to make use of the knowledge. Facilitating interaction between people in the firm are thus seen as a vital part of knowledge management (Birkinshaw, 2001). In this article we are looking at a firm producing white meat and we distinguish between the assembly line function (ALF) at the operating core of the firm, and different support functions (SF). Some of the SF can be seen as classical staff functions and some belonging to the operating core, but with a less bound role than that of those at the production line.

The research question we explore are if two different groups of workers, ALF and SF, have different structure of the knowledge transfer processes. The objective is to develop insights to see whether knowledge transfer can be generalized within the organization, independent of contextual factors or characteristics of senders and receivers, or to which degree such factors need to be taken into account.

The survey data used in the analysis was collected as part of a larger case study on competitiveness and knowledge within traditional firms (Westeren et al., 2018). The firms involved in this larger international study had to agree on being part of a program with multiple data collections over a period of four to five years. The Brazilian cooperative organized firm agreeing to be part of the research, was exposed to both domestic and international competition. As the larger of the cases in the original study, it was possible to distinguish between two separate groups, the ALF and the SF, in order to compare behavior in knowledge transfer processes.

This article will continue with a discussion of how different theoretical positions have treated knowledge transfer. Then, we will continue with a presentation of the methodology and data analysis. The research questions are based on a division of the firm into ALF and SF and we will discuss and answer what differences there are between these groups in relation to the structure of knowledge transfers, competence, innovative and cultural variables and end with conclusions about how these factors influence firm characteristics and performance.

## **2 – THEORETICAL BACKGROUND**

### **2.1 – KNOWLEDGE TRANSFERS – INTRODUCTORY COMMENTS**

Knowledge as a central factor in the competitiveness of firms is well documented, e.g. Huggins and Izushi (2007) and Westernen et al. (2018). The knowledge concept related to competitiveness has many aspects, but in this article, we will focus on knowledge transfer. This is not a unique concept and there are a variety of expressions, such as “knowledge sharing”, “knowledge flows” and “dissemination of knowledge”, which in most cases reflect the same phenomenon. We therefore consider these expressions, like many authors do e.g. Kumar and Ganesh (2009), as synonyms for transfer of knowledge. Argote and Ingram (2000) define knowledge transfer: “Knowledge transfer in organizations is the process through which one unit (e.g. group, department, or division) is affected by the experience of another” (p. 161). This definition situates the transfer in a separate context of knowledge acquired previously.

Teece et al. (1997) defines the transfer of knowledge as the ability to reproduce organizational knowledge outside its original unit. The author uses the term replicability to describe this capacity. The term *replication* is also used by Winter and Szulanski (2001) in their case study on the transfer of knowledge and strategic practices. In an empirical study of the transfer of best practices, Szulanski (1996) defines this process as being an exchange of knowledge between a source and a recipient, meaning an exchange consisting of a coordination of relationships to connect specific resources.

Among the theoretical models of knowledge transfer, three are widely used in studies in this area, the models of Shannon and Weaver (1949), Szulanski (1996) and Nonaka and Takeuchi (1995). Several studies in the field of the transfer of knowledge (Rogers, 1983; Inkpen and Dinur, 1998; Gupta and Govindarajan, 2000) are based on the mathematical model of communication developed by Shannon and Weaver (1949) to explain the transfer of knowledge. In this linear model, communication is reduced to the transmission of a message. The sender is using a coding system and sends a message to a receiver that performs the decoding of this message, which can be disturbed by “noise”. This model has been criticized because it does not allow for feedback between the recipient and the sender of the message.

### **2.2 – SZULANSKI’S MODEL**

Szulanski (1996) was one of the first to propose a conceptualization of knowledge transfer in terms of a process. He defines the transfer as an exchange of organizational knowledge within a system consisting of a sender and a receiver. Szulanski (1996) considers that the transfer of knowledge takes place in four steps:

Step 1: The initiation.

This includes all events that are at the origin of the transfer. A transfer occurs when the need is formulated in such a way that it initiates a response from the organization. During the initiation phase, the problems that arise are often related to the identification of needs and the definition of the terms of the transfer.

Step 2: The implementation.

Implementation begins when the decision to proceed with the transfer of knowledge is taken. At this stage, resources start to flow between the sender and the

receiver, and social links between them are established. The transferred knowledge and practice undergoes adaptations based on the anticipated needs of the receiver in order to prevent problems and to allow the introduction of new knowledge. During the implementation phase, the problems that arise are often related to the difficulty of finding common ground for communication between the sender and the receiver.

Step 3: “Ramp-up”.

The receiver has just started using the transferred knowledge. At this stage, the receiver’s focus is on solving unforeseen problems that prevent him from fully utilizing the advantages of the transferred practice (Adler, 1990).

Step 4: Integration.

Integration begins at the point where the receiver begins to take advantage of the new practice, transferring it into profitable use and building up to improved/changed routines. The sender and the receiver are now using the same practice together. This joint use of the same knowledge promotes better coordination of activities between the sender and the receiver.

