

## **Codified Knowledge Transfer: Limits and Approaches**

### **Author**

Guzman, Gustavo, F.Trivelato, Luis

### **Published**

2007

### **Conference Title**

ANZAM 2007 Conference - managing our intellectual and social capital

### **Rights statement**

© 2007 Australian & New Zealand Academy of Management. The attached file is posted here in accordance with the copyright policy of the publisher, for your personal use only. No further distribution permitted. Use hypertext link for access to publisher's website.

### **Downloaded from**

<http://hdl.handle.net/10072/18590>

### **Link to published version**

<http://www.anzam.org/past-event-material/past-conference-papers/>

### **Griffith Research Online**

<https://research-repository.griffith.edu.au>

## **Codified Knowledge Transfer: Limits and Approaches**

Gustavo Guzman\* <sup>1</sup>  
*Griffith Business School, Griffith University, Australia*  
g.guzman@griffith.edu.au

Luis F. Trivelato  
*Universidade Federal de Minas Gerais, Brazil*  
trivelato@gmail.com

Preferred Stream:        Knowledge Management

Profile: Gustavo Guzman's research focuses on the social and organisational processes that shape the processes of sharing practical and codified knowledge. He is currently using this angle to examine the 'transfer' of management and operations concepts from developing to highly industrialised economies in commodity industries.

---

<sup>1</sup> Corresponding author Gustavo Guzman, phone +617 55528919, Fax +617 55529206. Postal Address: Griffith Business School, Gold Coast Campus, PMB 50 GCMC, Queensland, 9726, Australia.

## Codified Knowledge Transfer: Limits and Approaches

**Abstract.** *The goal of this paper is to examine an instance of the codified knowledge transfer process in non-routine activities from the socio-organizational perspective. We examined knowledge codification, decodification and mechanisms to transfer knowledge considering two aspects: the role of context and the portion of tacit knowledge required to codify/decodify knowledge. The empirical evidence came from a higher education institution that used ‘course guidelines’ (codified knowledge) as part of its mass-education strategy. Findings indicated that different assumptions key stakeholders had regarding the nature of knowledge, the role of context and, the portion of tacit knowledge required during the process of transfer of codified knowledge, helped to explain the codification process. Moreover, the codification process was part of a wider process of commodification that attempted to create a knowledge product that could be stored and distributed. This is a new form of organizing knowledge that involves dividing, codifying and replicating knowledge by third parties. The paradox of this situation is that, while the codification strategy implies the separation of the processes of codification and decodification, an adequate decodification process needs integration between those two processes.*

**Key words.** Knowledge management, codified knowledge, limits, learning, higher education

### INTRODUCTION

The aim of this study is to contribute to the further understanding of the process of Codified Knowledge (CK) transfer. This process is conceptualized as having three processes: knowledge codification, mechanisms used to transfer knowledge and knowledge decodification. This examination is developed considering two aspects that have been neglected by the literature. The first is type of codified knowledge. We consider two extremes types of CK: one that needs a low portion of tacit knowledge and the other that needs a high portion of tacit knowledge. This is important because empirical studies have rightly addressed, Knowledge Transfer (KT) mechanisms (e.g. Prencipe and Tell, 2001) or implementation stages (e.g. Szulanski, 2000), yet those studies have not directly addressed the nature of knowledge issue. The second aspect is context, since it plays a crucial role in the processes of knowledge codification and decodification (Lave and Wenger, 1991).

The empirical component of the study was developed at a higher education institution that followed a ‘codification strategy’ (Hansen, Nohria and Tierney, 1999) in order to geographically expand its educational activities. That is, ‘course guidelines’ were used as the main mechanism to transfer CK about course content, assessment, and teaching delivery strategies. Expert professors developed course guidelines to teaching instructors who needed to understand course guidelines in order to plan and deliver course content. In other words, a highly experienced professor designs and develops a course outline (codification of knowledge). On the other hand, a course instructor develops an understanding, based on the course outline, of how to apply specific theories, concepts, case studies, and exercises in order to deliver that knowledge to students (knowledge decodification). In the next section, we outline key education and management concepts that will frame the examination of the empirical evidence.

Subsequently, methodological aspects and the research setting are described. In the last three sections, the research findings are outlined and discussed and conclusions drawn.

### **CODIFIED KNOWLEDGE TRANSFER: EDUCATION AND MANAGEMENT INTERFACES**

The education and the management literatures have converged in significant extent in the way they explain learning and knowledge related processes. On the one hand, the education literature follows either learning or constructivist approaches. In the former the idea is to detail comprehensive teaching content and procedures (Castro, 2000). The problem with this approach is that “the very notion of transfer rests upon a conceptual separation of learning and the contexts to which the learning may be applied” (Tennant, 2001: 169). The latter suggests that, rather than learned, knowledge is constructed through social interaction in a specific socio-cultural context. It is based on the individual’s previous personal experience, knowledge, and epistemology (Lynch, Leo and Downing, 2006; Pea, 1987). The situated learning approach (Lave and Wenger, 1991) can be categorized within this view. McLellan (1994) noted that well-known pedagogical approaches, such as apprenticeship, collaboration, coaching, and action learning, have incorporated some of the key components of the situated learning model.

On the other hand, in the management literature, in spite of the recognition of the codified and tacit dimensions of knowledge (Polanyi, 1983), research approaches knowledge as being either mostly codified, overlooking its tacit dimension, or tacit, ignoring its codified dimension (Empson, 2001; Hazlett, McAdam and Gallagher, 2005). The implication is that the group that approaches CK as an objective entity will tend to follow codification strategies. The group that approaches CK as having tacit components will tend to consider social aspects entrenched in the codification process in order to understand its associated processes of abstraction (Lillrank 1995), translation (Czarniawska and Joerges, 1996), and transformation, recognizing that that part of tacit knowledge is uncodifiable (Tsoukas, 2005).

