MANAGING SOCIAL CAPITAL AS KNOWLEDGE MANAGEMENT – SOME SPECIFICATION AND REPRESENTATION ISSUES

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'Classic' accounts of social capital have emerged in accounts of stable networks or institutional environments. These conditions do not apply in the case of many firms – a case in point being small firm networks that rely on rapid turnover of projects. Our research team is attempting to identify how social capital is manifest in these contexts, and thus to make suggestions for building, maintaining and refreshing such capital. We present work to date that converts this type of tacit knowledge into sets of explicit and manageable local data, and provide examples of information visualizations for profiling and retrieval that support the management of social capital.

Introduction

Can social capital be managed? The concept is not new. It was current in the 1960s in community studies where it was used to describe the development of individuals, and has been applied subsequently to the development of human capital, and the economic performance of firms, geographic regions, and nations. There is general agreement (Lesser, 2000) that this form of capital is embedded within networks of mutual acquaintance and recognition; considerable social capital in the form of reputation can be derived from membership in specific networks. We suggest that what is embedded is, in effect, a form of collective tacit knowledge, and that the question of managing social capital may be addressed from a knowledge management perspective. There is a growing body of work on knowledge management (reviewed in Huysman and de Wit, 2002) that suggests that social capital rather than technology may be a significant driver of knowledge diffusion.

As we imply, the concept has been invoked to account for interactions in a number of diverse social contexts. In deriving a specification, a balance must be sought between a set of generic attributes, and attributes that reflect a local situation. One way to address this problem is to provide a portfolio of sets of attributes (some generic, some specific) that can be to assess the collaborative potential of specific teams and partnerships. Our opening question thus needs to be re-phrased as 'how may social capital be described, specified and represented in order that it may be managed in local circumstances?'

Theoretical Framework

To address this question, we have drawn on prior studies of social capital and organizational trust. Rather than attempt to synthesize these[1], we have drawn on a narrow sub-set of material that takes an experiential or grounded approach, and focuses on social capital and trust in specific organizational situations. Nahapiet & Ghoshal (1998), for example, suggest that micro-level ordering of work is an important factor in the formation of social capital, as, without such ordering, partners and collaborators in teams and projects may not achieve anticipated benefits. They focus on three areas that underpin social capital: 'structural dimension' (position and participation in relevant social networks), 'cognitive' dimension (shared codes and language and shared narratives), and 'relational' dimension (trust, norms, obligations, and identification), or common

[1] They have been comprehensively reviewed in recent articles by Marsh & Dibben (2002) on trust, and Adler & Kwon (2002) on social capital.

Table 1. Local working terminology (after Nahapiet & Ghoshal, 1998) for social capital specification.

Nahapiet and Ghoshal terms	**Local terms**
Structural dimension:	Competence:
Network ties	Track record/history
Network appropriation	Endorsements
Appropriable organization	Recommendations
Cognitive dimension:	Compatibility:
Shared codes and language	Shared practices
Shared narratives	Shared techniques/tools
	Shared professional protocols
Relational dimension:	Confidence:
Trust	Motivation
Norms	Responsiveness
Obligations	Reliability
Identification	Tolerance

understanding of practice. We have adapted these to construct a framework for assessing the social capital 'potential' of prospective partners. To accommodate business partners, we have re-labeled the dimensions in terms that managers can use (Table 1). 'Structural dimension' becomes 'competence' layer; 'cognitive dimension' becomes 'compatibility' layer; 'relational dimension' becomes 'confidence' layer.

The competence layer brings together elements of any standard resume such as track record, endorsements, qualifications, and may be compared with a number of existing partnering databases (e.g. monster.com). What distinguishes the proposed system from these is the compatibility and confidence layers, where 'soft' attributes are elicited by means of interpersonal assessment of behavior in social interactions. These interactions are structured to the extent that participants are required to address a number of topics in discussion.[2] Discussion of these topics will provide potential partners with the means to assess each other in terms of the dimensions that are presented in Table 1.

