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An Investigation on Integrating Eastern and Western Medicine with Informatics

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Abstract

Today, in many western countries, acceptance of alternate forms of healthcare such as Chinese medicine (CM) is increasing. In fact, countries such as Australia, Canada, and England are going so far as to set regulations, education, and standards regarding the practice of CM in these respective countries. Further, we can see the integration between western and Chinese medicine delivery of care and treatments in many instances. Information Systems and Information Technology (IS/IT) can be a key enabler in assisting this integration. The following study examines aspects of such integrations using IS/IT and identifies that CM IS/IT is more likely to succeed when there is synthesis between key aspects of the unique environment and user requirements. This perspective is supported theoretically by adapting Churchman's Inquiring Systems to frame CM as a combination of Hegelian and Kantian inquiring systems with the support of Singerian, Lockean, and Leibnizian inquiring systems and Knowledge Management (KM) features. Based on this, the study then proposes a new design for a patient management system in clinics and hospitals.

Keywords: Healthcare Informatics, Clinic Management System, Inquiring Systems, Knowledge Management Systems, Information Systems, Information Technology

1. Introduction

Integrating western medicine (WM) with Chinese medicine (CM) has been a feature in China since WM was introduced to the country in the mid-19th century of Qing dynasty (Lin, Yang, Pittayachawan, & Wickramasinghe, 2015b). Today, it is common that patients are treated with both types of medicine (E. Chan, Tan, Xin, Sudarsanam, & Johnson, 2010). Although this integration has been very popular in China, it is relatively new to western countries. WM uses disease diagnosis with the foundation of pathological examination of individual organ functions or malfunctions (E. Chan et al., 2010). CM, on the other hand, is largely a philosophy, although it has been in practice for thousands of years based on its incredible values in healing and well-being. The lack of scientific and medical evidence is one of the major reasons that CM has not been fully accepted and integrated into the western healthcare system (Lin et al., 2015b). The situation, however, has altered in recent times. Studies have shown that CM is used in treatment plans either as ingredients (E. Chan et al., 2010; A. C. Chau, Cheung, Jiang, Au-Yeung, & Li, 2009; Xijun Wang et al., 2011) or to improve physical and emotional well-being (Molassiotis et al., 2005). World Health Organization's (WHO) traditional and complementary medicine (T&CM) strategy 2014 – 2023 urge its member counties to promote integrating “T&CM services and self-health care into national health systems” said general director Margaret Chan (WHO, 2013). WHO's goal and vision is to have a blended system which takes the best of both types of medicine and compensates for the potential weaknesses in each (Lin et al., 2015b; WHO, 2013). Lin et al. studied the current and future movements of CM and WM integration, and suggested that some developed countries (such as Australia, Canada, and England) are in a situation where WM predominates, with CM as a complementary and alternative medicine (CAM). National regulation, policies and standards are established and CM practices are partially integrated in these settings (Lin et al., 2015b). Furthermore, health insurance companies cover percentages of CM claims, and qualified CM practitioners must comply with the regulations.

In the process of this WM/CM integration, Information Systems and Technology (IS/IT) can play a key contribution. Developments can already be found in various applications and systems. For example, these include expert systems (Lam, Leung, Heng, Lim, & Wong, 2012), knowledge-based systems such as database/warehouse functions (Huang & Chen, 2007) and diagnosis and treatment assistant systems (He, Huang, Lu, Xue, & Lu, 2006). These systems have shown that IS/IT is an essential tool in assisting CM to be accepted into mainstream medicine practices. Nonetheless, literature reviews show that the existing CM IS/IT developments have limitations and there is a lack of suitable synthesis for this unique combination (Lin et al., 2015a; Yang, Allan, Li, & Xue, 2009).

This paper serves to extend Churchman's Inquiring Systems to depict CM as a combination of Hegelian and Kantian inquiring systems with the support of Singerian, Lockean, Leibnizian inquiring systems and Knowledge Management (KM) features and by so doing enable a deeper understanding of CM so that it might be then possible to design a patient management system (PMS) to support CM practice in a given clinic.