The above suggests that both the education and the management literatures function under similar paradigms regarding the nature of knowledge and its associated processes. That is, some lend itself towards a codification and structured strategies. Others lend itself towards constructivist and situated strategies. This polar situation facilitates the examination of the empirical data. Now we turn our attention to three key processes of the CK transfer process: knowledge codification, mechanisms used to transfer knowledge, and knowledge decodification.

Firstly, knowledge codification (Zollo and Winter, 2002) is the extent to which ‘accumulated experience can be abstracted into manuals to provide know-what, know-how, and know-why for the execution of tasks’ (Zollo, 1998: 26). This process, however, is problematic. Firstly, CK might need tacit knowledge that cannot be codified (Ancori et al., 2000; Cowan, David, & Foray, 2000; Roberts, 2000). Secondly, the extent to which knowledge is ‘codifiable’ is debatable (Johnson, Lorentz and Lundvall,

2002; Zack, 1999). On the one hand, Cowan (2001) and Cowan et al. (2000) point out that the codification process is more linked to technical and economic aspects than to tacit features of knowledge. On the other hand, Ancori et al. (2000) and Johnson et al. (2002) suggest that it is not possible to codify the tacit components of knowledge.

Secondly, empirical-based studies (Grimaldi and Torrisi, 2001; Olivera, 2000; Prencipe and Tell, 2001) have identified numerous mechanisms to transfer (or learn) knowledge. Nevertheless, it is not possible to generalize what mechanism is adequate for what situation, because research focussed on different stages of knowledge management and referred to different types of knowledge.

Thirdly, knowledge decodification encompasses interpretation and translation (Czarniawska and Joerges, 1996; Zahara and George, 2002) that in turn involves 'knowing the meaning of the codes used by the sender as well as the underlying knowledge necessary to interpret the use of those codes' (Hall, 2006:18). This means that both knowledge-related (e.g. cognition) and non-knowledge related (e.g. trust) aspects need to be considered during both codification and decodification (Guzman and Wilson, 2005). Considering these aspects, in the next paragraphs we critically review contemporary knowledge transfer theories.

### **Knowledge transfer theories**

The literature on KT can be divided in two groups. The first group has focussed on uncovering 'factors' that facilitate the KT process. They have agreed on a set of aspects that influence the KT processes, such as task and context similarity (Dixon, 2000), characteristics of the sender–receiver social relationship (Hansen et al., 1999), technology features (Argote and Darr, 2002), degree of knowledge ambiguity (Simonin, 1999), type of organizational control used (Turner and Makhija, 2006), and properties of knowledge (Argote, McEvily and Reagans, 2003). The second group has developed theories to promote KT. While earlier theories focussed on disciplines (Senge, 1990) and core activities (Leonard-Barton, 1998), contemporary research focussed on processes and means. Argote and Ingram's (2000) 'reservoirs' of knowledge theory is complemented by Szulanski's (1996, 2000) four-stage implementation of organizational routines study. Nonaka & Takeuchi (1995)'s influential SECI model is another key representative of this group.

The above theoretical and empirical studies have, without doubts, contributed to the understanding of the CK transfer process. However, they have treated CK generically without reflecting on the fine texture of different types of CK, which might need a higher or lower proportion of tacit knowledge. The reservoirs of knowledge theory (Argote and Ingram, 2000), for example, does not address the connection between the different types of knowledge and mechanisms used to transfer knowledge. Secondly, there is a void in respect to the tacit dimension knowledge-- that is not possible to codify.

This is not a surprise since the reservoirs theory has not considered seminal research on tacit knowledge (e.g. Lave and Wenger, 1991). Thirdly, there seems to be a bias towards the ‘knowledge codification’ (Hansen et al., 1999) strategy. There is evidence of its successful application in mass-production organizations (e.g. Argote and Darr, (2002) but there is little evidence of its application in organizations dealing with more complex and heterogeneous tasks.

In a similar way, Nonaka and Takeuchi (1995) embraced the objectivist view of knowledge by treating tacit knowledge as knowledge to be ‘articulated’ through externalization and conversion, a claim that has been challenged. Clegg and Ray (2003) argue that the tacit dimensions of knowledge cannot be articulated and codified because of the embedded experiential meaning(s), which are socially constructed and contextually dependent. Supporting this view, Ribeiro and Collins (2007) replicated Nonaka and Takeuchi’s (1995) bread-making machine pivotal experience and empirically demonstrated that there was no ‘conversion’ of knowledge from tacit to explicit. Instead, they found that tacit knowledge was still necessary but it was supplied by a set of people in which the machine environment was embedded: “At the end, the master baker’s tacit knowledge has been neither explicated nor incorporated into the machine. Part of it was substituted by the tacit knowledge of the other actors brought to the automated bread-making scene, such as the users at home, the workers in the factory and repair specialists, while the other part has disappeared entirely at the cost of a standardized set of products and procedures” (p. 3). Furthermore, while Nonaka and Takeuchi (1995) claim universal validity, their propositions rest heavily on a tacit foundation of Japanese values and management practices, such as the pervasive mutual obligation networks combined with the unique characteristics of Japanese employment systems, suppliers and banks (Clegg and Ray, 2003; Glisby and Holden, 2003).