Situated Trust

The design of the template for these structured interactions has been informed by a body of work on 'situated trust' corroborates the importance of micro-level organization as a site where the elements of this form of tacit knowledge may be observed and described.[3] Dibben (2000) has explored this approach to understanding trust in an extensive empirical study of venture capitalists and entrepreneurs. His analysis draws much of its strength from typologies of trust and situations that illustrate the importance of alignment (of interests, skills reputation) and provide a systematic framework for making judgments about levels of alignment. Dibben's 'process' approach treats trust as a form of tacit knowledge that is to some extent amenable to re-presentation. The 'trust processes' that Dibben identifies occur in situations, can be described in terms of actors, goals and activities, and may be described by means of attributes. Potential collaborators (actors) can reflect on these attributes, and make assessments about their confidence in each other by ranking attributes in relation to the different goals and activities that characterize different situations, in a process that may be described as 'qualified' typification.

Dibben's casework is largely concerned with organizations that are stable: familiarity, a pre-cursor of trust, can thus be established over time. Our interest as a research team is the world of small networked enterprise, where partnerships must be configured rapidly, and these conditions do not apply. We have thus exploited a sub-set of the situational trust literature that considers 'swift trust' (Meyerson *et al*., 1986), in our search for a set of localized 'focal points' for social capital. Jarvenpaa and Leidner (1998) state that swift trust may be created very early in the interactions between members of a virtual team, especially where there is a clear definition of roles and responsibilities, clarity in order to avoid confusion and disincentive, effective handling of conflict, and "thoughtful" exchange of messages at the beginning of the

[2] The approach is similar to that in negotiation support systems such as Zeno which has been designed by Fraunhaufer Institute in Bonn.

[3] According to Adler and Kwon (2002), many analysts consider that 'social capital', and 'trust' are commensurate (p. 26). Preece (2002), for example, in a recent discussion of social capital and community, suggests that: 'A key ingredient for developing social capital is trust' (p. 37)