### **2.3 – THE SECI MODEL**

The book by Nonaka and Takeuchi (1995), in which they introduce the SECI model, has more than 35,000 citations, so here we will only provide some brief comments. The SECI model is based on a metaphor whereby different knowledge processes follow each other and are put on top of each other in a spiral movement. At the heart of the conversion logic, the model moves through four stages:

1. Socialization: tacit – tacit knowledge
2. Externalization: tacit – explicit knowledge
3. Combination: explicit – explicit knowledge
4. Internalization: explicit – tacit knowledge.

There has been serious criticism of the use of the tacit knowledge concept by Nonaka and Takeuchi see e.g. (Gourlay, 2004; Tsoukas, 2005; Gourlay, 2006). Nonaka and Takeuchi (1995) claim they build on Polanyi’s concept of tacit knowledge (more correctly termed tacit knowing or the tacit component) and add elements from Japanese philosophy to their understanding of his ideas. This raises the question of how clearly defined and understood Nonaka’s tacit knowledge concept is. Most skeptics agree that Nonaka is not completely in line with Polanyi (1962).

### **2.4 – ALTERNATIVE PERSPECTIVES ON KNOWLEDGE TRANSFERS**

In recent decades, new perspectives of knowledge transfer and its mechanisms have come to challenge the simple objectivist model initiated by Shannon and Weaver (1949). One framework has abandoned the assumption that knowledge and learning are individual processes and instead looks at knowledge transfer processes as cultural and social phenomena (Brown and Duguid, 1991; Lave and Wenger, 1991). This framework sees organizational knowledge transfer as a form of distributed social expertise, “knowledge-in-practice”, meaning that knowledge is not separable from its historical and cultural context. Knowledge is thus linked to practice and is formed in interaction.

This implies that organizational knowledge is here based on four main features:

1. It is located in a system of ongoing practices.

2. It is relational.
3. It is rooted in a context of interactions and is acquired through participation in communities of practice.
4. It is continually reproduced and renegotiated and is therefore always dynamic and temporary.

This interpretation of knowledge builds on a social constructivist philosophy of science whereby knowledge is assembled and takes form within a social context characterized by the presence of multiple collective and individual actors. The transfer of knowledge here is looked on as a process of translation in which dissemination involves transformation. The idea of knowledge translation implies an ongoing process through which practices emerge, grow and become routines, and eventually disappear.

### **3 – A CLOSER LOOK AT FACTORS INFLUENCING THE SUCCESS OF KNOWLEDGE TRANSFER**

It is possible to establish many classifications when analyzing factors influencing the successful transfer of knowledge, but the following four are often used:

- The types of transferred knowledge.
- The receiver.
- The sender.
- The organizational context.

#### **3.1 – THE TYPES OF TRANSFERRED KNOWLEDGE**

One important type of transferred knowledge is based on the distinction between tacit knowledge and explicit knowledge, and this may also have a decisive influence on the process of knowledge transfer (Polanyi, 1962; Szulanski, 1996; Hansen, 1999; Håkanson and Nobel, 2000; Foss and Pedersen, 2002; Hansen, 2002; Kotabe et al., 2003). The tacit knowledge concept is central in both the theoretical and empirical literature on types of knowledge. This concept is derived from the work of Polanyi (1966), which came with the famous statement that: “we can know more than we can tell” (p. 4). If we look at the knowledge concept from a positivistic philosophical view, tacit knowledge needs to be codified before it can be transferred.

The success of a knowledge transfer is also dependent on its complexity, and Reed and Defillippi (1990) observe: “Complexity and, thus, ambiguity arise from large numbers of technologies, organization routines, and individual or team-based experience” (p. 91). After about the year 2000, research on transfers has begun to take into account the complexity of knowledge, see e.g. (Simonin, 1999; Carlile, 2004; Dyer and Hatch, 2006). Simonin (1999) showed that more complexity in general has a negative impact on the transfer. Most researchers consider that complex knowledge is more difficult to transfer because it demands a high variation in skills and technologies. Another characteristic of knowledge studied in the literature on transfer, is the specificity of the knowledge. Reed and Defillippi (1990), building on Williamson (1985), describe the specificity as the transaction skills used in production processes and in the provision of services to individual customers. Reed



and DeFillippi (1990) argue that tacitness and complexity create problems for knowledge transfer much faster than specificity, yet specificity of knowledge is often necessary for the development of the core competencies of the firm.

Minbaeva (2007) offers a new dimension of knowledge called availability of knowledge. Minbaeva (2007) says that availability is “the characteristic of knowledge that refers to the ‘not observable in use vs. observable in use’” (p. 574) dimension in Winter’s taxonomy. Availability can be linked both to the tacit and explicit nature of knowledge. Knowledge can be tacit, and the availability is then dependent on the process of transforming tacit to explicit knowledge. Moreover, explicit knowledge may not be accessible if the employees are reluctant to share with the newcomers. In general, Minbaeva (2007) views availability as positively associated with knowledge transfers.

