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Mapping Tacit Knowledge Flows within Organisation X

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Abstract

We present the findings of research conducted by way of a complete pilot study on two teams within an organisation we choose to label organisation X. Certainly from a knowledge management perspective, tacit knowledge is vital in preventing knowledge loss from skilled staff leaving the workplace and taking the 'soft' knowledge with them. More proficient means of capturing this knowledge by mapping who is likely to be more tacit knowledge savvy and how these personnel interact with other staff may yet provide the key to better attaining a handle on its diffusion. What we present here is our research into assessing tacit knowledge capabilities of individuals but also importantly the inter-personal relationships of individuals as a means of determining likely tacit knowledge transfer. Our methodology utilises both a psychological and social network approach at a macro level. What we present here are the results of a pilot study whilst detailing our methodology at more of a micro level. Within this paper, we focus on our tacit knowledge research from a quantitative positivistic perspective. Results seem to suggest that certain personnel who are not necessarily considered experts may be good tacit knowledge receptors, whilst personnel in general may be too reliant on electronic means of information transfer which impedes the tacit knowledge diffusion process.

Keywords

AL01 Knowledge representation; AL04 Knowledge acquisition; AP Psychology; AI0801 Positivist perspective; DD07 Information flows; FC15 IS models; HB26 Simulation and modelling IS; Formal Concept Analysis; Social Network Analysis; Codified Knowledge; Tacit Knowledge; articulable Tacit Knowledge; Diffusion of knowledge

INTRODUCTION

It is the 'sticky' nature of information (Ramaprasad and Rai 1996), which provides us as researchers with an exemplary reason to undertake tacit knowledge related research. While for millennia now, articulate or codified knowledge has been the primary researched domain of knowledge sharing, attention is now slowly being turned to unlocking tacit knowledge. Our research focuses on the tacit knowledge component of the IS organisational domain. More specifically, we wish to test for tacit knowledge concentrations in individuals and how likely it is that tacit knowledge, given its competitive nature (Sternberg 1999) are transferred from one individual to the next within the context of the IS field. Within this paper however we limit ourselves to presenting initial research results from a pilot study undertaken within a large organisation we shall refer to as Organisation X. In order to illustrate likely tacit knowledge differences between individuals we adopt expert – novice comparisons where an expert or more experienced individual is considered to make greater use of their tacit knowledge resource. By comparing the results of our general control group population with that of an expert sample population, we attain closeness of fit between that of an 'average' individual and an 'expert', and thus determine the tacit knowledge utilisation of individuals. Furthermore, as we are seeking to visualise intra – organisational knowledge flows, Social Network Analysis (SNA) permits us to map interactions between individuals and how likely or otherwise soft knowledge is able to be transferred. For discovery of shared features and illustration of the tacit knowledge identified, we use Formal Concept Analysis (FCA), whilst the processing of SNA results is achieved with Netmap Analytics™ software. In other words we seek to:

- (a) determine who as an individual has more tacit knowledge than others, and
- (b) map the interactions between personnel in terms of how they transfer or perhaps do not transfer their tacit knowledge within the workplace.

We use the terms IT and IS concurrently here to mean people working within the computing field. Given that we are exploring tacit knowledge diffusion within the extra-educational domain, our use of the terms IT and IS does not include academics or students.

While we all acknowledge the Hungarian-born Oxford chemist turned philosopher, Polanyi (1958; 1967; 1968) as the father of the term tacit knowledge, the Austrian economist Hayek (Ebeling 1999) had some decades

earlier, in fact first considered the concept of inarticulate knowledge. Undoubtedly one of the most controversial issues in tacit knowledge research relates to defining the term itself. Definitions have varied from 'all purpose algorithms', 'rules of thumb', 'hunches', 'innovation', 'non focus on parts', 'practical intelligence', 'possessed by itself', 'action slips' and 'reflection upon reflection' to name but a few. And whilst it could be argued that tacit knowledge by its very definition is not able to be articulated, for the purposes of our research we focus more on the 'in between the lines' knowledge which to some degree is able to be codified. Nevertheless it may indeed be the type of knowledge people are not inclined to articulate for competitive reasons (Sternberg 1999). For all the above definitions others have defined before us, we consider tacit and/or inarticulate knowledge to be, "... terms refer[ing] to the kind of knowledge we all possess about how to do many things in daily life but which we all would find difficult to explain or formalize into a simple textbook formula for others to completely understand and easily copy" (Ebeling 1999).