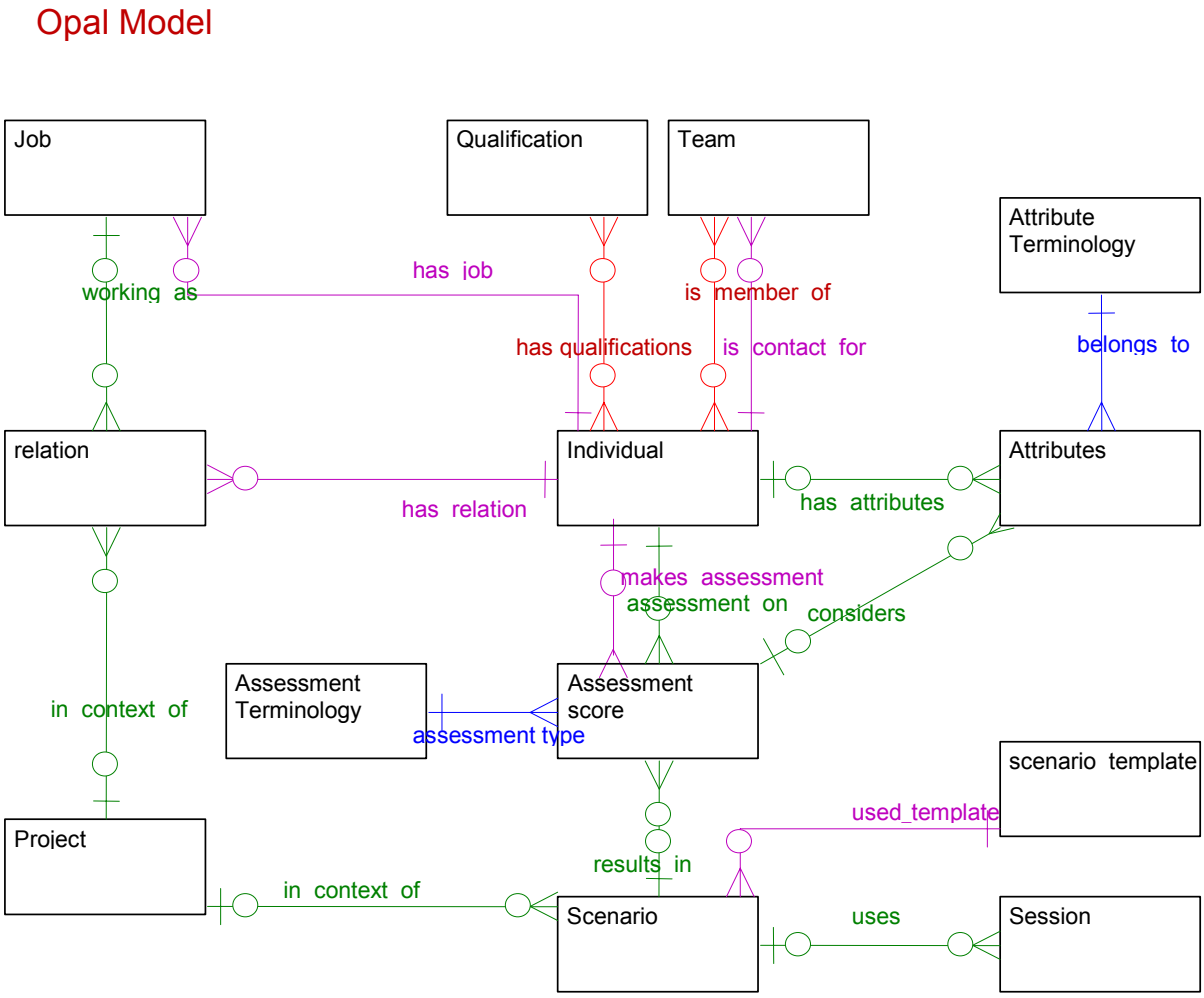

Figure 1. Initial E-R model for overall OPAL database

team's existence (Jarvenpaa and Leidner, 1998; Jarvenpaa *et al*., 1998).

Recent work on the formation and maintenance of teams provides comparable instances of the impact of swift trust on subsequent team performance. Iacono and Weisband (1997) describe a project with distributed electronic teams, who must 'quickly develop and maintain trust relationships with people that they hardly know, and may never meet again, with the goal of producing interdependent work'. In this situation, say the authors, trust is less about relating than doing, as swift trust is 'less an interpersonal form than a cognitive and action form'. (p. 1). Temporary systems require quick mutual adjustments so that people can innovate as required; in online work, technology must support this process. Good communication habits and the ability to multi-task and handle remote requests while attending to local demands are key practices.

Weisband draws on extensive work by Steinfield *et al* (1999) on the design of a collaborative platform for teamwork. This suggests that transparency and presence and awareness are critical components in successful online work. Weisband (2003) has summarized a subsequent study (15 teams in two universities): low performing teams rely on their perceptions of others as a predictor of good performance; high performing teams rely on what people do and say as a predictor of good performance; teams who may not engage in the hard work of doing distant collaboration may feel good about the process and each other, but such perceptions do not lead to successful outcomes. Activity awareness information (or knowing what actions are underway at any given moment) is important, as is availability awareness or knowing whether others can meet or take part in an activity. Process awareness allows people to see where they fit at any give time and how the project is moving along, and perspective awareness gives information (about beliefs and values for example) that is helpful for making sense of actions. We have adapted these headings for some of the sections in the structured dialogue template.

Empirical Work To Date: The Partner Lens Project

We are currently working on a large consortial project (the 'Online Partner Lens', or OpaL) funded by the European Commission to design and implement a prototype system to support the management of social capital. The objective of the Partner Lens project is to build and evaluate a computer application that explores the quality of online partnerships before a contract is signed in situations where time is short and physical interaction is limited. The project thus focuses on the early stages of interaction where rapid and robust assessments must be made of partners' competence, compatibility and confidence in each other's future performance. The first prototype is scheduled for July 2003. The Lens integrates the three layers in the right hand column of Table 1, and has been designed with the help of the practitioner partners, all classed as small enterprises, in the project. User stories from these partners have informed the project in two ways; they are the basis of 'sue cases' that drive the function specification of the system, and they have served as a reality check for the theoretical framework. Our practitioner partners want to be able to explore potential collaborators before a contract is signed. The design challenge is to initiate and support computer-mediated interactions between potential partners that allow them to make rapid but valid assessments of each other in the early stages of cooperation.

