A HOLISTIC APPROACH TO ORGANISATIONAL LEARNING IN MANUFACTURING: A MODEL AND A RESEARCH AGENDA

Marcia Nathai-Balkissoon* and Kit Fai Pun

University of the West Indies, Trinidad & Tobago

Abstract: Structuring learning and maximising the use of knowledge in manufacturing organisations can further Trinidad and Tobago's (T&T) quest to diversify its energy-based economy, promote sustainable development and enhance the creativity and competence of its population. Existing Organisational Learning (OL) and Knowledge Management (KM) models have not sufficiently integrated soft elements (e.g., culture) and hard elements (e.g., technology) to enable direct application within T&T's manufacturing sector. This paper discusses the conceptual foundations of OL/KM, and identifies several key OL/KM elements (such as culture, KM tools and instruments, learning processes and learning practices) that would be used to devise a holistic manufacturing OL model. A research agenda is also presented, by which the model would be validated.

Keywords: *Knowledge Management; KM; Organisational Learning; OL; holistic model; Trinidad and Tobago; T&T.*

INTRODUCTION

The Republic of Trinidad and Tobago intends to develop competent and innovative people. T&T's work to establish a knowledge-based economy lags similar attempts by many other countries by 15 to 20 years, and from the challenges faced by other countries, it is obvious that developing the values and structures that are key to knowledge-based economies does not happen serendipitously. T&T's advantage is that it can benefit from the conceptual and empirical work that has been done in Knowledge Management (KM) and its related field, Organisational Learning

(OL). Charting the course would be simplified were there an available guiding framework or model, but a single holistic model does not exist to cover the wide-ranging spectrum of concerns that are spanned by KM and OL, nor have any models been derived for cultures and conditions similar to those of T&T.

Diversifying T&T's energy-based economy will include the investment of great effort to strengthen and propel the country's non-energy sector. At least two of the seven priority industries identified for development by the T&T Government (Printing and Packaging

*Corresponding author: University of the West Indies, Trinidad & Tobago; e-mail: mnbalkissoon@gmail.com

and Food & Beverage) belong to the manufacturing sector (Ministry of Trade and Industry, 2007). Based on informal discussions with several persons in the manufacturing sector, it appears that there is a tendency to retain the status quo for much longer than is advantageous. The manufacturing industry needs to establish systems to recruit and develop people who want to learn and innovate, and it needs to develop an outlook that recognises learning and enhancement as part of our job functions, rather than something we do when there is time.

Without a structured OL system, the cycle of loss of expertise and competitive advantage will persist. The organisation and the new incumbent find themselves at a disadvantage, as past decisions may lose context, developmental plans may go into hibernation or may even regress, the organisation may lose out on opportunities for growth through process improvement, enhanced market share and income increases, or it may even suffer due to reduction of income or loss of job opportunities.

CONCEPTUAL FOUNDATIONS OF OL AND KM

What are KM and OL?

According to Gupta et al. (2000), the term KM refers to the need to capture, collate, organise, process and transfer knowledge in support of organisational processes including planning, decision-making and learning. The separate field of OL also arose to support organisational needs related to learning, adaptation and performance excellence (Senge, 1992). Firestone and McElroy (2004) and Zuber-Skerritt (2005) point our that, while KM has traditionally been seen as an IT-intensive function, this is a limiting viewpoint as KM partners with OL to support the human and organisational needs of our industries (Lin and Lee, 2005; Shah et al., 2007).

OL and KM research

Most of the empirical research on OL and KM has been limited to 'traditional western economies', i.e., countries such as the USA and parts of Western and Northern Europe (Walczak, 2008). Some work has also been done in other countries like Jordan (Jamali et al., 2009) and Taiwan (Lin and Lee, 2005) but these were either case studies or studies performed in developing countries and so the work could not be generalised for application in wider (international) practice. This work proposes to study a wide cross section of the manufacturing companies in T&T, and therefore would enable the formulation and testing of an OL model than can be applied throughout the country. Furthermore, given the similarities between T&T's culture and that of other Caribbean islands, the OL model may find wider regional application as well.

Key elements of OL and KM

Many studies have been done in the fields of KM and OL, with several perspectives having been offered, and a wide range of conceptual models being proposed. Some empirical models have also been developed, but there has not yet been a holistic model that seeks to combine the field's wide range of considerations (e.g., learning processes, organisation culture, organisation structure, KM and learning practices). In this section, several of the contributions from the field are considered.

