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Developing OMS in IHL

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***Abstract*—**Managing knowledge of research is one way to ensure just in time information and knowledge to support research strategist and activities. Unfortunately researcher found the vital research knowledge in IHL (Institutions of Higher Learning) are scattered, unstructured and unorganized. Aiming on lay aside conceptual foundations for understanding and developing OMS (Organizational Memory System) to facilitate research in IHL, this research revealed ten factors contributed to the needs of research in the IHL and seven internal challenges of IHL in promoting research to their academic members. This study then suggested a comprehensive support of managing research knowledge using Organizational Memory System (OMS). Eight OMS characteristics to support research were identified. Finally the initial work in designing OMS was projected using knowledge taxonomy. All analysis is derived from pertinent research paper related to research in IHL and OMS. Further study can be conducted to validate and verify results presented.

***Keywords*—** corporate memory, Institutions of Higher Learning, organizational memory system, research

I. Introduction

TERTIARY education system in Malaysia has undergone a series of changes in the early 21st century. They are upgrading of university colleges to full public university status, granting universities with Research University (RU) and Accelerated Program For Excellence (APEX) university status, the establishment of new private universities as well as the penetration of foreign universities [1], [2], [3], [4]. The goal is to place the Malaysian education on the global map by transforming the tertiary education into a center of academic excellence and own first class mentality human capital by 2020 [2].

Academic staff in the public universities of Malaysia, are required to fulfill their responsibility in teaching, research and services. [5] in his study found that the most productive role in the eyes of the academics in Malaysia university, was found to be teaching, with research and administration coming second and third, respectively. Academicians are forced to adapt to the changes brought by global and local changes [4]. While teaching has been the core academics responsibility since ever, in the past 30 years, there were several scholars trying to link research as portion becomes a performance indicator in higher education [6].

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Academic institutional need research activities to stay competitive and maintain their excellencies. From previous study related to Institutional of Higher Learning (IHL), researcher found interesting factors contribute to the needs of research in the IHL. The findings are as per Table I.

TABLE I
FACTORS CONTRIBUTE TO RESEARCH NEEDS IN UNIVERSITY

No	Factors	Author/s
1	Produce knowledge	[7], [8], [9], [10], [11]
2	Extensive study impact on industry	[12], [13]
3	Promote the commercialization	[9]
4	Stimulate academic publications	[6]
5	Accomplish the national higher education strategic plan 2020	[14], [2]
6	Monitoring the implementation of policies and programs, and in refining policy	[4]
7	Improve the teaching and learning	[6], [3], [13]
8	Enhance curriculum to meet rapid technology changes	[15]
9	Fulfill individual academic promotion criteria	[5], [16]
10	Fulfill organization performance criteria	[16]

Researcher found ten factors that determine the needs of research in IHL. The most agreed factor by the researchers is *research is in need for producing knowledge- factor 1*. IHL has been admired for conducting research that able to produce new knowledge for the public in varies domain. The new knowledge would be applied by others to improve their product and processes in their organizations. This result has to be tested and evaluated to *prove the impact and benefits in industry – factor 2*. Proven result of research applied in product and process would bring the research to commercialization. Research result and findings of product or services is the initial step of commercialization. So in order to *promote commercialization, we also need research – factor 3*. Producing knowledge, studying impact on industry and promoting commercialization are projecting the needs of research in IHL affecting public and industry.

Research in IHL also give direct impact to government. *Number of publications- factor 4*, give an indicator of quality of education in one country. *National higher education strategic plan 2020 - factor 5* need research to fulfill the

target. Research also has an important role to play in *monitoring the implementation of policies and programs - factor 6*, and in refining policy. Lastly research in IHL is needed to improve academic institutions itself. This is possible by *improve the teaching and learning -factor), enhance curriculum to meet rapid technology changes - factor 8, fulfill individual academic promotion criteria -factor 9 and fulfill organization performance criteria -factor 10.* As a conclusion, this analysis found three main impacts of research needs that are 1) impact to public and industry, 2) impact to government and 3) impact to IHL. Combining all the three impacts of research showing 10 factors reflecting to the needs of research in IHL.

As the importance of research in IHL is agreed by all their stakeholders, they have to face the challenges in fulfilling those needs. Researcher has identified difficulties of practicing research in their institutions from recent studies. The analysis of the identification are depicts in Table II.