### **3.2 CHARACTERISTICS OF THE RECEIVER**

The motivation and the absorption capacity of the receiver have a determinative effect on the transfer process. The capacity for absorption depends on the stock and flow of knowledge of the receiver. It determines the ability to assimilate and apply new knowledge in the organization. The absorption capacity concept is one of the most widely used and discussed in knowledge transfer literature and was first introduced by Cohen and Levinthal (1990), then further developed by Foss and Pedersen (2002), Minbaeva et al. (2003); Minbaeva et al. (2014) and Tsai (2001). Cohen and Levinthal (1990) say the following: “The concept of absorptive capacity can best be developed through an examination of the cognitive structures that underlie learning” (p. 129). The lack of absorption capacity of the receiver is one of the most analyzed barriers to transfer of knowledge and the general conclusion is that a lower level of absorption capacity in the receiver contributes greatly to unsuccessful knowledge transfer.

### **3.3 – CHARACTERISTICS OF THE SENDER**

Any transfer of knowledge requires a collaborative effort, which means that it depends not only on the absorption capacity of the receiver (Cohen and Levinthal, 1990) but also on the attitude and behavior of the sender. While the absorption capacity concept of Cohen and Levinthal (1990) has more than 31,000 citations and is one of the most discussed concepts, less work has been done on the behavior of the source. Existing studies include Husted and Michailova (2002), Michailova and Husted (2003), and more general summaries by Riege (2005) and Foss *et al.* (2010). One conclusion is that the general level of knowledge of the sender is important, but that this factor is interlinked with many others such as trust and communicative skills, so no common interpretative paradigm would appear to exist.

### 3.4 – THE CHARACTERISTICS OF THE ORGANIZATIONAL CONTEXT

In communication theory, in general, the context is an important factor and Reagans and McEvily (2003) consider that the intra-organizational context plays a vital part in determining the success of the transfer of practices. The intra-organizational network consists of the set of relationships that are established within the firm. This network is based on structural configurations such as communication, coordination, and control mechanisms (Foss and Pedersen, 2002; Björkman et al., 2004). The success of these exchanges depends on the ability to communicate and the relationship between the source and the receiver.

## 4 – METHODOLOGY

### 4.1 THE FIRM IN THE STUDY – A COOPERATIVE ORGANIZED FIRM FROM THE STATE OF PARANÁ (BRAZIL)

Our empirical analysis stems from data collected at a Brazilian cooperative organized firm LAR in the western part of the state of Parana. Data were collected over the five-year period 2013–2017. Repeating the same survey multiple times provide data that capture several different production periods of the firm. We have checked for stability in responses and there is no structural changes during the time period of collection so we can use the data as one complete aggregated set.

The firm has a daily production of 340,000 chickens, from which about 40% are exported. The cooperative uses standard technological solutions, available on the world market, but compared to poultry producers in Northern Europe, the cooperative has a considerably higher number of employees. In total the cooperative had 4,451 employees as an average in 2017.

The survey used to collect the data was targeted at group leaders (person responsible for coordinating part of production, and to whom a number of employees answered to) in the firm; each group leader responded to our fixed questionnaire four times during the data collection period. For the analysis, we organized the respondents into two major groups based on their production functions: ALF (receiving, killing, defeathering, evisceration, deboning and partitioning, and packing), or SF (freezing, expedition, maintenance, hygiene and quality control, and management).

Table 1– Data collection from the cooperative.

Function	Number of questionnaires
Receiving	35
Killing, Defeathering, Evisceration	50
Deboning and partitioning, Packing	77
<b>Assembly line functions (ALF)</b>	<b>162</b>
Freezing	37
Expedition	22
Hygiene and quality control, Maintenance	34
Management	11
<b>Support functions (SF)</b>	<b>104</b>
<b>Total: Assembly line + Support functions</b>	<b>266</b>

Source: Authors' own data collection.



## **4.2 VARIABLES IN THE DATA COLLECTION**

From the firm we collected data that we divided into four categories: communication variables, competence variables, innovation variables and cultural variables.

### Communication variables

We collected data using three communication variables based on answers from the group leaders about their:

- Communication from the group leader level up to the executive level: Number of communicative initiatives up to manager (Variable name: Comm number up to boss).
- Communication to their group: Number of communicative initiatives from the group leader to her/his own group members.
- Communicative initiatives from the group members up to the group leader: Group member initiatives to the group leader (i.e. the respondent).

The general assumption here based on both theoretical literature and case studies is that more communication improves productivity. For a survey of the literature, see Kretschmer (2012).

### Competence variables

The education variable is measured by asking the group leaders to distribute the workers between six standard education levels:

1. Did not finish primary school/illiterate
2. Finished primary school – can read and write simple text
3. Finished secondary school – general level (nine years of education)
4. Finished secondary school with special relevant skills for the job
5. Finished high school (12 years of education)
6. University education

The other competence variable concerns how the workers in the group understand technology, and the information was collected by asking the group leader about the average participant in the group, “What is the competence level for understanding technology?”