Organisation structure and culture

Knowledge utilisation depends on several factors, including the degree of organisation structure (Menon and Varadarajan, 1992), trust and partnership within an information and innovation culture (Edwards and Kidd, 2003; Menon and Varadarajan, 1992, and organisational culture generally Bapuji and Crossan, 2004; Chang and Lee, 2007). These factors would likely address such issues as corporate policies that support

learning, empowerment, openness to new ideas, tolerance for mistakes, establishment of performance expectations, reward and incentive policies, and even partnering beyond organisational borders. Holtshouse (1999) points out that elements of leadership, for example Knowledge Leadership, also impact on knowledge utilisation.

Learning processes

Over the years, learning has been recognised to take place at three different levels: single loop learning where the organisation corrects errors and learns in increments (Argyris and Schon, 1978), double loop learning where the organisation seeks more proactively, to correct and prevent problems (Akgun et al., 2003; Wang and Ahmed, 2003), and triple loop learning (Wang and Ahmed, 2003), through which organisations 'learn to learn' or learn strategically, a mode of learning that is practiced by only the most mature organisations. Wang and Ahmed (2003) further emphasise that learning progresses more effectively once organisations recognise the value of organisation unlearning so that they do not wait for current concepts to fail-in-use.

Many authors have discussed the intricacies of how learning takes place in organisations. Significant concepts include systems thinking as discussed by Senge (1992), social and cognitive interaction (Akgun et al., 2003), and individual, group and OL cycles that enable individual and collective conversion of emerging knowledge to be embedded in processes, systems and organisational culture (Sanchez, 2005). Lee and Roth (2007) are proponents of the emerging view that OL is not just the sum of the learning of individuals and groups, but it is its own form of learning.

Learning tools and practices

A valuable concept is that of tacit knowledge being innately held and being difficult to codify and capture. One practitioner's tacit, experiential or living knowledge must be transferred through conversion into explicit knowledge (e.g., through mentoring and storytelling) and back again into tacit knowledge held by another practitioner (Polanyi, 1958). The SECI Model conceptualised a knowledge spiral through which tacit knowledge is converted to explicit knowledge in order to be shared by one person and back again to tacit knowledge when internalised and adopted by another person, through the continuing sequential process of Socialisation, Externalisation, Combination and Internalisation (Nonaka and Takeuchi, 1995).

The SECI Model also seems well-aligned with Kolb's (1984) Learning Styles Cycle, which illustrated the value of four stages of learning, namely experiential learning, observation and reflection, abstract conceptualisation and active experimentation. Other -models promote active learning styles from both personal (Zuber-Skerritt, 2005) and social perspectives (Boisot, 1998). The establishment of learning practices that are embedded in the organisation's culture, and that are supported by KM and other tools and instruments are valuable contributors to OL.

Cognitive ability

Finally, cognitive ability is a key OL need (Akgun et al., 2003), in order to effectively utilise learning tools, implement practices, maintain and improve processes and systems, and contribute within and influence the organisation's culture.

STUDY HYPOTHESES

The considerations of several existing models illustrate that, while each model addresses important concerns, there is no one model that is holistic and empirically validated to suit the context of a developing country such as T&T.

To establish a holistic OL model for T&T's manufacturing sector, the following research hypotheses have been derived from the key elements of OL and KM that were outlined in Section titled "key elements of OL and KM":

H$_1$: Organisation Structure and Culture influence OL

H$_2$: Learning Processes influence OL

H$_3$: Learning Tools and Practices influence OL

H$_4$: Cognitive ability influences OL

PROPOSAL OF CONCEPTUAL MODEL

In order to better promote OL in the manufacturing sector, it becomes necessary to try to consolidate the viewpoints put forward by theorists and practitioners in the field. This paper seeks to combine viewpoints based on similar themes or sub-areas that impact on OL.

Main factors influencing OL

Based on the hypotheses stated above, the authors put forward the premise that the ability of an organisation to learn (i.e., OL) is influenced by four major groups of factors. These are:

A Cognitive Ability of Individuals.

B Learning Tools and Practices.

C Learning Processes.

D Organisation Structure and Culture.

Preliminary OL model

These four factors are the inputs from which a preliminary conceptual OL model for the manufacturing context has been devised. Figure 1 presents the basis of the model.

