An Enquiry into the Extraction of Tacit Knowledge

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Introduction

The extraction of knowledge from a person or group of people is becoming a growing factor in how business is conducted in the 21st century. It is no longer satisfactory to simply employ people who can do the job. We must know how they do it. We must understand the processes behind their work. Transparency is the key for both maximising our productivity and safeguarding our sustainability.

Arguably the most useful knowledge that one can capture is tacit knowledge. This is, broadly speaking, knowledge that resides in the sub-conscious level of the human mind. Simply put, it is knowledge that we know but we may not be aware that we know. Predictably, it is also the most difficult to capture accurately.

This essay aims to provide a brief enquiry into the nature of tacit knowledge as well as some of the aspects of the extraction. I will begin by providing a brief description of what is meant by tacit knowledge. I will then endeavour to illustrate some of the difficulties in extracting tacit knowledge and indeed, why we would want to even extract it in the first place. I will then provide a brief non-exhaustive survey of some methods currently used in the extraction of tacit knowledge. I will conclude with some thoughts for the future.

What is Tacit Knowledge?

It is difficult to estimate the entire nature of knowledge. It can be regarded as a spectrum where one extreme can be seen as entirely tacit knowledge and the other as completely explicit and codified knowledge [2][9].

The explicit expression, tacit knowledge, was introduced by Michael Polanyi (1958/1974), although the idea that certain thoughts and knowledge were contained in areas that were inaccessible to a conscious process (a cognitive unconscious [13]) goes back at least as far as Helmholtz's work in the 19th century.

[14] describes two distinct types of knowledge, namely tacit and explicit. These can be expressed in the form of knowing-how and knowing-that, respectively. Tacit knowledge can also be thought of as embodied and explicit knowledge as theoretical [14].

Explicit knowledge refers to knowledge that is learned and is consciously accessible by the holder. It may refer to knowledge that has been learned through explicit instruction or recitation, or to a skill acquired through repetition. Explicit knowledge may refer to such declarative knowledge that the holder may know to be true, but only through instruction that they are so. Once we acquire this skill, [12] argues that we also acquire a corresponding articulation that defies understanding. Therefore, we no longer need to hold such declarative knowledge once we have transcended from novice to expert level.

Tacit knowledge (or embodied knowledge) is a prime characteristic of an expert who can act, work and make judgements without having to directly reference the declarative knowledge behind the decisions. The expert works without any explicit theory as to why they work in that particular way, they just perform skillfully without any serious deliberation or hesitation.

Knowledge resources have been described with the paradigm of an iceberg [1]. The structured, explicit knowledge can be thought of as the visible area of the iceberg above the water. This part is easy to see, easy to investigate and recognise and is, therefore, easier to share. The part of the iceberg beneath the water can be thought of as the tacit knowledge area. There is an unquantifiable mass under the surface that is difficult to see, estimate and investigate.

Why do We Want to Extract it?

There are many reasons to warrant the extraction of tacit knowledge other than for simply research purposes. Many organisations are experiencing the departure of experienced and highly knowledgeable people. These people who are leaving take with them a substantial amount of knowledge, not only business-specific information, but also knowledge that has been instructed to them in order for them to do their job correctly. It is this knowledge that, preferably, the organisation would like to retain hold. The overall aim of extracting tacit knowledge in this case is to mitigate the negative consequences observed by the removal, moving on or retiring of experienced personnel. This has been referred to as "Human Capital" which is the knowledge, skills, experiences and intuitions within an organisation [17].

The dissemination of scientific knowledge into the public arena represents an ongoing concern within the scientific community [6]. One of the problems in this area is the "laymenisation" of terms used by experts in order for them to be understandable by the public. As the expert possesses a large amount of tacit knowledge on the subject, he/she may miss it out when attempting to transmit knowledge to the public. The public who, in turn do not possess this tacit knowledge, will not understand the high-level language of the expert. Means are therefore required to achieve this. A "middle-man" may be required who will interpret the expert's commentary, extract the relevant tacit knowledge connected with the subject and, subsequently, present the entire picture to the public in an understandable way.

If the nature of the presentation of knowledge to the public is ignored, journalistic sensationalism can replace accurate translation of scientific knowledge for the only reason that it can be readily grasped by the public [3].

