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THE STRATEGIC ASSOCIATION BETWEEN ENTERPRISE CONTENT MANAGEMENT AND DECISION SUPPORT

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List of Acronyms

BSC	Balanced Scorecard
DSS	Decision Support Systems
ECM	Enterprise Content Management
FSP	Formal Strategic Planning
IS	Information Systems
KM	Knowledge Management
PLS	Partial Least Squares
REDCap	Research Electronic Data Capture
SEM	Structural Equation Modeling
SMF	Strategic Management Framework
GA	Graduate Admission
KSF	Key Success Factors
ABO	Administration and Business Operations
FERPA	Family Educational Rights and Privacy Act

ABSTRACT

To deal with the increasing information overload and with the structured and unstructured data complexity, many organizations have implemented enterprise content management (ECM) systems. Published research on ECM so far is very limited and reports on ECM implementations have been scarce until recently (Tyrväinen et al. 2006). However, the little available ECM literature shows that many organizations using ECM focus on operational benefits while strategic decision-making benefits are rarely considered. Moreover, the strategic capabilities such as decision making capabilities of ECM are not fully investigated in the current literature. In addition, the literature lacks a strategic management framework (SMF) that links strategies, business objectives, and performance management although there are several published studies that discuss ECM strategy. A strategic management framework would seem essential to effectively manage ECM strategy formulation, implementation, and performance evaluation (Kaplan and Norton 1996; Ittner and Larcker 1997). The absence of an appropriate strategic management framework keeps organizations from effective strategic planning, implementation, and evaluation, which affects the organizational capabilities overall. Therefore, the objective of this dissertation is to determine the decision support capabilities of ECM, and specify how ECM strategies can be formulated, implemented, and evaluated in order to fully utilize the ECM strategic capabilities. Structural equation modeling as well as design science approaches will be adopted to achieve the dissertation objectives.

1. INTRODUCTION

1.1 BACKGROUND AND DEFINITIONS

As the business environment is getting ever more complex and competitive, the requirement of good and timely decision-making is becoming increasingly evident, and the employment of decision support (DS) technology is becoming not only desirable but also essential. DS technology can reduce uncertainty and increase efficiency in the decision-making process, and much research has been published focusing on the efficiency and effectiveness of DS systems (Arnott 2004; Arnott and Pervan 2005). DS technology encompasses many types of systems, including decision support systems (DSS) in its original and narrow sense (Sprague 1980), expert systems (ES) (Luconi et al. 1986), executive information systems (EIS) (Watson et al. 1991; Singh et al. 2002), and group decision support systems (GDSS) (DeSanctis and Gallupe 1986). In addition, there are hybrid systems and newer types of DS technologies, often developed and designed around specific problem contexts, including systems that make use of knowledge management (KM) techniques (Oppong et al. 2005; Anderson-Lehman et al. 2004). For example, by using a knowledge-based approach, Zack (2007) showed how the organizational and technological DS systems are linked to solve knowledge-based problems.

Enterprise content management (ECM) systems are implemented in many organizations to deal with the increasing information overload and with the complexity of the structured and unstructured organizational data. ECM has many definitions; for instance, the ECM Association (AIIM) defines ECM as “the strategies, methods and tools used to capture, manage, store, preserve, and deliver content and documents related to organizational processes. ECM tools and strategies allow the management of an organization's unstructured information, wherever that

information exists" (www.aiim.org). ECM is also defined as "the strategies, tools, processes and skills an organization needs to manage all its information assets (regardless of type) over their lifecycle" (Smith and McKeen 2003, p.648). ECM can be viewed as an evolutionary phase of information management that involves the management of structured and unstructured content through the complete content lifecycle (Boiko 2002). There appears to be a consensus in the published research that ECM is not only a practical set of technologies but also includes organizational concepts that involve many business perspectives (Blair 2004; Munkvold et al. 2006; Tyrväinen et al. 2006; vom Brocke et al. 2008). Rockley (2006) reported that one of the main goals of ECM implementation is to have transparent content sharing by making different and disparate applications (i.e. web content management, records management) interoperable. Shared transparent content that facilitates cross-departmental collaboration, can facilitate the capturing of knowledge and content (Jenkins, 2004).

