

Measuring the impact of knowledge loss

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ABSTRACT

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The impact of knowledge loss on the firm is a largely unexplored area of strategic management. This paper reports the findings of an in-depth case study of an organisation within the Australian Department of Defence. The study examines the nature and impact of knowledge loss within the construct of social capital. Of particular interest were the relationships between individuals' activities, their levels of knowledge, and their motivation and ability to share this knowledge. The paper proposes a method to parameterise the knowledge resource variable. Findings suggest that the impact of knowledge loss may be traced directly to reduced capability in strategic activities at the organisational level, and indirectly to ineffectiveness and inefficiencies at the individual level.

Keywords: knowledge loss, social capital, measuring resources

Stream: Knowledge Management - (KM)

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INTRODUCTION

The impact of knowledge loss on the firm has been little documented or understood. When staff exit a firm, the organisation loses their human capital and accumulated knowledge. For many years, this was considered normal organisational behaviour and staff were simply replaced by others with similar skills and experience. Two recent organisational developments have led me to question the wisdom of this thinking. First, researchers argue that knowledge is now the firm's most valuable resource (Grant, 1996; Zack, 1999). Second, employee turnover rates are increasing (Arthur and Rousseau, 1996) and, on many occasions, staff are not being replaced. No study has yet sought to explore the effects of knowledge lost through staff turnover within the context of declining staff numbers. The difficulty is in measuring the value of knowledge resources and the impact of their loss. This paper addresses this important gap in our understanding of the contribution of knowledge to firm performance.

There has been extensive research on organizational knowledge and employee turnover. Some researchers have identified positive affects of employee turnover, e.g. eliminating poor performers (Dalton *et al*, 1981), and reducing costs, others have looked at the negative impact in terms of declining productivity (Osterman, 1987), loss of organisational level social capital (Dess and Shaw, 2001), disrupted social relations (Pennings *et al*, 1998), and declining performance (Dess and Shaw, 2001). While there has been some research into how knowledge loss affects the organization (Shah, 2000; Droege and Hoobler, 2003), these studies are limited to single impact areas, e.g. social relationships. Given that knowledge includes other aspects, e.g. human capital and structural capital, there is a need to develop an integrated holistic method for measuring the impact of knowledge.

The perception that knowledge is a firm resource emerged from the strategic management literature's resource-based view of the firm (RBV). This gained momentum in the mid 1990s with the emergence of the knowledge-based view of the firm (KBV) (see Grant, 1996), which was an extension of the RBV. While there have been attempts to measure the contribution of knowledge to firm performance

(Mertins *et al.*, 2001; Boyett and Boyett, 2001), managers are still unsure how to evaluate their most important knowledge resources. The difficulty in measuring the impact of knowledge loss is that we do not yet know how to allocate a value to knowledge resources. This problem exists due to the intangible nature of knowledge and the difficulty in tracing its impact on firm performance. This is identified by the RBV literature as the ‘exogenous determination of value’ (Priem and Butler, 2001).

Therefore, the research question is: How can we measure the value of knowledge resources and the impact of the loss of valuable knowledge? The contribution of this paper is twofold. First, we contribute to the conceptualization of the RBV and the Knowledge-Based View (KBV) by proposing a method to parameterise the knowledge resource variable. Second, while other studies have examined the impact of knowledge loss in broad terms (e.g. Droege and Hoobler, 2003), we extend these studies by providing a method that explains how to measure the impact. My approach differs from the previously mentioned studies, as we look at all aspects of knowledge and offer an integrated framework. We go a step further by linking the knowledge resource to the firm’s strategic objectives and performance via its activities. The paper proceeds in several sections. First, we provide a brief review of the relevant concepts regarding knowledge loss. Based on the literature review, the next section develops a conceptual framework that may be used to (1) measure knowledge loss and (2) the impact of knowledge loss on the firm. The third section describes the research strategy, including details about the case study firm. The fourth section describes the main findings of the study. The final section summarises the research and discusses the wider implications of the study’s findings.

LITERATURE REVIEW

The review of the relevant literature begins with definitions of knowledge, then discussion of knowledge as a firm resource and the difficulty in measuring knowledge resources, and finally, a review the concept of knowledge loss.