Sub-factors Influencing OL

Each factor that influences OL is expected, in turn, to be influenced by several sub-factors. Table 1 provides a breakdown of 23 sub-factors linked to the four major factors that are expected to influence OL.

Extended holistic OL model

The 23 sub-factors can now be included in the preliminary model to further develop a
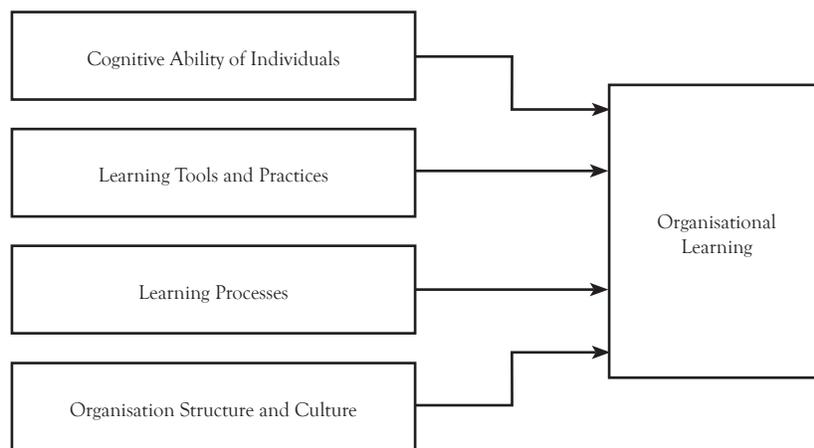

Figure 1   Preliminary conceptual model of OL for manufacturing

Table I The four factors and 23 sub-factors that influence OL

Factor influencing OL	Sub-factors influencing OL
Cognitive ability of individuals	Ability to memorise and recall
	Ability to comprehend
	Ability to synthesise, analyse, evaluate, apply and think logically
Learning tools and practices	KM tools and instruments
	Mentoring and storytelling
	Experiential learning
	Observation and reflection/internalisation
	Abstract conceptualisation
	Active experimentation
	Training and self-development opportunities
Learning processes	Learning at the individual level
	Learning at the group level
	Learning at the organisational level
	Single loop learning
	Double loop learning
	Triple loop learning
	Organisational unlearning
Organisation structure and culture	Corporate philosophy and values
	Strategy adaptation
	Organisation structure
	Corporate leadership and decision-making
	Learning culture
	Incentives and rewards

holistic model of OL. This extended holistic model is depicted in Figure 2.

THE PROPOSED RESEARCH AGENDA

In order to test and proof the holistic OL model, empirical exploration of the relationships between the various factors and sub-factors would be necessary. The following research agenda provides an indication of how respondents would be selected, as well as how the data collection, data analysis and model validation would take place.

