Exploring Demand and Capability for Managing Organizational Knowledge in Government

Zamira Dzhusupova, Elsa Estevez and Adegboyega Ojo
United Nations University – International Institute for Software Technology
Center for Electronic Governance
P.O. Box 3058, Macao
+853 2871 2930
{zamira, elsa, ao}@iist.unu.edu

ABSTRACT
The ability of governments to develop and effectively manage knowledge assets is now considered a critical capability for electronic governance. Good Knowledge Management (KM) practices in government are usually driven by clear vision and objectives which are part of KM strategies. Developing such government-wide KM vision and objectives requires inputs from individual government agencies and other stakeholders on their needs and priorities (so-called demand-side). However, while there is significant literature on models and tools for measuring KM capabilities (so-called supply-side) and impact of KM practices, very few scholarly work is available on assessment of specific KM needs of individual agencies or other stakeholders. This paper presents an Integrated KM Assessment Model which measures both the demand and supply sides of KM in government. The model was used for assessing the KM needs and capabilities of government agencies in Macao SAR as part of a study for determining the readiness of government as a whole for KM. Results from our study show that innovation in government operations is considered by agencies to be the most KM demanded area, while KM capability for task-specific activities was found to be the weakest KM capability area. In addition, document-intensive and high-volume transaction agencies, such as educational, financial, electronic data interchange agencies have relatively higher KM awareness and capability.

Categories and Subject Descriptors
J **[Computer Applications] -** J.1 Administrative Data Processing – *Government*

General Terms
Management, Measurement

Keywords
Knowledge Management and Electronic Government; Knowledge Management Assessment

1. INTRODUCTION
The management of organizational knowledge is recognized as one of the critical elements for achieving connected or transformational government [46] [37]. Consequently, governments across the world are beginning to implement Knowledge Management (KM) initiatives [49]. In particular, KM ranks high on the management agenda of majority of central government organizations across OECD member countries [36] and in a number of developing countries [51].

The changing nature of how governments work, from the use of intermediaries and non-state actors in delivering services [40], to engagement of citizens in government decision making [46], in addition to the increasing pressure to make information open and accessible to citizens, business, other governments and the society at large [23]; create new challenges for KM in government organizations. At the same time, advances in KM-related technologies such as social networking, semantic web, document management, mass storage technologies, mobile communication, etc. [47] [45] [6] [39] all create unprecedented opportunities for technology-based innovations in acquiring, representing, storing, sharing and applying knowledge in government organizations [44] [43] - archetypes of knowledge-based organizations [51]. Leveraging KM opportunities and addressing related challenges in specific government context requires clear vision, objectives and strategies. However, developing government-wide KM vision and objectives requires inputs from individual government agencies and other stakeholders on their needs and priorities (so-called demand-side).

In measuring KM practices, literature is replete with KM assessment frameworks. Most of these frameworks focus on measuring KM capabilities. Such "supply-oriented" frameworks have been criticized based on the grounds that KM practices does not automatically contribute to organizational performance and could in fact negatively impact performance [41] by introducing non-value added KM process which invariably become overhead. Lately, so-called integrated KM assessment frameworks that attempt to capture KM needs or demands in addition to KM capabilities are emerging [27].

This paper describes one such Integrated KM Assessment Model developed by the authors to assess through an online survey the KM needs and capabilities of government agencies. The assessment model was based on KM Capability theory described in [41], KM Success Factors models [27] and models of government functions [38]. The developed model consists of six constructs. Three of these constructs are related to needs and demands for KM in government and the remaining three constructs are associated with KM capability. The proposed model was used to design the instruments for a survey on KM

dg.o '12, June 04 - 07 2012, College Park, MD, USA

needs and capabilities involving all 57 agencies of the Government of Macao SAR.

Results from our study show that innovation in government operations is considered by agencies to be the most KM demanded area, while KM capability for task-specific activities was found to be the weakest KM capability area.

Our contributions in this work include – (i) development of a model and supporting instrument for measuring KM needs and capabilities of government organizations; (ii) providing empirical evidence to support the plausibility propositions on KM needs and expected impact of KM practice in the government domain; and (iii) providing data to support possible link between KM practices and transformation agenda of governments.

The rest of the paper is organized as follows. Following introduction, Section 2 presents background to KM assessment in government organizations. Section 3 examines related research on improving this practice. Section 4 describes the research design, introducing the conceptual framework and research objectives. The methodology for our study including the survey instrument, data collection and analysis is presented in Section 5. Survey results and key findings are described in Section 6; while Section 7 discusses findings. Finally, Section 8 presents conclusions.

2. BACKGROUND

This section provides background information related to our work including basic concepts (Section 2.1), approaches to KM (Section 2.2), KM assessment (Section 2.3) and the relevance of KM for EGOV (Section 2.4).

2.1 Basic Concepts

2.1.1 Organizational Knowledge

Organizational Knowledge is "knowledge possessed by organizations, recognized as their preeminent resource" [22]. It is created through a "continuous dialogue between tacit and explicit knowledge" [35]. It is held "both in the minds of individuals and groups, and in explicit forms, and together they comprise the distributed organizational knowledge base of a company" [31].

2.1.2 Knowledge Management

Knowledge Management (KM) refers to managing organizational knowledge. KM is a "systemic and organizationally specified process for acquiring, organizing and communicating both tacit and explicit knowledge of employees so that other employees can make use of it to be more effective and productive in their work" [2]. Important aspects of effective organizational KM are: 1) Organizational Memory – comprising the "experience of its employees combined with the tangible data and knowledge stores available in the organization" [11] [3]; and 2) Organizational Learning – concerned about "continuous testing of experience and the transformation of that experience into knowledge that is accessible to the whole organization and relevant to the organization core purposes" [BO].

2.1.3 KM Capability

KM capability (KMC) is an 'organizational capability to manage the organization's knowledge with efficacy" [41]. KMC refers to the abilities of an organization "to mobilize and deploy KM-related resources in combination with other organization resources and capabilities" [9]. KMC is a socially complex organizational capability which is being examined by scholars from various perspectives. For example, [2] defines KMC as: 1) information-based, 2) technology-based, and 3) culture-based capabilities. In [21], KMC are classified into: 1) infrastructure capabilities - including technology, structure, and culture, and 2) process capabilities - including acquisition, conversation, application and protection. As for creating KMC, the process requires KM enablers - including people, process, and technology [25]. In addition, organizations must "encourage the sharing of expertise between workers, through collaborations and processes, to transform experts' implicit knowledge into explicit" [16].