Considering the outlined strengths and weaknesses of the current KT literature, the theoretical framework guiding this investigation is presented in Figure 1. It considers three key aspects that the literature has agreed as fundamental in any knowledge and learning discussion. First the CK transfer process that, as above-mentioned, is composed by knowledge codification (Zollo and Winter, 2002), mechanisms used to transfer knowledge (Olivera, 2000; Prencipe and Tell, 2001) and knowledge decodification (Hall, 2006; Zahra and George, 2002). Second, in order to appreciate the role of the nature of knowledge in the KT process, we have considered two extreme cases. One that requires a low portion of tacit knowledge in order to transfer CK and, another that needs a high portion of tacit knowledge. Third, the overwhelming role of context (Thompson and Walsham, 2004) in the KT process is also considered. Two contrasting contexts were examined. On the one hand, we analysed a situation in which contextual conditions of operation of the receiving (U-one) unit were similar to the sender unit (HEI). On the other hand, contextual conditions of operation of the receiving unit (U-two) were very different to the sender unit (HEI). Thus, this framework enabled the simultaneous examination of the CK transfer process

considering different types of both knowledge and contexts. Contrasting polar situations contributes not only for a better understanding of the role of the nature of knowledge and context in the KT process (e.g. Poole and Van de Ven, 1989), but also supports theory building (Eisenhardt, 1989). Moreover, nature of knowledge and context are directly connected to the use of artefacts, interpretation, political environment, and cognition— aspects that affect CK transfer processes.

- - - - -  
 - insert Figure 1 Here  
 - - - - -

Considering the education and the knowledge and learning literatures simultaneously, it is suggested that, on the one hand, the structuration approach deals with some elements of the codification stage but does not incorporate transfer and decodification aspects into the understanding of the transfer process. On the other hand, the constructivist approach has several elements in common with contemporary knowledge and learning theories. The most notable is that both approaches are based on Lave and Wenger's (1991) situated learning theory. The problem arises when those approaches are viewed as competing. This can be addressed if we adopt the view that codified and tacit dimensions of knowledge are complementary rather than substitutes (Nightingale, 2003). Finally, and following Schultze and Stabell (2004: 205), we see those categories as dualities, useful to examine contradictions since opposing ideas are examined simultaneously. This is the theoretical line that we will follow in the examination of the empirical investigation. Before this examination, we now outline the methodological strategy.

## **METHODOLOGY**

Case study methodology (Yin, 1981) was used. It is not only a recognized qualitative research method, but also supports the deep understanding of contextual conditions surrounding knowledge codification, transfer, and decodification processes (Bryman and Bell, 2003), including the complex socio-political and interpretive issues (Burrell and Morgan, 1979) that permeate KT related processes. This is important since one of the key assumptions in this study is that all codified knowledge 'needs' tacit knowledge.

Methods of data collection involved in-depth, non-structured interviews, direct observation, and document examination. Six course instructors, three expert professors, three course coordinators, three guideline planners, ten students, two Heads of associated units and the HEI's Dean of Studies were interviewed. Because one member of the research team was working as course coordinator and course instructor during the time of research, interviews were both formal and informal. This avoided some of the well-known problems of interviews (Fontana and Frey, 1998). Interviews occurred between September 2004 and September 2005, were recorded, and generated more than 10 hours of recording. The use of

multiple data collection methods, the independent examination of data by the authors and the feedback of interviewees concerning data collected enabled triangulation, a key aspect that supported validation. Multiple case studies were developed, at the headquarters, and in two associated units (see details below).

### **THE RESEARCH SETTING**

The empirical component of the study was developed at a higher education institution ('HEI') that operates under a franchise model. While the academic content of courses is centrally determined by HEI, local units have significant autonomy to manage operational procedures. HEI applies a 'structuration' approach to achieve its strategic goal of geographical expansion and growth. In order to assure the delivery of consistent course content, HEI 'packaged' knowledge into course guidelines (CG). According to HEI, CG must provide course instructors with both theoretical and practical knowledge about course content, examples, case studies, teamwork activities, and didactical tips. HEI temporarily contracted 'expert' professors to design CG. HEI operates its own units and has franchisees (associated units) that are distributed around the country.

In order to examine the influence of type of CK on the CKT process, we focused on two very different courses of the Production Engineering undergraduate degree, one quantitative (calculus), that represents CK that needs a low portion of tacit knowledge, and the other qualitative (organizational theory), that represents CK that needs a high portion of tacit knowledge. Likewise, in order to examine the influence of the context on the process of CK transfer, we have focused on two units. One ('U-one') owned by HEI, has similar context than HEI. It is located close to HEI, in a large city with abundant and qualified human resources. The other ('U-two'), an associate unit, has very different contextual conditions than HEO. It is located in a small city, and had difficulties hiring course instructors with the required academic qualifications and professional experience.

The formal role of the course instructors was to assimilate the academic and teaching advice codified in the CG, adapt it to the local conditions of operation, and deliver the lectures. Because HEI is a 'teaching' university, its policy is to hire course instructors with Master level qualifications only. This is related to HEI's mass-education strategy to deliver standard course content with consistent quality and at a competitive price. In theory, HEI aims to match professional experience profile of the instructor with the course to be delivered. In reality, as we will explain in the findings section, this does not happen in the associated units located far from large cities. Expert professors were hired to develop CG only. They had the academic requirements (PhD and research experience in the area) to develop CG. However, in the majority of cases, they were not aware of the specific profile of students, instructors' academic and professional background, availability of suggested materials (e.g. textbooks), and, most importantly, the contextual conditions of the units.



## RESEARCH FINDINGS

The empirical evidence suggests that the codification strategy has limitations that are connected with the different assumptions of key stakeholders regarding the codification process, the nature and role of knowledge transfer mechanisms, and the decodification process and the role of the context. These four aspects are detailed next.

### **Assumptions regarding the nature of knowledge and the codification process**

HEI's top management, expert professors (knowledge codifiers), and course instructors (knowledge decoders) had different assumptions regarding both the nature of academic knowledge and the codification process. On the one hand, HEI's top management strongly believed that all academic knowledge can be codified; they treated knowledge as an undifferentiated product, ignoring the difference between courses that require more and courses that require less tacit knowledge in order to be codified, and therefore consciously pursued a 'codification' strategy. HEI's top management was convinced that structure-based mechanisms based on knowledge codification (CG) were enough to enable the transfer of academic knowledge from HEI to associated units.

