Measuring Transactive Memory Systems among IT Outsourcing Project Team Members at Malaysia Public Agencies: New Scale Development

A. H. NOR AZIATI

Production Management and Operation Department
Faculty of Technology Management & Business, Universiti Tun Hussein Onn Malaysia
86400 Parit Raja, Batu Pahat, Johor
MALAYSIA
aziati@uthm.edu.my

S. JUHANA

Information Science Department
Faculty of Information Science and Technology
Universiti Kebangsaan Malaysia
43600, Bangi, Selangor
MALAYSIA
js@ftsm.ukm.my

Abstract: - IT outsourcing project is a knowledge intensive process with diversified knowledge and competencies are required among the teams. Team members are required to transfer, coordinate and process knowledge resources effectively. Recent research reported that half of outsourcing projects often failed because of insufficient knowledge transfer and the lesson learnt resulting from ineffective transactive memory system **(TMS)** among team members. Besides, there is limited research reported on the contribution of transactive memory system (TMS) for knowledge transfer in IT outsourcing particularly among Malaysian Public Agencies. Hence, the issue highlights the importance of understanding that the organizational memory system can effectively promote knowledge transfer and facilitate the matching of task, resources, and people. To address this gap, the study aims at developing a new measurement scale of TMS that is more in accordance with the context as well as routine-based measurement for direct TMS measures rather than indirect measurement used by many researchers. The study employed survey method to validate the new scale. The questionnaire is distributed among 195 IT personnel at three e-government lead agencies in Malaysia. The result of the study confirmed that there are three main transactive processes in TMS; directory maintenance, coordination and information allocation. Among the TMS routines, the referral, allocation and updating routines significantly shows higher impact towards knowledge transfer. The research contributes to the development of TMS theory particularly, while the enhancement of TMS scale measurement can be used for future studies.

Key-Words: - Transactive Memory System (TMS), IT Outsourcing, E-government, Malaysia Public Agencies

1 Background

The Malaysian Government has endowed large amounts of money in transforming the government delivery system and access to government information. One of the prominent initiatives in transforming government is through e-government outsourcing. Current e-government IT outsourcing activities in Malaysia involved data entry, ICT hardware maintenance, network management service, web-hosting management and development application system maintenance and training [1]. These services are turn-key projects whereby the tenders are awarded to local native vendors. Pilot projects on e-government that have been implemented include *e-Perolehan*, Project Monitoring System II, HRMIS, e-GL, MyExchange, MySMS, MyGovernment Portal, e-Shariah, ePBT, e-Filing, Tele-Consultation and e-Services.

Despite the reports on e-government achievement has shown the increment rating for Malaysia e-government initiative, yet, there are still some projects that do not fully **satisfy** by the stakeholders. This is supported by [2] reports on outsourcing quality at Malaysia's public works

department. They claimed that the vendors' performance in general is unsatisfactory and incompetent. Similarly, from a recent unpublished thesis by [3], the researcher mentioned, out of six e-government applications, only 40% of them are successful and the rest are considered as failed projects. This shows that there is no specific guideline for measuring or evaluating the success or failure of existing or current IT projects in the public sector. Yet, all these projects have been outsourced to the third party vendors for development. Notwithstanding, the failure of e-government projects have not merely happened in Malaysia, but all over the developing countries. Failure of e-government projects among public agencies have been reported in many literatures. For example, [4] reported that failure rates of e-Government projects in developing countries are estimated to be as high as 85%. Only 15% can be fully seen as successful. IT outsourcing involved teams which are part of two or more different organizational structures with different communication protocols working within an environment characterized by an unbalanced knowledge distribution [5,6]. Hence, most e-government projects failed because there is no lesson learnt since knowledge about the failure was not captured, transferred or applied.

Previous scholars [e.g. 7,8,9] have highlighted the importance of organizational learning as one of the determinants of e-government project success since the lesson learnt needs to be understood and applied. Organizational learning helps to retain some of project experiences and best practices that enable government to compare its various projects more systematically and document its most effective problem solving mechanisms. In addition, the systematic documentation lessons learnt or potential pitfalls help to reduce project failure [8]. In line with such advances in the IS field, scholars have increasingly considered the concept of the Transactive memory systems (TMS) as an enhancer of organizational memory development [10]. The organizational knowledge and transactive process (e.g. encoding, storing and retrieving) involved in a transactive memory system (TMS) [11] could motivate individuals or team members to learn and shorten the learning time. While the concept of transactive memory has been studied in the context of traditional organizational forms and collocated teams, little is known about the process through which a TMS in outsourcing projects teams. The early TMS studies were empirically tested but it was done in experimental setting [e.g. 12,13] rather than in real organization practices. There were a few

studies that have indeed explored the concept of transactive memory among IT project teams and the impact of TMS towards team performance [e.g. 14,15,16] however, past scholars have repeatedly used TMS measurement taken from [17]. Originally, [18] measures TMS with three components; specialization, credibility and coordination. However, we argued that the Lewis' measurement for TMS do not align with the conceptualization of TMS derived in this study. Therefore, this study attempts to fill this gap by measuring TMS among IT project team members based from the project routines rather than just measuring TMS from general perception. Consequently, this study highlights some important routines in IT project that will help the development of organizational memory to increase organizational learning capability and sustainability of the outsourced project.