Extracting Attributes

As we indicate above, competence in our social capital model can be captured by conventional means – fields in a database. The other two layers (compatibility and confidence) are more challenging. Our working definitions of compatibility and confidence are ' based on mutually agreed objectives, procedures and tools. 'Mutually agreed' is not necessarily the same as 'shared' – in some cases, a partnership will be formed to achieve complementarity, not consolidation. In order for users of the proposed online partnering tool to assess each other on relevant dimensions, the project team has designed (as explained above) a series of structured interactions that relate to the initial planning tasks of a given partnership. The dialogue that ensues may be supported by a video-conference, by audio input, or by online text. In such a structured interaction, potential partners are invited to discuss topics that articulate focal points of trust – such as shared vision, or mutual understanding of roles.

We suggest that a number of 'assessment objects' can be linked to a number of 'assessment activities'. For example, an initial dialogue between two potential partners may discuss their 'vision' of the project. In this case, the 'assessment activity' is a 'vision discussion', and the 'objects' that are rated might be 'motivation', 'investment', 'realism' and so on. A further 'assessment activity' might be a discussion of 'technology alignment'; this would also be associated with a number of attributes for rating mutual compatibility, such as 'comparable bandwidth', 'common application toolkit'. A further dialogue might explore alignment of work practices by asking questions such as the following: 'What systems design approach do you normally use?' 'Do you use project management tools?' 'Which ones?' 'How do you think this will work in the current project?' 'What role are you comfortable with in this project?' 'Should we work in parallel or serially on this project?' 'Are there areas that you think might need special care in the project?' 'How do you think we might apply current standards in the design approach?'

Sets of activities, attributes and assessments can be tagged and stored in an XML database (a brief description is given in the next section) that will support flexible searching and profiling. A project or team leader, for example, may reflect on the focal points of trust for a given project, and construct a benchmark profile for a potential partner. After interaction with, and assessment of a number of candidates, a visualisation of their trust profiles may be compared with the ideal pattern, tradeoffs, made, and the most promising candidate may thus be selected.

The practitioner partners in the project expect that an archive of such templates, held for an appropriate period (long or short) can support a more reflective approach to judgments about future collaborators. The coding and externalisation of what were previously fleeting and intuitive judgments should broaden the field of view, as remote exploration saves time and allows a larger number of candidates to be examined. If the templates can be viewed in a number of ways (to check a single attribute or to check a composite profile that fits the task in hand), partners may be able to consider a range of possibilities, and make tradeoffs that reflect particular sets of circumstances; they can thus identify areas where a partnership may be vulnerable, and assess if they have the resources to take due care

Deriving a Data Model

As the project aims to support selection and decision-making, any specification must allow partners to record and store their assessments. A number of different infrastructures are likely to be involved: face-to-face with paper and whiteboard; multimedia conferencing, text messaging, discussion list. Though we have worked with the first of these in designing a specification, any subsequent management tool must support appropriate display and presentation: the visualisation will only be as good as the data that support it.

OPAL's database is to be implemented on the Tamino platform, a native XML database that stores all data in XML format (http://www.softwareag.com/tamino/), with our initial data schema being shown in E-R format in Figure 1. To capture this data as XML at source, XForms (W3C, 2002) are being considered for their ability to place

user input directly into XML skeletons that can then be validated before they are submitted onwards to their destination. Thus, values given for ratings such as 'confidence' or 'motivation' can be placed into the appropriate tags within an XML document and sent as XML to the Tamino database or an intermediary module for processing. This is a recent development by the W3C and currently requires a plug-in such as FormsPlayer (www.formsplayer.com), or a specifically XForms enabled browser for XForms to operate. However, once its final specification is ratified, it is expected that XForms will be incorporated into popular browsers much as XML and CSS support are now.

Feedback has been positive in initial validation sessions with users (in two sessions, one with the local practitioner SME and one with the national Enterprise Agency). They have, however, expressed concern about levels of access and permission to view interpersonal assessments. These users suggest that they will tolerate long-term storage only of high-level anonymised data for ratings of soft attributes such as motivation or responsiveness. At the time of writing (May 2003) we are developing an acceptability scale to be used in further validation exercises of the first prototype.

Visualizing Social Capital

To date (December 2002), the project team has identified the elements of assessment of social capital in the form of attributes that may be stored in a database, and thus make social capital 'manageable'. Visualization is important here, in at least two different ways. The first is in the related techniques of visual query, the ability to graphically specify a query on a dataset, and in query visualization, the corresponding ability to have result data returned and displayed in an, ideally, similar graphical format. Consens *et al*. (1992) liken these techniques respectively to the 'manipulation' and 'display' of data.

