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Change in Organizations: Best Practices in the Implementation of External Changes Imposed on Government Agencies

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The complexity and the magnitude of the healthcare sector impose considerable challenges on the federal government, particularly with regard to the role played by knowledge management systems (KMS) necessary for the effective discharge of the federal healthcare functions. The federal involvement in the sector ranges from a vast regulatory apparatus to the massive funding of care through Medicare and Medicaid, the research, monitoring, and prevention of diseases, and the provision of care through military departments and the Department of Veterans Affairs.

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Change in Organizations: Best Practices in the Implementation of External Changes Imposed on Government Agencies

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I. INTRODUCTION

The healthcare delivery sector in the United States is the largest in the world. It consumes over 1/6 of the Gross Domestic Product of the nation—the largest such slice of an economy among all developed countries. The federal and state governments account for about half of the national expenditures in this sector.

The complexity and the magnitude of the healthcare sector impose considerable challenges on the federal government, particularly with regard to the role played by knowledge management systems (KMS) necessary for the effective discharge of the federal healthcare functions. The federal involvement in the sector ranges from a vast regulatory apparatus to the massive funding of care through Medicare and Medicaid, the research, monitoring, and prevention of diseases, and the provision of care through military departments and the Department of Veterans Affairs.

This paper addresses the issues related to the adoption, implementation, and utilization of knowledge management systems (KMS) in the federal government health agencies. The emphasis of this paper is on the metrics of KMS, as they are applicable to the evaluation of KMS—all within the management of the federal healthcare system.

To this end, this paper starts with the discussion of what KMS are, how they are adopted and implemented, and why they succeed or fail. Next, the book describes the critical success factors (CSFs) and the metrics used in the evaluation of KMS. Part Three focuses on the transformation of the federal healthcare agencies, in view of the new healthcare legislation and its legal challenges. The emphasis in this chapter is on how KMS helps these agencies to discharge their obligations.

Part Four describes a study of KMS in the federal health agencies. Eight cases are described, and

a comparative analysis of the cases is provided. The focus of the chapter is to explore common factors that may explain how KMS is used and evaluated by the various government healthcare agencies.

Part Five focuses on the best practices in the use of KMS, which are extracted from the eight cases. The chapter lists and discusses what works, what doesn't work, and why.

Part Six describes the challenges faced by federal health agencies and lessons they can learn from this paper. These lessons are also applicable to other government agencies, including state health agencies and even county and municipal healthcare delivery organizations,

In these times of fluid events that unfold with the continuing transformation of the nation's systems of healthcare delivery, it is essential to understand how KMS contributes to the effective management of healthcare organizations. This paper focuses on government agencies, yet the findings and the lessons may also be applicable to the private sector.

This paper integrates knowledge management and the management of healthcare delivery: two topics that are very current and relevant to the nation's welfare and its economic stability and growth. As such, this paper will appeal not only to academics and to managers of healthcare organizations, but also to the everyday reader—who looks at the headlines and wonders: where is all this going?

The United States spends over \$2 trillion or one sixth of its gross domestic product (GDP) on the provision of health care to its citizenry. This sector of the economy has been growing steadily in the past two decades at a pace considered by many to be unsustainable (Geisler, 2001; Mango and Riefberg, 2008). The complexity of the healthcare sector and its immense impact upon the economy, all employers, and all Americans make any changes envisioned for this sector a very difficult endeavor (Hill, 2006).

The federal administration has undertaken the task of reforming healthcare in America. Both Congress and the President have invested considerable effort in drafting legislation and enacting plans for radical changes in the healthcare system. Whatever form the final product will ultimately take, the process of transforming health care will be lengthy and will

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undoubtedly result in a dramatically different system from the one we have today (Lincoln, 2009).

The changes that are planned in the reform of the healthcare system will entail different dimensions of funding the system, regulating providers and payers (such as the health insurance industry) and restructuring of the balance of interactions among the many constituents in the healthcare delivery segment of the economy. Thus, a major participant in this effort of reform will be the role of federal health agencies. Their task will involve lending support to the change process and restructuring themselves to successfully deploy the new processes, procedures, and objectives of the changed healthcare system (Fredrick, 2009).

In the current reform environment, federal health agencies face a very difficult task of navigating a national system of many divergent constituents, values, expectations, and perceptions of success and failure (Currie and Finnegan, 2009). Examples of these agencies include: The Centers for Medicare & Medicaid Services (CMS) within the Federal Department of Health and Human Services (HHS), The National Institutes of Health (NIH), Food and Drug Administration (FDA), and The Centers for Disease Control and Prevention. Besides HHS, there are other federal agencies engaged in the health arena, such as the National Institute of Occupational Safety and Health (NIOSH), the Veterans' Administration (VA), and the Military Health System (MHS) whose mission is the provision of healthcare services to the nation's armed forces.

In their effort to carry out their mission, the federal health agencies are confronted with the need to maintain an adequate stock of knowledge. This is a challenging demand in the "normal" course of events, but it becomes even more exacting in times of change. The combination of the complexity of the federal healthcare system, rapid technological advances, and the forthcoming pressure of healthcare reform contributes to the formidable challenge of managing knowledge (Chan et al., 2005).

The difficult task of navigating the federal healthcare system through these changes also requires effective management. How do we provide federal managers with lessons and recommendations for action? What do these managers need to know? and What is the role that KMS plays in their effort to ensure the successful transition of their agencies from the current healthcare environment to the new system, with its unique challenges and opportunities?

This paper is an attempt to answer some of these questions. The author and his colleagues have been studying KMS in healthcare organizations for over two decades (Geisler, 1999; Geisler, 2009). The complexity of the healthcare sector is a strong deterrent to a comprehensive report or study with most or all of the answers. This paper contains a set of individual cases of federal agencies and offers lessons we can

learn from the perceptions and opinions of their managers.

This is a *descriptive* rather than a normative approach. The managers who are in the front lines of the challenging transformational environment are those who explain and define the issues. Parts Four and Five offer an empirical insight into how federal health agencies are coping with the reforms in the nation's healthcare delivery system.

II. PART ONE WHAT ARE KNOWLEDGE MANAGEMENT SYSTEMS (KMS)?

Knowledge Management Systems (KMS) are generally defined as the integrated set of artifacts, processes, and mechanisms that organizations create to make the flow of work more efficient so as to contribute to their success and survival (Geisler, 2007; Nicolini et al., 2008; Rubenstein and Geisler, 2003). Other definitions abound. Some consider KM as a discipline that promotes an integrated approach to the management of the information processes of the organization. Consulting companies define KM as a discipline that enables the processing of knowledge to accomplish business objectives, or as a formal process providing solutions to getting knowledge to the right members of the company when they truly need such knowledge.

There are currently several acceptable definitions of knowledge management (KM). They are summarized below:

- KM is a discipline that promotes an integrated approach to identifying, managing, and sharing all of the enterprise's information needs (Gartner Group).
- KM is an intelligent process by which raw data is gathered and transformed into information elements. These are assembled and organized into a contextual relevant structure that represents knowledge.
- KM is a formal process that engages an organization's people, processes, and technology in a solution that captures knowledge and delivers it to the right people at the right time.
- KM is the discipline of enabling individuals in an organization to collectively acquire, share, and leverage knowledge to achieve business objectives (Arthur Andersen/Accenture).
- KM is the management of intellectual capital in the interests of the enterprise.
- KM is the concept under which information is turned into actionable knowledge and made available effortlessly in a usable form to people who can apply it.

In this paper, KM is defined in terms of an amalgam of the definitions in the list above. KM is the

formal organization, the processes and the standards and the procedures by which government organizations collect, store, manage, share, and analyze actionable information that enables these organizations to perform their functions and to achieve their objectives. This means that KM in this paper is considered an active component of the organization's discharge of its responsibilities and functions. In these organizations, KM contributes to the processes of decision making, structure and design, evaluation and monitoring, and to the processes of change and transformation that affect all managers and employees.

There are still some unresolved issues with the differences between knowledge management and the management of information in the organization (Geisler, 2006). How distinctly unique are KMS compared with management information systems (MIS)? And to what extent has the conceptual and empirical separation of KMS from MIS indeed crystallized? (Geisler, 2007).

Because knowledge in organizations is still being defined and measured with some specificity, the "rift" between KMS and MIS is a work in progress. KMS continues to be equated by many experts with MIS. Knowledge is still described in many instances as a more advanced or *actionable* form of information—not as an independent notion and mechanism (Geisler, 2006a).

This also means that a key difference between information and knowledge is the use of knowledge in the actions of the organization and its managers. When information is integrated into such actions as decision-making, this information is now called *knowledge*. In this vein, the experiences of the organization in actionable information (or *knowledge*) are collected in a repository of the Knowledge Management System (KMS). Therefore, knowledge exists as a part of the organization's actions and activities, hence also a part of its functions and structure.

All federal agencies and their various divisions, departments, and sections continually collect information. When such information is used in the function, purpose, and actions of the agency, we now have a knowledge system. For example, within the federal department of the Veterans' Administration (VA), the Office of Information and Technology collects information and develops information and knowledge tools. Within the same agency, the hospitals and clinics of the VA utilize knowledge to make clinical and administrative decisions in the pursuit of their function to provide care to veterans and their families.

However, KM systems have evolved in the past decade to the point of being considered—in most organizations—as a system possessing its own distinctive characteristics. Among these are: (1) cognitive aspects of "tacit" knowledge; (2) links to decision-making; and (3) applications throughout the organization. So, although inadequately defined, in

practice, KM in the private and public sectors can be treated as a stand-alone, organization-wide system (Geisler, 2009).

a) A Typology of KMS

Geisler (2006a) proposed a typology of KMS, based on three criteria: (1) *structure* (how knowledge is designed and what it contains); (2) *purpose* (why organizations collect knowledge—for what purpose); and (3) *function* (what organizations do with the knowledge they collect, store, and manipulate). This classification scheme allows the analyst to evaluate the KMS of an organization such as a federal agency and to make reasoned statements about why and how these agencies utilize a specific form of KMS.

According to their different functions and structures, organizations will create and utilize a KMS best suited to their needs. For example, a federal department may be mainly responsible for collecting information and assembling knowledge, whereas a different department utilizes information and knowledge as a tool in the discharge of its responsibilities.

Geisler's classification scheme by structure, purpose, and function is a powerful analytical instrument. A KMS can now be assessed according to its design: what it contains; why it was created; and what outputs, impacts, and benefits it provides to the organization and its stakeholders. Moreover, comparison can now be made among KMS by using these three variables (structure, purpose, and function), common to all KMS.

A government department may be different from a midsize company when we compare their KMS by: (1) how the system is structured; (2) for what purpose it was established; and (3) what function it performs. Such an assessment result should provide empirical support to the argument that KMS should *not* be designed and implemented on the basis of "one size fits all," but should rather be tailored to the specific needs and unique characteristics of an organization (Rubenstein and Geisler, 2003).