Although interest in tacit knowledge is increasing (Donaldson 2001; Horak 2001; Athanassiou and Nigh 2000; Osterloh and Frey 2000; Thorburn 2000), few means actually exist to measure this type of knowledge, among which Sternberg's (1999) approach could be said to be the most practical because of its more applied nature. Other known approaches to tacit knowledge measurement involve mental scanning (Reed, Hock and Lockhead 1983), or grammatical memorisation tasks (Reber 1993). Another approach is that of software that sifts employee email with a view to establishing an organisational tacit knowledge 'database' based on keyword occurrences within messages (Anon. 2001; Fridman 1999; Lattig 1999; Ploskina 1999). From a workplace point of view, arguably Sternberg's approach is the most feasible for measuring both expertise and likelihood that an individual is making use of their 'street – smart' as opposed to 'book – smart' knowledge. Sternberg's (1999) premise, built on years of research is that in general the more senior (in terms of experience rather than age), the individual, the more likely they are to make use of tacit knowledge. Nonaka's research (Nonaka, Takeuchi and Umemoto 1996; Nonaka, Ray and Umemoto 1998) on the other hand, indicates that tacit knowledge is culturally influenced, in that this knowledge form is more prized in Japan for example where nuances and body language play a greater role than the objective, financially oriented, scientific and Tayloristic management oriented west.

Lam (2000) identified the pluralistic epistemological perspectives of Polanyi's, Nelson and Winter (1982 in Lam 2000), and Nonaka's (*et.al.* 1996; *et.al.* 1998) work in the organisational domain, namely that the combination of explicit and tacit knowledge lead to the creation of new organisational knowledge, hence the increasing importance of tacit knowledge in the knowledge management domain. The social embeddedness (Granovetter 1985 in Lam 2000) of our study is primarily focused at the cognitive level, rather than at the organisational or societal level. Furthermore, our ontology is positivistic for we as externally located organisational researchers treat knowledge in this instance as a measurable resource, whilst we at that same time consider our research not to affect the subject and object under study. Furthermore, we are interested in obtaining a 'snapshot' of an organisation's tacit knowledge diffusion profile, rather than undertaking longitudinal research.

METHODOLOGY

Although we broadly follow the techniques of Sternberg's (1999; Wagner and Sternberg 1991a; 1991b; Wagner and Sternberg 1990), research into Tacit Knowledge at Yale University, we choose specifically to focus on the Information Systems domain. Tacit knowledge is contextual, as such our research along with others (Sternberg 1999; Colonia-Willner 1999) makes use of expert vs. novice comparisons but importantly that these comparisons should take place *within* the *same* organisation, rather than comparing one organisation's tacit knowledge profile with another's. To that end, in December of 2000 an organisation selection process took place, whereby of 28 organisations sampled, some 8 felt interested enough to participate in our study of tacit knowledge diffusion. Of these 8, it was decided to proceed with one of these for the meantime, within which a CIO was particularly interested in what we were researching. For the purposes of confidentiality, we shall refer to this organisation as Organisation X. It is however a large privately listed, nationally based company with a Software Engineering staff profile of some 400 personnel, and a total IT profile of 1,400 personnel.

Given that we were researching IT related tacit knowledge, and that only IT practitioners were to be participants in our research, we felt justified in producing an electronic web based questionnaire, with the not unreasonable assumption that IT practitioners would be able to access a URL and use a mouse to fill out our questionnaire. To that end January to March of 2001 saw programming of the beta version of the questionnaire take place, incorporating 3 sections. The coding utilised Javascript with a CGI backend, which was extensively custom tailored from sample templates that existed on the Internet.