2. Problems and Challenges of CM developments

Medical developments in the 21st century have arisen from a multitude of factors, including a rapid increase in chronic diseases such as diabetes, a lack of resources in both drug manufacturing and medical funding, as well as educated patients who seek for better and holistic treatment of their illnesses and well-being (Lin et al., 2015b). Integrating WM with CM is a new approach that has shown some remarkable achievements in this aspect (E. Chan et al., 2010). Like any major change, challenges and problems are to be expected (Savery, 2015). This section reviews some of the major concerns in this regard.

2.1 Different regulations and standards

Research shows that most developed countries classify CM as a type of CAM (WHO, 2013). Regulations and experiences differ between countries; for example, Australia is at a stage where CM practitioners are expected to be qualified, and WM doctors who are trained and have knowledge in CM can be found in many medical clinics (Lin et al., 2015b). Specifically, with regard to Australia: 1) The CM profession is included in the National Registration and Accreditation Scheme (NRAS). A national registration of practitioners, acupuncturists, and dispensers of Chinese herbal medicine commenced on the 1st July, 2012 (AHPRA, 2014; CMBA(c), 2012). 2) Policies, registration guidelines, codes and standards are created and published to assist the CM medical profession. Accreditation standards and processes for consultation were developed by the Australian Health Practitioner Regulation Agency (AHPRA) and Chinese Medicine Board of Australia (CMBA) (AHPRA, 2014). 3) CM undergraduate and postgraduate courses are offered in the Australian tertiary education system. 4) A CMBA website was created which enables online service delivery and communication. The Chinese Medicine Portal was created in 2009 and serve as an online CM knowledge pool where information and clinical data can be retrieved and accessed (Yang et al., 2009). 5) AHPRA will directly allocate cost funding to CMBA to assist various activities undertaken by the agreement and strategies (AHPRA, 2014).

Regarding other western jurisdictions, in Switzerland CM was covered by the nation's basic health insurance program in 1999, but was taken out in year 2005 except CM acupuncture (Busato, Eichenberger, & Kunzi, 2006; Okma et al., 2010). In most of Europe, it is illegal to sell manufactured unlicensed herbal medicines without the appropriate license (Fan et al., 2012). In the UK, the 2009 "Statutory Regulation of Practitioners of Acupuncture, Herbal Medicine, Traditional Chinese Medicine and other Traditional Medicine Systems Practised in the UK" states that all CM practitioners must be qualified and regulated (Holmes, 2011). In the USA, CM is recognised as dietary supplements and is regulated by the Dietary Supplement Health and Education (DSHEA) (C. F. Chau & Wu, 2006). Hence, CM is loosely regulated and assessed compare to WM. Patients' safety is a major concern.

In summary, different levels of legal foundations to establish quality and safety standards for CM and its practice exist in some countries on a national basis. An internationally recognised standard should be enforced to avoid confusion, aid in coordination and mitigate any health risks. Building on the existing contributions from Australia and other countries, future works may include increasing all aspects of WM and CM integration (Lin et al., 2015a). For example: a) combine and integrate existing CM databases to international recognised format and standards; b) make global standardised CM practice regulations and guidelines what can be accessed online; c) develop suitable IS/IT solutions for various CM practice, and gradually achieve WHO's goal – a blended system. In this research, it is focused on finding the suitable synthesis to justify the IS/IT development in supporting managing the patients information at the clinic level.