Other typologies also focused on outputs of KMS. Popov and Vlasov (2011) classified organizations by the impacts of new knowledge they generate on their technological processes. This model suggests that *qualitative* knowledge will have weak impacts on technological processes, whereas *structural* knowledge will have moderate impacts and *functional* knowledge will have strong impacts.

Similarly, Geisler (2006b) focused on the actors who transact in knowledge. They are classified as: generators, transformers, and users. *Generators* procure, collect, acquire, assemble, prepare, and store knowledge, thus creating the KMS and its content. *Transformers* are people and organizations who transfer, share, transmit and exchange knowledge. They put the KMS to use by transforming the content of the KMS into

a usable commodity for others to use. They are similar to the “marketing” function of the organization, whereas the generators are the research, development, and new product functions. Users are people and organizations who utilize, adapt, absorb, and exploit the outputs and benefits from the KMS.

In this classification scheme, each type of transactor in knowledge has different motivators for establishing and using the KMS. The structure, purpose, and functions of a KMS depend on the type of transactor. Thus, there are three distinct perspectives in

the classification and later evaluation of a KMS. The more influential type of transactor will bias the KMS to better fit its needs and motivation.

b) *Adoption and Implementation of KMS*

The adoption of KMS in an organization is a complex process with multiple stages and an elaborate set of actors and activities. There are powerful pressures or facilitators to adopt the KM system but also strong barriers. Figure 1 lists these variables that affect adoption.

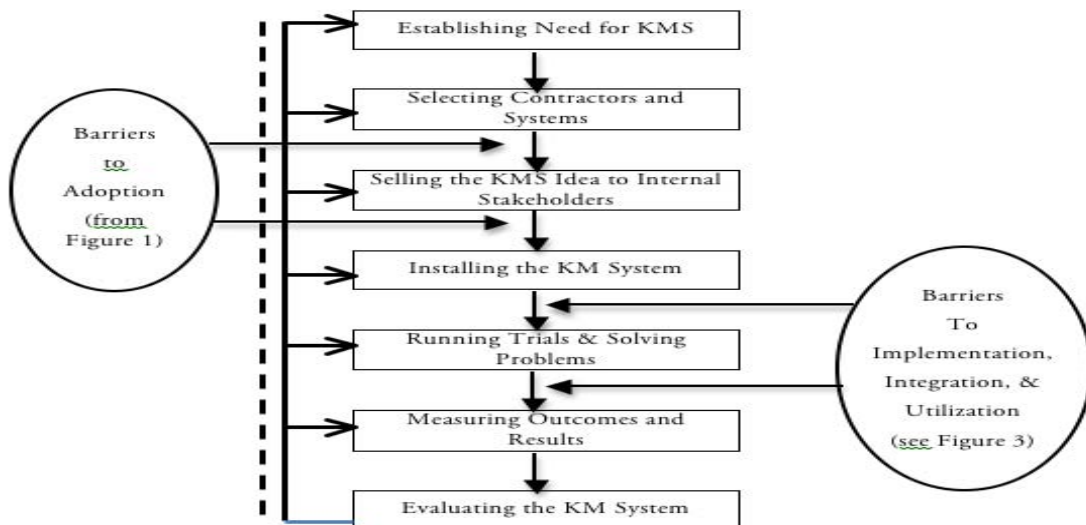
Figure 1
Illustrative Pressures and Barriers to the Adoption of KM Systems

Pressures to Adopt	Barriers to Adoption
<ul style="list-style-type: none"> • Government paperwork elimination legislation • Government performance and results legislation • Developments & innovations in e-government • Some initial successes with KM initiatives • Perceived need to manage mass of information • Perceived need to share and disseminate knowledge • Changes in federal workforce: retirements, telecommuting, aging workforce • Competition and demands from the private sector and the knowledge economy • Growing roles of government involvement in the economy and society 	<ul style="list-style-type: none"> ➤ Lack of standards ➤ Lack of connectivity and shared platforms ➤ Lack of executive support ➤ Unwillingness to invest adequate resources ➤ Few cases of successful adoption experience ➤ Issues of ownership: who owns the KMS and where should it be housed? ➤ Lack of clarity in the distinction between KMS and information systems ➤ Issues of cost and economics: What is the total cost and who will pay?

A simplified model of the adoption of KMS is shown in Fig. 2. This model contains the stages in which KMS is marketed to stakeholders and installed in the

organization. In both cases there are several factors that act as barriers to the successful implementation and adoption.

Figure 2
A Simplified Model of the Adoption of the KM System



In most organizations in the private sector this process of adoption is yet to produce an enduring and successful KM system. There are too many factors impinging upon the implementation of KMS and their integration with other processes and activities. Some units implement *local* KM systems with some measure

of success, but the real challenge remains the adoption of the KMS throughout the entire organization, with links also to external stakeholders (Rubenstein and Geisler, 2003). A similar scenario is also found in public organizations.

Figure 3

Why KMS Fail: Key Barriers to Implementation, Adoption, and Utilization

<p>I. Organizational Factors</p> <ul style="list-style-type: none"> ▪ Ownership issues ▪ Clarity of adoption process ▪ Economics of establishing the system ▪ Lack of top management support
<p>II. Human Factors</p> <ul style="list-style-type: none"> ▪ Users' disregard, fear, and lack of trust ▪ Reluctance to deposit or use knowledge ▪ Perception of KMS as intrusive change ▪ Reluctance to share knowledge
<p>III. Systemic Factors</p> <ul style="list-style-type: none"> ▪ Insufficiently interactive ▪ Extracts are irrelevant or difficult to use ▪ Too broad for specific unit uses ▪ "Identity issues" for KMS as separate from MIS
<p>IV. Implementation/Strategic Factors</p> <ul style="list-style-type: none"> ▪ Installing without goals: "shooting blind" ▪ Using concept of "one size fits all" ▪ "Notify once and forget it" ▪ Weak marketing KMS to stakeholders ▪ Focus on functional and localized system

Source: Rubenstein and Geisler (2003), review of the literature, and studies by the author and his colleagues.

c) *Why KM Systems Fail*

The barriers to adoption listed in Figure 1 impact the initial stages of the importing and implementing a KM system in the organization. Once installed, KMS may still fail due to a set of factors that act as barriers to the adaptation, integration, and utilization of the system. These barriers are listed in Figure 3.

The four categories of barriers encompass the key factors that may impinge upon the success or failure of KMS. The fourth category of "Implementation/Strategic Factors" is an especially powerful inhibitor of KMS performance (Hochstadt and Kent, 2009; Tirpak, 2005; Zamont, 2010). The lack of preparatory work for KMS implementation is often coupled with weak internal marketing of the system, and the neglect of follow-up and evaluation of the KMS (Fahey and Burbridge, 2008).

There are few systematic studies of the rate of failure of KMS in the private or public sectors. There is, however, the prevailing belief in both sectors that knowledge management has not had a stellar record of

successful adoption and utilization. This belief is due, in part, to the very few reported cases of successful application of organization-wide KMS and, conversely, the very few reported cases of failure of KMS adoption by contractors and users. What remains is a universal wisdom of popular genesis that KM systems—in general—don't succeed or don't work (Rubenstein and Geisler, 2003).

d) *Factors Affecting the Adoption of KMS in the Federal Government*

The revolution in the exchange of information that e-commerce has generated has also manifested itself in the growth of knowledge management (KM) in federal agencies (Boyle, 2009). There is a host of companies selling software, hardware, and solutions targeted to the needs of federal agencies to better achieve their mission (Barquin, 2008). Among the key components of the various initiatives to develop useful knowledge management systems for these agencies are: (1) management of the exploding volumes of government information and the extraction of relevant

knowledge from this massive volume; (2) management and sharing of such knowledge; and (3) application of this knowledge for better decision making, improved services, and higher efficiency (Barth, 2009; General Accounting Office, 2005).

There are some differences among agencies in the rate and breadth of KM adoption. The U.S. Army, for example, developed in 2008 a list of twelve KM principles, the first being the training and education of KM leaders. In addition, the principles include the manipulation, sharing, and dissemination of knowledge (Tirpak, 2005). The Department of Homeland Security is concerned about the balancing act between sharing its knowledge and matters of trust and security threats (Barth, 2009).

The differences in rates of adoption and implementation of KMS by federal agencies are mainly explained by the elements of the typology of KMS. Agencies and their units are more likely to adopt a knowledge system when they believe that their function or purpose requires such a system for the discharge of their responsibilities. The structure of these units is another determinant of the rate of adoption. Multiple units of similar functions within the agency (such as the network of VA hospitals or research centers at NASA) will drive the need for sharing and the interchange of knowledge—hence leading to a higher rate of adoption of KMS.

There is also a constant tension between the needs of federal agencies to institute KM systems in their information management processes and the barriers to the implementation and use of such systems. The pressures on the agencies to advance the pace of KM adoption are considerable, from within and from external constituencies such as Congress, the Administration, and the evolving state of information and

knowledge technologies (Kho, 2009; National Research Council, 2010). But the barriers to adoption and utilization (shown in Figure 1 above) are also formidable deterrents to KMS adoption.

A cumulative trend of installment of KM systems throughout the federal government, combined with the set of constraining barriers, have led to a situation of—at best—mixed results. Some agencies, such as NASA, the Department of Defense, and the Department of Homeland Security have publicized their effort to establish KM systems with cases of relative success (Clancy, Anderson, and White, 2009). Yet, the “push-pull” scenario of KM adoption by federal agencies is similar to that found in the private sector (Heier, Borgman, and Manuth, 2005).

However, the special case of the federal agencies is also characterized by unique pressures from the public sector (Congress and the Administration). Unlike private companies, federal agencies are more exposed to such public stakeholders who fund and control them. In addition, these agencies also face internal competition with other public entities for budget and resources, bounded by the political priorities of the current administration and its policies.

III. PART TWO: CRITICAL SUCCESS FACTORS AND METRICS OF KMS

a) *Organizational Objectives of KMS*

The objectives of adopting a KMS depend on the actors within the organization’s set of stakeholders. *Generators* of knowledge (individuals, groups, organizations, and external stakeholders) have objectives such as personal growth and increased productivity. Figure 4 shows what *generators* of knowledge desire from a KMS.

Figure 4

KMS Objectives of Generators of Knowledge

Who are Generators	Objectives of KMS
<ul style="list-style-type: none"> • Individuals • Groups • Units/Departments • Organizations • External stakeholders 	<ul style="list-style-type: none"> • To obtain personal growth • To achieve personal benefits • To be competitive • To increase productivity, efficiency, and effectiveness • Improved market position • Improved quality of life

The objectives of KMS adoption for *transformers* of knowledge are shown in Figure 5.

