Decision Support through Knowledge Management: An Empirical Examination of Two Strategies

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Abstract

This paper reports the results of an empirical examination of the effectiveness of two knowledge management strategies (codification and personalisation) in improving decision making performance in a simulated forecasting task. Codification was manipulated with and without a procedural knowledge map, and personalisation in terms of an interactive and non-interactive decision environment. Results indicate that only codification had a significant effect on performance. Subjects with a procedural knowledge map demonstrated less frequent use of decision heuristics, and generated more accurate forecasts compared to those without such a map. Subjects from an interactive decision environment performed similarly to those working on their own.

Keywords

Decision Support, Knowledge Management, Codification, Personalisation

1. INTRODUCTION

The growing interest in knowledge management has been fuelled by three major development trends: globalisation with the increasing intensity of competition; digitalisation enabled by advances in information and communication technology; and the rise of knowledge based organisations together with changing organisational structures, new worker profiles, preferences and predispositions. As organisations move towards becoming knowledge-based, their business success will increasingly depend on how successful knowledge workers are at developing and applying knowledge productively and efficiently.

Knowledge management (KM) is seen as a key factor in realising and sustaining organisational success from improved efficiency and innovation. The basic assumption of KM is that organisations that manage organisational and individual knowledge better will deal more successfully with the challenges of the new business environment. More specifically, knowledge management is considered as central to process and product improvement, to executive decision making and to organisational adaptation and renewal (Earl 2001).

The central task of those concerned with organisational knowledge management is to determine ways to better cultivate, nurture and exploit knowledge at different levels and in different contexts. However, there are serious differences among researchers in what constitutes useful knowledge and the ways in which it should be managed. Various descriptive and prescriptive KM models and frameworks have been appearing in the academic literature of many disciplines for some time and, recently, there have been a sequence of articles attempting to summarise and categorise these (for review see Handzic and Hasan 2003).

According to Tsui (2003) the two most dominant approaches to deploying KM initiatives in organisations are codification and personalisation. The proponents of codification approach show a central preoccupation with explicit knowledge. They favour greater emphasis on the use of technology, especially organisational databases and discovery tools. On the other hand, the proponents of personalisation seem to be more interested in tacit knowledge and sharing. They focus more on people and cultural issues in the attempt to establish knowledge communities. Locating and connecting people of common interest is the prime goal here.

It is not unusual for organisations to adopt a combination of the two approaches in deploying KM initiatives. Some authors argue that such a holistic approach to KM is the only possible way to realise the full power of knowledge (Davenport and Prusak 1998). Others, like Hansen et al. (1999) emphasise that trying to pursue the "wrong" approach or both at the same time can waste time and money and even undermine business success. They propose that the codification approach is more suited for situations where work tasks are similar and existing knowledge assets can be reused. In contrast, they suggest that the personalisation approach is more suited for situations where the tasks are fairly unique and knowledge largely tacit. Empirical evidence to support these propositions is largely missing.

To gain a greater understanding of the effectiveness of different KM strategies, this study attempts to address the issue by empirically investigating the impact of personalisation and codification approaches in the context of decision making. Managerial decision making can be viewed as a knowledge intensive activity. In response to the demands of their work, decision makers often obtain explicit knowledge from the stores of business intelligence available in organisations, and gain tacit knowledge through personal interactions with peers. It is implicitly assumed that the availability of knowledge stores, and the opportunity for peer interaction, should lead to an increase in their working knowledge, this resulting in improved decision performance. However, little is known about the actual success of these initiatives and the returns resulting from them. Therefore, it is of particular interest to this study to examine whether and how two different KM strategies (codification and personalisation) affect decision makers' working knowledge, and what impact this may have on the quality of their subsequent decisions.