2.2 CM IS/IT developments and challenges

The rich traditional knowledge of CM has helped the Chinese for thousands of years, integrating this medicine practice to the western world involves transferring this massive knowledge (K. Chan, Hu, Razmovski-Naumovski, & Robinson, 2015). So far many databases, repositories and information systems (IS) have been created (K. Chan et al., 2015). For example, the Traditional Chinese Medicine Information Database from the National University of Singapore contains information on 1588 commonly used prescriptions, 1313 herbs and 5669 herbal ingredients (E. Chan et al., 2010; TCM-ID, 2015). The University of Michigan Comprehensive Herbal Medicine Information System

for Cancer includes 527 anticancer herbal formulations (E. Chan et al., 2010; Fang, Shao, Zhang, & Wang, 2005). Some CM expert systems and applications are developed for certain diseases or particular treatment. For example, a Chinese acupuncture expert system can assist physicians on acupuncture prescription, needle insertion position, and acupuncture points usage (Lam et al., 2012). Recent research studies addressing major IS/IT activities in CM are summarised in Table 1 below.

IS/IT	Group	Description	Examples
Databases	Database	<ul style="list-style-type: none"> Repository, database containing detailed information on CM formulas, syndromes, herbs information including: pharmaceutical name; botanical name; multilingual pronunciation; distribution of the herb; properties (characteristics); Channels (meridians) entered; medical functions; actions & indications; chemical ingredients; recommended dosage; samples of formulae, toxicity, side effects and cautions; basic molecular properties; optimized 3D structures; origins; clinical effects. 	<p>Chinese Herbs Dictionary: Complementary and Alternative Healing University (Chu, 2013)</p> <p>3D structure database of components from Chinese traditional medicinal herbs (Qiao, Hou, Zhang, Guo, & Xu, 2002).</p> <p>Phytochemical Databases of Chinese Herbal Constituents and Bioactive Plant Compounds with Known Target Specificities (Ehrman, Barlow, & Hylands, 2007)</p>
	Dictionary		
	Knowledge base grid		
	Information System		
Data mining	CM data mining & biomedical mining systems	<ul style="list-style-type: none"> Data mining tools for CM herbs and formulations Information Management System of CM Syndrome Study on combination of hierarchical cluster approach and Bayesian networks. Research approach and method including harmony learning and model selection 	<p>MeDisco/3T - text mining for clinical Chinese herbal medical knowledge discovery (Zhou, Liu, & Wu, 2005).</p> <p>Data mining system for multi-dimensional data analysis (Li et al., 2004).</p> <p>Structural learning of graphical models and its applications (Deng, Liu, Gao, & Geng, 2005).</p>
CM diagnosis assistance	Diagnosis systems & approaches	<ul style="list-style-type: none"> Individual diagnosis and treatment assistance system including: pulse-measuring points on wrists and their corresponding organs; electronic-brain medical erudite medical expert system; analysis packages of tongue and facial images, odour, speech and pulse; fuzzy expert systems assisting diagnosis for certain disease 	<p>Expert system for diagnosis in CM (Xuewei Wang, Qu, Liu, & Cheng, 2004).</p> <p>Web-based CM diagnosis system (Huang & Chen, 2007).</p> <p>Pulse analysis & diagnosis system (He et al., 2006).</p> <p>Fuzzy logic and its applications in medicine (Phuong & Kreinovich, 2001)</p>

Table 1: Summary of existing CM IS/IT developments (sourced from (Lukman, He, & Hui, 2007)).

Studies have shown that the existing IS/IT developments have several limitations, such as: 1) selective information and lack of comprehensive data on the number of Chinese herbs with no or limited resources in Chinese acupuncture or vice versa (Yang et al., 2009); 2) most of the IS/IT system solutions are created in China or Asia, with limited scientific and evidence-based research in western countries (Lukman et al., 2007); 3) There is not a theory to support the IS/IT development in the integration of these medicines (Lin et al., 2015b). Further, a study of the current CM clinic management systems (consisting of SmartTCM Australia, TCM Herbalist Israel, TCM Organiser Canada, and Shen Professional Venezuela) also indicates some significant concerns including: a) Incorrect use of the Chinese language as well as lack of translation into other languages apart from Chinese and English (Lin et al., 2015b); b) Lack of a multi-user systems which can accommodate administrator, physician, and dispenser (Lin et al., 2015b); and c) current systems cannot be used on multiple platforms and devices (Lin et al., 2015b).