Survey design

The research would survey respondents from the manufacturing sector of T&T, in order to draw inferences about the OL systems and practices therein. In order to generalise findings leading to the validation of the model, a large number of responses across the sector would be needed. The survey would be cross-sectional, rather than longitudinal, and so would obtain results at a single point in time. Also, the survey would be self-administered, with both paper
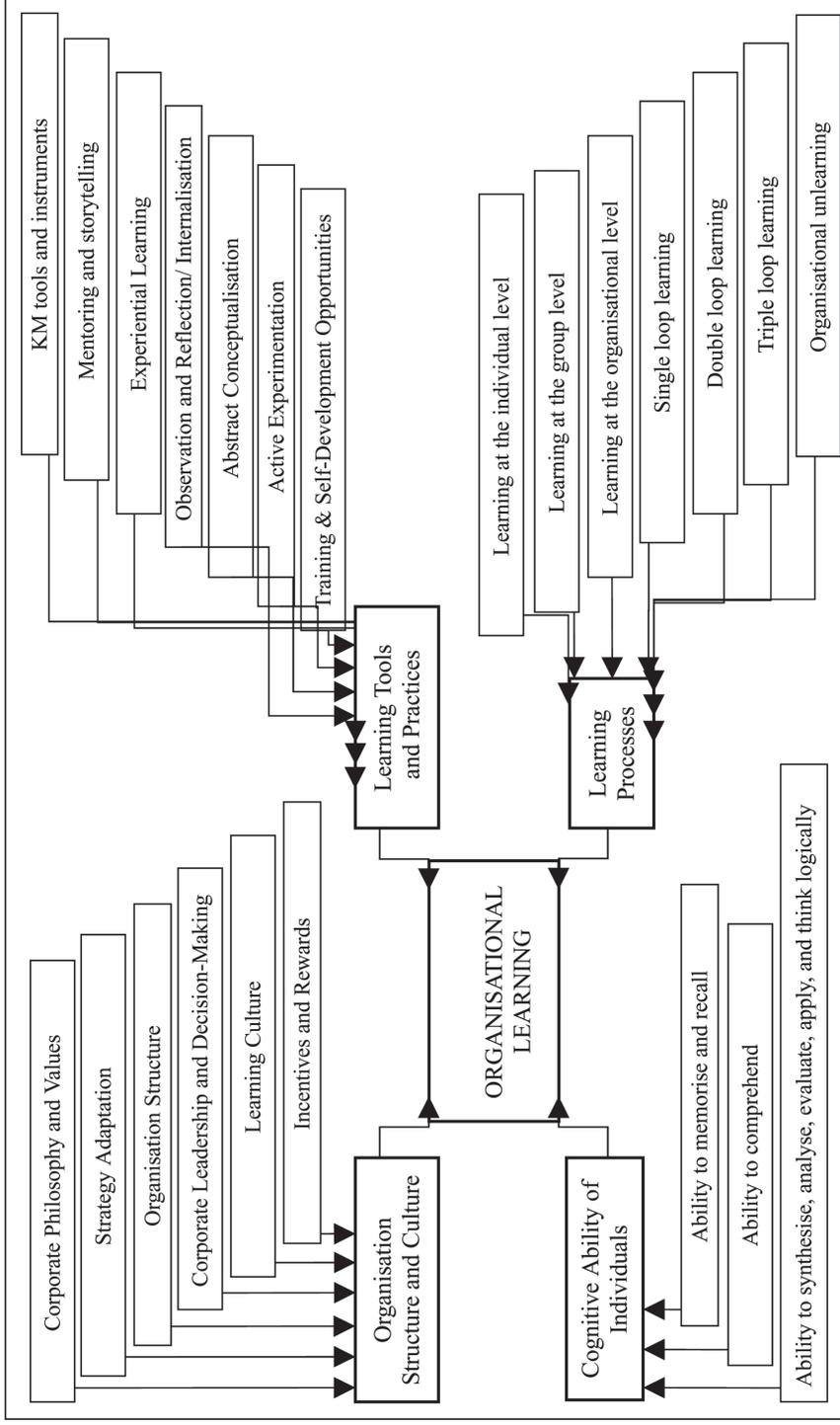
Figure 2   Extended Holistic Model of OL for Manufacturing

versions and electronic versions of the questionnaire being used depending on the preference of respondents.

Population to be surveyed

It would be difficult to survey all manufacturing enterprises in T&T, since one comprehensive listing of the entire population is not held in an accessible database. However, organised membership listings of manufacturing companies' contact information are maintained by groups such as the T&T Manufacturers' Association (TTMA), Trinidad and Tobago Chamber of Industry and Commerce (TTCIC), The Energy Chamber of T&T (ECTT) and Point Lisas Chamber of Industry and Commerce (PLCIC). The largest listing of manufacturing enterprises (209) is held by the TTMA; therefore the survey would utilise the TTMA's publicly accessible database to seek responses from those 209 companies, as a minimum.

Questionnaire development, piloting and revision

A Questionnaire organised around the four factors and the 23 sub-factors would be developed using a Likert-scale to promote clearer interpretation and better quality of responses. The draft questionnaire would be piloted (Creswell, 2009) in a small number of manufacturing organisations in order to check content validity of the instrument and improve the structure, format, scales and understandability of the instrument's items. The final questionnaire survey items would clearly represent the variables related to each of the four hypotheses.

Questionnaire survey

The revised questionnaire would target a wide cross-section of T&T's manufacturing enterprises, with at least 209 companies being approached, as mentioned before. Multiple responses would be sought from each company surveyed, so that the data would represent the opinions of employees, supervisors and managers.

In addition to using introductory/ explanatory letters and confidentiality clauses, collaboration with the TTMA is expected to positively impact on the frequency and quality of survey responses.