TABLE II
RESEARCH CHALLENGES IN IHL

No	The challenges	Author/s
1	Knowledge has not being manage appropriately	[9]
2	Knowledge function in the university is being undermined	[11]
3	Research is difficult	[5], [13]
4	Dominating specific area	[2]
5	Measuring performance	[16]
6	Promote working together	[4], [8]
7	A major paradigm shift	[3]

Analysis of previous study related to research revealed seven challenges of IHL in promoting research to their academic members. All of them are the problems from internal IHLs. [9] claimed that *knowledge has not being managed appropriately- challenge no one.* This is true as mentioned by [17] that knowledge in IHLs are scattered. Knowledge in IHL has not being centralized into one channel from the beginning. This is due to decentralize governance to unit or department in the IHLs. Knowledge as end result of research, unable to be traced and shared to the public and industry. Challenge no 2 is closely related to previous challenge. When knowledge is kept in its working platform, it will finally *become undermined- challenge no two* [11]. This is absolutely wasting the time and resources allocated. [5] and [13] agreed *research is difficult - challenge no three.* They are referring to the process of doing the research that is often time-consuming and frustrating - conducting research involves high focus commitment and discipline besides passion in data collection and deriving the results. [2 proposed *dominating specific area in research – challenge no four* in establishing academic research . These will extensively allow focus and full effort in achieving outstanding quality of research. Establishing research cannot be done with a small group of academicians. All academic members of the IHL must take part, so the impact reflect to the *performance measurement – challenge no five* criteria is clear. This is a kind of enforcement is necessary for a teacher and lecturer to have researcher characteristic that can develop not only the university, but the nation. [16], [4] and [8] *promoted working together – challenge no six* in research towards creating a more sustainable future for educational and research in the region. A *major paradigm shift – challenge no seven* is not only a kind of technological and theoretical change but also a kind of deep cultural change including changes in the attitudes of all concerned stakeholders and in their whole line of thinking about the future of the global world, the vision, aims, content, methods, processes, practices, management, and funding of education [3].

All the seven challenges show a leakage of enforcement, strategy and monitoring of IHL research knowledge. This study is suggesting a comprehensive support for all the difficulties in practicing research by using Organizational Memory System (OMS). Research knowledge and OMS is a perfect match. This is due to the main concept of OMS is to be shared across the organizational. Knowledge about research is important to almost all the unit and department in IHL organization. Most of the time research knowledge reflects the quality of knowledge produced by the institution. OMS could facilitate research in IHL in many ways. Figure 1, summarized and visualize main facilitation of OMS to IHL research.

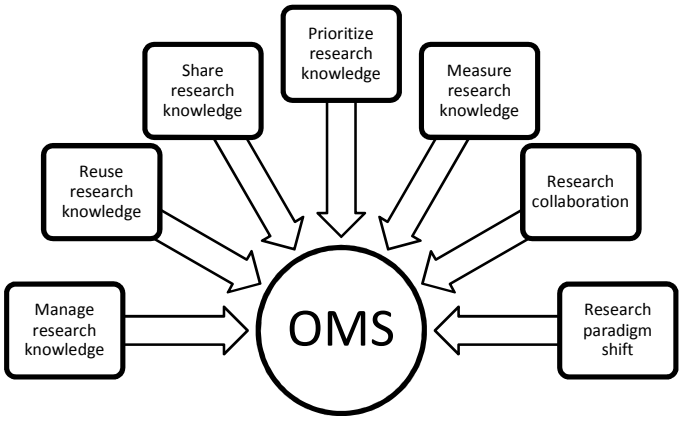

Fig. 1 How can OMS facilitating research in IHL

Research knowledge needs an integrated and centralizes institutional (IHL) knowledge *management*. This is to assure high consistency and reliability in term of the enforcement and operational process. Integration knowledge shall also allow effective mining and *reuse* of knowledge. People in organization would able to identify trends, patterns, even preferences and researchers' behavior. *Sharing* knowledge shall promote working together and stimulate special interest groups that are beneficial for research. Lesson learnt and best practices share in OMS would be able to shorten the learning curve pertaining to research. Those shared knowledge are very useful especially to junior researcher. Knowledge in OMS should provide ample analysis for IHL to strategically focus on specific area so that institutional focus and able to *dominate* on its niche are. Enforcement is one way to establish research. *Measurement* will complement enforcement to drive full synergy focusing on vision and mission. By doing this academician cum researcher are inculcating rich knowledge societies. This strategy also would finally allow a great

opportunity on internal and external *collaboration*. As a conclusion, OMS is a way of sharing using centralized system to improve productivity of research and should be seen as a major paradigm shift in IHL. While IHL have demonstrated less action to manage knowledge, developing and applying OMS concept as a start is essential so that IHL can continuously be the center of excellence of the nations.