The most important limitation to the further application of CM is that the synthesis of IS/IT developments so far has been mainly studied and applied to WM (Lin et al., 2015b). This study suggests that blindly adopting these theories and technologies is not the best solution for CM. This view is supported in practice in other domains for example when we look at Enterprise Resource Planning (ERP) systems, such as SAP and Oracle, as they have failed to conquer the Chinese market by simply applying the same tools and techniques without first understanding and mapping the underlying circumstances and requirements (Xue, Liang, Boulton, & Snyder, 2005). To avoid similar failures, it is therefore necessary to systematically examine past experiences with WM IS/IT developments, and develop a theoretical foundation that is suitable for CM practice. Hence, we analyse the different inquiring and knowledge management systems in this domain drawing upon the work of Churchman (1971).

2.3 Inquiring Systems

C. West Churchman defines the five inquiring systems as: Leibnizian, Lockean, Hegelian, Kantian, and Singerian (Churchman, 1971). Each of these represent a type of inquiring organisation from a system view of knowledge creation, examination, and management (Churchman, 1971). This theory has been adopted, improved and implemented in many IS/IT research paradigms and developments (Parrish Jr & Courtney, 2012; Wickramasinghe, 2005). Below is a summary of these systems.

The *Leibnizian* inquiring system uses formal logic and analysis to generate fact nets and manipulate explicit knowledge (Churchman, 1971; Courtney, Haynes, & Paradise, 2005; Hall & Croasdell, 2005). Tacit knowledge gets little emphasis and new knowledge is generated as an externalisation of editing and systemizing. Most suited IS/IT models to this type of systems are expert systems (Hall & Croasdell, 2005; Mason & Mitroff, 1973; Parrish Jr & Courtney, 2012). The *Lockean* inquiring system contains communities sharing a common mind-set, knowledge is constructed through attention to symbolic references such as legends and/or well-respected authorities (Hall & Croasdell, 2005; Mason & Mitroff, 1973; Nonaka, Reinmoeller, & Senoo, 1998; Parrish Jr & Courtney, 2012). IS/IT used in this type of system include data warehouses (storing observations), data mining (analysing the observations), and groupware tools like emails (facilitating the communication and sharing) (Parrish Jr & Courtney, 2012). The *Singerian* inquiring system generates cycles of processes which resolves problems and disagreements by introducing new variables and laws to provide guidance and overcome inconsistencies at each cycle, until the problem is fully investigated and understood from all sides (Hall & Croasdell, 2005; Mason & Mitroff, 1973; Parrish Jr & Courtney, 2012). All forms of knowledge including tacit and explicit, deep and shallow, declarative and procedural, exoteric and esoteric are considered, measured for improvements, judged by both organisational and society ethical standards (Hall & Croasdell, 2005; Mason & Mitroff, 1973; Nonaka et al., 1998; Parrish Jr & Courtney, 2012). The *Singerian* approach is best supported by networks based on groupware and web-based to allow virtual information gathering and learning because of its need to include a wide range of individual stakeholders (Hall & Croasdell, 2005; Mason & Mitroff, 1973; Parrish Jr & Courtney, 2012). The *Hegelian* inquiring system builds new synthesis by reflecting and resolving diametrically opposed perspectives. It tries to understand all behaviours, forms, processes, methods, arguments, and technology (Hall & Croasdell, 2005; Mason & Mitroff, 1973; Parrish Jr & Courtney, 2012). IS/IT solutions that support *Hegelian* inquiring systems include groupware, document management solutions, repositories that hold the debate data for better understanding of each other's proposals (Hall & Croasdell, 2005; Mason & Mitroff, 1973; Parrish Jr & Courtney, 2012). The *Kantian* inquiring system generate hypothesis base on multiple perspectives and inputs from various knowledge sources. It use explicit and tacit knowledge to consider the many interpretations of the inputs, in this process, the inquirer can study and determine different ways, modelling,

methods and techniques to incorporate the new knowledge (Hall & Croasdell, 2005; Mason & Mitroff, 1973; Parrish Jr & Courtney, 2012). Examples of IS/IT using Kantian systems are the World Wide Web (www), databases, model management systems, decision support systems (DSS) and effective information systems (Hall & Croasdell, 2005; Mason & Mitroff, 1973; Parrish Jr & Courtney, 2012).