Figure 5

KMS Objectives of Transformers of Knowledge

Who are Transformers	Objectives of KMS
<ul style="list-style-type: none"> • Individuals • Groups • Units/Departments • Organizations 	<ul style="list-style-type: none"> • Economic and social benefits • Better standards • Improved communication • Improved operations • Improved interoperability • System benefits & improvements

Users have a similar set of objectives, as shown in Figure 6.

Figure 6

KMS Objectives of Users

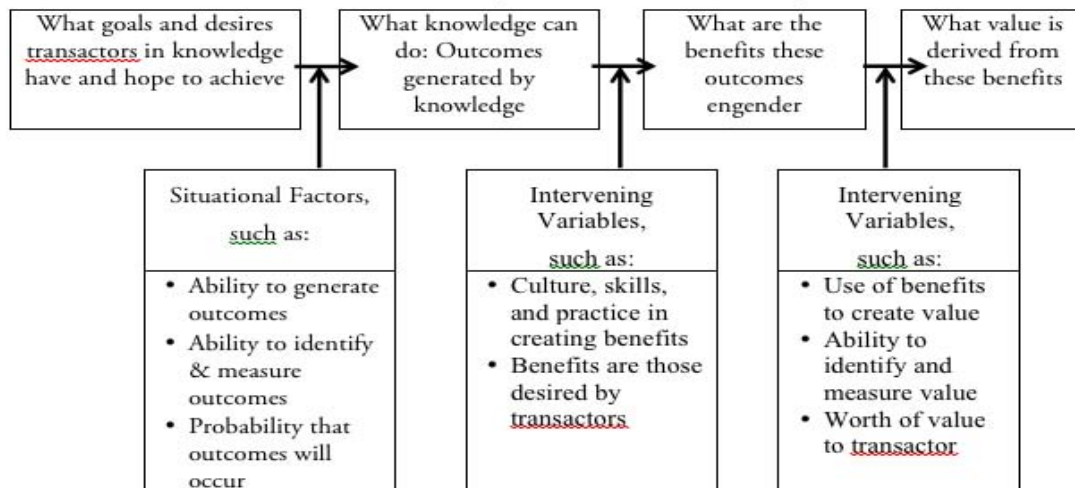
Who are Users	Objectives of KMS
<ul style="list-style-type: none"> • Individuals • Groups • Units/Departments • Organizations • Society at Large 	<ul style="list-style-type: none"> • Economic gains • Technical skills • Competitiveness • Commercial success • Improved capacity to discharge tasks • Dissemination of knowledge • Better life

Such objectives include short- and long-term goals. They are the desire for immediate benefits and even ultimate goals such as "improved quality of life."

Overall, transactors want to gain value from their investment in the adoption and use of KMS. Figure 7 shows the process of value creation by KMS.

Figure 7

Objectives that Transactors in Knowledge Want and the Value They Derive from Knowledge



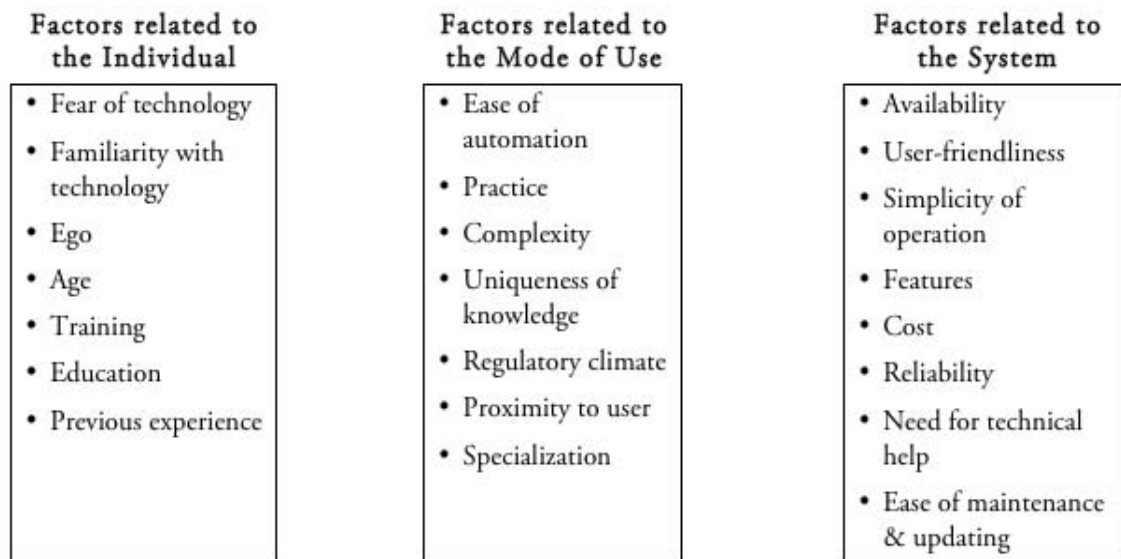
As shown in Figure 7, there are limits to the benefits accrued from KMS and to the value these systems can generate. Successful adoption and use of KMS would depend on the congruence of some—perhaps not all—of the objectives of transactors-in-knowledge with the benefits and value generated by the KMS.

of organizational stakeholders and divisions/ departments. Rubenstein and Geisler (2003) proposed a classification of critical success factors (CSFs) by: (1) factors related to the individual using the KMS; (2) factors related to the mode or method of using the KMS; and (3) factors related to the system itself. Figure 8 lists these factors.

b) *Measuring Critical Success Factors (CSFs)*

Knowledge management systems are complex organizational frameworks. They impinge upon a variety

Figure 8
Classification of Critical Success Factors (CSFs) of KMS



Another set of CSFs was shown in Figure 7. Successful adoption of KMS will also depend on meeting the objectives set by individuals and the organization upon the establishment and roll out of the KMS (Carlucci et al., 2004; Geisler, 2010).

The success of KMS is measured by: (1) how well the KMS works; (2) how well the KMS meets the objectives; and (3) how well the KMS has performed—from the viewpoint of individual users and other stakeholders of the organization (Bose, 2004).

c) *Measuring the Value of KMS*

The successful adoption and implementation of a KMS does not guarantee the creation of value to be derived from the KMS. At each stage of adoption and for each actor in this process there is some value being gained from the benefits generated by the KMS (Boyle, 2009; Davenport and Jarvenpaa, 2008).

However, the generation of value from KMS depends on the interplay between the barriers and the facilitators that act as factors in gaining value from the system. Figure 9 lists examples of these factors.



Figure 9

Barriers and Facilitators to the Generation of Value from Knowledge Management Systems

Factors Acting as Barriers	Factors Acting as Facilitators
<ul style="list-style-type: none"> • Lack of willingness to share what one knows • Sharing in untimely manner • Sharing and diffusing knowledge in a mode that is difficult to absorb by others • Previous negative experience • Sharing and diffusing marginal or irrelevant knowledge • Lack of willingness of others to receive or absorb knowledge • Benefits and ultimate value not recognized or perceived by knower • Cultural, organizational, and economic factors hindering sharing and transformation of knowledge 	<ul style="list-style-type: none"> • Perceived or recognized benefits • Competitive pressures • Perceived or recognized ultimate value • Past positive experience with benefits and value • Strong need for accomplishing goals (e.g., need for skills or improvements) • Cultural, social, economic, and organizational factors supporting sharing of knowledge and its transformations

The nature of the value derived from KMS is subjective, largely depending on the perception of the actors whether the KMS has produced outputs and benefits that they consider of value. When the KMS critical success factors are satisfactorily identified and measured, there is high probability that the various

actors will also identify some value in these CSFs (Yu-Min and Yi-Shun, 2009).

d) Issues in the use of Metrics

Figure 10 lists three categories of metrics of KMS that measure: (1) utilization; (2) outputs from KMS; and (3) contributions to CSFs.

Figure 10
Metrics of KMS

<p>I. Metrics of Utilization</p> <ul style="list-style-type: none"> • # Of nuggets put into system • # Of queries received • # Of queries answered • Retrieval time • Perceived accuracy of answers • Perceived quality of answers to queries • Perceived usefulness of answers 	<p>II. Metrics of Outputs from KMS</p> <ul style="list-style-type: none"> • Savings in time and effort • Mistakes avoided • New ideas engendered as result of use • Added organizational credibility • Improved decision-making by managers • Contributions to project/program success
<p>III. Metrics of Contributions to Success Factors</p> <ul style="list-style-type: none"> • New sales • Cost reductions or cost savings • Increased profits • Increased growth and market share • Increased regulatory compliance • Accomplishing the mission (public sector) • Improved effectiveness of operations 	

Although there are metrics for the various stages of KMS adoption, most organizations do not make ample use of this powerful assessment methodology. The key reasons include: (1) lack of standardized evaluation framework; (2) lack of acceptable definition of what we measure (this is related to the tenuous definition of what constitutes knowledge management separately from information systems.); and (3) lack of agreement on the strategic role of KMS (why we measure, who are the stakeholders, and how we can causally link the outputs from the KMS to the organization's critical success factors (Yu-Min and Yi-Shun, 2009).

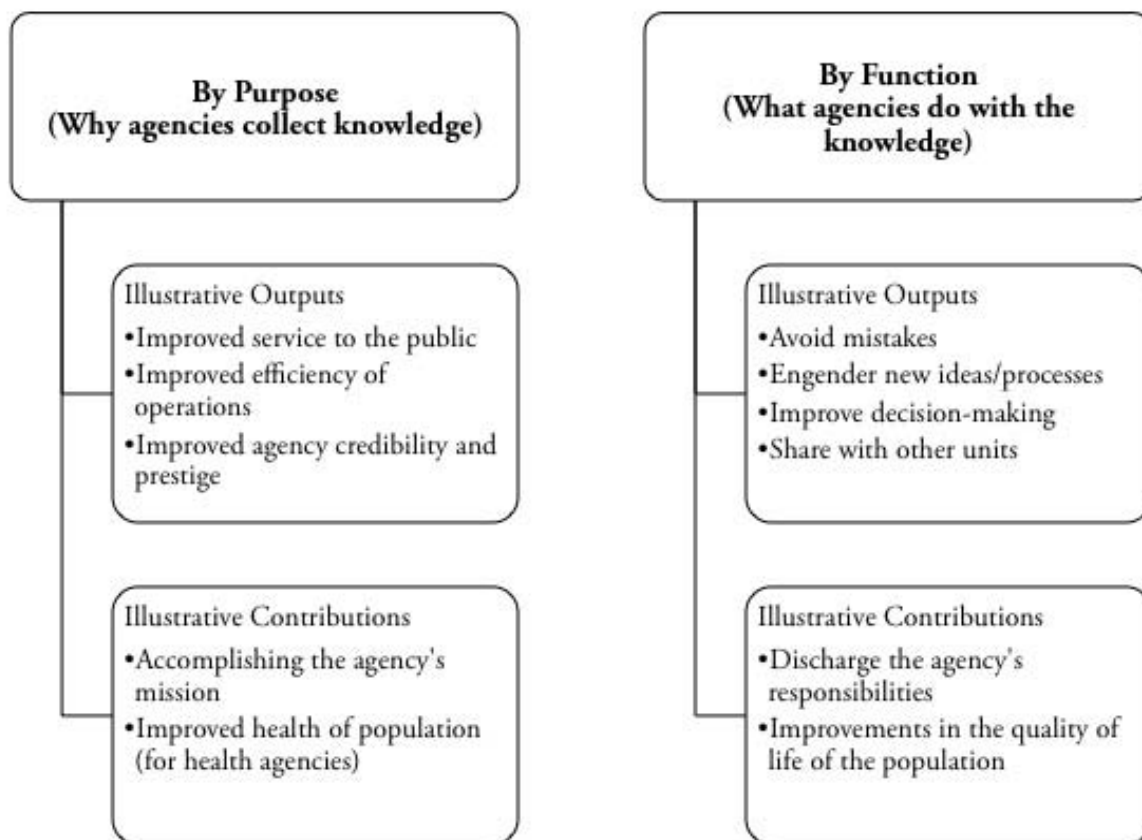
The metrics of utilization, outputs, and contributions of KMS to the organization are of particular

interest to the analysis and evaluation of KMS in government agencies. There are differences in the metrics to be used for different agencies, depending on their structure, purpose, and function. The metrics of utilization are generally applicable to all types of organizations. However, outputs and contributions from KMS differ among public agencies, and between private and public organizations.