2.1.4 KM Impact

Successful KM has valuable impact. KM becomes "a meta-capability with the potential to improve lower-order capabilities by leveraging organizational assets to secure competitive advantage" [18]. It potentially improves its competitive position in global business environments [12], [20]. Moreover, KM plays pivotal role in creating an internal working environment that supports creativity and fosters innovation [10] [32] [1]. Given the potential of KM as sources of innovation, business strategies should focus more on KM-related issues [15].

2.2 Approaches to KM

Various views and approaches to KM are available in literature. We examine those related to supply- and demand-sides of KM.

2.2.1 Supply-side KM Approach

A supply-side KM approach assumes that valuable organizational knowledge exists, and that the primary task of KM is to find, codify, and deliver knowledge [32]. Considered as a delivery-oriented-approach, the emphasis has been closely associated with organizational capabilities [22]. According to [33], "driven by a supply-side approach, several organizations implementing KM projects pay little attention to articulating useful KM goals, involving end-users, selecting useful contents and establishing motivational programmes".

2.2.2 Demand-side KM Approach

A demand-side KM approach focuses on "how an organization can increase its ability to satisfy its demand for new knowledge that is relevant to competitive advantage and improved enterprise performance" [32]. This approach assumes that "knowledge not only exists, but is continuously created by human agents in response to the adaptive needs of organizations" [15]. A demand-side KM approach can be seen as an implementation strategy for organizational learning, since it aims at meeting organizational needs by creating new knowledge, and hence, facilitating innovation and creativity [31].

2.2.3 Integrated KM Approach

Various researchers [20] [32] [33] expressed the need for a "new approach to KM, where both, the supply- and demand-side of KM, work in an integrated way". Their main argument is that KM is concerned with managing the processes that fulfill the demand for KM as well as the supply. When both "knowledge supply and demand are synchronized, the outcome of KM endeavors is likely to be positive" [33]. An integrated approach to KM will accelerate the rate of organizational learning and innovation and maximize performance leading to competitive advantage [19] [18] [15].

2.3 KM Assessment

In implementing KM practices (KMP), managers should comprehensively examine their organization's underlying readiness to embrace KM initiatives [25]. Regular assessments or audits of KMP help to broaden and continuously improve practices [10].

Various assessment models and tools are proposed by researchers and practitioners. For example, KMC Assessment model [29] [16] assesses Knowledge Capability Areas – the knowledge assets including lessons learned, expertise, data and knowledge documents; while KM Success Model [27] [26] evaluates success as an improvement in organizational effectiveness based on perceived benefits and impacts from KM. Existing KM assessment and audit tools [10] and maturity models [11] help to assess the state of KMP and determine the maturity level.

2.4 KM and Electronic Government

The prospects for KM in Electronic Government (EGOV) are "remarkable since complex decisions are particularly knowledge demanding" [30]. EGOV requires the "rethinking of knowledge distribution and management for citizen- and business- oriented service delivery and inter-organizational cooperation between agencies" [49]. KM provides "strategies and techniques to make knowledge more usable and accessible, and to keep it updated in support of EGOV development" [4].

KM helps to transform government processes and to enhance the government's overall innovation and capacity by maximizing access and use of knowledge [52]. The key "objective of a knowledge- based public administration is achieving the goals of government agencies and improving the quality of services to citizens as well as the underlying processes" [45]. For "redesigning transactions in EGOV, it is important that both, explicit and tacit knowledge of the organization, are adequately captured to prevent any knowledge loss" [50]. In particular, knowledge-sharing capabilities are considered key to meet constituencies' needs at all government levels [28], to ensure success in EGOV development.

In public organizations, "employees are expected to have adequate knowledge of core business activities, to enable them to effectively provide services to the public" [42]. KMP in government facilitates better policy- and decision-making and improves the quality of internal processes and service delivery to customers [5]. KM is also central for the "creation of public value and relational capital through more deliberative, participative and flexible forms of participative governance" [45].

3. RELATED WORK

Despite growing interest in assessing KMP in public administration and availability of many assessment models and tools, our literature review revealed very limited number of empirical studies and well-established KM assessment practices in public sector.

The nature of KM projects in public service agencies in Singapore was assessed by [8]; while [28] studied the knowledge sharing capabilities among government employees in national government agencies in South Korea. KM benefits, problems, responsibilities and technological aspects in government agencies in Malaysia were examined by [42]. Strategies for KM to promote knowledge transfer and to contribute organizational effectiveness and efficiency in a local government level were explored by [34].

The Government of Canada measures progress in KM practice by using KM maturity indices [7]. The US Department of Navy regularly assesses its current status in becoming a knowledge centric organization [13]. The assessment of current KMP in government agencies was conducted in Dubai [14].

OECD has measured the actual efforts made at improving KMP in member countries [36] and similar study in developing countries was carried out by [51].

4. RESEARCH DESIGN

This section presents the research design for this work. We introduce a conceptual framework (Section 4.1) and research objectives (Section 4.2).

4.1 Conceptual Framework

We built a conceptual framework based on key constructs identified from literature review. Following an integrated approach to KM, we classify the constructs into two main categories: 1) demand-side – organizational needs for KM, and 2) supply-side –available KM capabilities in an organization.

The KM demand-related constructs (demand-side) are organized around: 1) KM needs for general government functions – including internal administration and public service delivery [38]; and 2) needs for KM operational support. KM capability-related constructs (supply-side) are classified into three major areas: 1) KM Enabling Environment, 2) KM Processes and 3) KM Technology [21]. Specific KM Capability constructs are considered in our model based on how critical they are for KM success or effectiveness [27].

The identified constructs are presented with references to literature in Table 1, and the resulting Integrated KM Assessment Model for government organizations is presented in Figure 1.