2.4 Inquiring System for WM

Healthcare Information Systems (HIS) have been largely developed to produce expert systems, theorem-proving systems, problem-solving and DSS, algorithm-generating systems, databases, and repositories in WM (Ferlie, Crilly, Jashapara, & Peckham, 2012; Liao, 2003). Hence, the existing HIS developments and solutions are mostly in the categories of Leibnizian and Lockean inquiring systems. For example, these include electronic knowledge repositories storing codified knowledge for future reuse, clinical DSS linking characteristics of patients with chest pain to software algorithms recommending specific action (Ferlie et al., 2012). Early form of Kantian inquiring system can be found in some DSS which takes information from various data sources and use these data to provide assistance with the structured portion of the semi-structured, however the human decision maker must rely on intuition and experience to assist them with the unstructured portions (Parrish Jr & Courtney, 2012). Singerian inquiring system's emphasis on ethical behaviour can be seen in most HIS where medical ethics and professionalism are mandatory and expected to maintain strictly in practice. An example of this is a DSS which is developed and implemented with the guidance and principles of patient safety, quality performance, regulations, and policies (Parrish Jr & Courtney, 2012).

3. Methodology

A mixed research method was chosen to address the research question because it allows exploring the issues faced by individuals (Venkatesh, Brown, & Bala, 2013), in particular, the CM practitioners, and it enables identifying the facets and propose productivity framework in order to better understand the proposed concept. Specifically, the research adopts Case Study methodology techniques in selecting the case clinics as well as conducting the interviews. Design Science methodology was also employed in this research to carry out processes in producing the proposed PMS.

3.1 Case Study (CS)

CS methodology is a commonly used and well-recognised research strategy in Healthcare Services and IS research. It attempts to examine a contemporary phenomenon in its real-life context (Yin, 1999, 2013). Through a typical CS, the research solution will be further supported by experiments which capture the circumstances and conditions of everyday and/or commonplace situation. In selecting the case clinics, this research uses a range of selection criteria including, for example, clinic size, number of patients and clinical staffs, and usage of both Chinese herbal medicine and acupuncture. The sample clinics must meet all the requirements and sign ethics agreements to participate in this research. Interviewing is one of the most familiar strategies for collecting qualitative data. It can provide important insights into the events or shortcuts to the prior history which helps to identify other relevant sources of evidence (Flick, 2009; Yin, 1999, 2013). This research will conduct semi-structured interviews with questions that are designed with experts assistance and existing documents from the study field. It is anticipated that open and broad questions will be asked at the beginning of the interviewing process, where the interviewee groups can express their opinions and/or propose their own insights into certain occurrences and for further enquiries. Interviewee groups from the

case clinic include the CM physician, acupuncturist, administrator, and dispenser. Each interview is scheduled for about 20 minutes, will be audio recorded and notes will be taken by the interviewer.