1. Understand immediately without no explanation
2. Understand immediately with short (less than 10 minutes) explanation
3. Must have more than 10 minutes but less than 30 minutes explanation
4. Must have special training and or long (more than 30 minutes) explanation

The next competence variable concerns group members participation in training (courses) within the last month. The results here are “normalized” by considering group size.

### Innovation variables

Innovations are often analyzed from three points of view. The first is the actual change (e.g. in the process, product, or organization of the firm). The second is what we call innovative behavior and the third is innovation management. In this article, we use data about innovative behavior to analyze innovations linked to creativity and we ask the group leaders if anyone in the group has come up with proposals for changes in routines within their area of responsibility, based on the following question: Has anyone in the group come up with proposals for changes in routines within your area of responsibility in:

- The last week
- The last month

- The last three months
- Any time in the past that you can remember
- Never

We ask what kind of proposal it was, whether it concerned a product, process, organization, or logistical issue. To get a clearer picture of the seriousness of the suggestions, we asked about the number of suggestions that had been formalized: Have there been formal (written) suggestions from members of your group to change routines? (This question had the same answer categories as the question above).

#### Cultural variables

Culture is becoming an increasingly important element in analyzing and explaining the link between productivity and communication. The data collection in this project is based on the analysis of Hofstede et al. (2010), and what they call cultural constructs. Ideally, we would like to use several variables for each category, which could increase maneuverability in the analysis. When testing the questionnaire we found it necessary to reduce the complexity in order to increase the respondent rate. The group leaders are asked to express their opinions on the following statements, based on a Likert scale where: 1. Disagree, 2. Partly disagree, 3. Neutral, 4. Partly agree, 5. Agree. The statements are:

- Do you try to avoid uncertainty?
- Do you expect and agree that power should be unequally shared?
- Do you encourage and reward collective distribution of resources and collective action?
- Do you express pride and loyalty in the firm where you work?
- Do you try to minimize roles between men and women?
- Are you confrontational in relationships with other people in the firm?
- Do you engage in future-oriented behaviors such as planning and investing in the future?
- Do you encourage and reward individuals for being fair, generous, caring and kind to others?

### **4.3 RESEARCH QUESTIONS**

In many traditional industrial firms we can divide the production activities into ALF and SF. In this study, we look at differences between the two groups in relation to communication patterns, competence variables, innovative initiatives and cultural variables. This leads to the following research questions:

- RQ1: Do knowledge transfers in SF have a more frequent pattern than for ALF?
- RQ2: What differences in competence can we find between the two groups?
- RQ3: Are SF more innovative than ALF?
- RQ4: Can we find differences in cultural variables between the two groups?

Intuitively we can assume that knowledge transfers will be more frequent in SF than in ALF. For competence, it is reasonable to assume that there is a difference between the groups due to the different competencies required for different job types. Innovative behavior is expected to appear with a higher frequency in SF than in ALF: first, because there are more functions to be innovative in and, second, because the competence level in general is higher. For culture, we do not have any assumptions about what to expect.

## **5 – DATA ANALYSIS**

In the project we are comparing behavior in two different groups of workers at the firm, ALF and SF. Through descriptive statistics, we identify the properties of the different variables, means and standard deviation, for each of the groups, ALF and SF, and for the total population (see Table 2). In most food production processes, assembly line jobs are quite standardized and monotonous, and the noise level can be high. This means that for the group leader, communicative contact requires that the workers take away focus from their job to communicate with her/him. For SF, the working procedures are much more varied, and it is easier to have contact during production. The SF vary substantially in skills, from master/PhD educated veterinary workers to freeze storage workers with very low formal education. But on the average the skill level is higher for SF than for ALF, where the formal skill level is quite low. We conduct a two-sample t-test (SPSS t-test for equality of means) to determine whether there is a significant difference between the means of the two groups. We also conducted non-parametric tests based on Mann-Whitney U and Wilcoxon W statistics. The t-test for equality of means assumes the variances for the two groups are equal. We test the assumption of homogeneity of variance using Levene's test of equality of variances. Table 3 shows the results from the t-test for equality of means conducted to compare RQ1 communication patterns, RQ2 competence, RQ3 innovation initiatives and RQ4 cultural impact. In most cases, we see that the test results show that we can assume equal variances.

### **5.1 – RQ1: COMMUNICATION PATTERNS**

When comparing communication from the group leader up to the boss (on the executive level) we found no significant difference between the scores for ALF and SF. The ALF group leaders spoke on average 7.63 times and the SF leaders, 6.38 times daily. These results suggest that communication from group leaders up to their boss is not affected by the work functions conducted. We find the same statistical result when comparing communication from group leaders to their group, ALF is 11.70 and SF is 10.30 (daily average). These results suggest that communication from group leaders to their group is not affected by the work functions conducted. The non-parametric tests show the same results.