Table 1: KM Key Constructs

ID	CONSTRUCT	DESCRIPTION	SOURCE
DEMAND-SIDE - ORGANIZATIONAL NEEDS FOR KM			
N1	Effectiveness	To improve enterprise performance and effectiveness, achieve business goals, support decision making, facilitate policy making	[30] [15] [19] [18] [10] [45] [13] [42] [5][8]
N2	Productivity	To improve productivity and efficiency of work, minimizing duplication of efforts	[20] [25] [2] [26] [45] [5] [14] [36]
N3	Quality	To improve work quality, enhance internal business processes	[36] [42] [52] [45][8]
N4	Innovation	To foster innovation, create environment for creativity, support organizational and cultural changes	[10] [32][1] [15] [31] [19][18] [25] [49] [52]
N5	Customer- Focus	To meet customer needs and demands of constituencies, improve satisfaction, create public value	[28] [42] [10]
N6	Service-Support	To improve service delivery, provide services effectively	[49][31] [45] [42] [5]
N7	Learning	To facilitate organizational learning	[31] [19][18] [15]
N8	Memory	To enhance organizational memory, protect/prevent from loss	[14] [50]

N9	Collaboration	To cultivate collaborative work, inter-organizational co-operation	[49][16]
N10	Expertise	To promote sharing of expertise, lessons learned and good practices	[28][16]
N11	Access	To improve access to and use of knowledge, expertise	[52] [51]
N12	Transfer	To foster knowledge/competence transfer	[28][34] [16]
SUPPLY-SIDE - KM CAPABILITIES			
C1	Leadership	Leadership, management/organizational support	[11] [26] [25]
C2	Strategy	Strategy, planning, evaluations, measurement	[7] [26] [11] [25]
C3	Culture	Culture, communication climate	[25][2] [21] [11]
C4	Structure	Responsibilities, budget allocation	[36] [21]
C5	Acquisition	Knowledge acquisition, access	[11] [52] [42] [21]
C6	Capture	Knowledge conversation, integration, capture, retrieval	[28][3] [21] [16] [50]
C7	Utilization	Knowledge application, use, re-use, delivery	[21] [32] [52]
C8	Sharing	Sharing knowledge, lessons learned, documents, expertise and information	[16] [28] [7] [29]
C9	Technology	Technology, tools	[2] [21] [25] [29] [11] [7] [8]

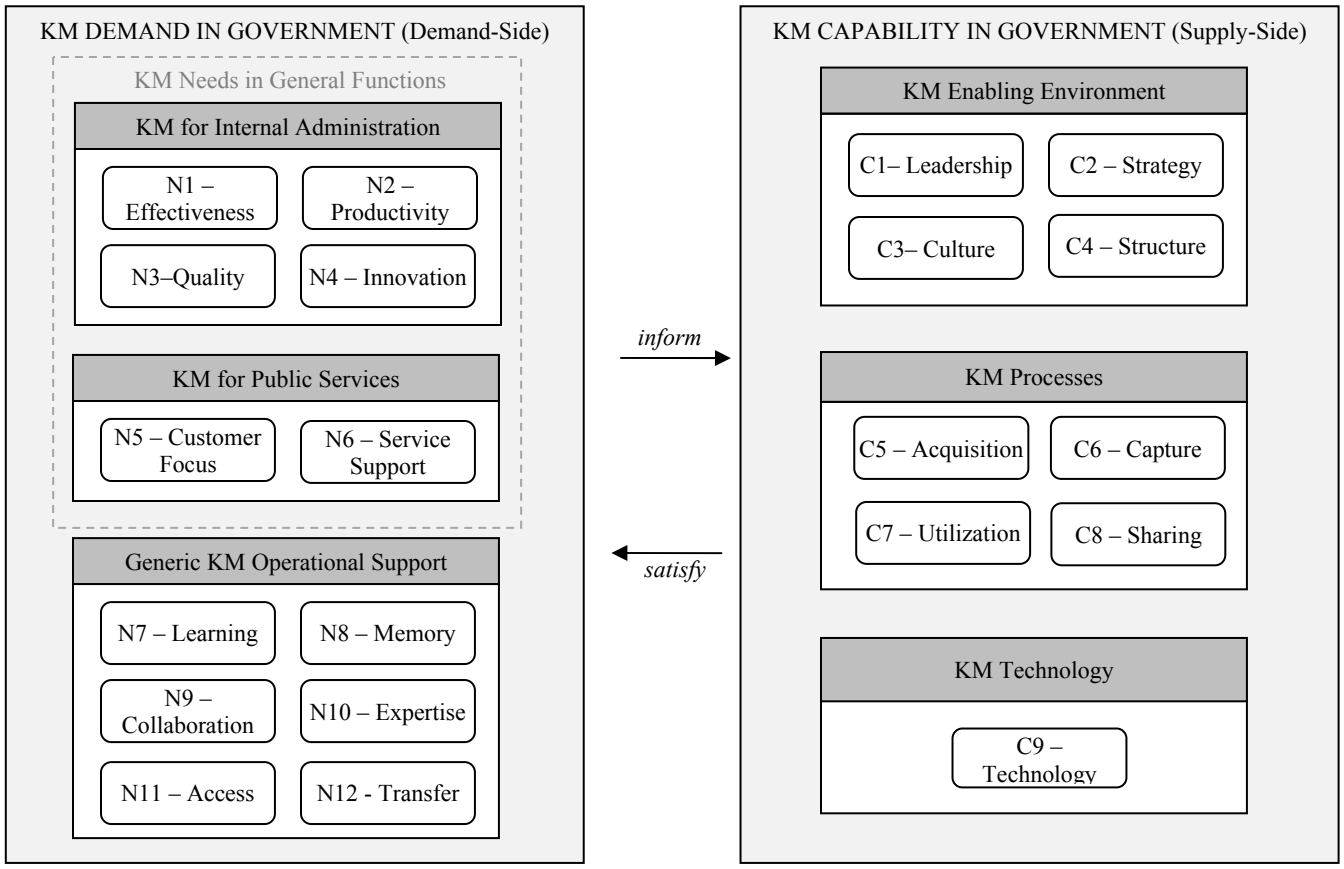

Figure 1: Integrated KM Assessment Model for Government Organizations

4.2 Research Objectives

Based on our conceptual framework, we formulate the following research questions to determine the KM demand and the available KM capability in a particular government context.