3.2 Design Science (DS)

DS methodology has its roots in the field of engineering and science. It “seeks to create innovations that define the ideas, practices, technical capabilities, and products through which the analysis, design, implementation, management, and use of information systems can be effectively and efficiently accomplished” (von Alan, March, Park, & Ram, 2004). DS has been commonly used in IS/IT researches because it is aimed at developing executive information systems and system support emerging knowledge processes with effective development methods and system solutions for particular user group requirements or models (Lewis, 2015; Vaishnavi & Kuechler, 2015; von Alan et al., 2004). Furthermore, Von Alan et al, provided a DS IS research framework and set of guidelines and practical rules for IS researchers to follow. Based on this framework, the research has four processes: 1) Problem verification - this means that the research problem is confirmed and documented as additional supporting evidence to the research literature. Interviews are carried out and guided by the interview questions. Data are collected, categorised, and stored in a database; 2) Solution design – the PMS is designed. A solution framework and structure is crafted for the research problem tailored to the current CM clinic practices. Therefore data analysis is performed in two major phases. First, the existing clinical (as-is) situation will be modelled, described, and analysed. Then, areas of improvements are identified according to the proposed PMS structure. The new (to-be) system is analysed, explained, and modelled. 3) Evaluation - this is conducted to ensure rigour; the modules of the proposed system are evaluated, refined and tested with specification, expectation, and precise scope. 4) Summarise results – this is the final stage of the research. Findings, publications and a thesis are the expected outcomes.

3.3 Data collection and analysis

A thematic analysis is used in this research as a facilitator to assist communication between the above mentioned research methodologies, as it allows communication between different qualitative methods (Boyatzis, 1998). When reviewing the collected data, the researchers identify themes, such as CM herbs, acupuncture, treatment formulas, etc. separate similarities and differences, then refine, sort the data into different categories for further analysis. Periodical and ad-hoc peers and participants debriefing and checking are mandatory in this research as it helps to increase the rigour of the research. This is because it can: 1) keep everyone informed and on-track; 2) reduce communication errors and prevent/remove potential risks that may be caused by lack of communication and misunderstanding; and 3) allow timely correction and recovery. Modelling and testing techniques are also used to capture the situation of the case clinics and the PMS solution.

4. Preliminary results

Apart from the inquiring systems, KM systems are designed and developed to enhance knowledge intense tasks, processes, and projects for the purpose of knowledge creation, storage, retrieval, transfer, refinement, reuse, revision, and feedback (Maier & Hädrich, 2011). Hence KM architecture and characteristics are important elements which should be considered in CM developments.

4.1 CM IS/IT Development Design

Typical KM systems contain data and knowledge sources (including organisational internal and external information, data warehouses, document management, personal information management, contents management, and groupware); infrastructure services (providing basic functionality for communication, data and electronic assets management, extraction, transformation, and loading); integration services (managing knowledge from a variety of sources); knowledge services (involving discovery functions such as searching, mining, navigation, and visualisation; publication functions like structuring, formats, and contextualisation; collaboration functions including skill/expert management, knowledge sharing, awareness, and experience management; learning functions that use tools and techniques for authoring, managing courses, tutoring, learning paths, and examinations); personalisation services; and access services (Maier & Hädrich, 2011).

This research analyses the CM clinics' information and knowledge through a case study approach. It looks into the clinics' IT infrastructure services for messaging and files transferring. It also investigates how the clinic manages external information such as films and laboratory test results in assisting diagnosis and treatments. The research analyses if any expert knowledge system is used in the clinic; if the physicians use any decision support system (DSS) in assisting diagnosis and treatments; how does the clinic manage its reporting and standards required by the authorities, and; how do the clinic practitioners search, order, and manage their medical/herb information. The research also addresses how the clinics manage its practitioners' personal devices and applications as well as access level and security.

4.2 Preliminary/expected results

Guided by the aspects from the inquiring systems and KM, this research propose that CM IS/IT developments should follow a synthesis that is a combination of Hegelian and Kantian inquiring systems with the support of Singerian, Lockean, and Leibnizian inquiring systems and KM features. This is discussed in details in the next section. As an extension of the proposal, a PMS is built for the CM clinics. Figure 1 maps the system architecture of the PMS.