2 Literature Review

2.1 Organizational Learning Theory (OLT)

Organizational learning (OL) focuses on the use of prior experiences that impact the future direction and changes in organization's knowledge [19]. OL processes encompass three sub-learning processes; creating, retaining and transferring [19]. In the area of knowledge retention, researchers have focused on whether organizational knowledge is cumulative and preserved through time or depreciates. Therefore, researchers started to explain the phenomenon by integrating various repositories in retaining knowledge. Research on the knowledge repositories of the routines and TMS is particularly the popular direction. TMS is claimed to improve team's task execution, performance and coordination. Besides, TMS provides a micro foundation of organization's dynamic capabilities [20]. As the TMS develops over time, the group processes that the team exhibits also improves team effectiveness, and consequently organization performance.

The importance of organizational learning capability in outsourcing relationship and success had been repeatedly highlighted in previous research [e.g. 21,22]. Organizational learning refers to the use of organizational memory, knowledge storage or documentation and feedback loop. Organizational memory is used to improve e-government implementation to achieve goals and objectives according to norms, strategies and assumptions of the project announced by the organization [7]. Although government can get access to specific technology from IT outsourcing partnership, such access may not fully replace internal learning or

guarantee government in strategically using and deploying the technology [23]. One of the critical concerns in outsourcing is that as the responsibility is transferred to the vendor, the learning-by-doing knowledge that comes from designing, coding, testing, supporting applications and IT problem solving skill will also be transferred to the vendor [24]. This situation hampered most Malaysia public agencies especially for complex projects that integrate various agencies and users. As such, the internal IT staff has lost their procedural and condition knowledge that is important for the learning process and continuous project improvement. This is probably because once the decision to outsource has been made and the deal signed, government tends to transfer the obligation to the vendor without a proper knowledge transfer plan and project governance. Therefore, the lack of emphasis on organizational learning may pose a severe risk to government by impairing their ability to innovate.

2.2 Transactive Memory Systems (TMS): Conceptualization and Evolution

The transactive memory system concept emerged in the mid 1980s as a process that was thought to facilitate knowledge management and team learning. The concept of TMS was first introduced by [11] and [25]. Initially; TMS was conceptualized as a theory to explain the implicit division of cognitive labour that develops in close couples. Hollingshead [26] defined TMS as the shared division of cognitive labour with respect to the encoding, storage, retrieval, and communication of information from different domains. This version of TMS was used to explain the cognitive processes in individuals' memories with some basic transactive process happening during the remembering process. Additionally, TMS also incorporates external memories or aids to support the development of individuals' memories. As defined by [27], TMS is a mechanism to illustrate how individuals can rely upon external aids such as manuals, workflow, or group members to extend individual memory. However, a commonly used definition of transactive memory system is a shared system that people in relationships develop for encoding, storing, and retrieving information about different substantive domains [28]. Based from the conceptualization of TMS developed over the past two decades (1985-2011), a fundamental premise of transactive memory theory is that members develop a directory of 'who knows what' or 'who is responsible for what' to determine where to go for information in a particular knowledge domain [29].

Some of the scholars used transactive memory (TM) and TMS interchangeably. Apparently, the two concepts differ. TM is the component of TMS [27]. TM is the memory that is held within the group; whereas, TMS describe how members actively use this TM to cooperatively encode, store and retrieve information about complex interdependent tasks [30, 18]. According to [11], TMS has two main components; i) *structural components*, which shows how transactive memory links individual memories and form a collective knowledge network and ii) *transactive processes* that can occur during the encoding, storing, and retrieval of information in the group memory. In the context of IT outsourcing TMS helps project team members in two ways; i) helps project teams to create new ideas and boost creativity in order to solve business and technical related issues and 2) entails the application of knowledge to new problem-oriented situations during the projects. Therefore, [31] asserted that the existence of TMS in project team members can be seen from; i) the shorter period for knowledge synthesizing, analysing and dissemination; ii) immediate mutual understanding of the project process more quickly; iii) faster decision making process and quick finding for the alternative solution; and iv) timely manner product and process related problems solved.