2. REVIEW OF KNOWLEDGE MANAGEMENT STRATEGIES

2.1 Codification

Knowledge has been widely recognised as a critical organisational resource for competitive advantage in the new economy. One of the important objectives of knowledge management is to capture, codify, organise and store relevant knowledge for later use by organisational members. Hansen et al. (1999) call this a codification approach to managing knowledge. The assumption is that the availability of a KM system such as a codified knowledge repository should lead to increased organisational knowledge and result in improved performance (Hahn and Subramani 2000). Various technologies including databases, textbases, data warehouses and data marts may be useful in building organisational knowledge repositories.

Currently, there is ample evidence to show that organisations do implement these technologies as part of their best KM practices (AA 1998). However, there is little empirical evidence regarding the impact of these knowledge repositories on organisational performance (Alavi and Leidner 2001). Some researchers point out that our ability to accumulate and store knowledge artefacts has by far surpassed our ability to process them, and warn of the danger that vast institutional memories may easily become tombs rather than wellsprings of knowledge (Fayyad and Uthurusamy 2001).

As cognitive overload increasingly chokes the effective utilisation of codified knowledge in organisations, scholars are pointing to some promising new knowledge technologies. Knowledge maps or k-maps are seen as a particularly feasible method of coordinating, simplifying, highlighting and navigating through complex silos of knowledge artefacts (Wexler 2001). Knowledge maps point to knowledge but they do not contain it. They are guides, not repositories (Davenport and Prusak 1998). One of the main purposes of k-maps is to locate important knowledge in an organisation and show users where to find it. (Kim et al. 2003). Effective k-maps should point not only to people but to document and databases as well. K-maps should also locate actionable information, identify domain experts, and facilitate organisation-wide learning (Eppler 2003). They should also trace the acquisition and loss of knowledge, as well as map knowledge flows throughout the organisation (Grey 1999).

A review of literature reveals a number of different types of k-maps. Eppler (2003) recognises five types: knowledge application, knowledge structure, knowledge source, knowledge asset and knowledge development maps. Wexler (2001) identifies concept, competency, strategy, causal and cognitive maps. Plumley (2003) suggests that knowledge maps are either procedural, conceptual, competency or social network based. Essentially, concept, structure, asset and cognitive maps provide a framework for capturing and organising domain knowledge around topical areas. Competency and source maps act as yellow pages or directories, which enable people to find needed expertise within an organisation. Finally, procedural or application maps present business processes with related knowledge sources. Any type of knowledge that drives these processes or results from execution of these processes can be mapped. For example, this could include tacit knowledge in people, explicit knowledge in databases, customer or process knowledge (Plumley 2003).

Procedural k-maps may offer various benefits. They help to improve the visibility of knowledge by showing which type of knowledge has to be applied at a certain process stage or in a specific business situation. On top of this, these maps also provide pointers to locate that specific knowledge (Eppler 2003). Procedural k-maps also help to improve the usability of knowledge by forcing participants to identify key knowledge areas that are critical to their business tasks. Finally, the analysis of this knowledge map triggers ideas for sharing and leveraging knowledge most suited to the organisation and the business context (Plumley 2003).

The main objective of this study is to empirically test these assumptions. In particular, the study will examine whether and how the availability of a procedural knowledge map may help decision makers to improve performance in a judgemental forecasting task.

2.2 Personalisation

In the personalisation knowledge management approach, knowledge is tied to the person who develops it and shares through person-to-person interaction (Hansen et al. 1999). The spiral model of knowledge creation (Nonaka and Takeuchi 1995, Nonaka 1998) suggests the crucial importance of socialisation in developing and transferring tacit knowledge in an organisation. The spiral model proposes that knowledge creation starts with socialisation, which is the process of converting new tacit knowledge through shared experiences in day-to-day social interaction. Socialisation within the originating "ba" (Nonaka and Konno 1998) provides a rich and meaningful platform for face-to-face natural interaction. Sometimes labelled as co-located communication, this enables a medium in which multiple senses and means (eg. tone, eyes, body) can be used to convey knowledge. A chat between employees may well foster the development of trust and provide a foundation for vital creative working.