II. OMS

Organization Memory Systems (OMS) falls under the umbrella of knowledge management. The OMS are using concept of human memory for improving effectiveness in organization [18] and [19]. Table III depicts the evolution of OM terms since it was first mentioned in 1976.

TABLE III
EVOLUTION OF OM TERMS [19], [20]

Author/s	Year	Terms used
Duncan and Weiss	1979	Corporate, organizational, enterprise knowledge base (EKB)
Hedberg	1981	Organizational Memory (OM)
Pralahad and Hamel	1994	Corporate Knowledge (CK) or Corporate Genetic (CG)
Dieng et al.	1999	Corporate Memory (CM)

Definitions of OMS have revealed various forms and contents of OMS. Table IV projected the contents of OMS derived from previous related research.

TABLE IV
OMS MAIN CONTENTS FROM PREVIOUS RESEARCH

No	OM items	Author/s
1.	Knowledge	[21, [22], [23], [24], [25], [26], [27]
2.	Knowledge & information	[28]
3.	Information	[29]
4.	Knowledge assets	[30], [31]
5.	Know-how & other k – assets	[18]
6.	Set of practices learned	[32]
7.	Memories of employees	[18], [33]
8.	Experience, perceive	[19]
9.	Human competencies	[31]
10.	Active & historical info	[34]
11.	Different rules of operation	[35]
12.	Something abstract (theory, explanatory model, thought schemata, concept) or Something concrete (documents, data bases, knowledge base, repository)	[19]
13.	▪ Knowledge and information (van heijst, van der spek & kruizinga, 1996) ▪ Data and knowledge resources, problem solving expertise, design rationale (nagendra Prasad & plaza 1996) ▪ Knowledge and know-how (Euzenat 1996) ▪ Knowledge (Promian 1996) ▪ Knowledge (simon 1996) ▪ Knowledge (Grunstein, 1995)	[36]

Referring to Table II, the main contents mentioned by previous researchers are *knowledge*. Some researchers use the terms *information and knowledge*, *information* and *knowledge asset* to refer to OMS contents. Besides the general terms or noun refers to knowledge, researchers also used terms associated with action or verb such as *know-how* and *set of practices learned through time*. The other group of researchers use terms related to employees memory that contains the organizational knowledge that are *memories of employees*; *experience and perceive* and *human competencies*. Lastly researchers represent knowledge in OMS connected to organizational operational knowledge such as *active & historical information*, *different rules of operation* and finally *abstract and concrete knowledge*. [36] compiled and reported researchers description of OMS contents mentioned as *data, information, knowledge, know-how, knowledge resources, problem solving expertise and design rationale*. As a conclusion the knowledge in OMS has been defined into four groups that are general knowledge, action knowledge, employees' knowledge and operational knowledge.

Study of literature related to OMS proven that researchers agreed there are various inconsistent definitions of OMS. [19] and [36] reported that there are no unified uses of terms related. [37] notes that the OMS term has been overworked and confused. These inconsistency is belief was due to multidimensional and multidisciplinary view of knowledge management concept itself [19]. Anyhow the echo of OMS continues studies until recent years confirmed that the theory of OMS is acceptable as one solution to overcome the shortcomings of current practices in managing organizational knowledge.

[19] in his study also highlighted the importance of understanding broader concept of knowledge in organization facing challenges to resolve construction paradigm (corresponding to technological system) and evolution paradigm (corresponding to characteristics of social system). Therefore it is important for organizational members to

understand clearly the terms before having idea on how OMS should improve the effectiveness of the organization. These will support mechanisms for varying implementation needs in building and maintaining OMS [25]. It will also ensure sustainable and successful system in the organization. Analysis of previous OMS related study conducted has directed researcher to characteristics of OMS as shown in Table V.

TABLE V
CHARACTERISTIC OF OMS

No	Characteristic description	Author/s
1.	Collection of knowledge/ storage/location	[21], [22], [30], [18], [19], [31], [24], [28], [33], [38], [37], [27]
2.	For understand & reuse	[30], [23], [18], [19], [24], [36], [38], [25], [34], [29], [37]
3.	Knowledge management process capturing, finding, disseminating	[18], [39], [24], [28], [25], [37], [2], [34], [35]
4.	Support decision making for continues enhancement and improvement	[21], [30], [18], [23], [19], [33], [26]
5.	Set of practices been learnt	[32]
6.	Intelligent database	[18]
7.	Integrations of existing systems	[36], [26]
8.	Socially constructed, maintained and directed	[37], [26]

The most popular characteristics of OMS mentioned have been pointed to *accumulation of knowledge*. These findings portray OMS as a place to continue collect and preserve organizational knowledge. Anyhow, accumulation of knowledge only is not enough for OMS. [36] and [26] emphasized that the OMS should be the only place integrating and collecting the organizational knowledge. The second characteristic is about *understanding knowledge and reuses* the knowledge for current and future activities in the organization. It is understood that OMS should able to stimulate the organizational learning that result in gaining new knowledge related to the organization. This knowledge should be interpreted and mapped to the current task in the organization. By doing this, the original knowledge is being referenced. This is how knowledge being reused.