Comparing group member initiatives to their group leader, there was a significant difference between the scores for ALF, 7.13, and SF, 10.31. These results suggest that group member communicative initiatives toward their group leader are affected by the position they occupy in the line of production. This does not come as a surprise, as workers in SF are freer to move around than those working in ALF and have more varied tasks. This results is also confirmed by the non-parametric tests.

### **5.2 – RQ2: COMPETENCE**

First we will look at the variables Competence average and Technical level and we find significant differences between the two groups for these two variables, both from the t-test and the non-parametric test (we will refer to the Mann-Whitney test since we have calculated the Mann-Whitney statistics, see Table 4, although the asymptotic significance parameter is the same for the Mann-Whitney and the Wilcoxon tests). As expected, the education variable, Competence average, suggests

that more education is needed to conduct SF than ALF operations. Workers in several SF are involved in work that demands specialist education and training, some at a high scientific level such as veterinary science. Comparing level of Technology level by workers in the different groups we also found a significant difference between the scores here. This variable is measured by looking at how much assistance the workers in the group need, so higher numerical values indicate greater need for assistance and lower skills. The average score for ALF is 3.09 and for SF it is 2.48. The results suggest that more resources are required to explain technology to workers in ALF than for those in SF.

The variable Group member participated in training last month needs more detailed explanation of the results. The statistics in Table 2 show that SF workers on the average participated more in course training than ALF workers. Looking more in detail at the data SF workers formed two groups, the highly skilled (like the veterinaries) had a very high rate of participation in advanced training while the low to very low skilled (like freeze storage workers) did participate little in training. This leads to the assumption that the results here do not have a normal distribution.

The ALF workers had an evenly distribution of the results. When we recorded this information we included both internal and external course participation. For the ALF workers they participated in internal training (defined as internal courses) about work security quite often. Not so often that they on the average outperformed the SF, but security training was taken seriously by the company. For the results here it is more likely to assume a normal distribution of the results.

The statistical tests show interesting results. The starting point is that there is a difference between the two groups, but the question is whether the difference is significant. The parametric results for the t-test show that we cannot assume equal distribution of variances. The result is not significant on the 5% level. The non-parametric Mann-Whitney U statistic shows a value that is far from having asymptotic significance. No doubt there is a difference of the means for the two groups, but because of the structure of the data the Mann-Whitney test show that there is no reason to believe that the difference is significant.

### **5.3 – RQ3: INNOVATIVE INITIATIVES**

Comparing initiatives to make changes in routines between workers in the different groups we found a significant difference between the scores for ALF (average 2.09) compared to SF (average 1.24) This indicator is measured so that low numbers indicate frequent suggestions. The indicator is defined by asking the group leader how many initiatives were sent through him/her. The results suggest that workers in SF are more active in suggesting routine changes than workers in ALF. The difference between the indicators is not so large compared to the difference in work tasks. Comparing formalized (written) initiatives to make changes in routines between workers in the different groups, we also found a significant difference between the scores for ALF (with indicator value 2.67) and SF (with value 1.55). As expected, we found fewer initiatives pass the formalization process, but nonetheless there are values signaling serious innovative initiatives in both groups. The non-parametric tests supports the results from the t-tests.

#### **5.4 – RQ4: CULTURAL VARIABLES**

In total, we analyzed eight different cultural variables, finding significant differences between ALF and SF for six variables, and no significant difference for two. The cultural variable “Avoid uncertainty” is asked of all group leaders and represents their attitudes to performing their job. It also reflects attitudes to tasks where they have to find solutions to daily problems and future challenges. We found a significant difference between the scores for ALF (indicator value 3.89) compared to SF (4.46). This result suggests that group leaders in SF are more likely to avoid uncertainty than those in ALF. From another point of view, one might intuitively expect the opposite. If the assembly line stopped a number of times then the loss could be substantial. Nevertheless, our research showed that stability in the production process was high, so the production routines seemed to function well.

Comparing acceptance of unequal distribution of power between workers in the different groups, we found no significant difference between the scores for ALF (2.48) and SF (2.74). This indicator is measured so that higher numerical values indicate higher power distance and, consequently, lower level of trust. The results suggest that the understanding between the group leader and the group in both SF and ALF is in partial disagreement with the statement that power should be unequally distributed. This is intuitive for supply functions with a high educational level. Our experience at the firm was also that the group leaders in ALF showed motivation for tolerance and friendly attitudes toward the workers at the assembly line. This is in contrast to experiences from countries with other cultures, such as the Arabic countries (see Westernen et al. 2018).

Comparing attitudes to rewarding collective action in the different groups, we found a significant difference between the scores for ALF (indicator value 4.31) and SF (4.73). Here, the indicator is measured so that higher numerical values express a more positive attitude toward collectiveness. These results suggest that workers in SF are more concerned with collective distribution of resources and collective action than workers in ALF. Comparing expression of pride in and loyalty to the firm in the different groups, we found a significant difference between the scores for ALF (indicator value 4.59) and SF (4.87). The test shows a statistically significant difference, yet the results do show that both groups have high scores for this indicator.