A comprehensive survey of best KM practices (AA 1998), reveals that most organisations implement some kind of KM initiative to connect people and enable their interaction and collaboration. However, there are differences among researchers regarding the value of virtual (technology-mediated) interaction in comparison with real (face-to-face) interaction in knowledge management. Some researchers warn that technologies lack the emotional richness and depth of real, live, in-person interaction (Santosus 2001), and are unable to fully develop relationships and an understanding of complex situations (Bender and Fish 2000). Others argue that communication mediated by technology is no less effective than face-to-face communication (Warkentin et al. 1997). More and more cyber-communities are also beginning to challenge traditional ideas about communities' needs for a physical presence.

There are also differences among the researchers regarding the nature of socialisation. Perhaps the most intuitive function of socialisation is to transfer knowledge between people. The exchange model of social process suggests that people interact primarily for the purpose of information collection. The situation-theoretic approach to interaction (Devlin 1999) assumes that, for most conversations, the aim of each participant is to take new information about the focal object or situation into his or her context. The persuasive arguments perspective (Heath and Gonzales 1995) assumes that an individual's position on any given issue will be a function of the number and persuasiveness of available arguments. It assumes that individuals come up with a few arguments of their own, but during interaction they collect novel arguments and may shift their initial opinions.

The group work approach recognises the collaborative nature of the interaction act and suggests the potential synergy associated with collaborative activity (Marakas 1999). However, much of the earlier research into group interactions questions the relative virtues of collaborative over individual performance due to the groupthink phenomenon. According to some theorists (Janis 1982), members of the cohesive long-term groups strive for unanimity and do not realistically appraise alternative courses of action. This results in unfavourable outcomes.

Decision-making involves a significant amount of social interaction. Individuals often seek to consult with others before deciding what jobs to take, what cars to buy, or what changes to make in their personal life. Managerial decision makers also follow similar interactive procedures when making business decisions. They collect information and opinions from their subordinates, peers and superiors, but make final decisions alone. Because they make their final decisions individually, decision makers can use or ignore the information they collect during social interaction. It is argued that situations where individual decision makers interact in a social environment but make their own decisions should be free from groupthink-style outcomes. In such situations, interaction is assumed to allow individuals to more accurately assess their information and analysis, and improve individual decision performance.

Given the high emphasis placed on socialisation by KM theory, and few inconclusive findings reported by prior empirical studies (for review see Handzic and Low 2001), the main objective of this study is to examine whether and how an interactive decision environment may influence decision makers' performance in a judgemental forecasting task.

3. RESEARCH METHOD

3.1 Experimental Task

A forecasting task simulation was created for the purpose of studying the effect of codification and personalisation strategies to aid knowledge gain and support decision making. It was implemented in Microsoft Visual Basic language. The procedural knowledge map was developed and incorporated into the simulation in order to give users a clearer and more understandable knowledge visualisation that could lead to higher quality decisions.

Users assumed the role of the Production Manager for the Dream Cream dairy company in Sydney. One of their responsibilities was to make decisions on daily production of ice-creams sold from the company's outlet at Bondi Beach. Users were required to make accurate sales estimates for ice cream which to be sold the following day. Users completed the task for thirty-five consecutive days.

All participants were provided with a sequential historic information of task relevant variable (product sales) to provide some cues to suggest future behaviour. The task differed with respect to codification and personalisation strategies implementation. One half of the subjects worked in an interactive decision environment, and were encouraged to share (in pairs) their information and opinions with others while making decisions, but were not required to reach a consensual decision. The other half made decisions on their own, without any interaction with others. One half of the participants performed a decision problem with a support of a procedural knowledge map, and another half performed the same task without such an aid.

Financial remuneration was based on users' performance. Users incurred costs depending on the accuracy of daily estimates. Therefore, minimisation of cost, or in other words, maximisation of accuracy was the goal of the task. Over and under estimation errors were equally costly. At the beginning of the experiment, task descriptions were provided to inform subjects about the task scenario and requirements. The given text differed with respect to the knowledge map provided and the form of interaction allowed. In addition, throughout the experiment instructions and feedback were provided to each participant to analyse earlier performance and to adjust future strategies.