Over the past two decades, the concept has been extended beyond individuals' of collective memorizing [e.g. 12,26] to team level [18,32] and organizations level [30]. Recently, scholars incorporated TMS with the organizational management information system and support tools [e.g. 33,34,35,36]. In the first decade, the majority of TMS studies focused on laboratory-based studies. This laboratory study uses a set of specific tasks to test the knowledge of each individual has about their partner. The earliest studies of TMS are more closely concerned with the relationships that had developed through a period of time, for instance a group member that have been trained together. In the second decade, TMS research has shifted from a close relationship to temporal relationship and bigger audience such as at organizational level [e.g. 33,36]. This is due to the increasing complexity of work processes and individual mobility that had resulted in the development of a renewed TMS by incorporating technology to facilitate access to external knowledge. In this second notion, tasks, problem solving and decision making process has been described as organizational memory that could exist in **a** variety of forms [35].

2.2.1 TMS Measurement

Several studies [12,37] has suggested that there are three measurable characteristics of TMS, namely; memory differentiation, task coordination and task credibility. However, these measures have only been tested in experimental settings. Eventually, [18] extends TMS measurement based on these characteristics that is particularly applicable for field settings. Lewis [18] measures TMS by three constructs; specialization, credibility and coordination. However, all of these measures are indirect measures of TMS [17]. Despite that, the usage of indirect measures is tied with few conditions. According to [17], indirect measures of TMS are appropriate for two conditions; i) when the tasks allocated to group members cannot be tightly specified and uncertain or, ii) when TMS structure and processes cannot be easily measured. Lewis [17] further asserts the choice of an appropriate TMS measure (whether direct or indirect measure) is based on research design and the research question or main interest. However, we argue TMS measurement developed by [18] is more towards behavioural indicators [27]. Hence, the manifest variables (specialization, credibility, and coordination) do not map onto the TMS structure and process components, and they therefore cannot be interpreted as either indicative of, or as measuring TMS components [17]. For that reason, it would be incorrect to draw conclusions about the efficiency of transactive processes from the coordination or other variables score because the constructs item does not portray the actual transactive processes. Besides, during IT project development, the constituents of the system or technologies and their respective task interdependencies are planned, and their respective performance requirements are stated earlier in the contract [38]. Thus, the utilization of indirect measurement of TMS as mentioned before is not suitable in the context of IT outsourcing.

TABLE I
TRANSACTIVE MEMORY SYSTEM MEASUREMENT

	Items
1.	We have arranged all our project documents (e.g. business requirement, tender and contract) systematically in the central repositories
2.	We used a set of rules or standard template to explicitly document our project progress
3.	We have associated our project templates/forms with detail information (e.g. subject and contact person/the contact expert) for further references/queries
4.	We continuously update our centralized document directories that contained project work-related processes
5.	Each of the team members were instructed to update resume/directory of expertise after attending training/workshop session given by the vendor
6.	We consistently modify any changes carried out during the project execution
7.	Different team members are responsible for expertise in different areas
8.	We have allocated a specialized/expert team to review and develop our business requirement
9.	We can easily identify the experts for each task based from their expertise
10.	We have kept team task routines for future projects
11.	We have kept the past experience /knowledge of the similar problem
12.	We are allowed to enhanced our acquaintance with the pool of expert available within the project through collaborative suite/system
13.	We have search mechanisms reside in our repositories to locate contact expert with specific task
14.	Each of the team members has the right to access to the project document
15.	Historical data utilized for decision making is easy to access whether from manual filing or central repositories
16.	Every team member has a basic knowledge about what others do
17.	We encourage to relate our own task-related knowledge with other member's job, roles and expertise
18.	There was not much confusion / misunderstanding about how we would accomplish the task

Alternatively, in this research, TMS is measured from the transactive process or routines that are practised during project execution. This new scale differs from [18] measurement. Routines-based measurement is more practical in the context of IT outsourcing rather than conceptual measurement. Routines-based measurement is clearer compared to conceptual measurement since the team members can directly relate the items to their project practices or activities. Overall, there are 18 items that were developed based on the process of information processing that happened between the team members during the IT outsourcing project execution. Table 1 shows the measured items for TMS. The measurement items were adapted from prior studies with similar research context.

3 Methodology

The aim of the this study is to develop and test a generic scale that can be used to quantitatively measure TMS routines among IT outsourcing team members. Although previous TMS measures are conceptually appealing and been adopted by most scholars; yet, there has been little systematic effort to empirically measure TMS using direct measure. In developing a scale that is applicable to different research settings, we employed a well-known process of scale development stages as has been adopted by previous researchers [e.g. 39,40].