To assess alignment, partners may assemble 'benchmark' or 'ideal' profiles of what each considers to be the social capital requirements for the project to hand. These can be used as statements of search parameters to find 'best matches'. They may also be edited and manipulated to reflect the emergent thoughts of partners as project criteria evolve – something that is likely to happen once 'structured dialogues' are underway, and new mixes of experts and ideas lead to fresh approaches. Simple visualizations of trust and social capital profiles in the form of 'thumbnail' sketches can be used for rapid comparison; they can be manipulated to reflect different views of the project in response to queries such as: 'Show me the rankings if we decide that process is the most important feature of this project?' 'Do the same if we take motivation as a key factor.' 'Show me the different sets of agenda items in the closure bits of these three dialogues?' This, for example, will help partners to assess how much effort it will take to establish a reasonable working relationship with each of a number of potential candidates.

Visualization can also contribute to an 'awareness' function that monitors interactions and can allow partners to assess each other's reliability or responsiveness. A number of studies are reviewed by Steinfield *et al*. (1998, p. 12), which analyze the technical specifications for such a function in groupware design, and this. The exercises that are used for experiential interaction must be amenable to formal analysis and representation. As is noted above, Iacono and Weisband suggest that initial patterns of 'initiation' and 'response' were indicative of successful team performance later in a project: in their empirical study, these were captured in a simple graph. Comparable visualizations are available for 'moves' and 'presence' in a range of online interaction spaces. Preece (2002) presents the goal of these as follows: 'to allow participants to more easily gauge such things as, who is present, what they are doing, how long they have been there, who the leaders are and how others judge the value of their contributions' (p. 38). Activity and process awareness (two of Steinfield and Weisband's categories) may be supported by proxy systems of the kind described by Erickson *et al*. (2002). These researchers define a 'social proxy' as a minimalist visualization of people and their activities' (p. 41), and describe a number of genres of online interaction (such as auction, and call-centre 'line') where such proxies can support judgments about how to proceed.

Erickson and his colleagues observe that 'by making social cues visible, and allowing traces to accumulate over time, we create a resource that allows people – especially those familiar with the interactive context – to draw inferences about what is happening which can, in turn, shape their collective activity' (p. 44).

Erickson *et al* also planned their minimalist visualization display as an antidote to the more immersive and resource-hungry 3D styles that previously dominated visualizations of awareness and collaborative activity, such as Q-PIT (Colebourne *et al*, 1996) or DIVE (Fahlén *et al*, 1993). Donath (2002) and Smith (2002) provide examples of comparable work to Erickson's group's in the specific online contexts of chat rooms and Usenet lists respectively.[4]

OPAL Prototype Visualizations

Such 'Information Visualizations' (Borner *et al*., 2002) can be viewed as a complementary technique to knowledge discovery and data mining, with Shneiderman observing that "skilled problem solvers often combine statistical tests and visual presentation" (Shneiderman, 2002). Previous

[4] Though these articulate situations that are less formal and goal-oriented than those of the interaction protocols that we propose, the mechanisms for extraction and presentation of attributes are comparable.

experience of user testing with visualization components, both by ourselves (Graham, 2001; Graham, Kennedy & Benyon, 2000) and by others (Nowell *et al*, 1996) has shown that a visual presentation of results is not only clearer than the raw statistics but also suggest further directions and tasks not previously anticipated by either the users nor the visualization developers. This ability depends on a high degree to the interactivity of the visualization, as responsive, dynamic visualizations elicit far greater reactions than static displays or slow, unresponsive interfaces.

Initial visualization prototypes for the social attributes have focused on displaying multi-dimensional data types, such as judgement value sets, in augmented parallel co-ordinate (Inselberg & Dimsdale, 1990) and table lens displays (Rao & Card, 1994). Figure 2 shows a parallel co-ordinate plot for five candidates and the values they scored over selected attributes. The highlighted paths show that a user has found someone who scores highly for credibility, diligence and expectation, but has found better candidates solely for the motivation and tolerance elements, who nevertheless score poorly on the other dimensions.