Questions related to KM Demand in Government:

1) What is the level of the demand for KM in government?
2) What are the most important reasons for implementing KM to support internal administration?
3) What are the major drivers for KM in public service delivery?
4) Which KM organizational operations are most demanded?
5) What are most important reasons for KM in supporting organizational operations?

Questions on available KM Capability in Government:

1) What is the overall level of KM capability in government?
2) How is KM practice organized and promoted?
3) How is the culture for instituting the KM fostered?

4) Which are most utilized KM processes?
5) What is the level of available KM technology infrastructure?
6) Which are the most utilized KM technologies?

5. RESEARCH METHODOLOGY

In the following sections, we present the context of the research work, research method applied, the survey instrument, data collection process and data analysis.

5.1 Research Context

The research was carried out as one of the activities of the KM Project implemented in collaboration with the Macao SAR Government, China. The aim of the project is to provide KM-related policy recommendations for establishing effective KM practices in government agencies, as part of EGOV initiatives.

5.2 Method

The study explores the perceptions of respondent agencies to determine current needs for KM and available KM capabilities. Online survey was used for gathering information from government institutions and quantitative methods were applied for analyzing survey data. Based on the survey results, key research findings are elaborated and discussed.

5.3 Survey Instrument

Guided by the conceptual framework presented in Section 4, we developed a survey instrument as follows. For each identified construct, at least one question was formulated. Table 2 presents the structure of the survey instrument. The instrument was designed as a closed-ended questionnaire, and two types of questions were included: 1) Likert summated rating scale questions - to ascertain respondents' attitude towards importance given by the agency to certain aspects of needs for KM and KM capabilities; and 2) multiple choice questions - used to evaluate if the object subject of the question applies to the agency and if not, if the agency has plans to implement or develop it.

The responses were encoded using numerical values. For rating scale questions, responses were assigned numerical values: from 1 - very low; to 5 - very high. For multiple choice questions, responses were assigned three possible values 1.0, 0.0 and 0.5 - meaning yes, no and planned answers, respectively.

5.4 Data Collection

All 57 government agencies across secretaries' lines were invited to participate in the survey out of which 34 agencies successfully completed the survey, producing about 60% of response rate. Responding agencies represent all secretaries and broad spectrum of services offered to the public, business and other agencies. Participating agencies belong to the different sectors: administration, law and justice, economy and trade, statistics, public finance and tax administration, defense and public security, welfare and social security, health, education, culture, land use and housing, transport and tourism.

Survey respondents were mainly the heads of IT departments and in a few cases the agency director or deputy director. They were requested to complete the survey on behalf of their agencies, in consultation with their senior management.

The survey lasted for six weeks including one week devoted to instrument validation with pilot agencies. Throughout the exercise, a help-desk from the project team was setup to support agencies in answering the questions and completing the survey. Data was collected using an online free and open source survey tool – Lime Survey.

5.5 Data Analysis

The collected data was consolidated into a spreadsheet of 34 rows - representing the respondent agencies; with 90 columns - representing the assessment variables defined for assessing the needs for KM and KM capabilities.

Data representing answers to the summated rating questions was analyzed based on the percentage of responses in each attitude; while data related to answers to multiple choice questions was analyzed based on the percentage of responses. Statistical analysis including central tendency of the variables, measures mean, median, and mode. The analysis of variability in the responses, measured as standard deviation, was also calculated. A normalized Likert score was computed for every agency in each perspective and also for the government as a whole, based on data of individual agencies. In addition, comparative analysis across respondent agencies was completed.

6. RESULTS

In this section we present the survey results (Section 6.1), key findings (Section 6.2) and arguments to support the validity of our results (Section 6.3).

6.1 Survey Results

6.1.1 KM Demand in Government

According to the results, over 70% of agencies indicated the need for KM to be at least high - 5% of the agencies assessed it as very high and 70% as high. About 18% of agencies consider the need for KM to be of medium importance.

The survey results indicate that the highest demand for KM in the area of internal administration is in facilitating innovation and improving work productivity. The survey revealed that the highest perceived needs for KM in public service delivery are related to customer focus and service support. Figure 2 shows the level of KM demand in internal administration and public services indicating that all six specific needs for KM in two core government functions are perceived by the respondent agencies above medium level.

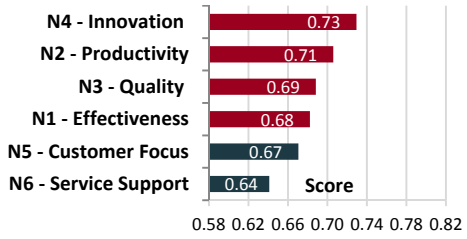

Figure 2: KM Demand in Government Functions

According to the survey results, the overall KM demand in internal administration is higher than in public service delivery as shown in Figure 3.

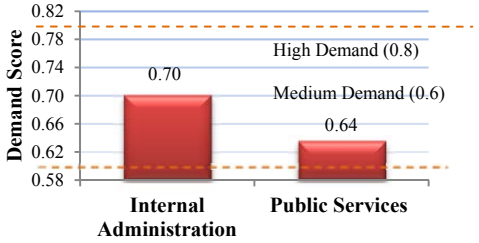

Figure 3: KMD - Internal Administration vs. Public Services

Regarding KM needs to support organizational operations the survey discovered that the agencies rated high the reasons for implementing KM in all of them. However, further analysis shows that managing organizational memory and sharing of expertise are the most demanded in KM practice as depicted in Figure 4.

Figure 4: Generic KM Operational Support

The highest perceived needs for KM in managing organizational memory are related to protecting knowledge loss - 70% of respondents considered this need as high; and to ensure consistency of policies and decisions - nearly 70% rated the need as high or very high. As regarding expertise, the highest scored need was for reusing solutions from other projects – 75% ranked it as high and very high. The highest perceived needs for KM in organizational learning are related to improving employees' skills and knowledge, and building human capacity for meeting strategic objectives – 76% and 56% respondents assessed such needs as high and very high, respectively. Related to collaboration, the highest perceived needs referred to minimize or eliminate duplication of efforts and to ease teamwork – 64% and 59% of respondents assessed these two needs as high and very high. The most relevant need for knowledge transfer was related to shorten the learning curve for new staff – 64% rated it as high and very high. The most important need for access to knowledge is to enhance ability to use knowledge from external and internal sources – 65% ranked it as very high.