The course guidelines are passed to the newly hired teachers [course instructors] the day they are contracted. This helps them to prepare their teaching [HR manager]

The above is partly explained by HEI's background. As owners of a large group managing independent schools, they just continued applying the same mass education strategy that they had successfully applied for the last 40 years. Secondly, from a financial and organizational perspective, it was more convenient for HEI to adopt a codified knowledge position across all courses than to organize a more painstaking process that considers courses containing differentiated portions of tacit elements. The latter might have been implied in higher costs since additional coordination would be necessary to facilitate CG adaptation to local units.

On the other hand, expert professors (knowledge codifiers) knew that it would not be possible to write down all their knowledge and experience related to a specific course. That is, they were aware that CG adaptation to the local conditions of operation was necessary. They even imagined that they would be called back to improve CG in the future. The temporal nature of their relationship with HEI, however, prevented this. This behavior of experts is common in codification processes (e.g. Morris, 2001).

I try to write in the guidelines [CG] the best advice ... but sometimes I am not sure if the reader will use the textbook in the way I am indicating [Expert Professor 3]

Course instructors shared a similar view to expert professors. They were aware that additional tacit professional and teaching experience was necessary in order to know how to apply knowledge contained in the CG. The quote below illustrates this point.

The guidelines [CG] are important since [it] indicates textbooks available in the library and describe examples. [However] I do have my own additional material and [I] always end changing guidelines instructions [Course Instructor 3].

It must be noted that the codification of academic and teaching knowledge into CG constituted the cornerstone of the HEI strategy to expand its operations. As franchisor, HEI's main product was composed of a group of courses and associated organizational and managerial routines established to set up and run the academic and operational portion of the business. Courses came in the form of course outlines. According to HEI's top management, CG ensures consistency of the course content and, at the same time, allows them to be competitive in price terms.

The lesson number one is the 'packaging' of teaching ... the adopted solution [course guidelines] seems to be adequate given our two main challenges. The accelerated expansion of enrollments and the opening of new units. That is, the goal is to grow without problems of having to replicate our teaching quality standards. [Academic Dean]

In order to achieve consistency, HEI standardized the delivery of the course in terms of content breadth and depth. That is, the same course, with the same format and content, needs to be delivered in the same number of weeks using the same textbooks and didactical supporting material. The quote below illustrates this.

The course guidelines must be always developed using the same template, using the same textbooks and page numbers. We cannot have two templates. They need to be identical. [Project manager, Course Guidelines project]

The above suggests that the difficulties of promoting CK transfer seem to be more linked with the assumptions held about knowledge of the individuals involved than with the very process of transferring CK. Although expert professors and course instructors were aware of the impossibility of codifying all academic and teaching knowledge into CG, HEI did not organize additional support in the decodification process because it believed it was not necessary.

### **Assumptions regarding KT mechanisms**

Structure-based mechanisms (CG) were the only mechanisms officially recognized and promoted by HEI to transfer knowledge.

The idea [of the CG] is that somebody has already ‘broken his head’ detailing each lecture, with the best way to conduct each difficult step ... to discover the best possible example. This is what we call lecture structuration. We hand in these guidelines [CG] to the new teachers [course instructors]. This process assures a high quality lecture. [Course Coordinator 2]

Nevertheless, different actors had different assumptions regarding the nature and role of CG. On the one hand, expert professors, for example, saw CG as ‘guidelines only’ that needed to be improved and adapted to the contextual conditions of the local unit, as the following quote suggests.

After the teacher [course instructor] receives the guidelines [CG], it would be great if they contact me ... it could be a good idea to do a training or discussion session. [Expert Professor 2]

On the other hand, different uses were given to CG at different locations. At U-one, CG was approached in a more flexible manner, providing space for adaptations. By contrast, at U-two, CGs were perceived in a less flexible way, as the next two quotations reveal.

The main role of course guidelines is to support the teacher [course instructor] in the preparation of class activities. We do not have intention to ask that, for example, all suggested textbooks were used or yet that all suggested exercises were applied as planned in the course guidelines. [Course Coordinator, U-one].

... at a non-structured course, outcomes are totally in the hands of teachers. At a structured course, there is a part that is in the hands of teachers [course instructors], but there is also a ‘back office’ that supports him [sic] ... from the general design of the course to suggestion of examples, exercises and case studies all is there ready to be used. [Academic Director, U-two].

### **Assumptions regarding the decodification process**

HEI did not supported the decodification activities. HEI assumed that knowledge contained in CG would be understood and assimilated without problems by course instructors. To HEI, having course instructors

with the required academic qualification and professional experience would be enough to efficiently deliver CG content. Decodification therefore, was taken for granted.

I never had any contact with the responsible [author] of the course guideline. When there is a problem I talk with the course coordinator ... usually we arrive to a common interpretation of the guidelines. [Course Instructor 2]

The profile of our course instructors must combine academic knowledge with professional experience. In general, we look for teachers with postgraduate qualifications and five years industrial experience, in average. [Human Resources Manager]

However, HEI ignored the difficulty of finding instructors with the required academic qualifications in certain geographical areas, or realized this but transferred the issue to the local unit management. By contrast, course instructors made it clear that adaptation was absolutely necessary in order to make class activities worthwhile.

It is important to remember that guidelines [CG] only suggest materials to be used. There are things that need to be worked out by the teacher [course instructor]. Group activities are a good example. We need activities that can be marked otherwise students go away. Sometimes, guidelines [CG] indicate a reading, but how may I allocate marks for a reading activity? [Course Instructor 4]

Additionally, course instructors' professional experience was key for contextualizing concepts from the CG and for creating their 'own' examples to illustrate subjective concepts.