The screenshot in Figure 3 displays a grid style representation of the assessments performed on and by over 200 candidates, though at this stage the assessments are generated dummy data. Such a visualization, together with some basic statistical manipulations, allows users to find candidates who achieve consistently high evaluations, but

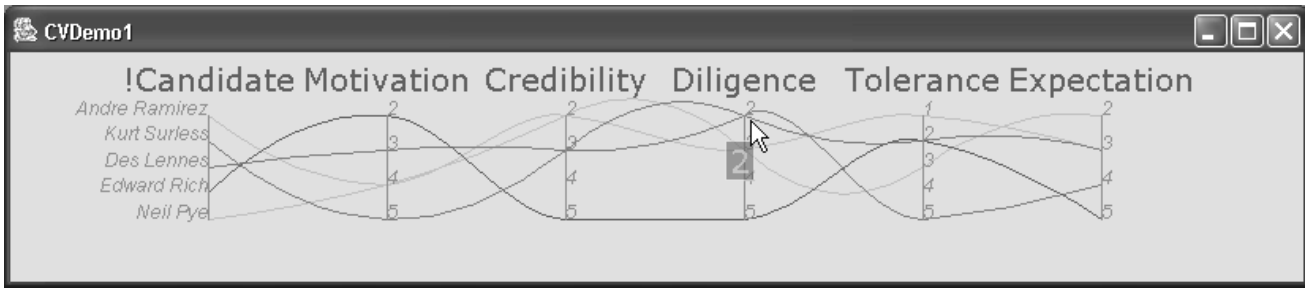

Figure 2. Parallel co-ordinate plot of candidates perceived values.