Defining knowledge

In exploring the impact of knowledge loss, we focus on social capital for several reasons. First, we suspect that the most valuable knowledge will be deeply imbedded in the social capital of the organisation and that an understanding of the effect of knowledge loss may lie within the context of the social collectivity, as well as the individual (see Granovetter, 1992; Nahapiet and Ghoshal, 1998; Kogut and Zander, 1996). Second, we can disaggregate social capital into sub-categories of knowledge, such as human capital, structural capital and customer capital (see Stewart, 1998), to help our efforts to measure the resource. Third, by placing knowledge in a social context it forces us to recognize that it gains most value when it is shared, particularly tacit knowledge which has been argued is the most valuable knowledge (Grant, 1996). This logic is supported by the knowledge management literature.

Most definitions of social capital refer to the value of relationships which create the opportunity to create, share, and combine knowledge resources. Granovetter (1992) sees economic actions as socially situated, embedded in networks and economic institutions as socially constructed. Kogut and Zander suggest that “firms are social communities that specialize in the creation and internal transfer of knowledge” (1993), while Nonaka and Takeuchi (1995) show that the social process between individuals generate or expand knowledge and create competitive advantage. Social capital is characterized by being embedded in networks of mutual acquaintance, by making remote resources available through connections and contacts and by creating the ability to draw on social status and reputation once membership is established in certain networks (Nahapiet and Ghoshal 1998). Researchers identify social capital as a valuable resource because it ‘provides members with the collectivity-owned capital (Nahapiet and Ghoshal 1998); collective goal orientation and shared trust (Dess and Shaw, 2001); the aggregate of firm members’ connectedness with potential clients (Pennings *et al*, 1998).

The way knowledge is socially constructed is further explained by the concept of intellectual capital. Stewart (1997) defines intellectual capital as “intellectual material that has been formalized, captured, and leveraged to produce a higher-valued asset.” In this way, intellectual capital is a way of adding meaning to data. We adopt the term intellectual capital for this paper because ‘capital’ fits nicely

with the theme of resources, value, and the concept of a knowledge bank, which is discussed later in the paper (see page 8). De Pablos' (2002) explains how intellectual capital is socially constructed: "it is resources created from internal learning and development of valuable relationships." Nahapiet and Ghosal (1998) define it as "the knowledge and knowing capability of a social collectivity, intellectual community or professional practice." While Granovetter (1992) and Nonaka and Takeuchi (1995) explain knowledge creation in terms of social exchange. All of these processes rely on social capital.

When we consider the conditions for intellectual capital creation and the outcomes, three categories of intellectual capital emerge: human capital, structural capital and interface capital. *Human capital* according to de Pablos (2002) "represents the individual knowledge stock of an organization as represented by its employees." *Structural capital* packages human capital and enables a company to reuse it over and over. It therefore belongs to the organisation, can be reproduced, shared and even sold (Stewart 1997). *Interface capital* "is the value of an organization's relationship with the people with whom it does business" (Stewart 1997). Interface capital, which de Pablos (2002) refers to as relational capital, consists mainly of the knowledge embedded in the relationships downstream (with customers) and upstream (suppliers) but in a broader range includes stakeholders and strategic alliance partners as well.

Measuring the value of knowledge resources

Even leading RBV researchers accept the problem that a 'firm's strategic advantage is based on causally ambiguous resources, and managers in that firm cannot know, with certainty, which of their resources actually generate their strategic advantage' (Barney, 2001). Critics of the RBV argue that resource advantages are highly context dependant, and that what is valuable in one industry is not valuable in another (Priem and Butler, 2001). The same criticisms apply to the management of knowledge resources. We do not yet know how to measure the influence of knowledge resources in terms of its contribution to firm performance or its loss. The knowledge-based view (KBV) suggests knowledge is the firm's most valuable resource (see Grant, 1996) but how is it valuable? If it is so valuable, surely there must be an impact of the firm loses this resource but, if so, what is the impact? It is, therefore, important to

parameterise the knowledge resource value variable, so that we may better examine the impact of knowledge loss.

As shown in Figure 1, intellectual capital has a connection to organizational strategy and organisational output (performance). Two important aspects explain the relation to strategy. First, intellectual capital can only be applied, distributed or cultivated if it is seen *in the context of the organisation's strategy*. Resources lie idle unless employed in a way that contributes to the organisation's objectives. In order to examine the contribution of knowledge resources to firm strategy and outputs, all intellectual capital elements should be linked to the organisation's key activities. Assessment about the relative value of knowledge resources should be considered within this context of strategy and activities (see Massingham, 2004). Second, if we accept the knowledge-based view's (KBV) argument that intellectual capital is the unique combination of resources that creates a competitive advantage, intellectual capital may be seen as a very important enabler for business activities.