The first section was a biographical one, asking for age brackets and gender (two questions which were not compulsory); language other than English spoken; Occupation Now; Occupation 3 years ago; Occupation 6 years ago; No. of years with the present organisation; ACS level (regardless of whether respondents were members); Permanent or Contract position within the current organisation; No. of years of IT experience in general; No. of subordinates; Societies the respondent may happen to be a member of; Highest formal

qualification and Computing/Industry specific qualifications. The second component of the questionnaire related to Social Network Analysis. We wished to track the relationships of IT participants. To that end respondents were asked to select the individuals with whom they networked; the importance of the individual in relation to themselves; the frequency with which they met the individual and finally the type of occasion, in other words from formal organisational meetings through to email. Given that the questionnaire was going to incorporate the SNA component meant that anonymity would only be possible through individual de-identification. As such it was particularly necessary for the University's Ethics Committee to be in a position to sanction the research. The Ethics approval process took place from November 2000 through to January of 2001. The third component incorporated the coded tacit knowledge scenarios with answer options and for each answer option, a Likert scale. Error checking routines were incorporated into each question with the exception of age, gender and the social network analysis section. It was not felt advisable by the researchers to *force* people to indicate with whom they interacted or understandably for that matter stipulating in the questionnaire a minimum number of people with whom they had to provide details of their social workplace interaction.

Although 16 scenarios were originally formulated (through a separate development process), and Sternberg's approach makes use of some 12 scenarios with between 5 to 20 answer options per scenario, we felt that given the time constraints on the average IT practitioner. Requiring our respondents to spend up to 2 hours filling out a questionnaire would have been unreasonable, and likely would have led to a very low response rate, with a high error rate due to the questionnaire not being taken seriously. To that end, our questionnaire for our complete pilot study incorporated only 6 scenarios with their answer options. However, two answer values would have to be provided for each answer option (ethical and realistic), multiplied in turn by anywhere between 5 to 13 answer options per scenario, multiplied by 6 scenarios; a social network analysis section; and some 13 biographical questions, meant that a respondent had in excess of 120 answers to provide. Remarkably, the questionnaire seemed to take respondents only 20 – 30 minutes to fill out. We feel the reason for this was its electronic nature. The nature of the tacit knowledge inventory with its scenarios and associated answer options may be gauged from figure 1. In essence a subjective 'soft knowledge' judgement is called for which tests the management or experience based knowledge of the individual, for tacit knowledge is considered relevant to managing oneself, one's career and others (Wagner and Sternberg 1991b). The expectation of the respondent to choose both an ethical and realistic Likert scale choice provides a 'reality check' for how 'street smart' an individual is considered to be compared to that of an expert in terms of how the latter would deal with the scenarios. We illustrate scenario 11, answer options 1 and 5 as we provide results for this particular set of questions in this paper.

The group of respondents to be chosen for complete pilot study was the decision of the senior Software Development Engineer in Organisation X. Two pilot groups were involved. One group consisting of 26 people were to be the 'control' group, the other group consisting of 7 personnel were to be the 'expert' group. They were deemed to be experts by their peers, in other words they were highly proficient in achieving their workplace tasks and were generally admired by their peers. Response rates for the control group were 20 out of 26 (77%). The response rate for the expert group was 100%, which may have had something to do with the fact that the 'expert' respondents were told they were as such, and that their results would provide comparisons with the 'control' group. For the next phase of the research however we will simply ask all respondents as part of the social network section of the questionnaire to name someone they feel is proficient at performing their workplace tasks. A compilation of the results of these people at data processing time would then permit us to perform expert vs. novice comparisons, once again, because the results of respondents are not anonymous, but of course de-identifiable.

RESULTS

Results of our exploratory research proved informative but given the small sample size we do not claim high confidence in our statistical results. We are using this final complete pilot study as a means of firstly testing our methodology, secondly debugging our electronic questionnaire. Finally, we wish to establish de-identified results that may be provided to the CIO so that we may progress with the next stage of our research, namely performing tacit knowledge mapping for the rest of the IT team within Organisation X, before we move on to concurrently performing similar analyses in organisations Y and Z. We envisage completing our research in some 6 – 8 organisations of varying sizes within the next 12 months.

Scenario 11

A newly appointed team member appears to lack competency in certain software engineering aspects that your group is working on.

Admittedly this person's background is more in the technical writing area, however you feel he should be a little more competent in understanding algorithms, parameter passing, functional and object oriented structures of software.

Although you are not the team leader, you feel it is your duty to point out the deficiencies in your colleague's software oriented knowledge.

The critical nature of this project means that failures will not be well tolerated and you are facing a fine time deadline.

Rate each of the following responses in relation to the given scenario. It is advisable to read all of the responses before replying.