Figure 11 shows the typology of metrics of outputs and contributions within the typology of KMS, by purpose and by function. The metrics measure how well the KMS contributes to the agency's mission and activities, and how the use of KMS ultimately may contribute to the social and economic welfare of the American public.

Figure 11

Typology of Metrics of KMS in Federal Agencies



In the effort to measure the success of KMS and the value derived from such systems, several frameworks have been suggested and some of these are described in the previous pages. None of these systems of metrics is a conclusive and comprehensive mode of measurement. There are many issues with KMS metrics that impinge upon the effectiveness of a

given system of metrics. These issues are summarized in Figure 12.

Figure 12

Major Issues in Metrics

- “Disruptive technologies” can have major impacts on KMS.
- What do beneficiaries and stakeholders want, need, expect, demand from KMS and what are they willing to pay?
- How do we recognize and measure “public good?”
- What are the roles of flow models and criterion trees for progress/results of metrics?
- Is there life after Demos?
- Pros and Cons of outsourcing.
- “Whole Life Cycle” and “Rolling Modified Delphi” (RMD) to metrics.
- Metrics: A tool for communicating with stakeholders of KMS.
- Progress metrics can signal need for changing direction.
- Weighting of “technical” versus “economic” metrics.
- Value of KMS contributions to stakeholders.

The need for better metrics is reflected in the following reasons:

- a) Usual process and behavioral measures do not impress managers; thus, they are not likely to use them (Ilebrand et al., 2010).
- b) Managers in the private sector are mostly interested in how KMS contribute to their “bottom line.” Similarly, managers in government organizations are interested in how KMS help them to accomplish their mission.
- c) Managers in both sectors have the need to relate immediate outputs and impacts of KMS to the Critical Success Factors—without going through intermediate stages.

IV. PART THREE: KNOWLEDGE MANAGEMENT IN GOVERNMENT HEALTH AGENCIES

a) The Case of Healthcare Delivery Organizations

Knowledge management systems are still in their infancy. Although there is a history of over two decades of adoption and implementation of these systems in both the private and public sectors, the experience with these systems is largely ambivalent. There are cases of successful local applications of KMS in some companies and within government agencies such as NASA and the Department of Defense. In both sectors, widespread adoption and successful inter-organizational exchanges are yet to be documented.

Public agencies have been initially slower to adopt these systems than private companies. Some possible reasons are the lack of the powerful market

pressures of competitors that drove private industry to early adoption. Once introduced into the public sector, KMS did not fare much better than in private companies (Gates and Urquart, 2007; Hess and O’Neal, 2010).

There is, however, a trend of development and inertia of vendors and users who continue to adopt KM systems and to experiment with the nuances of innovations in the hardware, software, and communication technologies. This trend has spilled over to public agencies and they have increased their investments in KM and their peripheral infrastructure. This trend may be accelerating as the demand for knowledge in specific areas—such as health care—may dramatically increase in the near future.

The American healthcare system is the most expensive in the world. It absorbs over 16 percent of the nation’s Gross Domestic Product (GDP). In 2008 the national expenditures for health care amounted to \$2.3 trillion, or \$7,681 per person, and 16.2 percent of the GDP (CMS, 2010). This share of GDP had increased in 2008 from 15.9 percent in 2007. Governments at all levels contributed 42 percent to these expenditures. In 2008, Medicare and Medicaid accounted for \$813 billion (35% of total expenditures).

By comparison, other countries spend much less per capita. In 2008, Switzerland and Canada, for example, spent about \$4,000 per person, whereas the United Kingdom spent about \$3,000 per person. These countries finance their healthcare sector primarily through public funds. There have been studies comparing various countries, how they finance their healthcare system, and measures of health indicators of

the populations (Lisac, Blum, and Schlette, 2008). As in the United States, countries in the European Union are also concerned with the growth in healthcare costs, considered to be unsustainable even in countries where the expenditures per capita are half those in the United States.

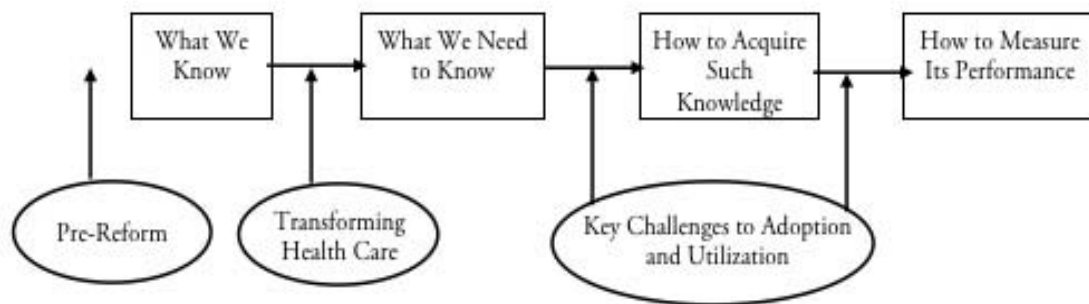
Within this national and global scenario of the rising burden of health care on the economy, the role of federal health agencies is a crucial component in the provision of care to the American public. The federal sector of the economy contributes roughly half of the cost of health care, hence there is a constant need for federal health agencies to improve their services and to efficiently accomplish their mission to support the health of the public.

The challenges are not limited to the unsustainability of the continuing rise in the cost of healthcare delivery. There are also issues of the administration of this immense segment of the economy, combined with the need for improved quality of care and maintaining an adequate level of access to healthcare delivery to all Americans of all social and economic strata. This challenges the ability of federal health agencies to improve performance, to share knowledge, and to sustain the level of effort expended by the federal government for national health services.

To better understand the needs for knowledge and how to measure its performance in the healthcare environment, the model in Figure 13 includes the main stages preceding the reform, and those that are likely to follow the planned changes.

Figure 13

Knowledge Needed by Federal Health Agencies in the Reformed National Health Care System



Based on the model of knowledge needed, an exploratory study was conducted with 23 managers in federal health agencies. The study questionnaire contained three main categories: (1) what knowledge is needed; (2) what are the barriers and facilitators to this knowledge; and (3) what are the best practices known or available at the agency. The study contained eight cases and these are described in the next chapter.

b) What Type of Knowledge is Needed?

There is a consensus among managers of federal health agencies that any *new* knowledge they would need is but an extension of the knowledge they already possess and are currently managing. The differences between the two stages of the model in Figure 13 (what we know versus what we need to know) are few and relatively attainable. There may be several explanations to this. First, the criteria for success of existing knowledge are similar to those of new knowledge. Managers in health agencies believe that their current stock of knowledge is sufficiently adequate to meet the challenges of the reform initiative.

Second, there is little trust that the existing KMS will be able to handle the new knowledge. The current KMS is perceived to be at best a step above the existing

information system. Third, there is a lack of consensus on what constitutes *new* knowledge, except for the need for “more of the same” categories of existing knowledge.

Although the underlying hypothesis guiding the exploratory study was that national healthcare reform would generate a need for new knowledge, managers in federal health agencies believe this will not be the case once reform is instituted.

Even when specific programs and systems are named (such as electronic medical records) and their accelerated adoption and use are forthcoming, there is not a sense of urgency in updating current KMS or preparing for the onslaught of new knowledge. A similar sentiment exists regarding the addition of millions of Americans to the roster of the insured, via private or public insurance.

The knowledge needed by federal agencies differs by agency. The knowledge the agency needs to know—as well as what the agency currently possesses—will be knowledge useful to the purpose and functions of the agency. Therefore, whenever the mission (purpose) and functions of the agency change, so will the type of knowledge it needs and should

procure and adopt. These changes occur, for example, when the agency is required to undertake different or additional responsibilities, or when the Congress or the Administration institutes a major reorganization or reform (California Healthcare Foundation, 2009).

The expected reform in the national healthcare system will lead to added administrative burdens on federal health agencies. However, such a burden may be qualified by expanding the *quantitative* aspects of knowledge needed to manage the change—not the variety or qualitative aspects of knowledge. The existing KM systems and their categories of knowledge may prove to be sufficiently robust to absorb and to manage projected additional, yet same, volumes of what the agencies need to know (Nicolini et al., 2008).

An example of this scenario is the upcoming development in electronic medical records (EMR). The planned acceleration of nationwide implementation of EMR is a central component of the national healthcare reform. Over \$700 million were budgeted in 2010 and 2011 for incentives to providers to adopt and use EMR systems. When this electronic revolution crystallizes and the rate of adoption increases from the current 10 percent to over 50 percent of providers, a powerful national health information highway could be established (Clancy et al., 2009).

Increased use of EMR would also suggest that federal health agencies would be encumbered with knowledge requirements in four areas. First, there would be new regulations on privacy issues and variants of the current Health Insurance Portability and Accountability Act (HIPAA). Second, compliance monitoring would engender legal cases and the need for intra and inter agency networking and knowledge exchange. Thirdly, a host of new administrative procedures and standards would be established. Finally, EMR usage would lead to intensive effort by government agencies to network and to integrate these medical records with other information and knowledge systems in the private and public sectors (Hess and O'Neal, 2010).

Surprisingly, most government managers do not consider such added knowledge a burden on their current obligations. There is a consensus among them that their agencies are already mired in an overload of knowledge and that their KM systems are inadequate to handle the existing load. Additional knowledge is not the problem. It is merely “more of the same.” The problem seems to be the KM system itself and its ability to process knowledge necessary for the discharge of the agency’s responsibilities.