Follow-up would be done to evaluate non-response rates, and to contact the target audience in order to encourage questionnaire completion and returns.

Analysis of data

Completed questionnaires would be analysed according to the following process:

1 Response data would be collated to reflect the number of responses and non-responses to the survey.

2 Analysis consisting of basic descriptive statistics (e.g., mean, standard deviation and ranges) would be performed for each question item.

3 The instrument would be reviewed for validity by considering content validity, concurrent validity and construct validity.

4 Reliability measurement of the instrument, looking at internal consistency, as well as test-retest correlations.

5 Calculation of scores for each company respondent, by averaging Likert response data to determine a score for every statement on the questionnaire.

6 Calculation of scores for each company by averaging the scores of all respon-

dents from that particular company, by statement, and then further averaging to obtain scores for each of the factors A, B, C and D.

7   Determination of measures of statistical significance and correlation factors in order to comment on whether the hypotheses were supported, and to determine suitability of the conceptual model. The multivariate statistical analysis would likely be conducted using the Statistical Package for Social Sciences (SPSS), Linear Structural Relations System (LISREL) for confirmatory factor analysis, and possibly canonical correlation analysis to investigate relationships between pairs of factors.

8   Evaluation and discussion of consistency or variability that was highlighted through the data analysis.

Model refinement and validation

Once the correlation and other quantitative data have been calculated, the hypotheses and the holistic OL model would be refined. Thereafter, a final phase of model validation would be done through data collection through one or two case studies.

DISCUSSION

As mentioned earlier, there have been relatively few empirical studies to support the OL/KM models that have been published. Furthermore, as noted by Walczak (2008), the dearth of studies outside of 'traditional western economies' has created difficulty for developing countries to obtain and adopt a model to fit their context. This research would contribute to the work needed from the developing country context and, while intended for use in T&T, may find applications in other developing countries,

especially the Caribbean Region. Further research should also be done across the Caribbean Region as a whole, as this would lead to the development of an OL model for the entire region, as it moves toward regional integration.

As the research is focusing on the manufacturing sector in T&T, there would be benefits from going forward to do further research to examine OL in other sectors, especially those sectors targeted for growth by the Government of T&T.

The research would be conducted through the administration of a questionnaire especially developed for this exercise. Use of a questionnaire was considered most appropriate for the purpose as this tool would be economical to administer, consistent in its survey of the topics/factors of interest, require only a small amount of time from respondents (therefore making questionnaire returns more likely), and allow data to be collected in a short timeframe from a wide range of respondents (Creswell, 2009) and across a wide geographic area. Case studies and interviews would limit the number of persons who could be surveyed, due to the longer timeframes required to collect and analyse data from both the perspectives of the researcher and the respondent.

Based on anecdotal information available to the author, an industry response rate of between 30% and 50% is typical in T&T. The survey approach would include follow up to attempt to influence higher response rates from the target audience. Also, the fact that the questionnaire would allow for anonymity of respondents may enhance participants' willingness to respond to more sensitive topics (e.g., about leadership or cognitive issues) as they may be perceived as non-threatening issues in the questionnaire format.

Design of the questionnaire items will be critical, as the questions must be self-explanatory and comprehensive. Review of successful questionnaires, such as the Dimensions of the Learning Organisation Questionnaire (DLOQ) (Watkins and Marsick, 1998) should inform the development of the research instrument for this study, in order to positively influence the structure and crafting of the items. Special attention must be paid to the construction of the questionnaire itself, including layout and question validity (i.e., construct and reliability), and the methodology has indicated that there would be a piloting stage geared toward pre-testing the instrument to identify problems and guide revisions before the actual survey would be performed.

CONCLUSIONS

This paper has reviewed several contributions to the related fields of KM and OL, with particular focus placed on understanding significant factors which other authors have recognised as contributing to KM and/or OL.

Grounded in the review and the author's own opinions, a holistic OL model, based on four main hypotheses, has been proposed for the manufacturing sector in T&T.

The paper has also proposed a research agenda to empirically test and validate the conceptual OL model in order to quantify the impact of various factors on OL, specific to the context of T&T's manufacturing sector.

The research is being done in a developing country, a context in which there has been a recognised paucity of empirical work; it would make a meaningful contribution to the field as very little insight is available from the perspective of developing countries, generally, and no research has

been found within the Caribbean region, in the field of OL and/or KM.

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