Comparing efforts to minimize disparities between men and women in the different groups, we found a significant difference between the scores for ALF (4.23) and SF (4.71). Though, once again, the scores for both groups show that the attitudes toward equality between men and women are highly positive. From one point of view, the lower ALF score is surprising because the number of females in ALF is high. On the other hand, lower levels of education and competence in the ALF group generally may partly account for the actual results. The indicator, confrontational behavior, is one of the variables that is the most difficult to interpret. However, for this variable we found the largest numerical differences in scores between the groups and a statistically significant difference, ALF with indicator value 3.57 and SF with 4.22. This result suggests that workers in SF are more confrontational in their relationships within the firm than workers in ALF. The explanation for this is probably the way communication takes place. The group leaders normally give short messages to the assembly line workers, messages that are rarely subject to discussion and in most cases are accepted by the assembly line workers with little or no dialog.

Comparing engagement in future-oriented behavior in the different groups, we found a significant difference between the scores for ALF (3.79) and SF (4.44). These

results suggest that workers in SF are more engaged in making plans and investigating what lies in the future than workers in ALF, which is intuitive because of the difference in their tasks. Comparing generosity toward others between workers in the different groups, we found no significant difference between the scores, ALF 4.59 and SF 4.68. These results suggest that both groups are equally concerned with being generous toward others in the firm.

It is interesting to see how close the results from the non-parametric tests comply with the t-tests for the cultural indicators. The Mann-Whitney U statistic is based on ranking criteria calculated in a fundamentally different way than the t-tests where you have to do assumptions about distributions. There has been discussions about how stable cultural variables are, see House et al. (2002), the results from this study suggest that statistical calculations like the ones we use here give reasonable results.



Table 2 – Statistical results for the cooperative from communication patterns, competence variables, innovative initiatives and cultural variables

		Comm number up to boss	Number speak to own group	Group mem ini to you	Compe- tence average	Tech level	Part in training last month	Ch routines time	Sugg in formal ch in routines
Assembly line funct. (ALF)	Mean	7,63	11,70	7,13	2,77101	3,09	3,56	2,09	2,67
	Std. Dev.	7,708	7,068	6,647	0,801340	1,146	4,943	1,288	1,468
	N	162	162	162	162	162	162	151	151
Support functions (SF)	Mean	6,38	10,30	10,31	4,05604	2,48	5,11	1,24	1,55
	Std. Dev.	6,881	6,798	7,450	1,121901	0,892	7,131	0,549	0,695
	N	104	104	104	104	104	104	104	104
Total	Mean	7,14	11,15	8,37	3,27343	2,85	4,17	1,75	2,21
	Std. Dev.	7,408	6,984	7,130	1,128731	1,094	5,931	1,130	1,332
	N	266	266	266	266	266	266	255	255

Table 2. Continued.

Avoid uncertainty	Power unequal	Reward collective	Pride in firm	Roles men/w	Confront in firm	Future oriented	Generous
3,89	2,48	4,31	4,59	4,23	3,57	3,79	4,59
1,410	1,513	0,603	0,529	1,005	1,086	1,139	0,530
162	162	162	162	162	162	162	162
4,46	2,74	4,73	4,87	4,71	4,22	4,44	4,68
0,880	1,441	0,526	0,484	0,602	0,607	0,620	0,579
104	104	104	104	104	104	104	104
4,11	2,58	4,47	4,70	4,42	3,82	4,05	4,62
1,260	1,488	0,609	0,528	0,900	0,980	1,020	0,551
266	266	266	266	266	266	266	266

Source: Authors' data collection.