(Insert Figure 1 about here)

The growing significance of knowledge loss

Arthur and Rousseau (1996) found that median employment tenure is now only four and a half years. Phenomena such as 'downsizing' and 'voluntary redundancies' mean that organizations are encouraging staff to leave and making do with those that are left. The problem of knowledge loss gains even further importance when we consider the context of the workforce's ageing demographic. Between 1946 and 1964, the "Baby Boomer Generation" created 75 million children in the United States alone (Beazley *et al.* 2002). The year 2005 marks the beginning of the retirement period for this demographic, peaking with the retirement of approximately 19% of the entire American workforce holding executive, administrative and managerial positions by 2008 (Beazley *et al.* 2002). Over the next eighteen years, a baby boomer will reach retirement age every eighteen seconds (Beazley *et al.* 2002). The problem's significance is shown by the fact many businesses are spending millions of dollars each to develop and

purchase solutions to combat knowledge loss (see Koudsi, 2000; McCune, 1999). Organisations, recognising that knowledge is valuable, are now beginning to devise ways to capture it, before staff leave. we suspect that the loss of senior, experienced staff through retirement may represent an even more significant impact on the organisation, particularly if staff retire en-masse and are not replaced, i.e. through a downsizing strategy.

RESEARCH STRATEGY

A case study approach

The aims of the study were addressed through the case study method of empirical enquiry. The reasons for this are as follows. First, exploratory fieldwork is essential in ‘new’ areas of research which lack an extant body of both theory and data (See Glaser and Strauss, 1967; Eisenhardt, 1989a. and 1989b). Second, qualitative studies are necessary where organisational processes, such as knowledge resources and knowledge loss, are involved which do not lend themselves easily to quantitative measures (Van Maanen, 1979). Finally, the use of exploratory case research enables ideas and propositions to be developed for further study (Noda and Bower, 1996).

Case study organisation

The case study organization, Directorate of Naval Platform Systems (DNPS), is part of the Royal Australian Navy (RAN). The role of the DNPS is largely technology management and covers provision of advice or information to stakeholders on engineering and other technology related matters. It plays an important role in identifying and managing technical risk within the RAN. The management of the RAN has identified the problem of knowledge loss due to their previous downsizing strategies (policies) and an ageing workforce but does not understand the extent of the problem or the consequences for their organisation. Data was gathered from full day workshops utilizing self-completion questions which we facilitated.

RESEARCH FINDINGS

The main findings of the study were analysed in the following way. First, we identified the DNPS's most valuable knowledge. This addresses the need to parameterise the knowledge resource variable. Second, we identified where the impact of knowledge loss is most likely to occur. This provides an ability to predict and plan for knowledge loss, which enhances the generalisability of our findings. Third, we identified the actual impact of knowledge loss at the levels of the individual, social network, business unit, and organisation. This provides a way to assess the outcomes of lost knowledge, and increases the explanatory power of the conceptual framework presented in this paper.

The Knowledge Resource Variable

We identified the most valuable knowledge resources within DNPS by deriving knowledge 'scores' for each participant. We did this by calculating a 'score' out of five in each of the areas of human capital, structural capital, interface capital, and social capital. These scores were then added together to derive an overall rating. In this way, we derived a rating of the 'value' of each individual based on their knowledge and the impact of this resource on the organisation's activities and performance. The method used to measure individual's knowledge value is illustrated by the table 1. The assessments were made through a triangulation approach. This involved self-assessments, comments from peers, and a validation by supervisors. We accept that the idea of allocating a quantitative rating to knowledge may be 'counter-intuitive' for some given its abstract nature, however, the concept has been used elsewhere, e.g. in defining knowledge levels (e.g. Tiwana, 2000).

(Insert Table 1 about here)

Each table shows how the value of each individual's knowledge was calculated. Table is two dimensional. For example, the Human Capital Score is derived by calculating a rating out of 9 for the first dimension – knowledge levels – and a rating out of 6 for the second dimension – knowledge facilitator

levels. The two ratings are then applied to a two dimensional matrix to produce a score out of 5. A matrix similar to the framework shown in Figure 2 was used to derive each knowledge score.