3.2 Experimental Design and Variables

A laboratory experiment with random assignment to treatment groups was used, as it allowed for greater experimental control and made possible drawing of stronger inferences about causal relationships between variables. The experiment had a 2x2 factorial design with two independent factors: (i) *codification strategy* (with or without procedural knowledge map) and (ii) *personalisation strategy* (interactive or non-interactive decision environment).

Codification strategy was manipulated in terms of the procedural knowledge map availability. The manipulation was achieved by developing two different versions of the experimental instrument. In one version, users were provided only with a simulated repository of knowledge artefacts, and in the other version, a procedural knowledge map was added to it in the form of a set of guidelines. These guidelines described critical steps in the decision process and key knowledge from the repository required to perform them. Personalisation strategy was manipulated in terms of the nature of decision environment. The manipulation was achieved by completely constraining or maximally encouraging (through dialogue) sharing of ideas and information before making own decisions.

Decision performance was evaluated in terms of *cost* operationalised by absolute error (AE) and expressed in dollar terms and *accuracy* operationalised by symmetric absolute percentage error (SAPE). AE was calculated for each trial as an absolute difference between subjects' forecasts and actual sales values. SAPE was calculated by dividing AE by an average of actual and forecast values, and multiplying by 100% (for details and justification see Makridakis 1993). Subjects' decision behaviour was evaluated in terms of self-reported dominant *forecasting method*. Individual subjects' *confidence* in the quality of decisions and *satisfaction* with their KM support were collected for control purposes and to supplement the measures of actual performance. These were rated on seven-point Likert scales with 1 as least and 7 as most end points.

3.3 Time Series Generation

For the purpose of the study, the product sales time series was artificially generated as a seasonal series with an upward trend in order to take into account days of the week and the holiday time influences. The error term was added to account for irregular or random events. The intention was to create a decision task that is "knowable" but "complicated". According to Kurtz and Snowden (2003) such tasks require sensing of incoming data, analysis of that data using a method which seeks to identify the patterns, and response in accordance with interpretation of that analysis or in accordance with expert advice. In the current study, the optimal response required subjects to detect and decompose the time series into trend, season and noise elements, and take these into account when making future predictions. Kurtz and Snowden suggest that a simple error in an assumption can lead to a false conclusion and result in poor performance. Thus, the detection of peak seasonal demands often can mean the difference between effective and ineffective decision.

3.4 Subjects and Procedure

Forty-eight graduate students enrolled in the Master of Commerce course "Knowledge Management Systems and Technology" at UNSW took part in the experiment. They participated on a voluntary basis, and received no monetary incentives. Some previous studies indicated that graduate students are appropriate subjects for this type of research (Ashton and Kramer 1980, Remus 1996, Whitecotton 1996).

The experimental session was conducted in a microcomputer laboratory. On arrival, subjects were randomly assigned to one of the two treatment groups by choosing a microcomputer from a number of units set for the experiment. Before commencing the task, subjects were briefed about the purpose of the experiment and read case study descriptions incorporated in the research instrument. They then performed the task. The session lasted about one hour.

3.5 Research Instrument

The research instrument used to facilitate the current study was adapted from Handzic (1996). The software was written in Microsoft Visual Basic. It included a task simulator, a decision support component and a data collection component. The sample screen layout of research instrument is shown in Figure 1.