Table 3 – T-test for Equality of Means based on data for the firm

		Levene's Test for Equality of var.		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Differenc	Std. Error	95% Confidence	
									Lower	Upper
Comm number up to boss	Equal var. ass.	6,410	0,012	1,350	264	0,178	1,255	0,929	-0,575	3,085
	Equal var. not ass.			1,384	237,287	0,168	1,255	0,907	-0,531	3,041
Number speak to own group	Equal var. ass.	4,165	0,042	1,599	264	0,111	1,399	0,875	-0,323	3,122
	Equal var. not ass.			1,613	225,943	0,108	1,399	0,868	-0,310	3,109
Group mem ini to you	Equal var. ass.	2,979	0,086	-3,628	264	0,000	-3,178	0,876	-4,903	-1,453
	Equal var. not ass.			-3,539	201,525	0,000	-3,178	0,898	-4,949	-1,407
Comp average	Equal var. ass.	40,082	0,000	-10,885	264	0,000	-1,285	0,118	-1,517	-1,053
	Equal var. not ass.			-10,138	169,862	0,000	-1,285	0,127	-1,535	-1,035
Tech level	Equal var. ass.	3,030	0,083	4,617	264	0,000	0,612	0,133	0,351	0,873
	Equal var. not ass.			4,873	254,313	0,000	0,612	0,126	0,365	0,859
Group member participated in training last month	Equal var. ass.	25,718	0,000	-2,085	264	0,038	-1,544	0,741	-3,002	-0,086
	Equal var. not ass.			-1,930	166,225	0,055	-1,544	0,800	-3,123	0,035
Ch in routines_time	Equal var. ass.	49,416	0,000	6,362	253	0,000	0,852	0,134	0,588	1,116
	Equal var. not ass.			7,236	217,471	0,000	0,852	0,118	0,620	1,084
Sugg form ch in routines	Equal var. ass.	60,385	0,000	7,242	253	0,000	1,121	0,155	0,816	1,426
	Equal var. not ass.			8,147	228,282	0,000	1,121	0,138	0,850	1,392
Avoid uncertainty	Equal var. ass.	12,307	0,001	-3,703	264	0,000	-0,573	0,155	-0,877	-0,268
	Equal var. not ass.			-4,078	263,834	0,000	-0,573	0,140	-0,849	-0,296
Power unqual	Equal var. ass.	0,926	0,337	-1,387	264	0,167	-0,259	0,187	-0,626	0,109
	Equal var. not ass.			-1,402	227,422	0,162	-0,259	0,185	-0,623	0,105
Reward collective	Equal var. ass.	8,103	0,005	-5,851	264	0,000	-0,422	0,072	-0,564	-0,280
	Equal var. not ass.			-6,029	240,687	0,000	-0,422	0,070	-0,560	-0,284
Pride in firm	Equal var. ass.	48,024	0,000	-4,240	264	0,000	-0,273	0,064	-0,399	-0,146
	Equal var. not ass.			-4,324	233,782	0,000	-0,273	0,063	-0,397	-0,148
Roles men/w	Equal var. ass.	20,429	0,000	-4,419	264	0,000	-0,483	0,109	-0,698	-0,268
	Equal var. not ass.			-4,901	262,909	0,000	-0,483	0,099	-0,677	-0,289
Confront in firm	Equal var. ass.	34,523	0,000	-5,598	264	0,000	-0,653	0,117	-0,883	-0,424
	Equal var. not ass.			-6,282	259,685	0,000	-0,653	0,104	-0,858	-0,448
Future oriented	Equal var. ass.	7,999	0,005	-5,350	264	0,000	-0,652	0,122	-0,892	-0,412
	Equal var. not ass.			-6,027	258,057	0,000	-0,652	0,108	-0,865	-0,439
Generous	Equal var. ass.	2,208	0,138	-1,393	264	0,165	-0,096	0,069	-0,232	0,040
	Equal var. not ass.			-1,367	205,678	0,173	-0,096	0,070	-0,235	0,043

Source: Calculations based on authors' own data collection.

Table 4 – Non-parametric test of means based on data for the firm

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Comm number up to boss	7719,5	13179,5	-1,1602	0,2460
Number speak to own group	7522	12982	-1,4995	0,1337
Group mem ini to you	6265	19468	-3,5437	0,0004
Comp average	2417	15620	-9,8133	0,0000
Tech level	5832	11292	-4,5365	0,0000
Group last month part training last month	8193,5	13653,5	-0,3817	0,7027
Ch in routines_time	4572,5	10032,5	-6,2852	0,0000
Sugg form ch in routines	4257,5	9717,5	-6,5200	0,0000
Avoid uncertainty	6416	19619	-3,6045	0,0003
Power unequal	7513	20716	-1,5727	0,1158
Reward collective	5177	18380	-6,0224	0,0000
Pride in firm	6055,5	19258,5	-4,9705	0,0000
Roles men/w	6014	19217	-4,5209	0,0000
Confront in firm	5669,5	18872,5	-5,3803	0,0000
Future oriented	5532,5	18735,5	-5,3209	0,0000
Generous	7514,5	20717,5	-1,7871	0,0739

Source: Calculations based on authors' own data collection

## 6 – DISCUSSION OF THE RESULTS

The starting point of the article was if it could be observed a difference in behavior related to knowledge transfer processes between two different groups of workers within the firm. The analysis captured communication patterns, competence, innovative initiatives, and cultural characteristics. The analysis proved several differences and some similarities between the different groups, ALF and SF. When we look at the patterns of communication we found a difference in communicative initiatives from group members toward their leader, with workers in SF being more active. Our interpretation of this finding is that the structural configuration of the work processes affects the opportunities to initiate communication during work, as pointed out by Reagans and McEvily (2003). Apart from the structural configuration, the general level of knowledge of the sender might (as pointed out in the theoretical discussions above) also be a reason for the difference in communicative initiatives found. The competence variables in our study aim to capture both formal level of knowledge (ranked by educational level) and eagerness to maintain building knowledge through participation in training and we found the more educated workers in the support functions. Therefore, we might conclude that structural configuration and level of knowledge affect the level of communication initiatives from employees.