6.1.2 KM Capability in Government

The results indicate that capability for KM across the agencies vary from very high (15%), high (50%), to medium (18%), low (15%), and very low (3%).

The results on assessing KM environment indicate that 44% of the respondent agencies have low KM capability, 35% medium and 21% high. With respect to KM promotion, 44% of the respondents agreed that their agencies have an active promotion/ communication strategy. Regarding the leadership support, 59% of the respondents agree that KM is strongly supported by the top management. Agency-wide KM programs are established in 21% of the responding agencies, while 38% confirm that KM is a part of their agencies strategies. Only 29% of the respondents agree that KM principles are taken into consideration in strategic, management, financial and human development planning. In terms of the responsibilities for KM practice in the agencies, the survey shows that in 44% of the agencies top managers are responsible for KM, and only 12% of the agencies have a team responsible for KM; while the IT team is responsible for KM in 12% of them. However, 17% of the agencies have no KM responsibilities assigned. As for financial support for KM in the agencies, the results demonstrate that 44% of the agencies have budgetary allocation for document management and record keeping only, and 24% have dedicated funds for ICT infrastructure, knowledge networks and collaborative work. However, 32% of respondents indicated that their agencies have no budget for KM-related projects or initiatives. While assessing KM culture, the survey reveals that the majority of agencies encourage experienced workers to transfer their knowledge to new or less experienced staff (85%), motivate staff to continue their education for self-development (85%), and also to share ideas and feedback on projects (68%).

The most utilized KM processes, according to the survey, are: acquisition, sharing and capture as depicted in Figure 5.

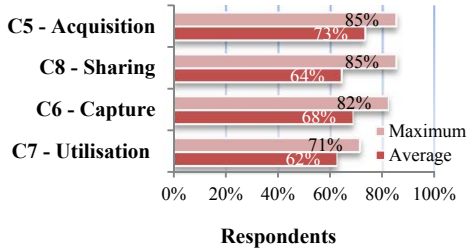

Figure 6: KM Processes

The most common techniques for knowledge acquisition are mentoring of new or less experienced staff by experienced workers while for knowledge capture - the regular recording and maintenance of formal minutes, and the management of user feedback on public services; with over 85% of the respondents confirming the use of these techniques. The most common knowledge sharing technique is sharing ideas and feedback on projects and for knowledge utilization - analyzing good practices, cases and lessons learned from past work.

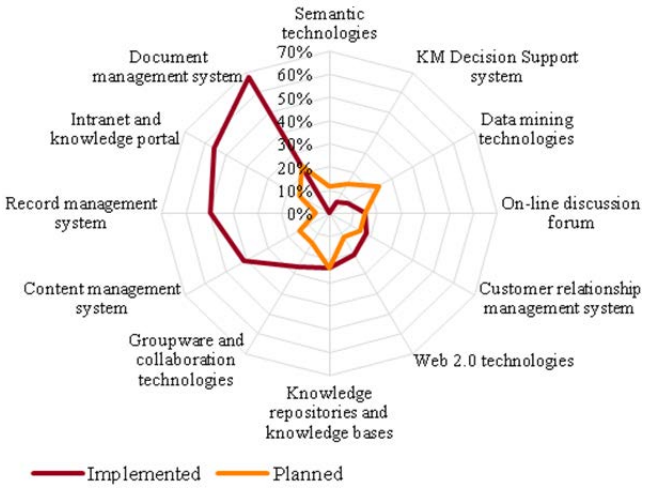

Figure 7: KM Technology

The survey results on KM technology deployment show that most of the respondent agencies (59%) have low level capability 29% - medium and only 12% - high. As shown in Figure 7, technology tools mostly deployed in surveyed agencies include document management system, intranet and knowledge portal, record management systems and content management systems. Groupware and collaboration technologies, knowledge repositories and knowledge bases, as well as Web 2.0 technologies are used less; while data mining, knowledge-based decision support systems and semantic technologies are the least used technologies.

Table 2: Survey Instrument Structure

<table>
<tr><th colspan="2">KM Demand in Government</th><th colspan="2">KM Capability in Government</th></tr>
<tr><th>KM Needs for Internal Administration</th><th>KM Needs for Public Services</th><th colspan="2">Enabling Environment for KM</th></tr>
<tr><td>N1 Effectiveness - to increase effectiveness of policy development and decision making in government through knowledge management system support

N2 Productivity - to improve work productivity by maintaining knowledge bases on operational processes, standard procedures, and competencies

N3 Quality - to improve quality of internal processes by creating and providing access to the repositories of good practices and lessons learned

N4 Innovation - to facilitate innovation by sharing know-how and reusing appropriate solutions</td><td>N5 Customer Focus
N5-1 to increase availability of public services by analyzing user needs from on-line and off-line surveys
N5-2 to provide personalized services by creating user profiles from on-line transactions

N6 Service Support
N6-1 to enhance relations with the public by harnessing citizen feedback through agency web sites and government-wide portal
N6-2 to provide integrated services by improving collaborative work with other agencies through knowledge networks</td><td>C1 Leadership - level of support provided by senior management staff to KM practices

C2 Strategy
C2-1 existence of a KM strategy
C2- 2 KM-related areas promoted on KM policies
C2-3 consideration of KM principles in strategic, management, financial and human development planning
C2-4 existence of communication strategy for promoting KM practices

C3 Culture – motivational practices in the organization to promote KM practices</td><td>C4 Structure
C4-1 KM-related responsibilities assigned to various levels of staff – i.e. top managers, human resource management staff, IT staff or information management team.
C4-2 budget allocation for specific KM practices, KM-related training and mentoring, and deployment and maintenance of technological infrastructure</td></tr>
<tr><th colspan="2">KM Needs for Generic Operational Support</th><th>KM Processes</th><th>KM Technology</th></tr>
<tr><td colspan="2">N7 Learning
N7-1 to build human capacity for meeting strategic objectives
N7-2 to improve employee skills
N7-3 to contribute to retain employees
N7-4 to ensure career development