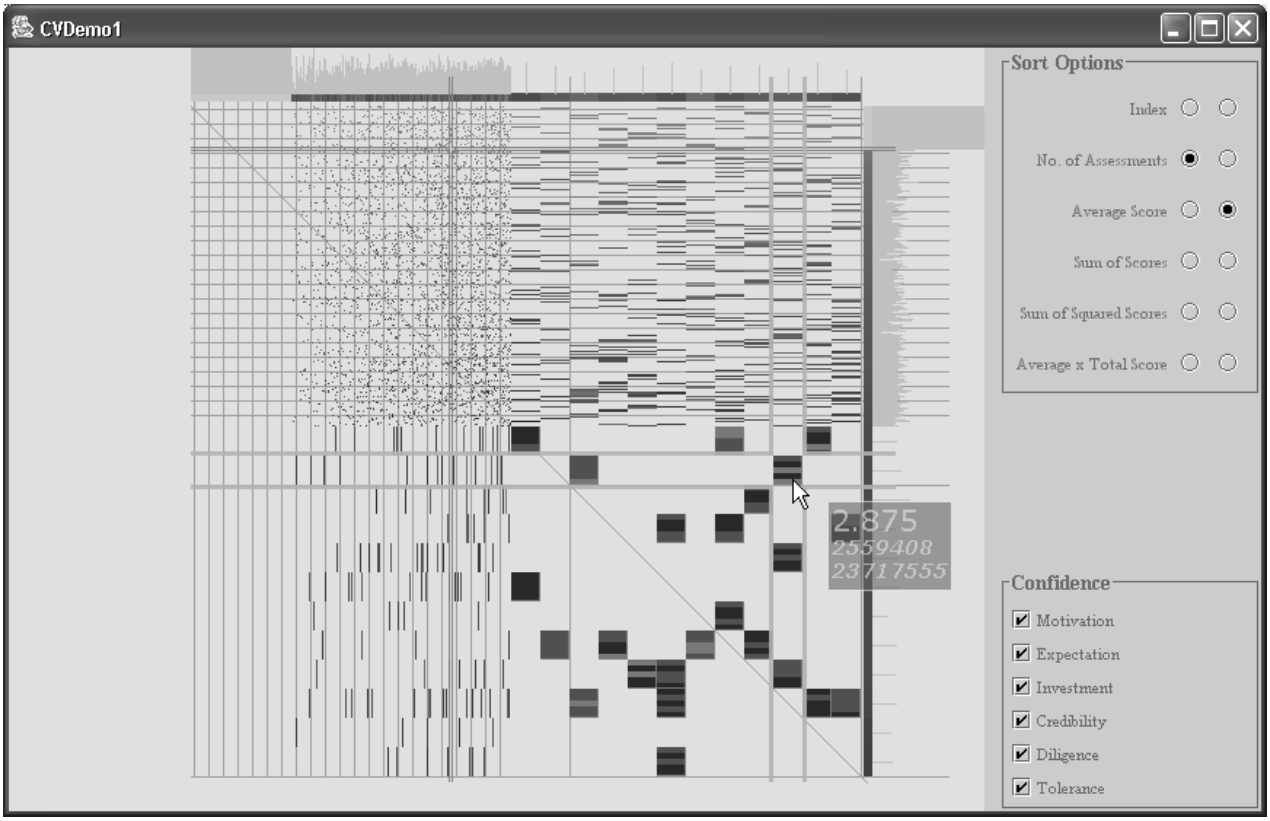

Figure 3. Table Lens style visualization of a confidence assessment network.

also to locate those who could skew judgements by consistently handing out high or low assessment scores to others. These can be identified and filtered out of any further consideration. The particular situation in Figure 3 shows an arrangement of 'most assessments given' by 'highest average scores achieved'. The smallest values for each of these metrics have been filtered out of the visualization, and also omitted from the subsequent re-calculation of the metrics, along with the highest values for 'average score given'. A visual focusing effect allows individual scores to be expanded from an overall 'confidence' assessment score down to the individual elements that compose this assessment. The nodes composed of different bands of grey in the expanded portion of the visualization demonstrate this, with darker stripes representing the higher possible scores for an attribute.

Many further visualization styles are conceivable, with one noteworthy approach being the mapping of users to a similarity map visualization by techniques such as multi-dimensional scaling or a spring-mass metaphor, an example of this being Tatemura's visualization (Tatemura, 2000) of movie ratings for a collaborative recommender system. Such approaches offer the prize of a layout of nodes where spatial proximity closely approximates their true similarity, but often require a degree of lengthy iterative pre-processing to arrive at the final layout, dependent on the specific layout technique chosen.

Further exploration of the possibilities with user partners is expected to shape the final visualization tools that will accompany OPAL. Initial user testing has begun by observing a handful of representative users acting on sample tasks with the visualizations, as detailed by Nielsen (1994) in a bid to find common usability problems. Such testing is quick and simple as usability testing goes, and importantly, identifies issues that are problems to the real users of the system. The visualizations were generally well received, with users also making suggestions for improvements where difficulties were encountered. For instance it was discovered that interaction with the parallel coordinate view may well be served better by using a mixture of curved and straight-line representations for the data items, with selected and brushed items being represented by the curves, and background items by straight lines. Filtering operations on the table matrix was also identified as a root of some problems and thus will be modified in the course of future work.

Conclusion

Our work to date has led to the production of a specification for social capital. The search for specification has combined close attention to working practice with insights from empirical research. We are not yet in a position to undertake validation work that can establish if the process is effective, as this cannot be done until a number of field projects with projects where the specification was used at the formation stage have been completed. We suggest, however, that the specification has prepared the ground for answering (in part) the questions that are raised at the start of the chapter.

Firstly, the specification identifies and describes a number of 'building blocks', or focal points, for social capital. This, we suggest, affords insight into how social capital is built in any situation, and also supports the concept of a 'blueprint' for social capital that can be used in the selection of candidates for partnerships. By helping project managers to identify areas where there are 'gaps', or where social capital appears to be depleted, the specification may contribute to 'building'.

Secondly, the specification can support management and maintenance work within a given project. It is grounded in practice, requires input that is derived from direct experience and assessment, and can act as a monitoring mechanism if applied in an iterative fashion. Areas where social capital is vulnerable can be identified as they emerge, and appropriate care taken, before a crisis hits a partnership.

Thirdly, we believe that the specification addresses the problem of social capital in temporary organizations. Where there is little or no prior knowledge, the framework allows partners to gain mutual insights (by means of visualizations) on the basis of their alignment in structured interactions. This claim is based on the assumption that as the protocol for interaction draws on commonly understood business practice in the sector, and as common practice is, in effect, 'congealed' history, it can be a proxy or surrogate for prior experience. As for lack of time, we suggest that our focus on motivation and 'awareness' and first impressions of reliability and responsiveness is a viable surrogate for familiarity established over time. There is some evidence (Borkenau and Liebler, 1992) that first impression data, specifically where conscientiousness (comparable to 'awareness') is involved, are a valid indicator of character judgment.

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