TABLE II
DESCRIPTIVE ANALYSIS

Item Code	Item	Mean	Std. Dev	Skewness	Kurtosis
TMS 1	We have arranged all our project documents (e.g. business requirement, tender and contract) systematically in the central repositories	5.3436	0.59195	-0.577	2.137
TMS 2	We used a set of rules or standard template to explicitly document our project progress	5.4051	0.67730	-0.304	0.831
TMS 3	We have associated our project templates/forms with detail information (e.g. subject and contact person/the contact expert) for further references/queries	4.9846	0.69220	-0.733	2.372
TMS 4	We continuously update our centralized document directories that contained project work-related processes	4.9590	0.69487	-1.156	3.448
TMS 5	Each of the team members were instructed to update resume/directory of expertise after attending training/workshop session given by the vendor	3.7846	0.85239	0.379	-0.699
TMS 6	We consistently modify any changes carried out during the project execution	5.2410	0.54523	-0.110	0.776
TMS 7	Different team members are responsible for expertise in different areas	6.0974	0.44922	0.424	1.637
TMS 8	We have allocated a specialized/expert team to review and develop our business requirement	6.1333	0.61983	-1.143	5.665
TMS 9	We can easily identify the experts for each task based from their expertise	5.9179	0.86955	-1.693	3.982
TMS 10	We have kept team task routines for future projects	3.7026	0.95450	0.448	-0.538
TMS 11	We have kept the past experience /knowledge of the similar problem	3.6154	0.94747	0.582	-0.287
TMS 12	We are allowed to enhanced our acquaintance with the pool of expert available within the project through collaborative suite/system	4.2769	1.04794	-0.684	-0.471
TMS 13	We have search mechanisms reside in our repositories to locate contact expert with specific task	4.7795	1.05400	-0.722	0.134
TMS 14	Each of the team members has the right to access to the project document	6.1282	0.52659	0.139	.386
TMS 15	Historical data utilized for decision making is easy to access whether from manual filing or central repositories	5.5846	0.61491	-0.932	2.015
TMS 16	Every team member has a basic knowledge about what others do	6.0718	0.29598	2.062	7.013
TMS 17	We encourage to relate our own task-related knowledge with other member's job, roles and expertise	6.0103	0.44246	-0.672	5.614
TMS 18	There was not much confusion / misunderstanding about how we would accomplish the task	5.6718	0.56072	-1.685	4.129

A survey study was conducted to collect data from IT personnel at three e-government lead agencies located at Putrajaya and Cyberjaya, Malaysia. The selected population consisted of lead agencies of the EG flagship application. The overall population of IT personnel in the three agencies is 447 personnel. The selected respondents are among IT staff ranging from operational level to top management level that have currently been managing the project and have experience communicating with the contracted vendor during the development phase or technology transfer phase. The generated poof of items **is** presented in Table 1. We explicitly chose the well known Likert scales measurement ranging from 1-Extremely Unimportant to 7-Extremely Important and 1-Completely Disagree to 7-Completely Agree. The measurement items are taken from the existing general theory from previous literature and pre-validated measurement items developed by past researchers to increase the reliability of the constructed instrument**.** Some of the newly constructed items are taken from the past qualitative result since most of the knowledge transfer research in IT outsourcing context was done in interpretive nature [e.g. 41,42]. Next, the generated items were then undergoing experts' validation process. The items were examined by 10 experts. The experts' team consists of 2 academicians, 6 public agencies IT managers and 2 representatives from vendors. All of these experts had at least 10 years of experience in specific areas. It has been established in various disciplines that it takes ten-years to become an expert from the time at which practice was initiated [43].

After a few attempts in purifying the questionnaire, the next step is to assess the reliability and validity of the constructed items by pilot testing. The pilot testing is done with 30 selected respondents. The selected respondents are the subset of the research sample population. This to ensure that the feedback and recommendation come from the actual environment. Next, data gathered from the pilot study is analysed for reliability. This study used Cronbach's Alpha Coefficient to test the survey item's reliability. A coefficient value, which is closer to value 1.0, is desired. The alpha value of new TMS scale is 0.685, exceeding the minimum cut off value of exploratory research ($\geq$0.5) as recommended by [44]. Hence, the acquired reliability level is acceptable, and the results indicated that the measurement items can produce consistent results when used by different respondents. Next, we performed an exploratory factor analysis (EFA) for item reduction and to parsimonious the item. Some minor revisions were done to eliminate possible vagueness or confusion in question items before the full scale survey. The final version of the questionnaire was then distributed to 195 respondents. In exploratory factor analysis (EFA), the recommendations of the minimum sample size range from 100 to 500 [45,46]; hence, the sample size of 195 deemed to be enough.