N8 Memory
N8-1 to protect strategic knowledge
N8-2 to minimize knowledge loss
N8-3 to ensure consistency in policies, decisions
N8-4 to shorten learning curve for staff

N9 Collaboration
N9-1 to minimize duplication of efforts within/between agencies
N9-2 to improve working relations government-wide
N9-3 to ease teamwork on crosscutting issues and inter-departmental projects
N9-4 to support organizational learning</td><td>N10 Expertise
N10-1 to facilitate problem solving based on experience from projects
N10-2 to overcome typical obstacles
N10-3 to re-use appropriate solutions
N10-3 to support organizational learning

N11 Access
N11-1 to avoid “reinventing the wheel”
N11-2 to use knowledge from external and internal sources
N11-3 to facilitate employees’ acceptance of innovations
N11-4 to support organizational learning

N12 Transfer
N12-1 to improve work productivity
N12-2 to ensure proper work performance
N12-3 to enhance business processes in the agency
N12-4 to shorten a learning curve</td><td>C5Acquisition - extracting knowledge from existing sources, such as experts, software systems, knowledge repositories and knowledge bases

C6 Capture - identifying, creating and representing organizational knowledge

C7 Utilization - using and reusing organizational knowledge

C8 Sharing - sharing organizational knowledge among staff</td><td>C9 Technology
C9-1 ICT tools currently available for KM practices including technological infrastructure, Intranet, knowledge portals, document management, record management systems and content management systems, groupware and collaboration technologies, knowledge repositories and knowledge bases, Web 2.0, customer relationship management, discussion forums, data mining, knowledge-based decision support systems and semantic technologies
C9-2 ICT tools planned to be used in the next two years</td></tr>
</table>

Results also revealed that agencies planned to implement document management systems, knowledge repositories and knowledge bases, and data mining tools.

6.2 Key Findings

Based on the survey results we are able to answer all questions formulated from demand and supply sides of KM in government (Section 4).

6.2.1 Demand-Side KM in Government

1) *Demand for KM in government* - KM demand in government is relatively high across agencies but with some variability among agencies.
2) *Government function in most need of KM* - KM demand in internal administration is higher than in public service delivery.
3) *Most important reasons for KM in government* - The most important reasons for implementing KM practice include facilitating innovation and improving work productivity.
4) *Organizational operation demands KM most* - Among organizational operations in government the highest KM demanding area is managing organizational memory and sharing of expertise.
5) *Most important reasons for KM in specific organizational operations* - Among organizational operations in government the most important reasons for KM practice are protecting organizational knowledge from loss of due to staff turnover and reusing or adapting solutions from other projects.

6.2.2 Supply-Side KM in Government

1) *KM capability in government* - The overall capability for KM across the government agencies is not high, but shows significant variability among agencies.
2) *Environment for KM and its promotion* - There is considerable leadership support in government agencies from top management for instituting the KM practice and they have an active promotion/communication strategy for KM. However, it was found that human and financial resources allocated for KM activities in the agencies are scarce.
3) *Fostering organizational culture for KM practice* - Agencies are making efforts in establishing knowledge-friendly organizational culture by motivating staff and encouraging experienced workers to transfer their knowledge and to share ideas and feedback on the projects.
4) *Most utilized KM processes across government* - The most utilized KM processes in the agencies are knowledge acquisition and knowledge sharing.
5) *KM technology infrastructure* - Technology deployment in the agencies is low, with relatively high variability across them.
6) *Most utilized KM technologies and systems* - The most deployed KM-related technology tools are document management system, intranet and knowledge portal, and record management system.

6.3 Validation

We argue here for the validity of our results, specifically the reliability and content validity of the instrument as well as the convergence validity of our results.

On reliability of our survey instrument, survey questions were directly derived from the operationalization of each of the 12 KM Need constructs and 9 KM Capability constructs. The Cronbach's Alpha Reliability Coefficients for all six dimensions of our instrument are shown in Table 3. Since most of the reliability coefficients are between 0.81 and 0.90, the reliability of our instrument is considered high or good [17]. Given that our assessment model was developed based on extensive review of literature on KM assessment theory, models, frameworks (as shown in Table 1), we argue for the content validity of the KM needs and capabilities constructs of the assessment model. By refining our KM capability constructs based on KM Success Models [27], we guarantee that no important construct is omitted in the underlying assessment model for the survey instrument.

Table 3: Cronbach's Coefficient for Constructs

Demand			**Supply**		
Construct		**Cronch Coeff.**	**Construct**		**Cronch Coeff.**
Internal Admin		0.89	Environment	Leadership	0.81
Public Services		0.87		Strategy	0.92
Operational	Learning	0.90		Culture	0.86
	Memory	0.90		Structure	0.74
	Collaboration	0.83	Processes	Acquisition	0.84
	Expertise	0.88		Capture	0.78
	Access	0.82		Utilization	0.83
	Transfer	0.90		Sharing	0.82
			Technology		0.71

On validity of results, our findings are consistent with previous findings on organizational KM needs and capabilities in literature albeit not in the government domain. This convergence is elaborated as propositions in the discussion section.

7. DISSCUSSION

In this section we discuss the implications of our findings and present a set of propositions aiming at generalizing these findings. Before this, we comment on the use of the Integrated KM Assessment Model particularly in the context of government-wide initiatives. Within a single organizational context, availability of information on the KM needs and capabilities enables better alignment and offers improved chances for KM practices to positively impact on organizational performance. In government-wide context, information on KM needs and capabilities across agencies enables agency-to-agency KM innovation transfer; for instance where the organizational KM need of one agency can be easily met by the capabilities available in other agencies.