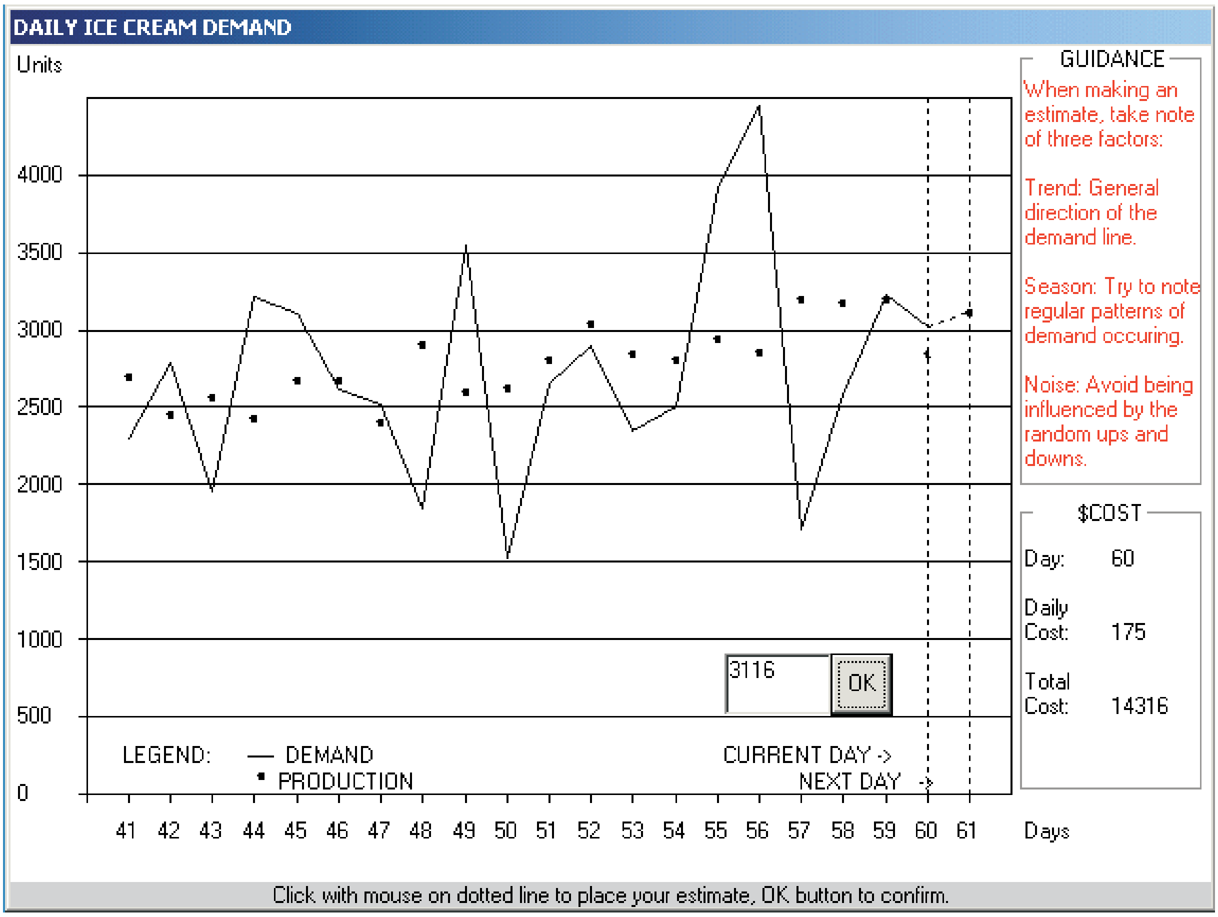

Figure 1. Screen layout of research instrument with procedural k-map

The instrument simulated a "complicated" forecasting task in a repetitive decision environment. The same program versions were used for interactive and non-interactive treatment groups. Entry of the final decision was enabled through clicking with the mouse on the special entry line and OK button for confirmation. Each prediction was displayed on the screen as a dot located above or below the corresponding actual sales. In this way the subject were able to quickly estimate the direction and magnitude of their errors.