4 Data Analysis and Result

To validate the measurement scale constructed, its validity and reliability are analysed. We employed EFA and Partial Least Squares (PLS) to validate the constructed item. For validity, content validity was analysed first to evaluate the instrument's capacity to include the content and attain the construct and its components, ensuring that the scale truly represent the construct measured. Concept validity was then studied, based on a factor analysis of the items that forms the measurement instrument and that determine the underlying variables and relations between the scale items. The result of this study confirmed that the scale development process has fulfils the property of parsimonious parameterization—that it contains a small number of items that carry relevant but not redundant information [39]. Prior to scale validation, we first present the descriptive analysis of TMS measurement items in Table II. In descriptive analysis, we presented four values; i) the mean values, ii) skewness values, iii) standard deviation and lastly iv) kurtosis values.

4.2 Exploratory Factor Analysis (EFA)

We employed EFA with Promax rotation method and Paralell Analysis using Monte Carlo Simulation to extract the most practiced TMS routines done by the team members. The intersection between EFA and Paralell Analysis is a component 5. Thus, only 5 components perceived as important TMS routines during IT outsourcing. Table III depicts 5 main components of TMS practiced in Malaysian public agencies, namely; referral (19.25%), coordination (16.02%), encoding (10.93%), allocation (9.31%) and updating (8.57%) routines resulting 64.09% of total variance explained. Out of the 18 items listed, only 13 items being practiced by the team members.

Referral component is the highest practiced routines. This component encompasses routines such as the acquaintance with the pool of expertise

available within the project using project workflow management or collaborative suite. In IT outsourcing context, workflow management is used to configure and control structured business processes using well-defined workflow models and instances. Coordination and encoding components are another TMS characteristic that exists in IT outsourcing team members. Coordination shows a high mean score compared to encoding whereby the encoding component shows a moderate practice

neutral mean scores range for storing and encoding routines. However, the results confirmed that the basic concept of TMS exists among Malaysian public agencies IT outsourcing project members. The highest mean scores for referral and coordination components shows that there is (i) a combination of the knowledge possessed by each individual, and (ii) a collective awareness of who knows what or (iii) interpersonal awareness of others' knowledge.

TABLE III
TRANSACTIVE MEMORY SYSTEM ROUTINES IN IT OUTSOURCING PROJECT TEAMS

Item Code	Items	Components					Communalities
		Referral	Coor.	Encode	Allocate	Update	
TMS 12	We are allowed to enhanced our acquaintance with the pool of expert available within the project through collaborative suite/ workflow management	0.860					0.703
TMS 13	We have search mechanisms reside in our repositories to locate contact expert with specific task	0.743					0.685
TMS 15	Historical data utilized for decision making is easy to access whether from manual filing or central repositories	0.628					0.636
TMS 16	Every team member has a basic knowledge about what others do		0.810				0.699
TMS 17	We are encourage to relate our own task-related knowledge with other member's job, roles and expertise		0.767				0.664
TMS 14	Each of team members have the right to access to the project document		0.686				0.461
TMS 1	We have arrange all our project document (e.g. business requirement, tender and contract) systematically in the central repositories			0.854			0.689
TMS 4	We continuously update our centralized document directories that contained project work-related processes			0.748			0.602
TMS 2	We used a set of rules or standards template to explicitly document our project progress			0.559			0.533
TMS 7	Different team members are responsible for expertise in different areas				0.887		0.751
TMS 8	We have allocate a specialized/expert team to review and develop our business requirement				0.853		0.757
TMS 6	We consistently modify any changes carried out during the project execution					0.749	0.594
TMS 5	Each of team members were instructed to update resume/directory of expertise after attending training/workshop session given by the vendor					0.652	0.529
	Eigenvalues	2.695	2.242	1.531	1.304	1.200	**8.972**
	% of Variance	19.252	16.016	10.933	9.312	8.574	**64.09%**

Note: Deleted Item: TMS3, TMS9, TMS10, TMS11 and TMS18. KMO: 0.643; Bartlett's Test of Sphericity: 557.156; p<0.001. Extraction Method: *Promax*

among the team members. The least routines practiced by the team members are updating routines resulting only 8.57%. The result indicates that there is still lacking in terms of preserving the important knowledge generated during IT project execution as this can be seen from the moderate and

4.3 Nomological validity

Nomological validity refers to the degree to which predictions in a formal theoretical network are confirmed [47]. MacKenzie [48] posited that in order to provide evidence that a measure has

construct validity; a nomological network has to be developed for its measurement. In essence, the researchers have to develop a nomological link between the variable that they would like to validate with another variable which has been proven theoretically to be related to this particular variable. For example, previous researchers have found a significant relationship between TMS and knowledge transfer [e.g. 49,15]. Knowledge transfer being measured with four continuous items. To test the hypothesis and investigate the nomological validity of the scale, we examined the path coefficient and the *t*-values using SmartPLS version 3. Table IV depicts the result. To conclude, the newly developed TMS scale supports the theory implied. Additionally, the constructed scale fulfilled the reliability and validity analysis. The results indicate that TMS serves as one important factor for knowledge transfer in IT outsourcing.