Our assessment model, illustrated through the conceptual model in Figure 1, allows us to ask two fundamental questions – how KM needs inform the development of KM capabilities and how existing capabilities could shape organizational KM needs. The specification of KM needs could be guided by existing KM success factors and KM success models which codify concrete KM project experiences [27]. These KM success models help to prioritize government efforts in improving specific KM capabilities to address various organizational needs identified. Carefully considered KM needs in turn enables logical deduction of requisite KM capabilities. For instance, considering our findings, the need for KM to support internal administration requires improvements in KM capability related to creating more knowledge-friendly environment within agencies, providing shared technological infrastructure and enhancing KM processes.

If we accept our findings as providing some evidence to support existing claims in literature about KM demand and capabilities, then the following set of propositions are plausible:

1) *Proposition 1: Awareness of KM in government is high particularly in improving internal administration* - our findings support earlier claims on increasingly recognition of the importance of managing organizational knowledge in the public sector vis-à-vis EGOV implementations [49] [30][45][24][4][51] [36].
2) *Proposition 2: Document-intensive and large transaction agencies have relatively more KM awareness and potentials* – agencies such as educational institutions, finance department, statistics with responsibilities to process large documents and high volume of transactions. However, agencies with social responsibilities such as Social Welfare and Sports tend to have lower KM awareness and capabilities
3) *Proposition 3: KM helps to transform government functions by maximizing access and use of knowledge* - our findings confirm that KM has potential to facilitate organizational changes in government and to improve the quality of services offered to citizens [52] [45] for EGOV development [4].
4) *Proposition 4: KM is important for government's overall innovativeness* - our findings confirm that KM enables sharing know-how and reusing appropriate solutions that supports creativity and fosters innovation [10] [32] [1] [15] [5].
5) *Proposition 5: KM can improve productivity and efficiency of government employees work* - our results imply that improving work productivity and efficiency are motivating factors for KM practice in public sector [51] [36] [14].
6) *Proposition 6: KM prevents knowledge loss in government by capturing explicit in its departments and tacit knowledge of its employees* - our findings confirm that it is critical for public sector and particularly for EGOV that both explicit and tacit knowledge are adequately captured to prevent any strategic knowledge loss [50] [14].
7) *Proposition 7: KM facilitate co-operation between government agencies* - KM supports EGOV in citizen- and business- oriented service delivery and inter-organizational cooperation [49].
8) *Proposition 8: KM helps to improve services to citizens and to meet customer needs* - our findings confirm that KM can improve the quality of services offered to citizens [45] [5].

8. CONCLUSION

Based on our results, we conclude that the focus of KM on internal administration and back-office issues rather than service delivery could imply: 1) that government agencies are still at the early stages of EGOV implementation or 2) that agencies are strengthening their internal administration for better integration to enable service delivery across agencies and levels of government. Given the specific EGOV context for KM in our case, the second scenario is more plausible. Thus, there is at least some empirical basis for linking KM practices in government to connected government initiatives.

Looking into the future of KM practices in government, we expect the implementation of KM projects as part of EGOV programs to increase due to the perceived strategic value of KM in achieving connected government. While the greatest demand for KM in government appears to be in strengthening internal administration and other back-office operations, future government KM needs would likely be different. Regardless of specific KM needs, we believe that the fundamental question in KM is about: "how to determine and develop KM capability to satisfy KM needs which consequently creates positive impact on the desired organization objectives". The Integrated KM Assessment Model presented, applied and validated in this paper provides a supporting tool for determining this need and measuring the KM demand-supply gap in government organizations. One of the limitations of our assessment model is that the policy function of government is not covered. This is being addressed in the next version of our assessment model - part of our ongoing work.

9. ACKNOWLEDGMENTS

The work presented in this paper is funded by Macao Foundation under the e-Macao program.

10. REFERENCES

[1] Al-hawamdeh, S. 2002. Knowledge management: re-thinking information management and facing the challenge of managing tacit kno ledge. *Information Research*. 8, 1, 1-14.

[2] Alavi, M. 1999. Knowledge Management Systems: Issues, Challenges, and Benefits. *Communications of AIS*. 1, February (1999), 1-37.

[3] Alavi, M. and Leidner, D. 1999. Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues.

[4] Arora, E. 2011. Knowledge management in public sector. *Journal of Arts Science & Commerce*. 2, 1 (2011), 165-171.

[5] Bellamy, C. 2002. From automation to knowledge management: modernizing British government with ICTs. *International Review of Administrative Sciences*. 68, 42 (2002), 213-230.

[6] Bertot, J.C. et al. 2010. Crowd-Sourcing Transparency: ICTs, Social Media , and Government Transparency Initiatives. *Proceedings of the 11th Annual International Conference on Digital Government Research* (2010), 51-58.

[7] Canadian Institute of Knowledge Management 2003. *A Common KM Framework for the Government of Canada*.

[8] Chua, A. and Goh, D. 2008. Untying the knot of knowledge management measurement: a study of six public service agencies in Singapore. *Journal of Information Science*. 34, 3 (Jan. 2008), 259-274.

[9] Chuang, S. 2004. A resource-based perspective on knowledge management capability and competitive advantage: an empirical investigation. *Expert Systems with Applications*. 27, 3 (Oct. 2004), 459-465.

[10] Coombs, R. et al. 1998. Knowledge Management Practices for Innovation: An Audit Tool for Improvement.

[11] Dalkir, K. 2005. *Knowledge Management in Theory and Practice*. Elsevier Inc.

[12] Davenport, T.H. et al. 1998. Successful knowledge management projects. *Sloan Management Review*. (1998).

[13] Department of the NAVY 2001. *Metrics Guide for Knowledge Management Initiatives*.

[14] Dubai School of Government 2011. *The Current State of Knowledge Management in Dubai's Public Sector Organizations: Assessment and Recommendations*.

[15] Firestone, J.M. and D, P. 2003. The New Knowledge Management: A Paradigm and Its Problems. *KMCI Press Knowledge management*. (2003), 1-8.

[16] Freeze, R. and Kulkarni, U. 2005. Knowledge Management Capability Assessment: Validating a Knowledge Assets Measurement Instrument. *Proceedings of the 38th Hawaii International Conference on System Sciences - 2005* (2005), 1-10.

[17] Gliem, J.A. and Gliem, R.R. 2003. Calculating , Interpreting , and Reporting Cronbach ' s Alpha Reliability Coefficient

for Likert-Type Scales. *2003 Midwest Research to Practice Conference in Adult, Continuing, and Community Education* (2003), 82-88.