Another important characteristic of OMS is *the process involved*. The processes are capturing, finding and disseminating. Noticed that creation is not mentioned in the process. This is contradicts with process of knowledge management system (KMS). All researchers in row 3 of table IV agreed on the process except [34] proposed creation being include in the OMS process. From detail analysis on the processes involved, it can be concluded that most researchers that refer to the process of OMS are referring to explicit knowledge. The rationale behind the fact is explicit knowledge has widely been created digitally. So in the scope of explicit knowledge, the creation process most probably can be omitted. While this is true for explicit knowledge, in considering tacit knowledge for OMS, creation process may be required. The last most mentioned characteristics is *supporting decision making for continues enhancement and improvement* in the organization. This attribute of OMS is derived from the reuse characteristic of OMS mentioned before. The output of knowledge reuse suppose to support any decision in the organization and the outcome of applying the decision should improve organization in any ways.

Besides the major four characteristics of OMS, some previous studies present different features of OMS. They are set of *practices being learnt, intelligent database, integration of existing systems and finally socially constructed, maintained and directed*. The last feature (socially constructed, maintained and directed) are projecting the way OMS should be constructed and implemented; using workflow that is acceptable and dispensable by members in the organization. Figure 2 is the illustration of OMS characteristics derived from the study.

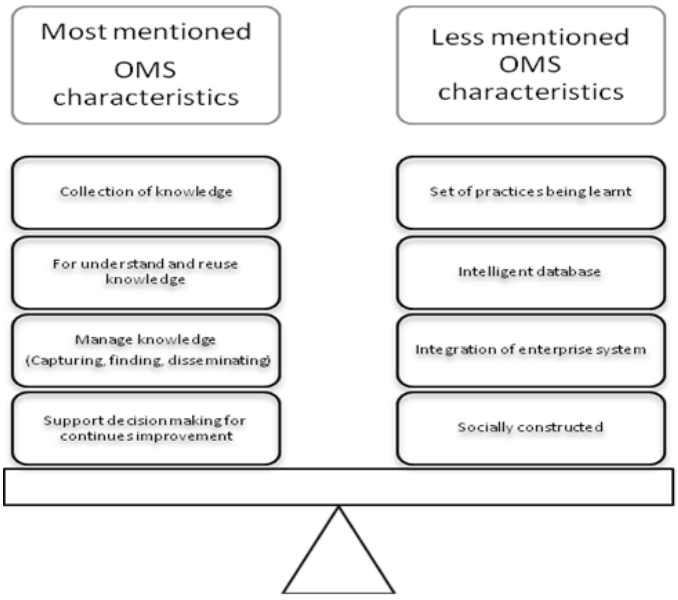

Fig. 2 OMS characteristics

This finding is fulfilling the gap in the literature about the definition and characteristics of OMS. It is representing the identical understanding among researchers related to OMS concept. Understanding OMS characteristic enable the researcher to do initial study for designing OMS for IHL to facilitate research.

III. DESIGNING OMS

Designing OMS for public IHL has its own challenges. Proposed OMS aimed on facilitates learning research for an organization specifically for public IHL in Malaysia.

Considering the eight founded OMS characteristics, OMS of IHL that able to facilitate learning should have all the characteristics mentioned in Figure 2. A strategy on designing OMS should take place.

There are two main item should be considered in designing OMS. The first item is considering designing content structure and another one is considering platform structure. Both of considerations should be done parallel because content process is build and accessed on the platform structure. The importance of having content structure is obvious because OMS should able to facilitate knowledge of research needs in IHL. This statement was agreed by [40] who suggested that researchers of Computer and Information Sciences work out the needs for which ICT system are adopted by the very significant user group. [41] proposed "Content must be described and accessed in standardized and interoperable ways". [42] in his research illustrates how public sector organizations can avoid the ''great trap in knowledge management" by focusing on designing IT artifacts to make explicit the tacit knowledge from people, and not in the information contained in document repositories. The importance in having platform structure are derived from the following statement; OM creation and usage must not be considered as an isolated activity but as daily practices, because humans have limited ability of memory and have limited capacities to perform in their job responsibility [43]. Technology cannot be considered alone, it is limited to supporting humans because of its variable accuracy levels when performing simple mundane human tasks [44]. Platform structure should reflect the existing workflow and technology infrastructure available in the organization. This identification and consideration in the very initial place would determine how the implementation of OMS should be adapted in IHL members' daily activity. Figure 3 visualize both of the consideration in designing OMS to facilitate IHLs' research.