Several features have been implemented in the simulation software to aid users in learning the sales pattern and making their predictions as accurate as possible. These features were based on two concepts: time series analysis and graphical visualisation. Time series of sales events for twenty days were initially provided in order to guide the decision making process. They were presented in the form of line curves in one consolidated graph. With the line graph of past sales, the users had a reasonable amount of knowledge to make fairly accurate future decisions. However, in a knowledge-based economy, "fairly good" is not enough. Therefore an extra KM feature was provided in one software version (see Figure 1) to help users extract as much useful knowledge as possible from raw content. To do so, the procedural knowledge map was employed. It consisted of a set of guidelines and pointers to key knowledge required to perform the task. It was assumed that these components jointly provided users with a very good idea of how to discover and use the predictive sales pattern in data. Alternatively, users could discuss the issue with peers and learn from each other.

Finally, the instrument enabled unobtrusive recording of the observed behaviour and performance. In addition, the instrument captured the subjective assessments of various task, behaviour and performance aspects of interest. The ratings were made by selecting the most appropriate options from a simple questionnaire included in the simulation software. These records were saved in separate files for each subject and treatment for later analysis.

4. RESULTS

Descriptive results (means or frequencies) for accuracy, method, confidence and satisfaction variables by experimental groups are presented in Table 1. The collected data were further analysed by a series of parametric (Two-way ANOVA) and non-parametric (Mann-Whitney) statistical tests. The analyses found some significant results.

Dependent	Without K-map		With K-map		
Variable	Non-Interactive	Interactive	Non-Interactive	Interactive	N
Cost (AE)	761.73	735.10	698.45	692.61	1680
Accuracy (SAPE)	7.8%	7.5%	7.0%	6.9%	1680
Method (Simple/Complex)	8/4	7/5	3/9	5/7	48
Confidence (Score)	2.9	2.7	3.5	3.8	48
Satisfaction (Score)	5.2	4.9	4.2	4.9	48

Table 1. Descriptive Results for Dependent Variables by Experimental Groups

As expected, the results indicate significant positive effects of codification on cost, accuracy, method and confidence, but not satisfaction. The mean AE of the subjects with the k-map was significantly smaller compared to those without the k-map (695.53 vs 748.42, F=3.636, p=0.057). Similarly, mean SAPE of the subjects with the k-map was significantly smaller than that of their counterparts without the k-map (6.9% vs 7.6%, F=5.151, p=0.023). Consistently, the subjects with the k-map tended to feel more confident in their performance than those without the k-map, as shown by their higher mean rank score (28.65 vs 20.35, U=188.500, p=0.033). Better performance suggested greater knowledge of the decision problem and the subsequent application of a more appropriate forecasting method. Indeed, Mann-Whitney results revealed significant differences in strategies used by the two groups (28.00 vs 21.00, U=204.000, p=0.045). Subjects with the k-map tended to use less often simple heuristics such as random or naive (8 vs 15), and more often complex methods such as averaging or trend analysis (16 vs 9) as their dominant approach. However, codification had no significant impact on satisfaction. Although, to our surprise, subjects tended to like slightly less the system with the k-map than that without the k-map, the difference between their mean rank scores was not statistically significant (22.23 vs 26.77, U=233.500, p=0.248).

In contrast to codification, the results indicate that personalisation had no significant impact on any of the dependent variables evaluated. With respect to cost and accuracy, interacting subjects tended to perform similarly to those working on their own. The mean AE of the subjects in the interactive environment was not significantly different from that in the non-interactive environment (713.86 vs 730.09, F=0.343, p=0.558). Similarly, subjects in the interactive environment had similar mean SAPE as those in the non-interactive environment (7.2% vs 7.4%, F=0.555, p=0.456). Consistent with the cost and accuracy results, subjects in the interactive environment reported similar level of confidence in their performance as those in the non-interactive environment. No significant difference was found between their mean rank scores (24.19 vs 24.81, U=280.500, p=0.872). This suggested comparable knowledge of the decision problem and the choice of similar methods for the task performance. Indeed, Mann-Whitney test found no significant difference in strategies used by the two groups (24.00 vs 25.00, U=276.000, p=0.775). The results show that interacting subjects tended to use, as their dominant approach, both simple heuristics (12 vs 11) and complex methods (12 vs 13) as often as their non-interacting counterparts. Finally, subjects were equally satisfied with both working environments, as shown by their similar mean rank scores (24.88 vs 24.13, U=279.000, p=0.849).