There is a belief in both the private and public sectors that the barriers to new knowledge are an extension of the barriers to the utilization of KM systems. The factors identified as barriers to adoption of KMS in the previous chapter are not a concern to the federal agencies. Most of them already have installed a KM

system and have adopted some form of knowledge gathering, management, and sharing.

The key barriers of concern to the managers in these agencies are mainly the systemic and implementation or strategic factors. Interestingly, the organizational and human factors that are prevalent in the private sector are not perceived as barriers in the government agencies. Issues such as ownership, economics, and human reluctance to share knowledge have been somewhat resolved in public organizations.

The factors acting as facilitators to the implementation and utilization of KMS in government health agencies can be grouped into a category of “organizational loyalty.” Federal employees generally believe that working with a KM system—established by their agency—is a way to explain their contributions to the mission and objectives of the agency.

c) *Issues in Managing KMS in Government Healthcare Agencies*

In the specific case of the healthcare sector, there are two distinct types of knowledge: (1) clinical knowledge and (2) administrative knowledge. The first includes all those clinicians need to know to practice medicine. The second type of administrative knowledge is composed of all that is needed to know in order to manage, organize, and fund the delivery of healthcare.

Clinicians are generally reluctant to share knowledge with non-human systems such as KMS (Geisler 2009). Hence the failure of medical expert systems such as Mycin. Clinicians also by and large fail to appreciate the benefits from KMS; thus, they tend to perceive them as an intrusion and a detriment to their professional capabilities (Nicolini et al., 2008).

In the government sector, the main barriers to the successful adoption and utilization of KMS in healthcare delivery are the administrative responsibilities embedded in the complexities of public bureaucracies. American government healthcare agencies provide care (e.g., the Veterans Administration and the various armed forces), regulate the provision of care and the health of the public (e.g., the FDA and the Centers for Disease Control & Prevention), and insure and fund the delivery of care (e.g., Centers for Medicare and Medicaid Services). This multi-purpose entity contains a plethora of objectives, needs, and inter-agency cooperation, as well as rivalry and competition (General Accounting Office, 2005).

All efforts to adopt, implement, and use KMS by these various government agencies is often perceived by clinicians and administrators in these agencies as an intrusion by management or the federal department, and as another layer of bureaucratic hurdles. Since KMS are very often designed and structured without much attention to the specific needs of the agency, its potential adopters and users fail to see its usefulness to *their* unique needs.

Federal healthcare agencies are also subordinated to the notion that their mission entails the attainment of some “public goods.” These are objectives of government agencies aimed at the general welfare of the nation. Examples include quality of life, environmental protection, the health and safety of the public, and the economic growth of the nation. Therefore, any knowledge needed by government agencies must also include items that will allow these agencies to strive to achieve such overall “public goods” (Nicolini et al., 2008).

V. PART FOUR: A STUDY OF KMS IN GOVERNMENT HEALTH AGENCIES

The typology of KMS and the convergence of this typology with the barriers to adoption and the process of acquiring new knowledge by federal health agencies were studied in an exploratory investigation. This study was based on responses from 23 respondents in eight different federal health organizations. This study produced eight cases. For each case, the analysis explores *why* (for what purpose) the organization collects knowledge and *how* the knowledge is being used by the organization. The underlying assumption of the study is that government health organizations differ in their need for knowledge and in their use of knowledge from the private sector.

a) Description of the Study and Methodology

The sample of eight health organizations in the federal health system was selected to represent different types of agencies with different missions, functions with the government, and different structures. These cases deal with the administrative, clinical, and technical needs for knowledge of the health agencies to which they belong.

The study was aimed at eliciting data on how managers in the federal health agencies perceive their need for knowledge; what barriers and facilitators do they encounter in the adoption processes; and what are the best practices currently available to them. The analysis integrates the KMS typology described above and is focused on the differences among agencies as well as the similarities that would encourage the sharing of knowledge.

The exploratory study was conducted in four stages. The first was the selection of the eight cases based on the criteria of differentiation listed above. Next, a study questionnaire was created with 14 questions. This research questionnaire was sent to selected managers in the organizations.

The third stage was the collection of data from returned and completed questionnaires. Of the 25 managers originally contacted for the study, 23 returned a completed questionnaire. Finally, the fourth stage was the analysis of the data and the generation of lessons and recommendations.

b) The Cases

Case 1: Department of Health and Human Services; National Institutes of Health (NIH); Office of Human Resources

This office is an administrative entity of the agency of the National Institutes of Health. It is responsible for the management of human resources of the agency, which comprises 27 institutes and centers. The office collects knowledge about the personnel (administrative and clinical) of the agency. This knowledge base is comprehensive and complex. It includes not only personnel files of employees but also the legal and economic aspects of employment. This organizational unit of NIH is similar in its purpose and functions to equivalent human resources units in the private sector.

The office has strong links with other institutes and offices within NIH in an advisory and guidance capacity, periodically advising them on aspects of their human resources: who is hired, who is about to retire, changes in laws and regulations governing personnel, and providing answers to specific inquiries.

The knowledge collected and shared by this office is centrally maintained for the agency. Sharing such knowledge is limited by challenges of privacy and confidentiality. The office balances the functional need it has to share this knowledge throughout NIH while striving to ensure the confidentiality of the knowledge base. Managers in this office are faced with the tension between the need to collect and share a broad spectrum of knowledge and the restrictions on how much and what types of knowledge they can collect and disseminate. In the case of human resources, this balancing act goes beyond the *internal* need versus *external* requests for knowledge. The office does not require this knowledge about personnel for its own functioning and performance. It plays a role of a *service organization* that provides assistance to other units within the agency. Some manipulation (such as analyses) is required for the knowledge collected to be in a form suitable for sharing, but not to the extent that such knowledge is intended for the routine functioning of the office.

As such, the metrics of performance and success of the KMS in this office are *functional* outputs. Key metrics are (1) sharing with other units and (2) contributing to better decision making in other units of the NIH.

The lessons derived from the case are threefold. First, KMS practices in this organization are a direct reflection of the purpose and functions of the organization. Second, this office's KMS is evaluated according to how well it collects, analyzes, and shares the knowledge base it has under its control. Third, this type of KMS is for internal agency usage and benefit, so that any attempts to conceptually or empirically link it to

the agency's metrics of performance (such as service to the public or improved national health) should not be undertaken.

Case II: Department of Health and Human Services; National Institutes of Health; National Library of Medicine (NLM); Office of Health Information Program Development

Unlike the previous case in which the Office of Human Resources collected and shared knowledge as a service to other units within the NIH agency, the Office of Health Information Program Development collects knowledge about the availability and utilization of health information, and the evolution of databases, knowledge systems, and other aspects of health information. This office resembles a research unit in the private sector, in which there is an effort to keep abreast of new developments in the field and to generate new ideas and innovative practices.

The office keeps track of progress in the areas of information systems and technology and, in particular, the growing field of health informatics. This is an important, perhaps even crucial, task for the agency and for the Institute (the NLM). One unique attribute of the knowledge collected by this office is the enormity of the task. Health informatics has grown exponentially over the past decade. The knowledge in this area is generated in a variety of organizations, industries, and countries. Keeping track of these developments is therefore a major task.

The office also needs to analyze the vast amount of knowledge it collects, in order to obtain trends and directions in the field of health informatics. This analysis is then shared with the NLM with the purpose of improving the efficiency of the institute. *Purpose* and *function* are the metrics with which the office would be assessed. The knowledge collected and analyzed by the office contributes to the institute's mission and to its efficiency of operations.

There are two key lessons learned from this Case. The first is that the office serves as the "eyes and ears" of the institute and also contributes to its operations. Hence, the combined function of the office requires not only excellence in the collection of knowledge for its KMS, but also, and just as importantly, excellence in state-of-the-art analyses of the knowledge in the system. In this Case, the office depends heavily on both its *external* contacts as well as the *internal* exchange within the institute. In cases where there is a composite function and purpose, there is also a more demanding need for KMS practices in the collection and dissemination of knowledge to the institute and the parent agency.

Secondly, changes in the health environment of the nation or the federal government will be less of a challenge for this office than for other government units because this office routinely deals with technological

and clinical aspects of health care and is designed to deal with the challenges of change, new developments, and progress in the rapidly-evolving field of health informatics.

Case III: U.S. Army Medical Corps; Armed Forces Medical Library

This is a Case of a highly specialized library serving the Army's medical needs. With its unique medical corps, the U.S. Army is in need of a library and a knowledge center able to supply Army medical personnel with the information and knowledge they require. There are at least two distinctive characteristics of this library that differentiate it from other medical libraries. The first is the Army's need for an organization that is totally dedicated to its needs, hence able to serve only the Army's Medical Corps. In times of crises and war, the Army's Medical Corps cannot afford to share its needs with other government agencies.

Secondly, the U.S. Army is operating on a global basis. Its medical corps deals with tropical diseases as well as the clinical effects of harsh wintery climates. The U.S. Army's Medical Corps also confronts the possibilities of chemical, biological, and nuclear conflicts. In all of these areas, the medical corps must rely on a dedicated library on a global scale that will supply it with current knowledge.

This means that the library must be a *service* organization, able to collect, classify, and share a vast amount of clinical and scientific knowledge. It must also be able to format this knowledge for specific requests and needs of the U.S. Army—in all theaters of war and wherever the U.S. Army is present.

As in the case of the NLM, the performance of this library is evaluated by metrics of a service provider: contributions to the medical corps in its operations and the accomplishment of its mission to provide care to Army personnel.

The library is faced with several challenges. It must balance the need to internally serve the Army Medical Corps while maintaining constant links and interfaces with similar organizations in the government (such as NLM, The Centers for Disease Control & Prevention (CDC&P) and other libraries of the Medical Corps of the U.S. Navy and Air Force). In addition, it needs to maintain extensive links with the national and international medical communities and with the healthcare industry (e.g., pharmaceutical and instruments companies). The rapid development of medical technologies and the fast-growing medical research literature requires the library to keep track of new knowledge, clinical practices, risk assessments, medical perils, and opportunities on a global scale.

Case IV: Department of the Navy; U.S. Navy Medical Corps; Naval Medical Research Center

The Naval Medical Research Center is an organization within the Naval Medical Corps much

different than other units of the Corps. The center collects and utilizes knowledge specific to naval needs and challenges, but this knowledge is used internally for research and analysis. The center can be loosely described as a combination of the CDC&P and a university medical research laboratory.

The U.S. Navy is spread throughout the globe in missions and naval bases, including navy personnel aboard navy ships in the seas and oceans of the world. This center collects and researches knowledge about clinical issues of diseases, epidemics, modes and practices of clinical treatments, availability and effectiveness of medical facilities around the world, and the state of the art of modern medicine—all in the service of the Navy Medical Corps.