(Insert Figure 2 about here)

The framework can also be used to identify the value of knowledge resources by unit and also at the organisational level by aggregating the results. In this way, a *knowledge bank* may be created that may be used to measure the ‘wealth’ in each of the four knowledge areas. Managers may then use this to simulate staff exits (e.g. if a staff member leaves or is transferred elsewhere in the organisation). We may then ‘withdraw’ or ‘deposit’ knowledge from the bank and evaluate the impact on the organisation.

Measuring the Impact of the Loss of Valuable Knowledge

We examined the impact of knowledge loss by simulating the exit of the most valuable employees. We took the top 20% (in our case this was six staff) out of the database. We then examined the impact of this withdrawal of knowledge from the organisation’s various *knowledge accounts* (e.g. human capital). This method allows us to quantify the overall impact on the organisation, and to identify the impact in each of the knowledge areas. We then examined the consequences of the reduction of knowledge on the organisation overall, and in each of the knowledge areas. We did this by examining how the organisation works, that is, how staff complete tasks, and how they create, share, and use knowledge, by identifying what knowledge employees need to do their work and where they go for help if they do not know what to do. This method allows us to establish the direct and indirect consequences of knowledge loss.

The research findings indicate three major categories of impacts: First, there are direct impacts on the organisation’s ability to perform tasks. This is a result of loss of experience, expertise or practical knowledge. Second, there are network impacts which influence the organisation’s performance through disrupting interdependences. Examples for these impacts are shifting workloads, stress on supervisors,

missing of background understanding, missing access to contacts, suffering of management duties, loss of contact for personal issues, reduction of innovative ideas for the provided services, loss of access to third party documentation and reorganisation. Third, there are impacts that can be connected to the replacement of retired employees. Impacts such as cost of recruitment and training costs, and following up predecessors' work belong in this category. Figure 3 provides a summary of the research findings in terms of the impact of knowledge loss found by simulating the exit of the top 6 staff in our case study organization DNPS.

(Insert Figure 3 about here)

This leads to the development of preliminary propositions that might be explored in further research:

- Proposition 1: Loss of human capital will lead to a reduction in capability at the organisation level, i.e. activities will no longer be performed or performed less well.
- Proposition 2: Loss of structural capital capability, i.e. staff with the ability and willingness to codify their knowledge, will lead to a reduction in capability at the individual level, i.e. employees will be less effective.
- Proposition 3: Loss of interface capital, i.e. staff with knowledge of customers and suppliers, will lead to a reduction in capability at the organisation level, i.e. customer and supplier relationships will suffer.
- Proposition 4: Loss of social capital will lead to a reduction in capability at the individual level, i.e. employees will be less effective.

CONCLUSIONS

This study presents methods to measure the value of knowledge resources and the impact of knowledge loss. We argue that it is necessary to parameterise the knowledge resource variable in order to examine the impact of knowledge loss. To characterise this, we advance an integrated conceptual framework (see Figure 1) for identifying valuable knowledge resources that includes a method to allocate 'scores' for human capital, structural capital, interface capital, and social capital (see Figure 2 and Table 1). This method allows organisations to identify valuable knowledge resources, measure its 'stock of knowledge' in terms of a knowledge bank, and plan for knowledge loss. We then propose a method for measuring the impact of this knowledge loss by linking knowledge resources with activities at the organisational level, and with how staff work, solve problems and learn at the individual level (see Figure 3).

A main contribution of this paper is the capacity of our measurement framework to allocate numerical scores, i.e. ratings, to individuals in each of the knowledge areas. This allows us to place a quantitative measure onto the knowledge resource, leading to conclusions about the location of valuable resources, i.e. at the individual, social network, business unit, and organisational levels. It also allows us to draw conclusions about the relative health of the organisation in terms of its knowledge resources by type of knowledge, e.g. social capital, and by activity. It also lends itself to the development of a decision model that has broad organisational application.