TABLE IV
RELIABILITY AND VALIDITY RESULTS

	AVE	Composite Reliability	Path Coefficients	STERR	T Statistics
TMS -> Allocation	0.745	0.854	0.654	0.066	9.909
TMS -> Coordination	0.705	0.825	0.440	0.111	3.946
TMS -> Encoding	0.558	0.790	0.395	0.121	3.246
TMS -> Referral	0.727	0.842	0.732	0.055	13.255
TMS -> Updating	0.666	0.799	0.657	0.059	11.006
TMS -> Knowledge Transfer	0.422	0.744	0.445	0.063	7.047

Note: Significant at level $p<0.001$

5 Discussions and Conclusion

The alternative measurement that this paper proposes offers new dimensions of measuring TMS. The proposed scale has demonstrated its value for measuring teams' encoding, updating, referral, coordination and allocation, as well as the impact of TMS on organizational learning. All components show that the proposed scale for TMS constitutes a valid and reliable measurement, making it appropriate for use in the scientific community in future empirical research.

The results of this study have supported the measurement of TMS developed by [33] and some qualitative findings of previous research. The new measurement instrument was constructed and validated following the most frequent recommendations in the scientific literature on the development of scales in the social sciences. From the foregoing, it can be concluded that the theoretical and practical contribution of this paper is important. From a theoretical perspective, the paper reduces the problem of direct TMS measurement and identifying the information processing that shapes the TMS practices. In addition, the study provides an exhaustive analysis of the prior scientific literature and guarantees a rigorous empirical validation providing methodological guarantees. From a practical point of view, this instrument develops empirical research that is much needed in the academic community that includes some or all of the processes of TMS. On the other hand, organizations need such an instrument to identify the abilities they possess, especially those useful for project success. Firm managers will be able to use the measurement instrument proposed for evaluating the TMS initiatives of their firms. Firms can use the instrument proposed to evaluate those aspects that they must improve to develop specific abilities from their capacities or the transferred skill or knowledge and to ensure that they obtain benefits from the IT outsourcing relationship.

5.1 Limitations and opportunities for further research

A key limitation of this study is its focus on three federal public agencies in Malaysia. Public agencies in Malaysia face challenge of practicing TMS especially in IT outsourcing context because of the high dependency of government to the vendor, thus, this holds the question whether the new scale being developed can be generalized to another context. Without further evidence, we cannot conclude that our scale is applied in the same manner to other sector or even other countries since each country has its own outsourcing practices. The future research should conduct scale developments for the TMS construct in, for example other sector that are characterized by certain organizational cultures and different outsourcing phases of development. For this purpose, initial pools of items that reflect the particularities of this context needs to be derived using extensive qualitative pre-test methods such as focus group discussion or interviews with experts. The qualitative research should be conducted in order to understand routines that developed TMS, therefore be part of a reliable and valid scale. When different scales are developed in specific contexts, one can compare the scale with our study to detect the differences and similarities between scales. Appreciating how different TMS dimensions may vary across time and setting could also enrich

discussions of the role of information processing and communication practices in knowledge transfer issue in IT outsourcing and discussions of the role of organizational memory in building, retaining and upgrading organizational capabilities. Such an understanding can add the young but growing literature that uses the Transactive Memory theory.

References:

[1] N. H. Arshad, Y. M. Lin, A. Mohamed, and A. B. Udin, "Service delivery in ict outsourcing: relationship intensity between vendor and client," *Public Sector ICT Management Review*, Vol. 2, No. 2, 2008, pp.15-21.

[2] A.R. Abdul-Aziz and N. Ali, "Outsourcing and quality performance: Malasian's public works department", *Structural Survey*, Vol. 22, No. 1, 2004, pp. 53-60.

[3] M. N. Norshita, "Penilaian Terhadap Projek dan Aplikasi Kerajaan Elektronik (EG) di Malaysia," PhD Dissertation, Universiti Kebangsaan Malaysia, 2012.

[4] R. Heeks, "Most eGovernment-for-Development Projects Fail: How Can Risks be Reduced?". *iGovernment Working Paper Series*, 2003Paper no. 14.

[5] E. Carmel and P. Tija, *Offshoring information technology*. Cambridge: Cambridge University Press, 2005.

[6] D. Craig, and P. Willmott, "Outsourcing grows up, perspectives on corporate finance and strategy", *McKinsey Quarterly*, Vol.12, Issue: Winter, 2005.