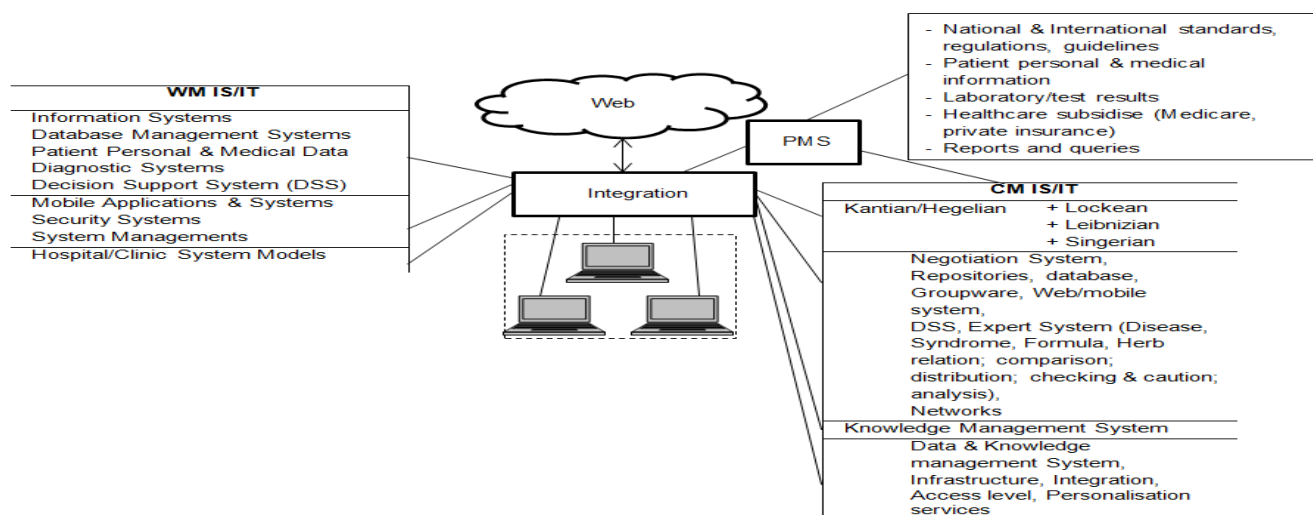


Figure 1: PMS system design

The PMS follows the CM IS/IT structure allowing negotiation and consultation between different systems, applications, and world views. It also has the intention to integrate WM and CM accordingly via the connection to different databases and accessing different network system functions for enquiring and confirmation. For example, a patient's medical history (other than CM medical history), which is stored in another database, can be obtained. Likewise, a WM doctor can access the patient's CM medical history (stored in bilingual format) to gain better understanding of the patient's overall health problem at the point of care.

The PMS is designed to comply with the national and international CM practice regulations, guidelines, and standards. According to CMBA, it should contain information about:

- Patient personal and medical data including cultural background information;
- Up-to-date sickness/problem/medication lists and its diagnosis and treatment plans;
- Record patients' progress, communications with other health service providers, and any discussion about possible side effects or alternative forms of treatments;
- Detailed record on prescriptions including name, strength, quantity, dose, instructions for use, number of repeats, start and end dates;
- Vital signs and changes including allergies and warnings;
- Incorporate clinical laboratory test results;
- Provide summary of care records for patients in case of referral or transition;
- All detailed procedures conducted (acupuncture points and stimulation methods);
- Generate reports, invoices, and rebates. (CMBA(d), 2012).

All of the above must be protected with access passwords and kept for at least seven years (CMBA(d), 2012). Therefore, a security archiving service may be necessary.

Information provided by the PMS can be used for: 1) knowledge sharing (Leibnizian inquiring system) between WM, CM, community and society; 2) further knowledge creation and transforming for both types of medicine practice; and 3) provide sources for studies on clinical trials and evidence-based research.