The extraction of tacit knowledge plays an important role in the elicitation of requirements during the inception of a new product or system. Typically, a requirements engineer will have the task of finding out what current people are doing and how they are working. This usually involves the extraction of tacit knowledge; i.e., asking the stakeholders[1] how they use the current system so that we can build the requirements for the new system. They may or may not be willing to help elicit the requirements but however willing they may be, they will find it difficult to articulate knowledge that they don't know that they know. Stakeholders may tell you what they think they need, but this may not be what they actually may need. Furthermore, they are not even aware of this discrepancy.

Knowledge Management has been involved in many "big-money" business applications. For example, an oil-well that is on-line might cost between $100,000 and $200,000 a day to run so if you make a mistake that leads to the loss of just one day, then that is still a lot of money. One of the most successful methods of sharing knowledge in the oil industry is the setting up of knowledge communities that invite people to volunteer their experiences and share their tacit knowledge.

1 A stakeholder can be thought of as anyone who has anything to do (has a stake) with the system to be built. Typically, stakeholders will include; managers, users, customers, maintainers, and those funding the project.

Why is it Difficult to Extract?

Extracting tacit knowledge is an art rather than a specified, explicit process. The extraction of tacit knowledge is difficult because such knowledge is located actually inside the expert's head. This knowledge can be thought of as being stored at a subconscious level and is, therefore not documented anywhere. What makes the process even more difficult is that the person you're trying to extract it may not even regard it as actual knowledge; i.e., they may not even know that they know it.

The difficulty arises because we are trying to translate the tacit knowledge into explicit or codified knowledge. The process of this extraction involves extracting tacit knowledge from minds, making it explicit and then incorporating it in some database or system that we can use [16]. So, how do you get tacit knowledge into the form of explicit knowledge so that it can be codified and managed?

One of the problems with the extraction of tacit knowledge within a knowledge management context is identifying the people who possess the worthwhile knowledge. Much of the advice to managers for extracting tacit knowledge from their workforce concentrate in the identification the mangers and workers who possess valuable knowledge that has yet to be documented.

Another issue to arise from the difficulties of extracting tacit knowledge concerns the evaluation of the knowledge once it has been extracted. It is all very well extracting tacit knowledge from someone who possesses some degree of worthwhile knowledge, but there is likely to be some (or even a lot of) knowledge that is not relevant or has already been captured elsewhere. It is the role of the knowledge investigator to be able to differentiate between these kinds of not always obviously disparate knowledge.

The extraction of tacit knowledge has been shown to be very important and profitable. The next section endevours to cover some of the processes currently offered to extract tacit knowledge.

A Brief Survey of Current Methods for Extracting Tacit Knowledge

During this section, I will cover some of the more abstract ideas of tacit knowledge extraction followed by one or two examples of explicit processes currently used for the purpose. Knowledge management is the name given to the process whereby an organisation can obtain the greatest value from the knowledge that is currently available to it.

The process of tacit knowledge extraction within an organisation typically falls under the heading of knowledge management. Effective knowledge management may typically contain a combination of approaches such as socialisation, externalisation and internalisation [10]. These are taken from [10] and are described below.

Socialisation: This is the transfer and sharing of tacit knowledge between people. For example, a team meeting is an example of socialisation. Socialisation generally occurs between people who have a common culture and understanding (i.e., colleagues in a particular work force)[7]. Sharing of such tacit knowledge might take the form of a discussion on feelings or experiences or it may take the form of a discussion of current problems in which the participant empathise with each other's situations. Such a process often occurs in a very informal atmosphere and is, therefore, difficult to document and structure. Moreover, any attempt to apply a process or structure to socialisation can cause it to break down. Socialisation must appear natural, at least to the principle protagonists, in order for it to be successful.

Externalisation: This is the translation of tacit knowledge to explicit knowledge and is the issue of major concern of this essay. Through its nature (described above), tacit knowledge is difficult to convert into explicit knowledge. Processes for externalisation include conceptualisation, elicitation and ultimately articulation so that a portion of a person's tacit knowledge may be captured in explicit form. A number of approaches for externalisation will be described below.

Internalisation:[2] This refers to the conversion of explicit knowledge to tacit knowledge. The primary aim of teaching is (or should be) getting the student to internalise the knowledge that is being taught and inducing them to create their own tacit knowledge. Methods for achieving internalisation may include; getting the student to do it themselves, further reading and re-reading, continued assessment.