Sometimes I use examples from our local industries. Here, for example, the mining industry is strong. It is where the students and I develop our professional activities ... talking about services, for example, it doesn't make much sense. [Course Instructor 2]

Expert professors were unable to figure out the decodification process since course guidelines were developed before the actual units were set up and therefore the course instructors had not yet been hired. Because of this situation, they assumed that course instructors would have the adequate academic qualifications and, more importantly, the experience for the course they were to deliver. As we will see below, this was not the case and problems emerged.

The person [course instructor] who will use this material [CG] need to be familiar with this type of literature ... it is not everybody that uses these authors ... Accordingly the HEI, the majority of teachers [course instructors] are Master or Doctors [PhDs], this leaves me more at ease. [Expert Professor 2]

### **The Role of Context**

HEI's top management assumed that the context between centrally located units and remotely located units was very similar in academic and technical infrastructure terms.

In general terms, our associate units have the same profile of our main campus. The infrastructure, organizational structure, course instructors' profile and the academic programs are all similar. [Academic Dean]

This, however, was not the case across the board. While in some units financial resources were adequate, in other units this was not the case. Moreover, in many cases, even with availability of financial resources, some academic resources were either not locally available (e.g. textbooks or qualified instructors) or they were inadequate (e.g. library and IT academic databases). Similar to HEI, expert professors, during the development of CG, did not consider the possibility of different contextual conditions for different units, as the quote below shows.

All faculties [units] are the same. Even the ones that are far away ... [if necessary] they must bring teachers [course instructors] from the capital city. [Expert Professor 1]

### **The role of type of CK**

The extent to which CK needs tacit knowledge seems to influence both codification and decodification processes. On the one hand, qualitative courses, such as organization theory, need a high portion of tacit knowledge because it is organizational knowledge. As such, it does not have clear boundaries, depends on people's interpretation, and only makes sense when it is applied to a specific situation (Tsoukas and Vladimirou, 2001; Spender, 1993). On the other hand, quantitative courses such as calculus requires a low portion of tacit knowledge, since content is fairly standardized and involves a set of mathematical based knowledge that can be represented by figures, there are few alternative ways to apply the formulae, and outcomes can be measured with precision. In Table 1 it is possible to observe that mathematical knowledge has a higher number of explicit elements than qualitative courses. This means that, in the case of calculus, both the codification and the decodification process were relatively well known, simple, and had few alternatives. Conversely, in the organizational theory course, a higher number of tacit elements was present. Therefore, both codification and decodification processes were complex and incomplete. The quotes below illustrate this point.

...in the case of calculus there are two basic textbooks ... they never change ... [I] always use the same material [textbooks]. The guidelines [CG] are good because there

is practically nothing new ... it is the same thing I teach in other institutions. [Course Instructor 3]

... the problem with the Organizational Theory guidelines [CG] is that I do not know the majority of the suggested books ... I have never used some of that material and even, I know some of them are out-of-print. This means that I need to study the whole course again and, in many cases, I either do not understand or do not agree with the proposed discussion .... at the end I change the textbook or the topic, otherwise I feel uncomfortable. [Course Instructor 2]

**Table 1** – The nature of mathematical and social science knowledge elements

<b>Elements of Knowledge</b>	<b>Mathematical</b>	<b>Social Science</b>
Propositions and statements (agreed)	Mainly explicit	Mainly explicit
Test and reasoning (applied to justify agreed statements)	Mainly explicit	Mainly tacit
Problems and puzzles (considered important to be solved)	Mainly explicit	Mainly tacit
Language and symbolism (used to enable mathematical communication)	Mainly tacit	Mainly tacit
Overarching vision: definition of standards, structure, and limitations of knowledge	Mainly tacit	Mainly tacit
Methods and procedures (applied to develop knowledge)	Mainly tacit	Both explicit and tacit

Source: Based on Ernest (1998).

## DISCUSSION

On the one hand, our empirical findings have confirmed some aspects of the codification process that have been noted by the literature. On the other hand, this study has advanced a more nuanced understanding of the CK transfer process. We have highlighted how different assumptions regarding the nature of knowledge and the nature of the whole process of knowledge codification by key stakeholders explain to a significant degree the limitations of the codification process.

The empirical evidence showed that the lack of congruence of key assumptions regarding the nature of knowledge and the role of context between HEI, knowledge codifiers (expert professors), and knowledge decoders (course instructors), shaped the KT process. In the case of courses requiring tacit knowledge in small extent, the CK transfer process was fairly adequate. However, in the case of courses

requiring tacit knowledge in significant extent in order to be codified and decodified, the whole transfer process was problematic. Different assumptions can be credited to political rationality and bounded rationality. Political rationality was applied by HEI when opting for the mass education strategy. This was not only a rational business strategy, but also a deliberate attempt to control educational services. This point is further explored in the discussion of the commodification strategy. Bounded rationality occurred, since in the early stages, HEI did not have associated units and therefore there were no course instructors. Expert professors had no information on how CG was to be applied, and course instructors were not informed about the role of CGs.

Any codification process needs decodification (Hall, 2006), and this must not be taken for granted since human resources, skills, and time are necessary in order to set up and implement adequate knowledge transfer mechanisms that help to bridge the codification and the decodification stages. Additionally, the decodification process contains political aspects that must not be ignored. Newly hired course instructors were inhibited from raising their voices to ask for additional support for fear of appearing academically 'weak' among peers and with top management. Furthermore, course instructors were mostly part time, contracted temporarily, and were not unionized. Because their main job was in another organization, they did not perceive themselves as 'teachers' but as experienced professionals. All of these aspects restrained course instructors from asking for help during the decodification process. This means that political aspects are important in understanding the decodification process and should not be ignored (e.g. Contu and Willmott, 2003; Huzzard, 2004).