Workers in the different functions of the firm are not only characterized as senders, but also as receivers in a knowledge transfer relations. In our analysis, we can see that there is a difference between groups in how they understand technology, where some understand the technology immediately without any explanation, others must have extended explanations and special training. It is the workers in the support functions, who also have the higher level of formal education, that understand

technology with relative ease, whereas the less educated workers at the assembly line are in more need of extended explanations. This is in line with prior research on absorptive capacity (see e.g. Cohen and Levinthal, 1990).

In our analysis, we have also included variables that indicate something about the content of the communication within the firm; these are labeled innovation initiatives – suggestions to develop or change routines in order to develop the firm. It seems easier for workers in SF to make suggestions to alter the firm's routines than it is for workers in ALF. An explanation for this difference in behavior might be that routines in ALF are already considered to be as effective as they can be, whereas there might be more room to maneuver or more slack, in support functions. The difference might also be due to differences in formal knowledge level between the two groups.

The last set of variables included in our analysis are the cultural variables. Cultural analysis of organizations were developed by Hofstede (1991) and Hofstede et al. (2010), who used them to characterize different societal cultures in organizations. Later, House et al. (2002) developed this further and we have used the cultural features to get an extended understanding of the contextual aspects of the firm. The cultural features represent behavior guidelines, and we wanted to see if there were any differences between SF and ALF in this regard. The analysis shows significant differences: SF (compared to ALF) are more eager to avoid uncertainty, are more future oriented, are more eager to encourage collective distribution of resources, take more pride in the firm and make more initiatives aimed at gender equality. One factor that comes to mind is that these differences have to do with differences in educational levels. Previous studies by House et al. (2002) and Westeren et al. (2018) point out that although educational level is relevant, other factors like age and income level are also important. Moreover, we must keep in mind that, although statistically significant, the indicator value differences are small. In addition, the kind of production function workers occupy also plays a role. Finally, the feedback mechanisms discussed in the theoretical section above may be relevant to these findings, with cultural factors influencing behavior in work relations and work experiences influencing cultural values; our statistical analyses do not allow us to make any decisive conclusion about this, but it would certainly be a field for future research.

Some of the cultural features, like uncertainty avoidance and future orientation, can be included in a more general interpretation, i.e. that one group of workers (SF) are willing to engage more in the development of the firm than the other group (ALF). On the other hand, we found two cultural features where there were no significant differences between ALF and SF; acceptance of unequal distribution of power and generosity; here, both groups contribute equally to improving the general “atmosphere” of the firm.

## **7 – CONCLUDING REMARKS**

The main research question was if a difference in behavior related to knowledge transfer processes between different groups of workers within the firm could be observed. Four research questions were used to acquire insight into the main research question on the issues: Communication patterns, competence, innovative initiatives, and cultural characteristics. The statistical analysis displayed several differences between the two groups of workers, ALF and SF. We found that characteristics of the sender and of the receiver, especially their level of formal education, are important for knowledge transfer. We also found that basic structural configuration of the firm can explain differences in knowledge transfer, where one

group of workers (SF) have a better base for participating in knowledge transfer processes than the other (ALF). There is also evidence supporting the thesis that job role affects views on more basic contextual features such as culture. Overall, we can identify differences between the two groups in behavior in knowledge transfer processes regarding communication initiatives, engagement in knowledge development, and in promoting innovative initiatives. Differences found in the culture variables, might explain some of the differences as workers in SF are more concerned about planning for the future and in avoiding uncertainty than their colleagues in ALF. At the same time workers in SF seem to be more outspoken than workers in ALF, interpreted from the culture variable *confrontational behavior*.

From a managerial perspective, our analysis demonstrates that workers in SF seem to contribute more to the development of the firm than those in ALF, both when it comes to innovative initiatives and their eagerness to expand their level of competence. On the other hand, the organization must spend more resources on providing workers in ALF with the necessary training or insight into technical skills than workers in SF. Organizations are of course dependent on both assembly line and support functions, and development has to happen in both functional areas. Knowledge of the differences in behavior on knowledge transfer processes between the two groups should trigger some attention of managers. The authors main suggestion is that managers take into account that knowledge transfer processes within the firm might be very different dependent on which functions they are looking at. If one function are organized in a way that workers are freer to move around, and others functions to a higher degree tie the workers to their working station, the knowledge transfer processes most probably will work differently, thus extra attention should be paid toward the second group of workers in strengthening the knowledge transfer processes. If we add that workers in the more free functions (SF) have significantly higher educational level than their colleagues in the less free functions (ALF), it may strengthen the difference in the knowledge transfer processes. If managers do not pay attention to the difference in the knowledge transfer processes, one possible pitfall might be that managers may risk establishing parts of their understanding of the firm's challenges and developmental opportunities on the voices that are most visible – it might represent a skewed framing of the realities.

Our analysis is based on findings from one organization, with the weaknesses that involves for generalizability. More research of this kind is of course needed, especially in the fields of innovation and cultural aspects because of globalization trends that will also impact traditional industrial production. The implication of such findings would also provide bases for further research on how to implement knowledge management in organizations, which is fundamental for firms being able to utilize knowledge to improve competitiveness.

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