FIGURES

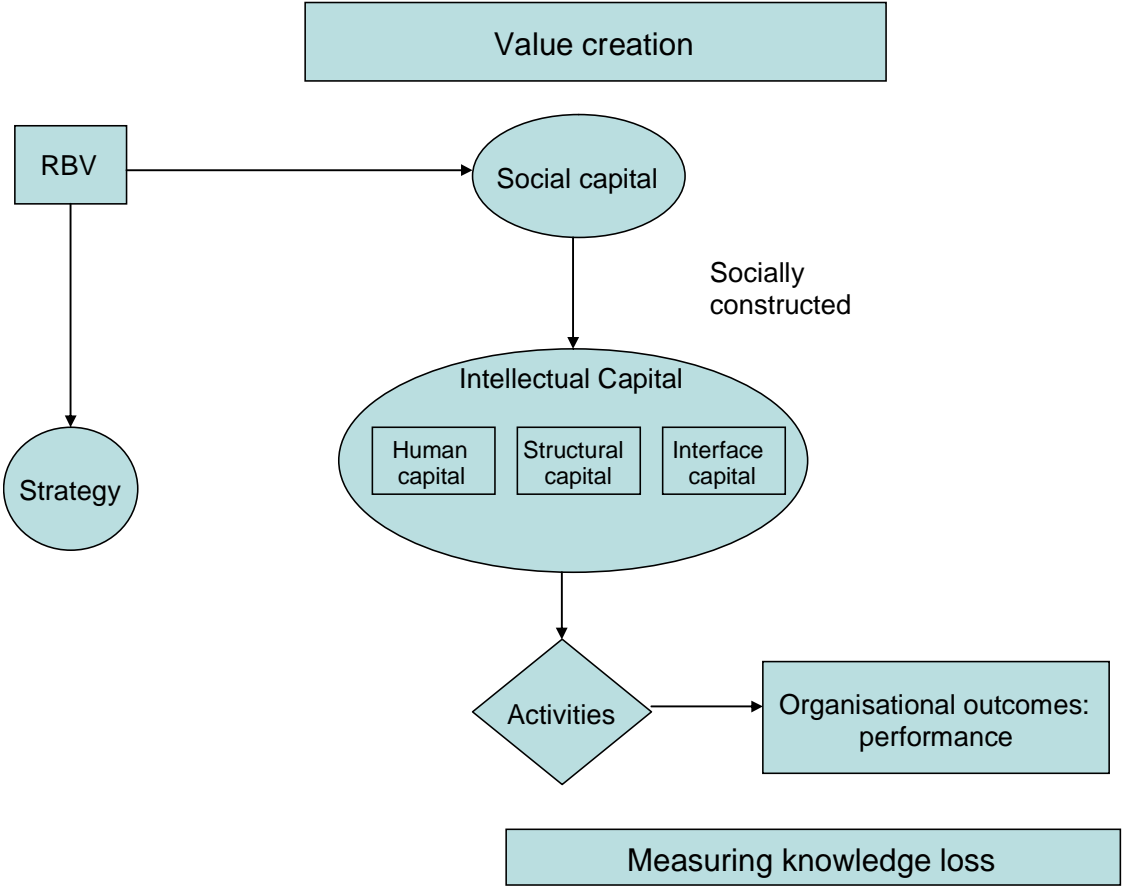


Figure 1. Conceptual framework for measuring knowledge loss impact

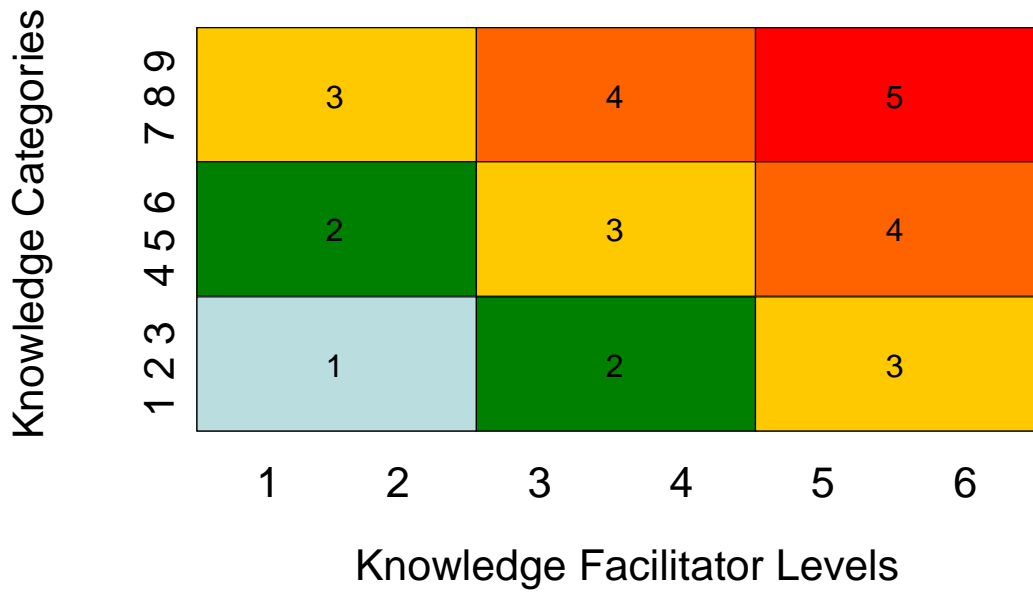


Figure 2. Two dimensional matrix for deriving a knowledge score

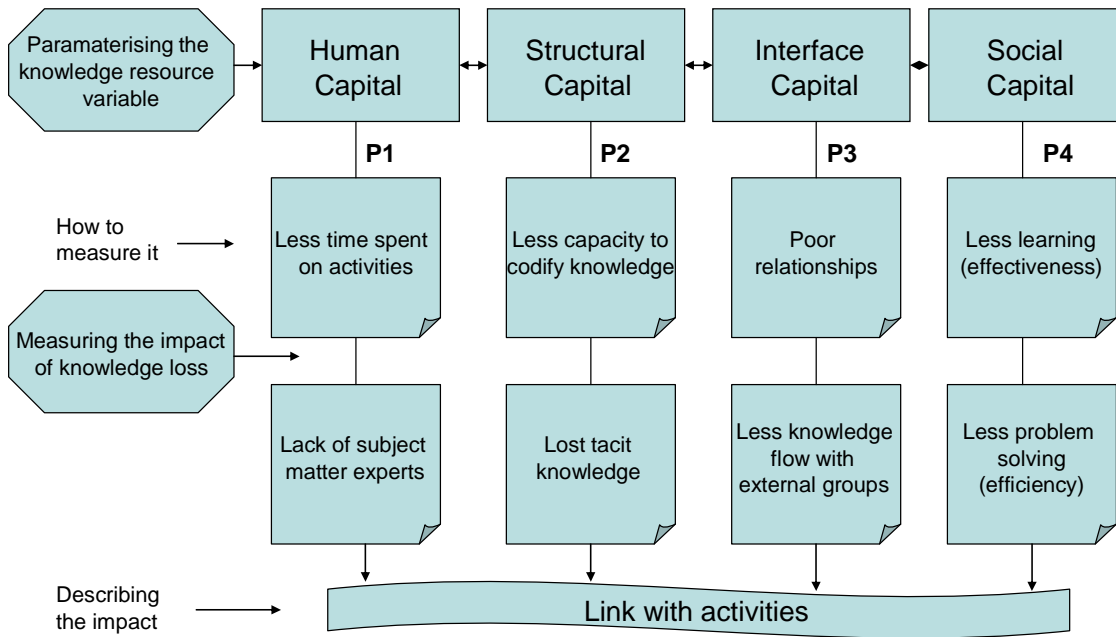


Figure 3 Measuring the Impact of Knowledge loss

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Table 1 – Definitions of Measures – Human Capital		
Level	Definition	Measure
HUMAN CAPITAL 1		
<i>Knowledge Levels</i>		
1	Ignorance	Do not demonstrate any understanding of the activity.
2	Have seen others doing it	Can provide a basic description of the activity.
3	Know basics of what to do	Can explain how to do the activity in very basic terms.
4	Know what to do (good understanding of procedures)	Can show somebody how to do the activity
5	Know how to do it well (i.e. identify measures of performance)	Demonstrates very good procedural knowledge and can also discuss performance measures
6	Can control performance (I.e. do it consistently well)	Shows good awareness of impact of having done a good job
7	Can identify key processes leading to consistent best practice	Demonstrates best practice thinking
8	Can demonstrate/teach key processes	Is nominated as a best person people turn to for help in this activity
9	Know-why the activity is done within a bigger context of cause & effect	Understands the impact of their work
<i>Knowledge facilitator levels</i>		
1	Ability to use structural capital	Uses policy information to perform task
2	Ability to use contacts	Uses Contact information to perform task
3	Work on problem solving groups	Demonstrated involvement in value adding teams
4	Can create or innovate to solve problems	Demonstrated useful ideas
5	Can explain how to solve problems	Nominated by others as someone who helps them solve problems
6	Can document problem solving creativity	Nominated by others as someone who helps them document creativity