1. Quietly pull the team member aside and suggest they may be better off engaging themselves on a different project

ETHICAL						
Choose	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
one:						
	Extremely Bad		Neither Good nor Bad		Extremely Good	
REALISTIC						
Choose	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
one:						
	Extremely Bad		Neither Good nor Bad		Extremely Good	

5. 'Have it out' with the person and tell them of your criticisms in front of the group in the hope they will see your side of things

ETHICAL						
Choose	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
one:						
	Extremely Bad		Neither Good nor Bad		Extremely Good	
REALISTIC						
Choose	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
one:						
	Extremely Bad		Neither Good nor Bad		Extremely Good	

Figure 1: illustrating Tacit Knowledge Inventory Scenario 11, answer bank items 1 and 5

In general although both control and expert groups were similar in makeup, the expert group was of noticeably smaller composition. The make up of the two groups is shown in table 1, which we present numerically rather than percentage-wise given the small sample sizes of our pilot groups. We have included age related information as research (Colonia-Willner 1999; Sternberg 1999) suggests that this factor plays a major role in tacit knowledge utilisation specifically and task related performance in general, and language other than English was felt to be vital in determining how much of an impact culture may play in knowledge transferral (Gudlaugsdottir 2001). Although space limits us in discussing in depth even a minor pilot study, nevertheless we can easily see that our control and expert groups fit typically within the 35 – 44 year age bracket and tend to be tertiary educated IT management practitioners. Furthermore, the respondents tend not to be graduate entry-level practitioners. Whilst not all at the CIO level (ACS Level 5), they typically have specialised experience (Level 3). Although the confidence levels are not high, it is interesting to note the gender and language background similarities between the expert and pilot control groups. The point we make with the descriptive statistics is that we are able to see in each instance that although the expert group is smaller than the pilot group, their scores rate lower on the Likert scale. In other words, the experts seem to favour responses that are more negative overall both ethically and realistically to the scenarios they are presented. Note that respondents answered 6 tacit knowledge scenarios in total and were presented with Likert scale values from 1: Extremely Bad, to 4: Neither Good nor Bad, through to 7: Extremely Good.

Formal Concept Analysis

As a counter-balance along triangulated research designs to descriptive statistics, we provide an alternative means of expressing the data by way of Formal Concept Analysis, based upon the work of Wille (Ganter and Wille 1999). FCA is a set-theoretic approach that views a concept formally as being comprised of a set of objects, (G)egenstande; and a set of attributes, (M)erkmale; and the relationship between them (I). Knowledge is seen as applying within a context, which can be represented as a crosstable. This crosstable is known as a Formal (K)ontext which may be formally expressed thus:

$$K := (G, M, I)$$

Biographical information			
Pilot 'Expert' Group		Pilot 'Control' Group	
No. of People	7	No. of People	20
No. of Females:	3	No. of Females:	8
Age Group: Unknown	0	Age Group: Unknown	1
Age Group: 20 – 24	0	Age Group: 20 – 24	1
Age Group: 25 – 29	0	Age Group: 25 – 29	1
Age Group: 30 – 34	0	Age Group: 30 – 34	1
Age Group: 35 - 39	4	Age Group: 35 - 39	8
Age Group: 40 – 44	2	Age Group: 40 - 44	7
Age Group: 45 - 49	1	Age Group: 45 - 49	1
Languages other English:	Cantonese: 2, Hindi: 1	Languages other than English:	Cantonese 4, Serbian 3, Kannada 1, Japanese 1
Years of IT experience:	From 10 to 29	Years of IT experience:	From 0 (1 individual) to 29
Highest qualification:	Bachelor (4), Grad. Dip. (1), Grad Bach. (1), Masters (1)	Highest qualification:	HSC (4), Ass. Dip. (1), Bachelor (6), B. (Hons) (1), Grad. Cer (1), Grad. Dip (2), Masters (5)
Type of employment	Permanent (4), Contract (3)	Type of employment	Permanent (11), Contract (9)
ACS Equivalence levels	ACS-2 (1), ACS-3 (5), ACS-4 (1)	ACS Equivalence levels	Undef. (1), ACS-1 (1), ACS-2 (4), ACS-3 (13), ACS-4 (1)
ACS Level 1: Little practical experience in IT work, may be supervising ancillary staff ACS Level 2: Experienced and capable of performing wide range of general IT work ACS Level 3: Experienced in specialised IT areas, well developed liaison skills ACS Level 4: Managing a number of teams and the allocation of resources ACS Level 5: Typically report to CEO, manage major function, extensive IT coordination			
Descriptive statistics			
Likert scale values	1 Extrem. Bad 7 Extrem. Good	Likert scale values	1 Extrem. Bad 7 Extrem. Good
Total scenarios attempted	6	Total scenarios attempted	6
Average mean for experts	3.4	Average mean for pilot	3.66
Average median for experts	2.5	Average median for pilot	3.38
Average St.Dev. for experts	2.1	Average St.Dev. for pilot	1.77