I shall now go on to describe some specific methods for the extraction of tacit knowledge. There are many companies that specialise in knowledge extraction, have their own specific tools, and charge their customers accordingly. As these tools and processes have obvious financial worth, it is difficult to persuade such companies to share them with me. Obviously, they want to keep it to themselves (unless I were to pay them for it). Therefore, the following is not an exhaustive list of all the methods available for knowledge externalisation, moreover it aims to deliver a brief survey of the principle methods that have been used and have been shown to work to some degree.

Facilitation

Facilitation has been shown to be an important process in the extraction of knowledge [15]. Although facilitation is not an explicit process, it is nonetheless an important aid to knowledge extraction. It is concerned with providing the necessary tools and resources in order for optimal knowledge extraction, transfer and transplantation. Such resources can include: providing the venue, equipment, experts, participants. It is concerned with making the stakeholders feel happy with the situation so that successful externalisation can take place.

Facilitation, when used appropriately, can make the flow of tacit knowledge effortless by simply reducing the effort it takes for the expert to express (externalise) knowledge whilst at the same time reducing the effort it takes for the recipients to internalise the knowledge. A discussion of the exact role of a facilitator is beyond the scope of this essay. However, more details can be found at www.facilitationfactory.com.

A Scenario Mediated Approach

A novel approach described in [17] proposes that tacit knowledge can best be extracted through a series of controlled challenge situations with the aim of allowing tacit knowledge to be utilised effectively to gain competitive advantage with a higher return-on-knowledge and experience. Rather than merely interviewing the domain expert or analysing the documentation, the domain experts are subjected to controlled challenges that are derived from existing solved real-life scenarios

The publication [17] describes the presentation of scenarios of hypothetical problems to healthcare experts and attempts to observe and record the tacit knowledge used when dealing with these problems. The problems are such that can not be solved using routine procedures, moreover they require the expert to use their ingenuity to solve the problem in order to bring their tacit knowledge to the foreground.

2 Although this form knowledge transfer is not wholly applicable to the topic of the essay, it is included for completeness. It may also be important to understand how explicit knowledge is transferred into tacit knowledge so as to have a better idea as to how it can extracted (i.e., externalised).

This process attempts to chart out the domain expert's thought processes and mental models for a set of well-defined problems. It has been shown in [17] that natural phenomena can be effectively adapted into Knowledge Management efforts to refine and categorise knowledge.

Mining Semantic Associations

The focus of this approach [11] is based on the automatic uncovering, extraction and sharing of knowledge (both explicit and tacit). Textual communication between a target group of people are processed and then converted into a high dimensional context space in which words are represented as weighted vectors with the number of dimensions consisting of other associated words. This context space is created by the hyper-space analogue to language (HAL) algorithm [5], which has been shown to possess similarities with the way that words are semantically linked by humans [4].

This contextual space allows the semantic linkage to be viewed and considered in a natural manner. The position and representation of the entities within the context space can be used to provide a degree of similarity of the respective words. Tacit knowledge can be uncovered by examining the elements of the space in relation to each other.

An simple example described in [11] is an examination of the word “John”. This examination leads to other proper names such as “David” and “Peter”, which have close association with “John”. The system can conclude that the entities “John”, “David” and “Peter” are closely related, i.e., they are friends.

Conclusion/Thoughts for the Future

The extraction, documenting and encapsulation of explicit knowledge is generally well understood and there are several commercial COTS (Customisable Off-The-Shelf) applications exist for such a purpose [8]. This allows the organisation to get value from the knowledge of their workforce and enables knowledge components to be re-used and freely transferred throughout the organisation. There is, however, a large amount of tacit, implicit knowledge that is lost when an employee leaves the organisation.

This essay has sought to investigate some of the methods that are available for tacit knowledge extraction and retention as well as providing some background to the subject.

It is clear that there is still some way to go in order to successfully minimise knowledge loss from organisations, although there are already many businesses focussed on contracting their services to organisations wishing to do that very thing. To date, there appears little research (that I could find) as to the specific nature of tacit knowledge. As a result, most applications have taken a pragmatic approach to tacit knowledge extraction with little regard to why their application enjoys success or not.

I propose that more research is needed into the specific nature of tacit knowledge. It is my belief that people can be trained to recognise their own tacit knowledge. If you were to ask most people how they get to sleep, most will likely remark that they don't know; they just do it. However, it is very common, especially in Japan for example, for people (often high-powered businessmen who get very little proper sleep[3]) can make themselves fall asleep in a very short time frame to exhibit “power-napping”. Such people have clearly learned what it takes for them to fall asleep, whereas the rest of us are still unaware.

3 Here, proper sleep is meant to refer to sleeping at bed time.

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