5. Discussion

CM is unique and follow a philosophy of systematic balance of Yin and Yang – opposite yet interdependent object (Bing & Hongcai, 2010; E. Chan et al., 2010). It emphasises inner, self-controlled system connectivity and balance between Yin and Yang energy, with any disorder being a result of failure and/or imbalance of the system (Huang & Chen, 2007; Lu, Jia, Xiao, & Lu, 2004; Zhao, Tsutsui, Endo, Minato, & Takahashi, 1994). Hence, an important element in CM practice is resolving, strengthening, and rebalancing the system with duality wisdom (Wickramasinghe, 2005). This is a typical Hegelian inquiring system which tries to resolve conflicts and proposes enlarged synthesis; as a result the problem is completely dissolved (Courtney et al., 2005; Hall & Croasdell, 2005; Morr, 2010). As indicated by Wickramasinghe that KM involves recognising the dualities in all knowledge creation and transform (tacit/explicit, Lockean & Leibnizian/Hegelian & Kantian, subjective/objective, people/technology), in so doing “a more complete and richer picture of knowledge is created and hence the impact to knowledge management” (Wickramasinghe, 2005). Hegelian's ability to understand all types of inputs support CM's comprehensive and systematic view of human diseases.

CM diagnosis methods are different to WM. In summary it uses four diagnosis methods: inspection (understand and predict the pathological changes by observing abnormal changes in the patient’s vitality, colour, appearance, secretions, and excretions); auscultation and olfaction (listening and smelling); inquiring (asking the patient’s condition); and palpation (place physician’s first three fingers on the radial artery of a patient’s wrist to detect different pulse qualities) (Huang & Chen, 2007; Zhao et al., 1994). These four approaches are used in combination in every diagnosis and cannot be separated or omitted (Zhu & Wang, 2011). A correct diagnosis can only be made based on a comprehensive and systematic analysis of a patient’s condition at the point of care. CM physician’s tacit knowledge and thorough analysis of each patient’s unique health condition is a key which differentiates between the two types of medicinal practices. This is a category of Kantian inquiring systems, as hypotheses is generated on the basis of the inputs received from various knowledge sources (Churchman, 1971; Parrish Jr & Courtney, 2012).

CM treatments can be any of the following: herbs (including leaves, seeds, roots, flowers, fruits, minerals and animal products); acupuncture, moxibustion, tuina (Chinese remedial massage), cupping, qigong and diet therapy (Zhu & Wang, 2011). All treatments aim to increase human body’s resistance to diseases and prevention by improving the inter-connections among self-controlled systems (Lu et al., 2004). This multiple compounds, methods, and diversities indicates that CM is a system of Kantian because it incorporates multiple perspectives and facts to determine different models and/or system design to discover and distribute information that it is the best-fit between itself and the environment.

To define a suitable CM inquiring system, we also need to consider that Kantian and Hegelian system rely on the Leibnizian inquiring system’s fact net to generate knowledge (Churchman, 1971; Parrish Jr & Courtney, 2012), so the Leibnizian inquiring system is included as part of the knowledge base. Furthermore, Singerian inquiring systems’ emphasis on ethical conduct is important. Patient safety, interests and social justice must be considered and built-in as principles and guidelines in any CM IS/IT developments and solutions. Table 2 illustrates this research’s perspective.

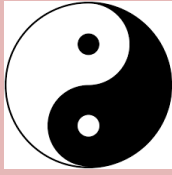
Inquiring Systems	Hegelian	Kantian	Singerian	Leibnizian	Lockean
Western Medicine					
Chinese Medicine		Diagnosis: inspection, auscultation and olfaction, inquiring, palpation Treatments: herbs, acupuncture, moxibustion, tuina, cupping, qigong and diet therapy			

Table 2: CM Inquiring System (source from (Lin et al., 2015b))

6. Research Contribution and Future development

This research presents a synthesis which extends Churchman’s inquiring systems theory into a new domain within healthcare and combining the inquiring system with a design science approach for actually designing and developing a proposed solution. The proposed PMS provide an example and suggestion for CM clinics to migrate from a manual system to a IS/IT solution. This in-progress research intends to also demonstrate integration between WM and CM

through the designed system architecture is needed. The research project can be used as assistance for both the CMBA and the individual CM practitioners in maintaining regulations and standards. It is a reference and resource for both types of medicine research and education. This theoretical extension and the proposed system can be further developed and customised to other areas in the same domain.

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