Table 1: Descriptive statistics from the pilot control and expert groups

A multivalued context may be expressed as a quadruple:

$$K := (G, M, W, I) \text{ and } I \subseteq G \times M \times W$$

where the relationship I is a subset of the combined components of Objects (G), Attributes (M) and Attribute-values (Merksmale(W)erte). We may interpret the responses to the Sternberg-style scenario as a formal context, which can be constructed thus:

- K** = Formal table with its corresponding
- M** = The seven Likert scale answer optio
- I** = Relationship between the answer options, the choices and the participants
- G** = The participant
- W** = The chosen answer

Kollewe (1989) had also used survey data to construct a formal context but he treated the “data of the table ... as a Formal Context; the units of questioning [as] the objects, and the answers... [as] the attributes (:125). We chose to represent the data differently as it seemed more intuitive to regard the participant as the object that has a number of features such as age and position in addition to a set of responses and their values. Our approach also made data entry and validation easier as there was a one-to-one correspondence between the survey returned and the participant object.

The nodes in figure 2 represent the FCA Concepts ($\{B\}$ egriff) (in this instance 19 concepts). Labels are attached to the right of the node. Labelling has been reduced for clarity. Remember in FCA that a concept is a set of attributes and the set of objects that share them. The set of attributes that belong to a concept are reached by ascending paths and descending paths reach the objects that belong to a concept. What we do here is provide maps that highlight similarities between individuals in terms of how they have answered ‘soft knowledge’ questions concerning IT workplace scenarios. Given space limitations we are only able to examine a small proportion of our results here. In the formal concept lattices provided below we are able to see results for scenario 11, answers 1 and 5 (there were in total 8 ethical and realistic answer options that respondents had to provide for scenario 11).