The challenges of this center are of two types. The first is the need to keep the Navy and its medical corps current on what medical emergencies exist or may erupt and the clinical resources available to the corps. This need for current knowledge feeds into the center's need to conduct specialized research into issues that are unique to the Navy's medical corps—its clinicians and its medical necessities. The second type of challenges is the need for the center to act as a laboratory and to respond in a very timely manner to any request from the medical corps for advice, analysis, evaluation, and recommendations in both routine and emergency situations.

The center also maintains links with medical research centers in universities, hospitals, and government research entities in the United States and around the world. This exchange of knowledge is crucial for keeping the center current and to enhance the skills and abilities of its own research personnel.

As a unique service organization, the center's performance can be evaluated by its contributions to the medical corps. These contributions are measured by how the center helped the corps in its mission, its effectiveness and efficiency of operations, and its contributions to the quality and availability of medical care the Corps provides the U.S. Navy.

Case V: U.S. Department of Defense; Armed Forces Health Surveillance Center (AFHSC)

This Center serves the entire complex of the U.S. Armed Forces and is a center of the Department of Defense (DoD). The center provides timely data and analysis for today's military health decision makers. The purpose of this Center is to process and share knowledge on the health conditions and the fitness and medical readiness of U.S. military personnel. The Center is a centralized organization that monitors military personnel from *all* the services. Since 2008, the Global Infections Surveillance and Response System were merged into the AFHSC and became a division of the Center. This organizational change has made the Center

the key epidemiological resource of the armed forces and the DoD.

The Center collects, analyzes, evaluates, and disseminates to the DoD knowledge about diseases or other health issues that may create obstacles to military readiness. In effect, this Center is the "health-knowledge-base for DoD." It produces studies, surveys, and analyses for military and defense decision and policy makers—routinely and upon request. The Center generates trends, benchmarks, and, when necessary, alerts the DoD and military commanders of health threats. The Center has the divisions of data and analysis, communications, standards and training, and the GEIS operations.

This Center is a web of data and knowledge bases received from such organizations as the CDC&P, state health agencies, the various service departments of DoD, the HHS, and universities and medical associations. For example, the Center publishes a Medical Surveillance Monthly Report (MSMR) containing reports of studies and surveys. In June 2010 the report included surveys of cancer and cancer-related deaths of U.S. Armed Forces personnel and instances of acute respiratory disease found in trainees at training centers of the U.S. Army.

The Center faces several challenges because of the magnitude of its mission and the complexity of its functions. As the main knowledge-base of health information for the entire military forces, the Center must interact with practically every health organization that can produce relevant knowledge on causes of diseases, trends of propagation, and means to combat and attenuate these threats. The Center is a combination of a CDC&P and a healthcare consulting organization—dedicated exclusively to the needs and special circumstances of the U.S. Armed Forces and the DoD.

Evaluating the performance of this Center is a difficult task. The metrics are by purpose and by function. One set of metrics measures the effectiveness of the Center in collecting and analyzing relevant knowledge. Another set of metrics measures the contributions of the outputs of the Center (reports, studies, and standards) to decision makers in the DoD and the armed services, as well as measuring the effectiveness of their actions in helping to maintain and improve the medical readiness and condition of the armed forces. Clearly, such decisions entail more inputs than those provided by the center, but the decision-makers at DoD and the armed services depend on the knowledge given to them by the Center to be current, accurate, relevant, and useful—among other attributes.

Another key measure of success for the Center is its ability to interact with the large number of organizations supplying it with knowledge as well as those requesting health knowledge. The Center is a "super-library" with the added functions of conducting studies and generating reports. These complex

responsibilities create a demand for knowledge combined with the processing of knowledge and its dissemination. The Center is effectively a knowledge management system dedicated to the Armed Forces.

Case VI: U.S. Department of Veterans Affairs (VA); Office of Policy and Planning

This case is of a unit of the VA responsible for developing initiatives, conducting analyses, and formulating possible courses of action for the senior administrators of the department. The office has four major areas of activities: (1) strategic planning; (2) analytics, evaluations, and surveys; (3) advisory committees; and (4) management systems improvements.

The office is a crucial component of the flow of information and knowledge for the Secretary and the senior VA leadership. In addition to the task of developing the department's strategic plan, the office is also engaged in a variety of studies, data collection and analysis, and the generation of ideas, innovations, and processes to improve the management of the department. This task is similar to the organizations in private companies responsible for industrial engineering, quality control, and managerial improvements.

This office has the double function of generating knowledge and using knowledge to meet its obligations of planning and evaluation. In organizational terms the office is a *staff* support unit whose contributions to the department encompass a long-term outlook and the monitoring of future events. The office formulates strategic options, directions, and scenarios. Once adopted by the Secretary, the knowledge embedded in these plans has a marked influence on the future of the VA and the services it provides the veterans of the nation's armed forces.

The Office of Policy and Planning faces several challenges in the collection, analysis, use, and dissemination of knowledge. First, it balances the need to acquire as much knowledge as possible not only of current operations and services of the VA but also the future needs, resources, and changes that the department and the Armed Forces will face in the coming years. Second, the office must sort through such streams of knowledge and process them with the ever-present limitations of the uncertainties of the nature and outcomes of wars, changing demographics, and the availability and nature of the national healthcare delivery system. Third, the office, as a staff unit, has little control over the use and effectiveness of its outcomes in the form of reports, plans, and recommendations.

The metrics for the evaluation of the office are in terms of its contributions to better decisions made by VA senior leadership. This outcome will depend on the quality of the knowledge collected and processed by the office. Measures of quality include: relevancy, reliability,

currency, and accuracy of the knowledge utilized by the office.

Case VII: U.S. Department of Veterans Affairs (VA); Veterans Health Administration; VISN 11: Veterans in Partnership; VA Hospital in Region 11

This Case is of the KMS in a VA hospital in region 11 that comprises the states of Michigan, Illinois, and Indiana. The VA has 23 such Veterans in Partnership regions in all 50 states and the territories. This case explored the needs and challenges of knowledge in one hospital.

Like any other hospital that is part of a large network of healthcare providers, the VA hospital is faced with the need to acquire clinical and administrative knowledge that will allow it to deliver care to its patients. The VA hospital has a unique target population of veterans and their dependents. It also has a single payor in the federal government and, in this instance, it is similar to hospitals fully funded and managed by states, counties, and municipalities. Unlike private hospitals, the VA hospital need not be concerned with competition for patients, malpractice, or payment for services. It does, however, compete for medical talent and needs knowledge about clinical innovations, new procedures, and advances in medicine.

The purpose of the hospital is to provide the best available care to its patient population. To do so, the hospital must have a knowledge base of clinical and administrative procedures and maintain a current state of quality and availability of care. This hospital, therefore, is evaluated by the same metrics used for non-governmental hospitals: how well is care provided to patients? The clinical staff of this hospital and its facilities must be equal in their levels of skills and services to the private sector and to university hospitals.

But, as a member of the network of hospitals under the Department of Veteran Affairs, the hospital competes for resources with other hospitals in the network and in its region. The hospital needs to acquire and process knowledge about the federal system, any changing policies and evaluation criteria, and any present and forecasted changes in its target population of patients.

Case VIII: U.S. Department of Health and Human Services (HHS); Centers for Disease Control and Prevention (CDC&P); Office of Non-Communicable Diseases, Injury, and Environmental Health; National Center for Chronic Diseases, Prevention, and Health Promotion (NCCDPHP)

The CDC&P is the nation's premier organization in charge of protecting the health of the American public. Its mission is multifaceted: to monitor, detect, and investigate health problems; to conduct research and to train health professionals; to foster prevention of health problems and diseases; and to educate the

public on issues of healthy behavior (such as the recent emphasis on obesity and chronic diseases).

Within these complex and critical objectives of the CDC&P, the National Center for Chronic Diseases Prevention and Health Promotion (NCCDPHP) is focused on prevention and control of chronic diseases such as diabetes, cardio-vascular disease, asthma, cancer, and neurological decay. In the national scene, healthcare expenses for chronic diseases take a disproportionate chunk of the nation's investment in healthcare delivery. Seven major chronic diseases account for about 80% of hospital admissions, almost 90% of prescriptions filled, and over 70% of the total expenditures for healthcare delivery in America.

These statistics clearly position this CDC&P Center for chronic disease prevention as a critical component of the nation's first-line defense instrument to help prevent and control chronic diseases. To accomplish these goals, the Center needs to acquire, process, and share various knowledge bases on the clinical aspects of chronic diseases, the epidemiological attributes of these diseases, modes of prevention and treatments, and the means by which the public can be made aware of the magnitude of threats from these diseases and how to prevent and combat them.

The Center faces the challenges of the need to balance the internal use of knowledge on these diseases and the external dissemination to the public and to other health organizations of the knowledge the Center has attained, processed, and analyzed. The Center's performance is measured by two sets of metrics: internal and external. The challenge is with the external measures. The Center can promote, advocate, and foster healthy behaviors, safety, and healthy environments. But it is up to the American public to heed the advice of this government organization. Therefore, improvements in the prevention of chronic diseases depend not only on the work of this Center but especially on the will of the American public to live a healthier life.

A Knowledge Management System (KMS) to be designed for this Center will have to account for the dual functions of clinical knowledge processing and diffusion, and the public-relations aspects of the Center's mission and objectives. These are two distinct types of KMS that need to closely collaborate and not only interface with each other but effectively merge to produce a single—albeit complex—and workable system.

c) *Comparative Analysis of the Cases*

Managers in the eight federal health organizations described above considered the strengths and challenges of their KMS. There is an agreement among these managers that any new tasks and new knowledge imposed by the federal government on their knowledge system can be met with their existing KMS. There are some concerns expressed by these

managers. Their current systems are not designed to meet the specific needs of their organizations. In most cases the systems are standard instruments installed by contractors without much regard for the unique attribute of the agency, the center, or the federal department or office. Another example is the challenge of implementation and evaluation of the KMS. As illustrated in several of the cases, there is a continuous tension between internal and external aspects of the acquisition, processing, utilization, and sharing of knowledge by the individual organization. Existing KMS are not designed to effectively address these concerns. The following section elaborates these concerns.

VI. PART FIVE: BEST PRACTICES

This part discusses the best practices of knowledge management in the private and public sectors of the economy. Although respondents in federal health agencies are distrustful of the experience of other organizations, there is, however, a pool of practices that can be a valuable source for lessons to be drawn by these agencies. The practices outlined in this section are derived from the literature and from the experience of the author and his colleagues in their research and consulting on knowledge management.

a) *Categories of "Best Practices"*

Best practices of knowledge management are classified into three categories: (1) implementation; (2) utilization; and (3) evaluation. These categories cover the process of adoption of KM.

i. *How to Best Adopt and Implement KMS*

The literature and our experience in research and consulting have yielded several principles on how to best adopt and implement KM systems. These principles are useful not only for newly adopted systems, but also for any restructuring or reconfiguring of existing KM systems (Gates and Urquart, 2007). Figure 14 shows this category of best practices as a list of what to do (what successfully works) and what not to do (what would very possibly lead to failure).