CK might need tacit knowledge to different extents depending on the degree of similarity between the context in which knowledge is codified and the context in which knowledge is decodified. The problem is that it might be difficult to map the 'degree of similarity' of the context, since context is a complex concept that possesses both objective and subjective dimensions (Thompson and Walsham, 2004), and its understanding must not be taken for granted.

CK needs tacit knowledge to differing degrees depending on the nature of knowledge contained in the specific course to be 'transferred'. As pointed out in the research findings section, qualitative courses have a higher portion of tacit elements than quantitative courses. This implies that, not only does the codification process of those courses need to be different, but also the amount of knowledge plausible to codify is different, and this brings implications for the decodification process and for the KT mechanisms used. Decodification in qualitative courses calls for differentiated resources and methods, since codified knowledge (textbooks) and semi-codified knowledge (lectures) will be unlikely to promote sharing of the tacit component. Similarly, because of the high number of tacit components contained in qualitative courses, knowledge transfer mechanisms that involve socialization, such as group discussion and case studies, seem to be necessary in order to cope with the tacit elements of the course. Conversely,

in the case of quantitative courses, knowledge transfer mechanisms that use codified means, such as textbooks and course guidelines, seem to be adequate to support knowledge decodification and transfer. The above means that organizations need to consider the extent of tacit elements contained in codified knowledge (CG) in order to organize differentiated processes to support knowledge transfer and decodification.

While the literature has posited that codification and decodification are two sides of the same process (Hall, 2006), organizations still continue to separate these activities since it is part of the mass production/consumption business model. Although there are well known economic benefits, the separation of knowledge creation from knowledge use cannot be taken for granted. There is a view (Wood, 2002) that suggests that it is not possible to separate knowledge production from knowledge use. There is also the problematic situation of experts disclosing their knowledge during the codification stage (e.g. Lazaric and Denis, 2001; Roberts, 2006). Here lies a contradiction of what we have called the new division of knowledge. On the one hand, attempting to re-integrate knowledge codification and knowledge decodification challenges the basic pillars of the mass education model. The very idea of the division of knowledge is that, by fractioning codification and decodification, not only will distribution (replication) costs be lower, but more importantly, its appropriation, storage, and marketing will become feasible. On the other hand, the non-integration of those elements might eventually cause its failure since their integration seems to be crucial for a 'complete' knowledge transfer. Moreover, this new division of knowledge can also be perceived as a modern form of skill polarization, with its attached employment and industrial relations issues, such as the one that occurred with the introduction of automated manufacturing technology in the 1980s (see Wood, 1990). This means that the deployment of codification strategies must be inserted within the new division of knowledge debate and not as an isolated behavioral or organizational event in the pursuit of organizational efficiency.

HEI's 'codification strategy' converges with what Suddaby and Greenwood (2001) have called the 'commodification' of knowledge, that is, the idea of reducing knowledge to a routinized and codified product. Knowledge commodification was based on the appropriation, storage and distribution (sale) of a product (course). Appropriation occurred when expert professors articulated, codified, and formalized part of their knowledge in a written document (CG). After expert professors delivered the newly-developed CG, codified knowledge contained in the CG become the intellectual property of HEI. The CG, however, needed to follow a detailed template that was borrowed from a United States higher education institution. Under this template, teaching and academic knowledge is pasteurized in order to look professional, rational, and more particularly, of universal application and unproblematic. This process, as Heusinkveld and Benders (2005) found in knowledge-intensive professional firms, increases the products' marketability.



## CONCLUSIONS

The aim of this study was to contribute to enhancing the understanding of the process of CK transfer. The theoretical framework integrated both education and knowledge and learning literatures. Rather than focussing on the micro psycho-cognitive processes that evolve during the codification or decodification processes, we have targeted the socio-organizational aspects that shape its main outcomes. Codified knowledge transfer was broadly defined as encompassing three interrelated processes: knowledge codification, use of a mechanism to transfer knowledge, and knowledge decodification. Cutting across these stages, two crucial dimensions were examined: context characteristics and the portion of tacit elements required by CK. Specifically, we empirically examined one instance of the process of transfer of CK at a higher education institution: from knowledge codification (by expert professors) of both academic and teaching knowledge, to knowledge decodification by course instructors, using ‘course outlines’ as the sole mechanism to ‘transfer’ knowledge. The empirical findings have shown that the process of transfer of CK is not without problems.

On the one hand, it was pointed out that some aspects that shape the CKT process are linked to the different assumptions that key stakeholders have regarding the nature of knowledge, the supporting or constraining roles that contextual forces might take, and the extent to which CK needs—in higher or lower extent-- tacit knowledge. On the other hand, our evidence has also indicated that the application of ‘codification strategies’ is not only part of a larger mass-education policy, but also a deliberate attempt to ‘commodify’ (Suddaby and Greenwood, 2001) academic and teaching knowledge, that is, to ensure the appropriation of academic and teaching knowledge and the conversion of that knowledge into an objective product (course outlines) that can be stored and marketed. The commodification of knowledge, however, represents what we have called a new division of knowledge. This is a new form of organizing knowledge that involves dividing knowledge, codifying it, and replicating it by third parties. The paradox of this situation is that, while knowledge codification entails the division of codifiers and decoders, in order to be effective, the CK transfer process needs the re-integration of codification and decodification activities. That is, because CK requires tacit knowledge in different extents, there is a need to use social-based mechanisms that might support, but not assure, the assimilation, translation, and adaptation of codified knowledge by end-users. The latter, simultaneously, goes against the very idea of knowledge commodification. We argue that, unless this tension embedded in the commodification process is considered, ‘conventional’ codification efforts are likely to fail in situations involving different contexts and CK requiring tacit knowledge in significant extent.