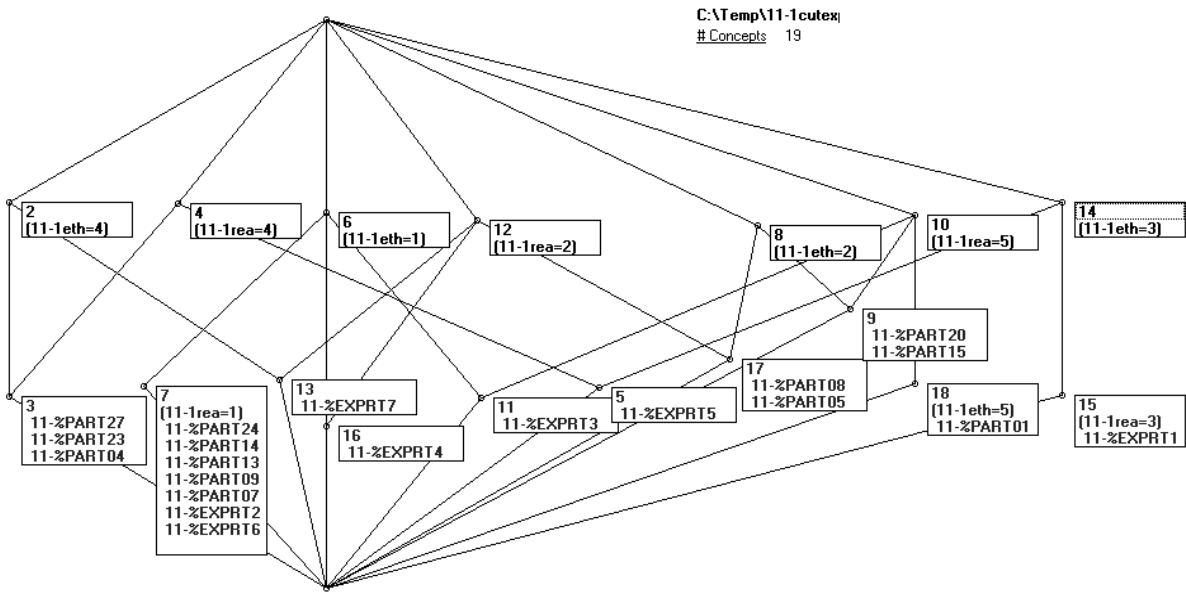


Figure 2: FCA diagram for the Scenario 11, response answer 1

We can see in concept 7 (bottom left) that participants 24, 14, 13, 9 and 7 and expert 2 and 6 all agree that the realistic *and* ethical answer is 1 (Extremely Bad). Expert 3 (concept 11) also agrees ethically but believes that 5 is more realistic. Such an observation raises the question whether Expert 3 tends to have such extreme differences between their ethical and realistic perceptions. Using the diagram we can see what responses are shared and with whom, which, with a more extensive set of results could lead us to conclude that participants 24, 14, 13, 9 and 7 share a number of similarities with experts. Could these participants be higher-level tacit knowledge users?

Let us now examine Scenario 11 but a different answer option (figure 3, 8 concepts). This diagram is far less complex than the one in the previous figure. This is due to a much greater degree of similarity and convergence between the participant's responses. Participant 20 agrees with the majority ethically but is a little less negative realistically. Participants 4 and 23 are close to the majority as they are only one point away on the likert scale. Of particular note on the diagram is concept number 6, which upsets the nice uniform shape of the lattice. Here we can see that participant 27 and expert 1 do not agree at all with the majority and see the answer option as ethically and realistically quite desirable.

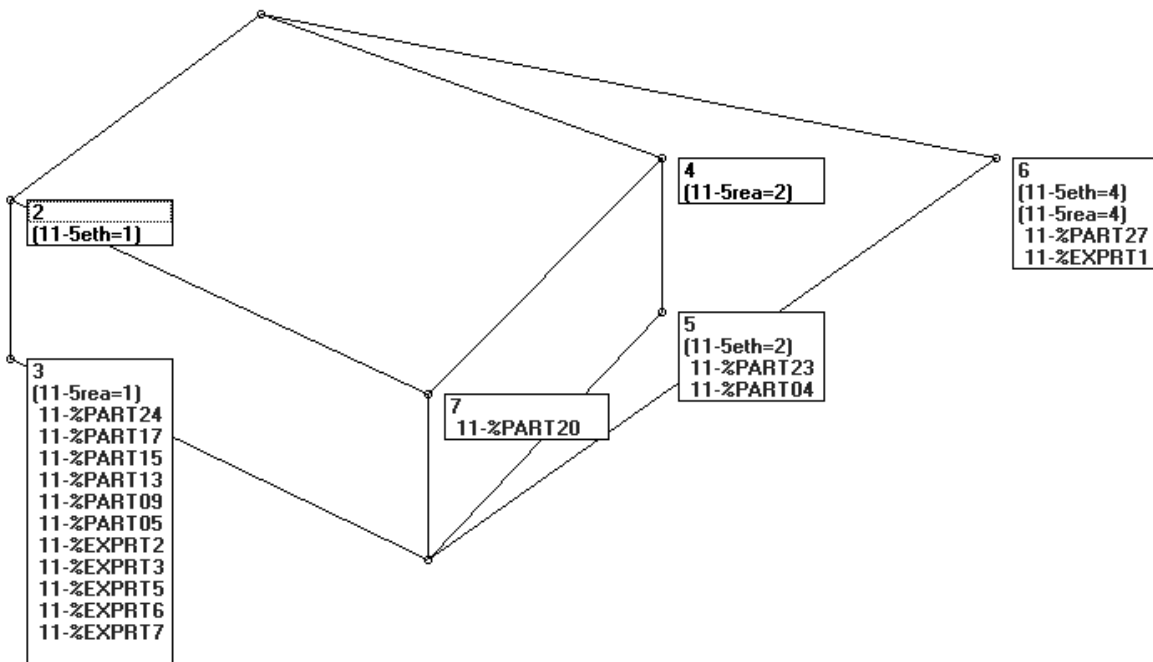


Figure 3: Scenario 11 – response 5

The point of this exercise is that in our using such a technique we are able to provide a balance to the descriptive statistical approaches used by psychologists in undertaking similar tests, and highlight individuals whose responses are considered similar to that of the expert group. In short, experts are considered by many (e.g. Sternberg 1999) to be storehouses and more importantly effective users of tacit knowledge. Thus those in the pilot group who present results similar to the expert sample could in themselves be earmarked as ‘higher level’ tacit knowledge carriers (for all of us make use of tacit knowledge to varying degrees of success). The idea then being that these individuals could be more effectively used in a mentoring role in many organisations given the teacher to apprentice role within the tacit knowledge transferral process. The concurrent inclusion of SNA within our methodology however, permits us to determine by way of interpersonal relationships, how likely the individual is to be a proficient mentor or tacit knowledge transferrer.