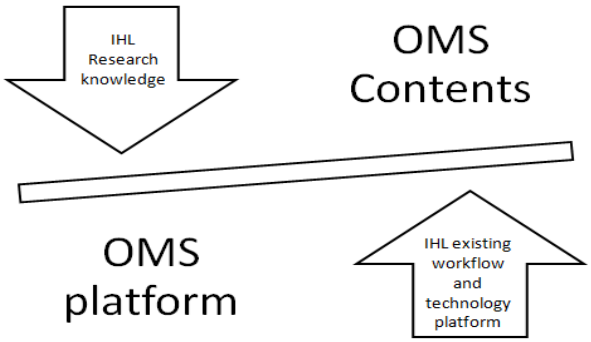

Fig. 3 Designing OMS for IHL to facilitate research

Early investigation was done by researcher to get some information for OMS content and OMS platform. In identifying OMS contents researcher used taxonomy approach. Suitable taxonomies play an important role in research and management because the classification of objects helps researchers and practitioners understand and analyze complex domains [45]. Any organization that needs to make significant volumes of information available in an efficient and consistent way to its customers, partners or employees, need to understand the value of a serious approach to taxonomy management [46].

Analyses of literature related to the OMS are discussed in the previous section become the basis on the OMS design. In the context of this research, individual knowledge is located as the initial stage of knowledge. Observations into the archives of public IHL reveals that knowledge resources can be categorized into three main sources namely paper documents, computer documents and self memory. The three components of OMS are mapped into the six OM or CM types proposed by [19] which are non-computational, documents bases, knowledge based, case based, construction of distributed and combination of several techniques OM or CM. The knowledge types have been aligned to knowledge management technology available in IHL. The findings of the analysis are fitted in the taxonomy developed and discussed in the next section.

Proposed taxonomy is presented in Figure 4.

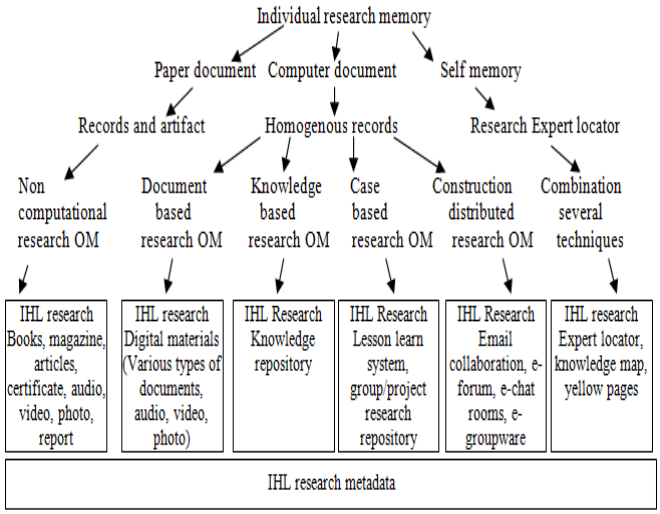

Fig. 4 Proposed taxonomy projecting research content structure in IHL

The current proposed taxonomy has to be validated on the actual contents based on scenario and environment of IHL to reflect accurate facts. In the other hands, to study OMS platform, researcher found Key Performance Indicator (KPI) workflow as very interesting. The KPI system flow is significant in adapting OMS because it will allow daily participations. It will drive people to use the system and raise chances of success implementation and sustainability. Processes are the main component in delivering organizational goals. Thus, any approach that is not associated with processes will tend to fail or to be perceived as failures. KPI report is the organization process and as part of organization culture to support the organization process. Employee is willing to support this process since it will return benefits to them. After all KPI is the widely used tool for employee performance evaluations in Malaysia. KPI workflow would be used as the flow to capture research knowledge from IHL members. Research knowledge then should make available for the IHL members for further reuse besides the other different process in KPI system as academician performance measurement.

IV. Conclusion

This paper analyzed the needs of research in IHL, problems faced to established the research, and proposed OMS to support research challenges in IHL. This paper also provided clear description of OMS by examining every characteristic of OMS. The intention are to highlight the relation of research in IHLs', with OMS capabilities in supporting those IHL needs. Extensive research through data collection methodology such as survey and interview the IHL related staff should be done in the next stage to project very specific case study.

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