This study has contributed to the understanding of the CKT process since we have applied a systemic approach examining the three main phases of the codification process focussing on non-routine knowledge intensive activities. This is important, because the conventional research on CK has usually

focussed on knowledge for routine activities that usually possess a low portion of tacit elements. Our study, by comparing CK requiring a high and low portion of tacit elements in different contexts, has shed additional light on the CK transfer process. The usual strengths and weaknesses of case study research apply.

## REFERENCES

- Ancori B, Bureth A & Cohendet P (2000) The economics of knowledge: The debate about codification and tacit knowledge, *Industrial and Corporate Change*, 9(2), 255-287.
- Argote L & Ingram P (2000) Knowledge transfer: A basis for competitive advantage, *Organizational Behavior and Human Decision Processes*, 82(1), 150-169.
- Argote L, McEvily B & Reagan R (2003) Managing knowledge in organizations: An integrative framework and review of emerging themes, *Management Science*, 49(4), 571-582.
- Argote L & Darr E (2002) Repositories of knowledge in franchise organizations, in Dosi G, Nelson R & Winter S (Eds) *The Nature and Dynamics of Organizational Capabilities*, Oxford University Press, New York.
- Bryman A & Bell E (2003) *Business Research Methods*, Oxford University Press, New York.
- Burrell G & Morgan G (1979) *Sociological Paradigms and Organizational Analysis*. Heinemann, London.
- Castro CM (2000) *TechKnowLogia*, November-December, 45-47.
- Clegg S & Ray T (2003) Power, rules of the game and the limits of knowledge management: Lessons from Japan and Anglo-Saxon alarms, *Prometheus*, 21(1): 23-40.
- Contu A & Willmott H (2003) Re-embedding situatedness: The importance of power relations in learning theory, *Organization Science*, 14(3), 283-296.
- Cowan R (2001) Expert systems: Aspects of and limitations to the codifiability of knowledge, *Research Policy*, 30, 1355-72.
- Cowan R, David P & Foray D (2000) The explicit economics of knowledge codification and tacitness, *Industrial and Corporate Change*, 9(2), 211-253.
- Czarniawska B & Joerges B (1996) Travel of ideas, in Czarniawska B & Sevon G (Eds), *Translating Organizational Change*, Walter de Gruyter, Berlin.
- Davenport T & Prusak L (1998) *Working Knowledge: How Organizations Manage What They Know*. Harvard Business School Press, Boston.
- Dixon N (2000) *Common Knowledge*, Harvard Business School Press, Boston.
- Eisenhardt K (1989) Building theories from case study research, *Academy of Management Review*, 14(4), 532-550.

- Empson L (2001) Introduction: Knowledge management in professional service firms, *Human Relations*, 54(7), 811-817.
- Ernest P (1998) Situated cognition and the learning of mathematics, in Watson A (Ed), *Mathematical Knowledge and Context*, Oxford University Press, Oxford.
- Fontana A & Frey J (1998) Interviewing: The art of science, in Denzin N & Lincoln Y (Eds), *Collecting and Interpreting Qualitative Materials*, Sage, Thousand Oaks.
- Glisby M & Holden N (2003) Contextual constraints in knowledge management theory: The cultural embeddedness of Nonaka's knowledge-creating company, *Knowledge and Process Management*, 10(1): 29-36.
- Grimaldi R & Torrisci S (2001) Codified-tacit and general-specific knowledge in the division of labour among firms – A study of the software industry, *Research Policy*, 30, 1425-1442.
- Guzman G & Wilson J (2005) The “soft” dimension of organizational knowledge transfer, *Journal of Knowledge Management*, 9(2), 59-74.
- Hall M (2006) Knowledge management and the limits of knowledge codification, *Journal of Knowledge Management*, 10(3), 117-126.
- Hansen M, Nohria N & Tierney T (1999) ‘What’s your strategy for managing knowledge?’, *Harvard Business Review*, March-April, 106-116.
- Hazlett S-A, McAdam R & Gallagher S (2005) Theory beliefs in knowledge management, *Journal of Management Inquiry*, 14, 31-42.
- Heusinkveld S & Benders J (2005) Contested commodification: Consultancies and their struggle with new concept development, *Human Relations*, 58(3), 238-310.
- Huzzard T (2004) Communities of domination? Reconceptualising organizational learning and power, *The Journal of Workplace Learning*, 16(6), 350-361.
- Johnson B, Lorentz E & Lundvall B-A (2002) Why all this fuss about codified and tacit knowledge?, *Industrial and Corporate Change*, 11(2), 245-262.
- Lave J & Wenger E (1991) *Situated Learning: Legitimate Peripheral Participation*, Cambridge University Press, Cambridge.
- Lazaric N & Denis B (2001) How and why routines change: Some lessons from the articulation of knowledge with ISO 9002 implementation in the food industry, *Économies et Sociétés*, 6(4), 585-611.
- Lazaric N, Mangolte P-A & Massue M.-L (2003) Articulation and codification of collective know-how in the steel industry: Evidence from blast furnace control in France, *Research Policy*, 32, 1829-1847.
- Leonard-Barton D (1998) *Wellsprings of Knowledge*, Harvard Business School Press, Boston.