Let us now turn our attention to the social network component of our research where we examine some of the types of interaction among our sample population and how this is likely to affect tacit knowledge diffusion.

TACIT KNOWLEDGE DIFFUSION WITH SOCIAL NETWORK ANALYSIS

To process information from the SNA component of our questionnaire (figure 4), we have used Netmap Analytics™ software which permits illustration in a circular fashion of the relationships between individuals. An examination of figures 5 and 6 demonstrates that the sub-group of people on the right hand side of the circle chose not to provide their gender. In the original colour maps, we can see the non – gender specific discriminator is represented in red. Females on the other hand, are represented in blue and males in green. The density of connections nevertheless to individuals who chose not to provide their gender in figures 5 and 6 is interesting, but plausible remembering that age and gender were the only two questions that did not compulsorily require an answer. Remember that one of the questions asked in the SNA section of the questionnaire, was in relation to the importance of the occasion, or in other words the type of communication personnel had with one another (figure 4). It is interesting to note the number of unidirectional interactions (figure 5) among the respondents where the only interaction the respondents had was in ‘accidental’ meetings. Evidence however seems to suggest that such interaction is conducive to the transferral of tacit knowledge:

Part B: Social Network Analysis

1. Select the appropriate individuals with whom you conduct your business affairs, along with frequency of contact and type of meeting

Who within the organisation are the people you make contact with?	How often?	Working relationship of the person to yourself?	HOW do you TYPICALLY communicate with this person?
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Figure 4: SNA component of the questionnaire

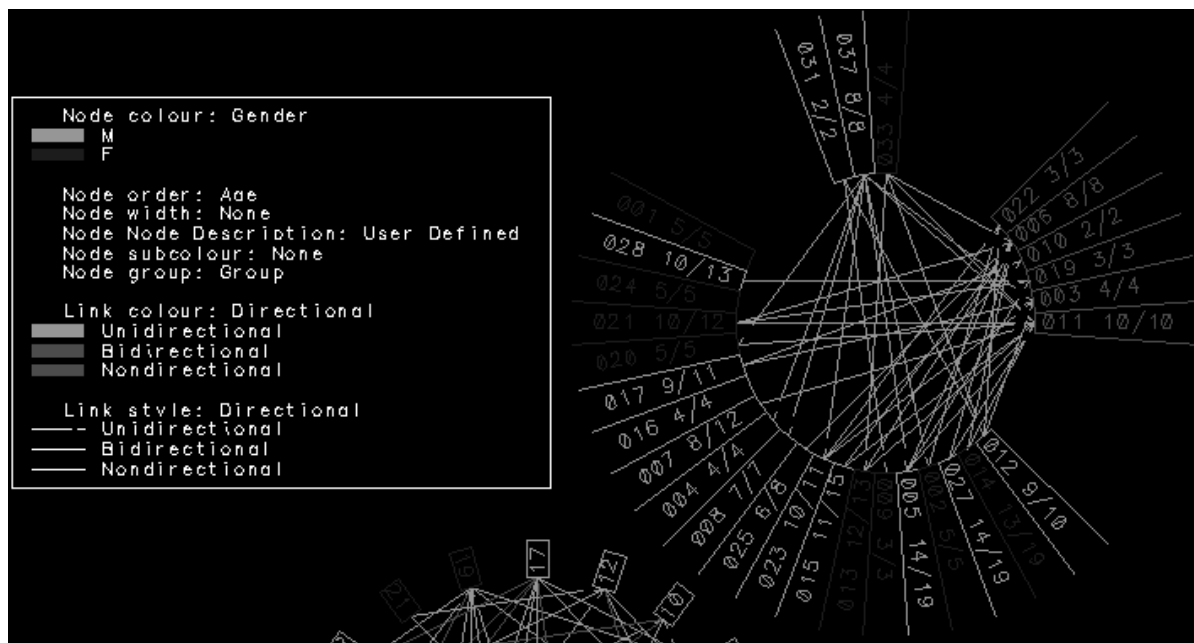


Figure 5: Tend to just ‘bump into’ the person in the workplace

In the traditional workplace, organisational members can interact with each other frequently, thereby converting existing tacit knowledge to new tacit knowledge. Very often, these meetings with colleagues follow an impromptu mode where people ‘bump’ into each other, be it near the elevator, the coffee percolator or the photocopying machine. Meetings might also take the less impromptu form of going out for lunch or for an after hours’ drink. Invariably these informal meetings follow a pattern where people share news about their work related problems and how they went about solving these problems... (Raghuram 1996 :862).