Figure 14
Best Practices for Adoption and Implementation of KMS

What To Do: Practices That Work	What Not To Do: Practices that Fail
<ul style="list-style-type: none"> • Plan the adoption process in detail. • Select an implementation mode or framework that covers the <i>entire</i> adoption process. • Select vendors who will support your system throughout the implementation process. • Select a KMS that is up to the needs you have and <i>will have</i> in the near future. • Market the system and gain support from <i>all</i> levels of the organization for adoption. • Select a KMS that allows you to network within the agency and outside. • Consider restructuring KMS as a <i>new</i> system. 	<ul style="list-style-type: none"> ➤ Don't assume that vendors have all the answers. ➤ Do not relegate the implementation process to vendors. You are in charge—vendors support you. ➤ Do not assume that making some changes in your KMS to accommodate new needs for knowledge will be sufficient. ➤ Do not confuse your agency's information systems: KMS is a different animal. ➤ Do not stop at the implementation of KMS. To have the system in place is only the beginning.

The best practices in this figure can be summarized in terms of careful planning and taking into consideration the special attributes of a KMS. For example, the California Healthcare Foundation (2009) offered some lessons learned from successful adoption of electronic health records. There are “best practices” that include: (1) “garner organizational buy-in”; (2) “engage in a comprehensive and multifaceted planning process that includes strategic, technological, business, and financial considerations,” and (3) “practice change management techniques.”

There is a similar set of best practices in the adoption and implementation of technological systems such as KMS. These practices are anchored in good planning and insightful organizational and behavioral tactics that allow for a smooth introduction of such systems into the organization (Ilebrand, Mesoy, and Viemmix, 2010).

ii. *What Works, What Doesn't, and Why*

Once the KMS has been selected and installed, there arises the need to make it work. This means that members of the government organization need to utilize the system by depositing knowledge into it, by sharing its contents with others inside and outside the organization, and by employing the system's content as elements in the discharge of their jobs. The mere existence of the KMS is the first step in a long process of adoption of the system. So, when the demand for knowledge and the diversity of types of knowledge increase over time, there will also be an added set of challenges to utilize the agency's KMS with more efficiency and to make the system work harder and smarter (Hess and O'Neil, 2010).

Figure 14 offered examples of best practices for the management and utilization of KMS. These practices cover the parts of the adoption process of KMS from its initial installation to its routine utilization by members of the organization.

The practices that work for making the KMS useful to organizational members can be summarized in two key notions. The first is to continue incessantly to sell the system throughout the organization. Work with all levels to overcome resistance to change and establish a culture that supports the creation and exchange of knowledge. It's not enough simply to adopt a KM system. Even when the agency lets the contractor install a “turnkey” operation, once the system is in place, the agency must be tireless in making the system acceptable, workable, and useful.

The second notion is to break the organizational barriers that hinder the use of KM systems. Key barriers are the existence of “silos” of knowledge and the reluctance of organizational members to exchange knowledge with those outside the agency. Silos are created and maintained due to differences in technical abilities, organizational divisions and functions (e.g., scientists versus administrators), different professions, and departmental cultures. These silos are also present in the networking of agency personnel with other people and entities in the healthcare sector. For example, clinicians in government health agencies are more likely to exchange knowledge with other clinicians in the private sector and other government agencies, but are less likely to exchange knowledge with non-clinicians in their own agency (Geisler, 1999).

As the need arises to overhaul existing KMS because of their challenges, the best practices are to avidly manage the KMS to make it useful. This is done by overcoming the barriers to utilization—such as silo mentality, adverse culture, and resistance to change.

iii. *How To Best Evaluate KMS*

The third category of best practices is the evaluation and assessment of KMS. This practice is not

limited to monitoring the success of the KMS. By its nature, evaluation is the means by which the organization can affect changes in its strategy and institute course redirection. Figure 15 shows the best practices for evaluating KMS.

Figure 15

Best Practices for the Evaluation of KMS

What To Do: Practices That Work	What Not To Do: Practices That Fail
<ul style="list-style-type: none"> • Link KMS outcomes and benefits to the mission, strategic objectives, and to the performance of the agency. • Bring to bear examples and anecdotes of KMS that worked. • Use metrics of positive outcomes and benefits, rather than solely relying on metrics of use. • Conduct your agency's own evaluation program. • Allow for a period of time for KMS adjustment and for users to get accustomed to the system. • Select metrics that assess exchange, cooperation, and intra- and inter-agency networking. • Evaluate the effort to sell the system and to overcome resistance to change. 	<ul style="list-style-type: none"> • Don't get bugged down with metrics of utilization. • Don't outsource the evaluation of your KMS to vendors. • Don't conduct the evaluation of KMS to manage the basket of incentives. • Don't mix the evaluation of KMS with that of your agency's MIS • Don't assume that all or many of your metrics are going to be positive: success of KMS is a relative concept. • Don't utilize one category of metrics to make the evaluation of the system: e.g., evaluating only on economics.

To make the evaluation of KMS a useful tool for federal health agencies, there are two key principles that emerge from Figure 15. The first is the choice of evaluation metrics. A common practice in evaluation programs is to focus on the accounting, financial, and audit aspects of an agency-wide system such as the KMS. This is poor practice that generates misleading findings. Cost accounting and financial oversight are important management tools but they are the least desired metrics to evaluate the effectiveness of KMS.

The emphasis in the choice of metrics should be on metrics of benefits and contributions of KMS to the agency, to its mission, and to the performance of its units, departments, and people. The question asked in the evaluation should not be: "How much does the KMS cost and how much use has the KMS had?" or "What is the ratio of these two measures?" This means that calculating the "cost per use" of the system is a meaningless metric of what the KMS has done for the agency.

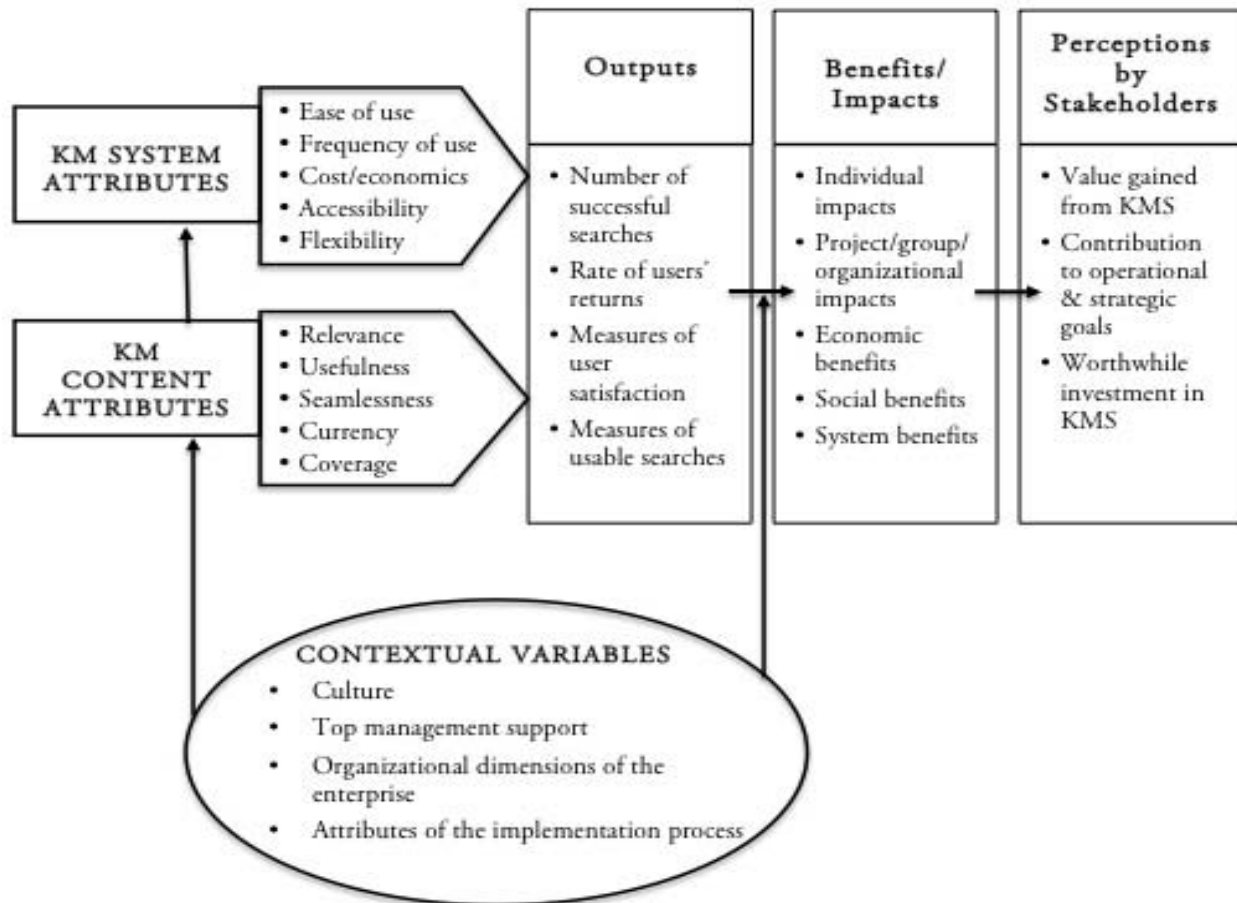
iv. *Key Metrics of Utilization, Performance, and Benefits*

The choice of metrics for the evaluation of KM systems in government health organizations is a crucial

component of best practices of KM. Wrong, weak, or inadequate metrics may lead to poor decisions on the adoption and assessment of KM systems. Figure 16 shows a model of KMS evaluation and some illustrative metrics.



Figure 16
A Model and “Best Metrics” of KM Evaluation



The model lists two sets of metrics. The first includes metrics of the *utilization* of the KM system. These metrics are employed to measure (1) the system attributes or (2) the content attributes of the KMS. *System* attributes are the measures of the frequency of use, ease of use, cost of use, accessibility, and the flexibility of the system. Similarly, *content* attributes are measures of how useful, relevant, current, and seamless the KMS happens to be—as perceived by its users.

These metrics of utilization can be quantified by measures of actual use (e.g., number of successful searches or cost per search) and measures of perceived satisfaction of users with the system. But, as emphasized above, these metrics provide some data on use of the KMS, but are not sufficient to measure the impacts, benefits, and value of the KMS to the organization.