- Lillrank P (1995) The transfer of management innovations from Japan, *Organization Studies*, 16(6), 971-990.
- Lynch R, Leo S & Downing K (2006) Context depended learning: Its value and impact for workplace education, *Education + Training*, 48(1), 15-24.
- McLellan H (1994) Situated learning: Continuing the conversation, *Educational Technology*, 34, 7- 8.
- Morris T (2001) Asserting property rights: Knowledge codification in the professional service firm, *Human Relations*, 54(7), 819-838.
- Nicolini D, Gherardi S & Yanow D (2003) Introduction: Toward a practice-based view of knowing and learning in organizations, in Nicolini D, Gherardi S, & Yanow D (Eds), *Knowing in Organizations*, ME Sharpe, Armonk, New York.
- Nightingale P (2003) If Nelson and Winter are only half right about tacit knowledge, which half? A Searlean critique of codification, *Industrial and Corporate Change*, 12(2), 149-183.
- Nonaka I and Takeuchi H (1995), *The Knowledge-Creating Company*, Oxford University Press, New York.
- Olivera F (2000) Memory systems in organizations: An empirical investigation of mechanisms for knowledge collection, storage and access, *Journal of Management Studies*, 37(6), 811-832.
- Prencipe A & Tell F (2001) Inter-project learning: Processes and outcomes of knowledge codification in project-based firms, *Research Policy*, 30, 1373-1394.
- Pea R (1987) Socializing the knowledge transfer problem, *International Journal of Education Research*, 11(6), 639-663.
- Polanyi M (1983) *The Tacit Dimension*, Peter Smith, Gloucester, MA.
- Poole MS and Van de Ven A (1989), Using paradox to build management and organization theories, *Academy of Management Review*, 14(4): 562-578.
- Ribeiro R & Collins H (2007) The Bread-making machine: tacit knowledge and two types of action, *Organization Studies* (forthcoming).
- Roberts J (2000) From know-how to show-how? Questioning the role of information and communication technologies in knowledge transfer, *Technology Analysis & Strategic Management*, 12(4), 429-443.
- Roberts J (2006) Limits to communities of practice, *Journal of Management Studies*, 43(3), 623-639.
- Ruggles R (1997) Tools for knowledge management: An introduction, In R Ruggles (Ed), *Knowledge Management Tools*, Butterworth-Heinemann, Boston.
- Schultze U & Stabell C (2004) Knowing what you don't know? Discourses and contradictions in knowledge management research, *Journal of Management Studies*, 41(4), 449-573.
- Senge P (1990) *The Fifth Discipline*, Century Business, London.

- Simonin B (1999) Ambiguity and the process of knowledge transfer in strategic alliances, *Strategic Management Journal*, 20(7), 595-623.
- Sole D & Edmondson A (2002) Situated knowledge and learning in dispersed teams, *British Journal of Management*, 13, 17-34.
- Spender J (1993) Competitive advantage from tacit knowledge?, *Academy of Management, Best Paper Proceedings*, 37-41.
- Suddaby R & Greenwood R (2001) Colonizing knowledge: Commodification as a dynamic of jurisdictional expansion in professional service firms, *Human Relations*, 54(7), 933-53.
- Szulanski G (1996) Exploring internal stickiness: Impediments to the transfer of best practice within the firm, *Strategic Management Journal*, 17, 27-43.
- Szulanski G (2000) The process of knowledge transfer: A diachronic analysis of stickiness, *Organizational Behaviour and Human Decision Processes*, 82(1), 9-27.
- Tennant M (2001) Is learning transferable?, in Boud D and Garrick J (Eds), *Understanding Learning at Work*, Routledge, London.
- Thompson M & Walsham G (2004) Placing knowledge management in context, *Journal of Management Studies*, 41(5), 725-747.
- Tsoukas H (2005) Do we really understand tacit knowledge?, in Easterby-Smith M & Lyles M (Eds), *The Blackwell Handbook of Organizational Learning and Knowledge Management*, Blackwell, Oxford.
- Tsoukas H & Vladimirou E (2001) What is organizational knowledge?, *Journal of Management Studies*, 38(7), 973-993.
- Turner K & Makhija M (2006) The role of organizational controls in managing knowledge, *Academy of Management Review*, 31(1), 197-217.
- Vince R, Sutcliffe K & Olivera F (2003) Organizational learning: New directions, *British Journal of Management*, 13, S1-S6.
- Wood M (2002) Mind the gap? A processual reconsideration of organizational knowledge, *Organization*, 9(1): 151-171.
- Yin R (1981) The case study crisis – Some answers, *Administrative Science Quarterly*, 26, 423-35.
- Zack M (1999) Managing codified knowledge, *Sloan Management Review*, 40(4), 45-58.
- Zahra S & George G (2002) Absorptive capacity: a review, reconceptualization and extension, *Academy of Management Review*, 20(2): 185-203.
- Zollo M (1998) Knowledge Codification, Process Routinization and the Development of Organizational Capabilities: Post-acquisition Integration in the U.S. Banking Industr, Unpublished doctoral dissertation, University of Pennsylvania, Philadelphia, PA.
- Zollo M & Winter S (2002) Deliberate learning and the evolution of dynamic

Capabilities, *Organization Science*, 13(3), 339-352.

TYPE OF CK CKT PROCESSS	Context	Low portion of tacit knowledge		High portion of tacit knowledge	
		From HEI to U-one	From HEI to U-two	From HEI to U-one	From HEI to U-two
<b>CODIFICATION</b> <ul style="list-style-type: none"> <li>•Assumptions regarding nature of Knowledge</li> <li>•Assumptions regarding end-users</li> <li>•Assumptions regarding end-users' context</li> </ul>					
<b>KT MECHANISMS</b> <ul style="list-style-type: none"> <li>•People-based mechanisms</li> <li>•Technology-based mechanism</li> </ul>					
<b>DECODIFICATION</b> <ul style="list-style-type: none"> <li>•Assumptions regarding nature of knowledge</li> <li>•Assumptions regarding end-user experience</li> <li>•Assumptions regarding end-user context</li> <li>•Relation with sender</li> </ul>					

Figure 1: The Analytical Framework