Not only is tacit knowledge typically transferred in this manner within an organisation, but in order for the knowledge to be passed, the groups are on average required to be very small, because “larger communities of knowledge can share certain practices, routines, and languages, but for new tacit knowledge to emerge through socialization the group must be small” (von Krogh, Ichijo and Nonaka 2000 in Allred 2001 :162). This teamwork then permits knowledge to be transmitted back into the organisation, through various but characteristically social means.

Perhaps what is more interesting are the numbers of respondents who communicate with each other only by email or fax (figure 6). Given that tacit knowledge is passed in a person-embodied relationship (Wyatt 2001), our pilot findings would tend to indicate that a significant proportion of personnel could be missing the tacit knowledge transferral process. Bear in mind however that although it appears as if a large proportion of our respondents do in fact only communicate by email or fax, the relationships presented here are only those amongst the respondents themselves. In other words, we do not illustrate *here* the relationships that these self same people may have with other colleagues throughout the domain of Organisation X, due to limitations imposed in the pilot study. Our main study currently underway however asks approximately 1,400 people to list their contacts throughout the IT domain of the organisation.



Figure 6: Only communicate by email or fax

By combining the tacit knowledge inventory outcome through the use of descriptive statistics and Formal Concept Analysis, in combination with Social Network Analysis we are therefore mapping tacit knowledge concentrations in individuals and how well or otherwise these personnel may be assuming a mentoring role within the IT organisational domain. We have for example noted elsewhere (publication submitted) that individual 020 (20: password of the respondent) holds a pivotal communication role between the two pilot groups, yet also shares similar tacit knowledge FCA results with our expert sample. Individual 020 is not however a manager, rather a female software engineer of between 35 – 39 years of age, who would appear to have excellent communication skills. What this tends to indicate is that were person 020 removed from the work groups the tacit knowledge flow would cease almost completely. As an aside, it is interesting to note Hasan (2001) foresees the CKO (Chief Knowledge Officer) of an organisation responsible for the tacit knowledge ‘gathering role’, as a female in her 40s or 50s due to the need for this role to be ‘approachable’ and ‘non – threatening’.

CONCLUSION

Formalising tacit knowledge has enabled us to better determine its characteristics, which we have attempted to do from a largely quantitative perspective in this paper. Arguably, one of the major factors to arise out of our most recent pilot study was that there was a noticeable difference in the way the expert sample had answered the tacit knowledge scenarios compared with the control pilot group. Answers on the whole for the expert group tended to be more negative, that is to say experts were more inclined to be cynical even though the standard deviation for the expert group was larger. Some the respondents in the pilot sample population shared answers closer to that of the expert sample. Moreover, while for example some answer options for a given scenario may *more* obviously point towards a bad or good value on the Likert scale, the same cannot be said for all answer options to all scenarios. In other words with a more complete study we would be able to derive trends in terms of how experts agree or disagree with the Likert scale answer options, compared with everyone else in the sample population. This then comprises part a. of our research, which was to find out who has more tacit knowledge than others. Part b. seeks to map relationships between individuals by way of social network analysis. We have seen from our initial results that a significant proportion of our subjects were communicating informally, which research suggests does enable tacit knowledge transference. Nevertheless, a proportion was only communicating with each other by way of email or fax, which on the contrary would not permit tacit knowledge diffusion. Here we have presented partial results of a complete pilot study, which in turn was based upon a series of pre-pilot studies, necessary to refine our techniques for tacit knowledge measurement at the individual level. We feel we have refined our technique to the point now that we can complete our research in Organisation X on the remaining 1,400 IT staff members. Our FCA approach will be balanced with descriptive statistics along the lines of Sternberg's research as well as Social Network Analysis as a means of mapping likely diffusion of knowledge among staff members.

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