[7] A. Aman and H. Kasimin, "E-government Evaluation and Organizational Learning School of Accounting School of Economics," *International Journal of Digital Society*, Vol. 2, No. 2, 2011, pp. 469–477.

[8] M. Schindler and M. J. Eppler, "Harvesting project knowledge: a review of project learning methods and success factors," *International Journal of Project Management*, Vol. 21, No. 3, Apr. 2003, pp. 219–228.

[9] J. Devos, H. V. Landeghem, and D. Deschoolmeester, "Outsourced Information Systems Failures in SMEs: a Multiple Case Study," *The Electronic Journal Information Systems Evaluation*, Vol. 11, No. 2, 2008, pp. 73 – 82.

[10] D. Nevo and Y. Wand, "Organizational memory information systems: a transactive memory approach," *Decision Support Systems*, Vol. 39, 2005, pp. 549 – 562.

[11] D.M. Wegner, T. Giuliano and P. Hertel, (1985). Cognitive interdependence in close relationships. In W.J. Ickes (Ed.), Compatible and incompatible relationships, pp. 253–276, New York: Springer.

[12] D. W. Liang, R. Moreland, and L. Argote, "Group versus Individual Training and Group Performance: The mediating Role of Transactive Memory,"

[13] Austin, J. (2003). Transactive memory in organizational groups: The effects of content, consensus, specialization, and accuracy in group performance. Journal of Applied Psychology, 88(5), 866–878.

[14] J. S.-C. Hsu, S.-P. Shih, J. C. Chiang, and J. Y.-C. Liu, "The impact of transactive memory systems on IS development teams' coordination, communication, and performance," *International Journal of Project Management*, vol. 30, no. 3, pp. 329–340, Apr. 2012.

[15] Y. Liu and R. Zhong, "Research on Transactive Memory System, Knowledge Reuse and Team Efficacy in Professional Service Teams," *Knowledge Creation Diffusion Utilization*, pp. 0–3, 2011.

[16] S. Y. Choi, H. Lee, and Y. Yoo, "The Impact of Information technology and transactive memory systems on knowledge sharing , application , and team performance A field study," *MIS Quarterly,* vol. 34, no. 4, pp. 855–870, 2010.

[17] K. Lewis and B. Herndon, "Transactive Memory Systems: Current Issues and Future Research Directions," *Organization Science*, vol. 22, no. 5, pp. 1254–1265, Apr. 2011.

[18] K. Lewis, "Measuring transactive memory systems in the field: Scale development validation," *Journal of Applied Psychology*, vol. 88, no. 4, pp. 587–604, 2003.

[19] L. Argote, "Organizational learning research: Past, present and future," *Management Learning*, vol. 42, no. 3, pp. 1–8, 2011.

[20] L. Argote and Y. Ren, "Transactive memory systems: Microfoundations of dynamic capabilities". *Conference on Micro-level Origins of Organizational Routines and Capabilities*, 18–19 June, Helsinki, 2010.

[21] Z. Shi, A. S. Kunnathur, and T. S. Ragu-nathan, "IS Outsourcing Management Competence Dimensions: Instrument Development and Relationship Exploration," *Information & Management,* Vol. 42, No.6, 2005, pp. 901–919.

[22] H. Solli-sæther and P. Gottschalk, "Maturity in IT outsourcing relationships: an exploratory study of client companies," *Industrial Management & Data Systems*, Vol. 108, No. 5, 2008, pp. 635–649.

[23] K. Steensma and M.A. Lyles, "Explaining IJV survival in a transitional economy through social exchange and knowledge-based perspectives", *Strategic Management Journal*, Vol. 21, No. 8, 2000, pp. 831–852.

[24] S. Cha, Hoon, D. E. Pingry, and M. E. Thatcher, "Managing the Knowledge Supply Chain An Organizational Learning Model of Information Technology Offshore," *MIS Quarterly*, Vol. 32, No. 2, 2008, pp. 281–306.

[25] D.M. Wegner, "Transactive memory: A contemporary analysis of the group mind". In B.

Personality and Social Psychology Bulletin, vol. 21, no. 4, pp. 384–393, 1995.

Mullen & G.R. Goethals (Eds.), Theories of Group Behavior, Vol. 9, 1987, pp. 185–208, New York: Springer.

[26] A.B. Hollingshead, "Cognitive interdependence and convergent expectations in transactive memory", *Journal of Personality and Social Psychology*, Vol.81, No. 6, 2001, pp.1080–1089.

[27] Y. Ren and L. Argote, "Transactive Memory Systems 1985 – 2010 of Key Dimensions, Antecedents, and Consequences," *The Academy of Management Annals*, Vol. 5, No. 1, 2011, pp. 189–229.