[18] Gloet, M. 2012. Knowledge Management and Innovation Performance in Australian Service Sector Organizations. (2012).

[19] Gloet, M. and Terziovski, M. 2004. Exploring the relationship between knowledge management practices and innovation performance. *Journal of Manufacturing Technology Management*. 15, 5 (2004), 402-409.

[20] Godbout, A.J. 1998. An integrated approach to effective knowledge management. *The Journal of Public Sector Management*. 28, 2 (1998).

[21] Gold, A.H. et al. 2001. Knowledge management: An organizational capabilities perspective. *Journal of Management Information Systems*. (2001).

[22] Grant, R.M. 2008. Prospering as in Integration Environments: Organizational Capability Knowledge. *Organization*. 7, 4 (2008), 375-387.

[23] Harrison, T.M. et al. 2011. Open Government and E-Government: Democratic Challenges from a Public Value Perspective. *Proceedings of the 12th Annual International Digital Government Research Conference* (2011), 1-9.

[24] Heck, U. and Rogger, A. 2004. Knowledge Management for E-service-Delivery – A Conceptual Approach within E-government. *KMGov 2004, LNAI 3035*. M.A. Wimmer, ed. 1-8.

[25] Holt, D.T. et al. 2004. The Development of an Instrument to Measure Readiness for Knowledge Management. *Proceedings of the 37th Hawaii International Conference on System Sciences - 2004* (2004), 1-6.

[26] Jennex, M.E. et al. 2012. Where to Look for Knowledge Management Success. *45th Hawaii International Conference on System Sciences* (2012).

[27] Jennex, M.E. and Olfman, L. 2004. Assessing Knowledge Management Success/Effectiveness Models. *Proceedings of the 37th Hawaii International Conference on Systems Sciences* (2004), 1-10.

[28] Kim, S. and Lee, H. 2004. Organizational Factors Affecting Knowledge Sharing Capabilities in E-Government: An Empirical Study. *Proceedings of the dg.o2004 Conference* (2004).

[29] Kulkarni, U. and Freeze, R. 2004. Development and Validation of A Knowledge Management Capability Assessment Model. *Twenty-Fifth International Conference on Information Systems* (2004), 657-670.

[30] Leitner, C. 2003. *eGovernment in Europe: The State of Affairs*. European Institute of Public Administration.

[31] McElroy, M.W. 1999. Second-Generation KM. *Knowledge Management*. (1999), 86-88.

[32] Mcelroy, M.W. 2000. The New Knowledge Management. *Knowledge and Innovation: Journal of the KMCI*. 1, (2000), 43-67.

[33] Moussa, C.B. 2009. Moving Beyond Traditional Knowledge Management: A Demand-Based Approach. *Journal of Knowledge Management*. 10, 3 (2009), 1-13.

[34] Ngcamu, B. and Sanjana, B. 2011. An exploratory study into employee perceptions of knowledge management in two service units in the public sector. *Public Administration and Policy Research*. 3, March (2011), 74-86.

[35] Nonaka I. 1994. A Dynamic Theory of Organizational Knowledge Creation. *Organization Science*. 5, 1 (1994), 14-37.

[36] OECD 2003. *Conclusions from the Results of the Survey of Knowledge Management Practices for Ministries/Departments/Agencies of Central Government in OECD Member Countries*.

[37] Obi, T. and Iwasaki, N. 2010. Electronic Governance Benchmarking - Waseda University e-Gov Ranking. *Proceedings of the 4th International Conference on Theory and Practice of Electronic Governance* (ACM New York, NY, USA ©2010, 2010).

[38] Peristeras, V. 2004. Governance Enterprise Architecture (GEA): Domain Models for E-Governance. *Proceedings of the 6th international conference on Electronic commerce* (2004), 471-479.

[39] Picazo-vela, S. et al. 2011. Social Media in the Public Sector : Perceived Benefits , Costs and Strategic Alternatives. *The Proceedings of the 12th Annual International Conference on Digital Government Research* (2011), 198-203.

[40] Rossel, P. and Finger, M. 2007. Conceptualizing E-Governance. *Proceedings of the International Conference on Theory and Practice of Electronic Governance* (2007), 399-407.

[41] Singh, S. et al. 2006. Knowledge Management Capability and Organizational Performance: A Theoretical Foundation. *Conference at the University of Warwick, Coventry* (Canada, 2006), 1-54.

[42] Syed-Ikhsan, S.O.S.B. and Rowland, F. 2004. Benchmarking knowledge management in a public organization in Malaysia. *Benchmarking: An International Journal*. 11, 3 (2004), 238-266.

[43] Traunmüller, R. and Kepler, J. 2010. Web 2.0 creates a new government. *EGOVIS'10 Proceedings of the First international conference on Electronic government and the information systems perspective* (2010).

[44] UNDESA 2010. *E-Government Survey 2010: Leveraging e-government at a time of financial and economic crisis*. United Nations.

[45] UNDESA 2007. Managing Knowledge to Build Trust in Government. *Workshop on Managing Knowledge to Build Trust in Government* (2007).

[46] UNDESA 2008. *United Nations e-Government Survey 2008: From e-Government to Connected Governance*. United Nations.

[47] Vitvar, T. et al. 2010. *Knowledge and Semantic Technologies for Agile and Adaptive E-Government*. Springer.

[48] Wimmer, M. 2004. *Lecture Notes in Artificial Intelligence*. Springer.

[49] Wimmer, M. 2004. *Proceedings of the 5th IFIP International Working Conference, KMGov2004*. Springer.

[50] Yong, J.S.L. and Koon, L.H. 2003. E-Government: Enabling Public Sector Reform. *e-Government in Asia*. 3-21.

[51] Yuen, Y.H. 2007. Overview of Knowledge Management in the Public Sector. *7th Global Forum on Reinventing Government: Building Trust in Government* (2007), 1-16.

[52] Zhou, Z. and Gao, F. 2007. E-government and Knowledge Management. *Journal of Computer Science*. 7, 6 (2007), 285-289.