5. DISCUSSION

The main findings of this study make two important contributions to the development of KM theory: (i) support the contention that for the effective use of knowledge, decision makers need to pursue primarily one KM strategy; and (ii) identify codification as a more appropriate strategy for solving "complicated" decision problems. More specifically, the study has demonstrated that the procedural knowledge map improved decision accuracy, reduced related cost, heuristics and enhanced confidence, but not satisfaction. Peer interaction made no difference in decision performance at all.

5.1 Codification Effect

Subjects provided with a procedural knowledge map were found to better understand the decision task, apply more appropriate forecasting method and consequently make more accurate decisions and incur less cost than those performing the task without such map. Subjects were also found to be more confident in the quality of their decisions. Interestingly, the k-map made no impact on user satisfaction.

The beneficial effect of this knowledge map is consistent with the theoretical expectations suggested by the KM literature (Plumley 2003, Eppler 2003, Wexler 2001). The map used in this study presented critical stages of the decision making process and pointed to key knowledge areas required at each stage. Thus, it improved the visibility of knowledge in the time series data, and helped participants to identify and locate it. The "reuse" economics (Hansen et al. 1999) can also explain the beneficial effect of the codification model found in this study. Once the k-map was developed and made available, it could allow fast and reliable reuse of explicit knowledge across the repetitive experimental trials.

The positive effect of the map can also be attributed to the nature of the task domain at hand. According to Kurtz and Snowden (2003), in ordered task domains, patterns are knowable and the only issue is whether we can afford the time and resources to move from knowable to known. Applying methodology which seeks to identify the patterns through study of task properties is considered both legitimate and desirable. The procedural k-map in this study provided such a methodology. It facilitated the analysis and led to more appropriate responses in accordance with interpretation of that analysis.

The lack of any impact of k-map on perceived satisfaction is quite interesting. One would hope that the users provided with more sophisticated tool would also have more favourable attitudes towards it. However, according to Straub et al. (1995), perceptual and behavioural scores can be radically different. This finding can be potentially attributed to the characteristics of the task context in which the investigation was carried out. The current study provided an iterative task context with the k-map provided on the screen at all times. Constant reinforcement of the same guidelines could have irritated subjects and thus affected their satisfaction. In addition, subjects could have learnt the task over time through experience and from feedback and would not feel the need for such a reminder after a while.

To test the potential learning effect, additional analysis of the collected data across five blocks of trials was done. The results confirm a significant main and no interaction effect of block on accuracy. As suggested, subjects tended to significantly improve the quality of their decisions over time. This was demonstrated by smaller errors (SAPE) found among these subjects in the later than in the earlier periods of the task (8.5% vs 7.3% vs 7.3% vs 7.6% vs 5.6%, F=7.817, p=0.000).

5.2 Personalisation Effect

With respect to personalisation, the current study found no significant impact on performance. Subjects provided with an opportunity for peer interaction were found to use similar forecasting methods and consequently make similar quality decisions and incur similar costs as those performing the task on their own. The opportunity for peer interaction also made no difference in subjects' confidence and satisfaction.

The lack of beneficial effect of personalisation found is contrary to Nonaka's knowledge creation theory (Nonaka 1998) which emphasises the critical importance of the process of socialisation for knowledge development. Rather, it agrees with the proposition that the impact of interaction on decision making is highly contingent upon the nature of the task. Previous empirical research found no significant effect of interaction in simple tasks, and significant positive impact in complex tasks (Handzic and Low 2001). These results are in accord with the proposition that personalisation is more appropriate for unordered decision domains with more complex, uncertain or novel problems, and codification for simpler, knowable or repetitive tasks (Kurtz and Snowden 2003, Hansen et al. 1999). However, the task used in this study was by definition neither simple nor complex, but complicated. As such, it was knowable and subjects could theoretically learn from each other, but failed to do so.