[28] Y. Ren, K.M. Carley and L. Argote, "The contingent effects of transactive memory: When is it more beneficial to know what others know?", *Management Science*, Vol. 52, No. 5, 2006, pp.671–682.

[29] C. Su and M. Huang, "Understanding the structures, antecedents and outcomes of organisational learning and knowledge transfer —theoretical and multilevel network analysis," *European Journal of International Management*, Vol. 4, No. 6, 2010, pp. 576–601.

[30] D. Brandon and A. Hollingshead, "Transactive memory systems in organizations: Matching tasks, expertise, and people", *Organization Science*, Vol. 15, No. 6, 2004, pp. 633–644.

[31] A. E. Akgün, J. Byrne, H. Keskin, and G. S. Lynn, "Transactive memory system in new product development teams," *IEEE Transactions on Engineering Management*, Vol. 53, No. 1, 2006, pp.95–111.

[32] P. Kanawattanachai, and Y. Yoo, "The impact of knowledge coordination on virtual team performance over time", *MIS Quarterly*, 31(4), 2007, pp.783–808.

[33] P. Jackson and J. Klobas, "Transactive memory systems in organizations: Implications for knowledge directories," *Decision Support Systems*, Vol. 44, 2008, pp. 2409–424.

[34] P. Jackson, "Requirements for an information system to support transactive memory," *Vine*, Vol. 41, No. 4, 2011, pp. 401–427.

[35] P. Jackson, "Transactive directories of organizational memory: Towards a working data model," *Information & Management*, Vol. 49, No. 2, 2012, pp. 118–125.

[36] D. Nevo, I. Benbasat, and Y. Wand, "Understanding Technology Support for Organizational Transactive Memory: Requirements, Application, and Customization," *Journal of Management Information Systems*, Vol. 28, No. 4, 2012, pp. 69–98.

[37] R. L. Moreland and L. Myaskovsky, "Exploring the performance benefits of group training: Transactive memory or improved communication," *Organizational Behavior & Human Decision Processes*, Vol. 82, No. 1, 2000, pp. 117–133.

[38] A. Tripathy and S. D. Eppinger, "Organizing Global Product Development for Complex Engineered Systems," *IEEE Transactions on Engineering Management*, Vol. 58, No. 3, 2011, pp. 510–529.

[39] M. M. Jiménez-Barrionuevo, V. J. García-Morales, and L. M. Molina, "Validation of an instrument to measure absorptive capacity," *Technovation*, Vol. 31, No. 5–6, 2011, pp. 190–202.

[40] J.-P. Noblet, E. Simon, and R. Parent, "Absorptive capacity: a proposed operationalization," *Knowledge Management Research & Practice*, Vol. 9, No. 4, 2011, pp. 367–377.

[41] J. T. Karlsen, L. Hagman, and T. Pedersen, "Intra-project transfer of knowledge in information systems development firms," *Journal of Systems and Information Technology*, Vol. 13, No. 1, 2011, pp. 66–80.

[42] S. Blumenberg, H. Wagner, and D. Beimborn, "Knowledge transfer processes in IT outsourcing relationships and their impact on shared knowledge and outsourcing performance," *International Journal of Information Management*, Vol. 29, 2009, pp. 342–352.

[43] D. Sharmistha and S. Darshana, "Information System Experts: Definition, Identification, and Application," in *European Conference on Information Systems*, 2011, p. 199.

[44] J.F. Hair, W.C. Black, B.J. Babin, and R.E. Anderson, Multivariate Data Analysis. Seventh Edition. Prentice Hall, Upper Saddle River, New Jersey, 2010.

[45] S. P. Reise, N. G. Waller, and A. L. Comrey, "Factor analysis and scale revision," *Psychological Assessment*, Vol. 12, No. 3, 2000, pp. 287–297.

[46] R. L. Gorsuch, "Exploratory factor analysis: Its role in item analysis", *Journal of Personality Assessment*, 68(3), 1997, pp.532-560.

[47] R. P. Bagozzi, "An Examination of the Validity of Two Models of Attitude", *Multivariate Behavioral Research*, Vol. 12, 1981, pp. 323-359.

[48] S.B. MacKenzie, P. M. Podsakoff, and N. P. Podsakoff, "Construct Measurement and Validation Procedures in MIS and Behavioral Research: Integrating New and Existing Techniques," *MIS Quarterly*, Vol. 35, No. 2, 2011, pp.293-334.

[49] I. Oshri, P. C. V. Fenema, and J. Kotlarsky, "Knowledge Transfer in Globally Distributed Teams: The Role of Transactive Memory," *Information Systems Journal*, Vol. 18, No. 6, 2008, pp. 593–616.