Successful implementation of KMS (such as the case of Siemens’ “Sharenet”: Heier et al., 2005) is measured by a combination of metrics of utilization and a second set of metrics of *value* of the KMS. This second set of metrics includes measures of perceived

and actual contributions of the KMS. In the case of federal health organizations, the contributions are a mix of clinical and administrative measures, applied to the *internal* and *external* impacts of KMS. Best metrics are those which combine measures of the intra-agency exchange and management of knowledge—with the networking and the interlocking of inter-agency systems to form a cohesive and integrative multi-agency knowledge exchange in the relevant aspects of the national health landscape.

An example of this network would be the seamless flow of knowledge among KM systems of such agencies of the HHS (Health and Human Services) department of the federal government, as the Centers for Disease Control and Prevention (CDC&P), the Food and Drug Administration (FDA), the National Institutes of Health (NIH), the Centers for Medicare and Medicaid Services (CMS), and the Agency for Healthcare Research and Quality (AHRQ). In addition, knowledge about health could flow between the KMS of these organizations and other offices, agencies, and departments in the federal and state governments.

Examples are the need for knowledge exchange in matters of health between agencies of HHS and the Federal Department of Homeland Security, state departments of public health, and the healthcare organizations of the armed services. Although some interface exists today, there is a long way to go before we achieve seamless flow.

The metrics selected to evaluate KM systems in the federal health organizations should capture the value of these systems throughout the federal government. A focus on the internal working aspects of a KMS and its economics would miss the more crucial aspects of knowledge management of the national healthcare landscape.

Best practices in the selection and use of evaluation metrics for KM systems are the inclusion of both sets of the utilization and the impacts/contributions of these health KMS. The application of these metrics within a framework of decision-making will depend on the culture of the agency and on the preferences of policy makers in the agency. Senior managers who are more concerned with the efficiency and performance of the KMS will emphasize the importance of metrics of utilization. However, senior managers in federal health agencies should give added consideration to the metrics that assess the impacts, contributions, and value of the KMS to the agency and to other organs of the government.

VII. PART SIX: CHALLENGES AND LESSONS LEARNED

The findings from the study of managers in federal health agencies and the literature suggest three key challenges to knowledge management. These challenges harbor potential solutions for these agencies.

a) *The Challenge of KMS Implementation and Evaluation*

Managers in federal health organizations consider the implementation and evaluation of KMS a challenge to their ability to best utilize the knowledge that they acquire and process. The existing KM systems are usually standardized versions of systems sold in the private sector. These systems are often implemented "as is" with insufficient amount of adaptation to the unique attributes of the federal organization. In addition, the KM systems implemented in these organizations are inadequately equipped with an evaluation framework that provides metrics sufficiently distinctive to measure the contributions of the KMS by the purpose, function, and structure of the individual government organization.

b) *The Challenge of Making Current KM More Effective*

Federal health agencies are consistently faced with the challenging situation whereby their KM systems are put to the test of meeting the current and the enhanced needs of the healthcare environment. The

challenge is to make their KM systems more effective and more able to transcend local foci and to become inter-agency systems of knowledge sharing and of strategic intelligence for the government organizations (Davenport and Jarvenpaa, 2008; Nicolini et al., 2008).

The challenge of the need for added effectiveness is compounded by the poor track record of KM contractors. Although strewn with good intentions, these contractors are unlikely to improve their KM systems to a level where they could successfully manage the added knowledge that the reform in health care will generate in the foreseeable future.

c) *The Challenge of Learning from Other Health Organizations*

The literature and the author's experience suggest very few cases of successful KM systems in health organizations. Government agencies face the challenge of learning from the experience of private companies and foreign government agencies.

Respondents in the cases of federal health agencies are not open to lessons from others. They seem to overly rely on their agency's experience and the support offered to them by KM contractors. The phenomenon of "not invented here" is prevalent in this case of KM systems. Although the agencies are apprehensive about the challenges of their KMS, there is a limited willingness to learn from others and to integrate such lessons into the future structuring and operation of their KM systems.

d) *Lessons Learned and Recommendations*

Although respondents in our study do not believe that the added knowledge requirements—due to healthcare reform—represent a pressing challenge to their current systems, the expanded involvement of government in the national healthcare sector is a strong possibility. Added regulations and an increased role in the funding of health care are foreseeable consequences of the reform. This added involvement of government agencies in the sector would soon engender added cooperation and a host of necessary, interlocking cooperative relations among the many federal and state agencies in the national health arena. Whatever format the final reform bill will take, the expanded role of government in the health sector will become a reality.

There are four lessons to be learned from the literature on KM, the eight cases above, and the experiences of private and public organizations. These lessons are described in summary form to provide managers in the federal health system with the extract of what we can learn from best practices in the health sector.

1. *Tailoring KMS to the Specific Nature and Needs of Federal Health Organizations*

There is a need to tailor the KMS for each government health organization, according to its structure, function, and purpose or goals. The implementation of the standardized KM systems is a poor practice. Federal health organizations, such as those described in the eight cases above, are a myriad of centers, offices, and institutes—each with different missions, objectives, and types of contributions to the federal government and to the American public.

2. *The Successful Adoption and use of Health KMS Requires Effort beyond the Installation by Contractors*

As contractors install the “latest versions” of their hardware and software, the agency must undertake a substantial program to “rally the troops” and to continuously market the redesigned KM system to all levels and members of the organization. This effort must include an adequate basket of incentives for employees to use the KM system and to continue using it. The effort must also strive to change negative perceptions that people tend to have of how effective their KM system seems to be by an ongoing campaign that emphasizes positive experiences with and potential benefits from these systems.

3. *The Successful Utilization of Health KMS Requires Cooperation, Coordination, and Networking within the Agency and with other Health Organizations*

Federal health organizations must break down the “silos” that prevent sharing of knowledge among offices, centers, and specialties within the parent organization and between this and other organizations. The persistent existence of independent knowledge systems (“silos”) separated by organization or professional specialty is not only unwarranted but, more importantly, is harmful to the effectiveness of the KMS. Silos produce unacceptable behavior whereby employees are reluctant to share their knowledge and are motivated to hoard what they know, thus effectively counteracting any benefits from an organization-wide KM system.

Because of the complexity of the national health sector and the very large number of private and public stakeholders and direct participants, federal health organizations—in their complex capacity and responsibilities in the national arena—must focus on their KM cooperation and networking with other stakeholders. The federal government is now a major player in the national health sector; therefore, its agencies must enhance and support the flow of knowledge within the sector. It is no longer sufficient to limit the flow and the management of knowledge within the confines of the government. There is a notable increase in the interdependence of private and public constituents in the national healthcare arena. Therefore, for the effective functioning of the delivery of care, there

must be an effective flow of knowledge among the participants in the sector.

4. *The Evaluation of Federal Health KMS and the Choice of Metrics for this Activity Must Account for Both Measures of use and Benefits*

Federal health organizations are bound to redesign their KM systems. In so doing, they should focus on the link of KMS to their processes of decision and policy making. This entails the design of an evaluation framework for KMS that contains metrics of the benefits, contributions, and value of KMS. Best practices of other organizations have shown that the evaluation of KMS must answer such questions as: “How did our KMS contribute to the strategic objectives, the mission, and the performance of the organization?”

In theory, KM systems are considered strategic assets to the organization. In practice, however, organizational members tend to view these systems unfavorably and with distrust. This third lesson on the evaluation of KMS offers a mechanism by which the focus on benefits and contributions—in addition to the usual measures of cost and operation—help people in the organization to appreciate the positive outcomes and the value they can derive from their KM system.

5. *Recommendations*

What should decision-makers in federal health organizations do to: (1) *rectify* the prevailing climate in which their personnel distrust their KMS; (2) *enhance* the role of their KMS to shoulder their mission and objectives; and (3) based on best available practices, *reinvent* their KMS as an effective intra- and inter-agency mechanism. The following are useful recommendations for decision-makers at all levels in the federal health network. They summarize the essence of the best practices reviewed in this paper.

Recommendation One: Reformulate the Process by which KM Systems are Acquired and Tailored to Specific Needs of the Organization

Federal health organizations are dependent on contractors with the result that most KM systems are standardized with the purpose of facilitating connectivity and coordination among organizations. Cost considerations are also taken into account for this type of solution to KM requirements. However, the different needs and characteristics of each federal health organization calls for the acquisition and implementation of more specific KM systems in order to make these systems more effective by serving the unique needs and requirements of each organization. It is recommended that an analysis of these needs be conducted before a KM system is installed, so that necessary adjustments can be made in the system. If a system has already been installed, this analysis should take place to modify the system as needed.

Recommendation Two: Work with Contractors to Implement a KM System with Capabilities to Manage Internal and External Objectives

Decision makers in federal health organizations should not consider their KM system as simply a warehouse of knowledge for the periodic use of internal employees/customers. The KM system must be a dynamic system that links the organization to the health sector within and outside the federal network, and continually provides updated knowledge from all sources—internal and external to the organization and to government.

It is recommended that the KM system be considered as a fundamental instrument in the health decisions and policies of the organization—rather than a marginal technique or information warehouse.

Recommendation Three: Establish a Comprehensive Program of Adoption and Adaptation of KMS

With all the good intentions, most organizations install a robust KMS, then simply “forget it” by saving on training and other elements of the “learning curve” for users. This practice leads to failure. KMS thus installed become obsolete, unimportant, and eventually ignored by actual and potential users. Managers in federal health organizations must approach the adoption of KMS with dedication and long-term commitment. KMS should be viewed as a “work in progress” rather than a system we install, let run, and don’t bother with until or unless it breaks down.

It is recommended that decision makers in federal health organizations work very closely with contractors and consult with other government managers as they adopt and use their KMS, with vigor and on a continuous basis.

Recommendation Four: Conduct Periodic Audits and Evaluations of the KMS

The KMS must be evaluated to assess the operations and impacts of the system. This audit should be done in terms of the costs, benefits, and contributions to the focal organization as well as the parent federal organization. It is recommended that such audits be conducted periodically by using metrics listed in this report. These audits will provide feedback that will allow decision makers to introduce necessary modifications to the KMS itself, and to better assess the contributions of KMS. These include: problems identified, classified, or solved with the help of the KMS; mistakes and potential disasters avoided thanks to the KMS; communication across silos; and contributions to the mission of the organization and the parent federal department.

These audits are not simply exercises in evaluation. They are crucial elements of the effort needed to keep the federal health organizations current, connected, and effective.

Recommendation Five: Establish a KMS for Each Federal Department

Individual offices, institutes, and centers in the federal health departments have their own KMS, designed to accomplish the organization’s unique goals and functions. It is recommended that a comprehensive KMS be established for each department of the federal government in which knowledge from all subordinate organizations can be collected. Health knowledge is essential for the wellbeing of the nation. Hence, such central KMS will allow each department to possess and to share knowledge in a timely and comprehensive manner. Exchange of health knowledge among diverse government departments such as the Department of the Army, HHS, and the Veterans Affairs would facilitate currency of the flow of health knowledge and more effective modes of reaction to threats to the health of Americans in situations such as epidemics or terror acts on a national scale.

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