One potential reason for the lack of personalisation effect on performance could be the level of expertise about the problem brought by the participants to the interactive act. For example, participants bringing similar levels of expertise to the interaction act are likely to enhance only confidence, but not accuracy of their decisions (Heath and Gonzales 1995). However, our findings show that about one half of subjects in the current study had a good understanding of the task as evidenced in their methods. So, there was an opportunity for those with less knowledge to learn from those with more knowledge through dialogue (Devlin 1999).

The fact that this did not happen suggests the lack of trust in peer advice. A chat between peers is assumed to foster the development of trust and provides a foundation for creative working. The persuasive arguments perspective (Heath and Gonzales 1995) further assumes that an individual’s position on any given issue may shift as a result of interaction with others due to the collection of persuasive arguments. However, conflict, status and number of participants in the interactive act all may have an adverse effect on performance The current study tried to avoid these by limiting interaction to groups of two (Panko and Kinney 1992, Schwartz 1995) and by giving participants equal and dual judge-advisor roles. Despite all of this, the current study shows that participants placed greater reliance on technology than people when solving complicated problems.

5.3 Other Issues

With respect to overall performance, the study revealed relatively poor performance across all treatments. The poor overall accuracy and confidence resulting from simple heuristics could be potentially attributed to the lack of monetary incentives. Other similar studies (Handzic 1997, Sniezek and Buckley 1995) provided their students with substantial monetary rewards for their performance. It is possible that without monetary incentives, the subjects did not try as hard as possible to use the full potential of their KM solutions to improve decisions. By not giving extrinsic incentives, this study attempted to prevent knowledge “hoarding”, and promote cooperation rather than competition among the participants. It was also assumed that graduates chosen from the pool of students attending an advanced Master’s level course should be motivated to do their best on the task by the intrinsic interest in the subject matter.

Alternatively, poor overall performance could be attributed to the characteristics of the task information and the task performers. Computerised knowledge repository available to participants in the current study with or without the procedural k-map was not sufficient to perform well on the task. The participants also needed analytical information such as an evaluation of the trend, season and noise components, as well as the relevant know-how to integrate this information into a decision response. This crucial information was assumed to be a part of individual tacit knowledge. However, non-expert participants were not likely to have high levels of the required tacit knowledge to perform well on the task without prior training or experience. An encouraging finding is that performance did improve over time.

In summary, the current study provides a number of interesting findings that may have some important implications for organisational KM strategies. First, they suggest that decision makers faced with complicated decision tasks may greatly benefit from codification strategy. Procedural k-maps may enhance critical knowledge visibility and usability, and thus alleviate the negative effects of task difficulty and subsequent use of decision heuristics. This in turn may result in improved decision accuracy and lead to desired business outcomes. Second, these findings suggest that pursuing personalisation instead or in addition to codification may not be beneficial to decision performance. Overall, the current study findings provide important empirical support for Hansen et al.’s (1999) theory.

However, some caution is necessary regarding the generalisability of these findings due to a number of limiting factors. One of the limitations refers to the use of a laboratory experiment that may compromise external validity of research. Another limitation relates to artificial generation of time series that may not reflect the true nature of real business. The subjects chosen for the study were students and not real life decision makers. The fact that they were mature graduates may mitigate the potential differences. No incentives were offered to the subjects for their effort in the study. Consequently, they could find the study tiring and unimportant and would not try as hard as possible. Most decisions in real business settings have significant consequences. Further study is necessary that would address these limitations and extend current research to other tasks and contexts.

6. CONCLUSION

This study was able to show the ability of a procedural knowledge map to improve understanding and enhance performance of a forecasting task. From our research findings one may conclude that codification KM strategy can effectively enhance decision makers' working knowledge and performance in the context of a complicated decision task. An alternative or additonal personalisation strategy does not provide any benefit in such task context. However, the study is not without limitations. Different techniques will have advantages and disadvantages under different situations, and thus careful consideration of different combinations of techniques is necessary. Further empirical research is recommended that would address some of these issues.

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