From financial point of view, the market of ECM is appealing for many vendors. Dunwoodie (2004) mentioned that the ECM market is estimated to be $1.54 billion; Meta Group estimated the ECM market to be $2.3 billion in software and $7 billion in services (Content Manager, 2004). Gartner estimates the ECM software revenue to exceed $5.1 billion by 2013 (EMC Corporation, 2009). Although there is a difference in the estimated market figures, the numbers indicate that the ECM market is growing. The numbers also explain the reason of the great interest that newer competitors to the market (i.e. Oracle, IBM, Microsoft) have. The senior director of Oracle noted, "Content management is entering a period of significant change and potentially explosive growth" (Buchheim, 2006). The market of ECM can be categorized as commercial (i.e. IBM, EMC, Interwoven, Vignette, Microsoft and Open Text), open-source (i.e. Plone and Mambo), and hosted systems (i.e. SpringCM and Document Commander) (Kemp,

2007). Commercial ECMs are more popular than the other two categories; Gartner has ranked EMC Documentum as the leader of ECM 2009 (EMC Corporation, 2009).

There is considerable overlap between the concepts of ECM and KM; in fact, some researchers consider ECM a subfield of KM, or view ECM as one specific tool of KM (Nordheim and Päivärinta 2006). Tyndale (2002) defined Knowledge management tools as the tools that "promote and enable the knowledge process in order to improve decision-making" (p.183); he mentioned the following as some examples of KM tools: intranet, content management, document management, and web portals. Duffy (2001), Lee and Hong (2002), and Carvalho et al. (2001) suggested that ECM is one type of KM. Traditional documents and data, corporate internet and intranet sites, extranets and external sources, are some examples of the enterprise content. ECM allows organizations to simplify managing heterogeneous data and to process structured, and unstructured information (O'Callaghan and Smits 2005) that are essential for the decision-making process.

1.2 MOTIVATION FOR THE RESEARCH

Though the increased use of Enterprise Content Management (ECM) system makes it an important topic for information systems (IS) research (Päivärinta and Munkvold, 2005), published literature on ECM to date is limited (Tyrväinen et al., 2006). The existing ECM literature indicates that many organizations seem to focus on operational benefits of ECM, while the strategic long-term benefits are rarely considered. Smith and McKeen (2003) found that the operational benefits (i.e. cost reduction and work process simplification) are the primary initiatives for ECM adoption. Some research has analyzed the impact of ECM on organizational performance based on efficiency and content availability (vom Brocke et al., 2010); however, long-term benefits (i.e. supporting decision making and competitive intelligence) are not major

drivers for ECM. A more strategic approach may result in better business value from ECM as organizations desire to do more with the accumulated information content. For example, firms should be able to utilize the information content to increase corporate knowledge for business decisions (Davenport et al., 2001). According to Davenport et al. (2001), less than 10% of firms analyze their transaction data to help in decision-making. Defining and implementing an effective ECM strategy may turn out to be one of the biggest challenges of the next decade (Varian and Lyman, 2000).

Many organizations desire to do more with the data and information content at their disposal. For example, many firms would like to utilize the enterprise content to generate knowledge; however, in practice, less than 10% of firms analyze their transaction data to help in decision-making (Davenport et al. 2001). As potential long-term benefits of ECM, the capacity for decision-making support is not utilized to any great extent, and there appears to be strong need to investigate the DS capabilities of ECM. Smith and Mckeen (20003) write that 'very few' firms utilize ECM to analyze the content to provide decision-making information to be used to make informed decision, and thus to help in generating business value.

In addition, the literature lacks a strategic management framework (SMF) that links strategies, business objectives, and performance management although there are several published studies that discuss ECM strategy (Smith and McKeen, 2003; O'Callaghan and Smits, 2005; Rockley et al., 2003). For instance, Tyrväinen et al. (2006) found that there is a paucity of evaluative work associated with ECM research. A strategic management framework would seem essential to effectively manage ECM strategy formulation, implementation, and performance evaluation (Ittner and Larcker, 1997; Kaplan and Norton, 1996). The absence of an appropriate strategic management framework will limit organizations from reaping the benefits of ECM capabilities.

1.3 RESEARCH OBJECTIVES, QUESTIONS, AND METHODOLOGY

Therefore, this dissertation has two objectives that will be conducted in two phases (see table 1). The first objective is to have an understanding of the association between ECM and decision support, and to identify the potential effects of ECM technology on decision support (DS) activities. This objective will be achieved by linking ECM to decision support activities based on the sequential framework of Mintzberg et al. (1976). Several hypotheses are proposed, and the Partial Lease Square (PLS) technique will be used to test the hypotheses. The contribution of this part is to prove (or refute) the less obvious strategic association between ECM and decision support; the findings will encourage practitioners to focus on the DS capabilities while implementing and using ECM.

The second objective is to have a strategic management framework for ECM systems that supports the formulation, implementation, and evaluation of ECM strategies in order to fully utilize the ECM strategic capabilities. To achieve the second objectives, several methodologies, including balanced scorecard (BSC) and strategy map are integrated to drive the strategic perspective. The contribution of this work is twofold. Firstly, an ECM strategic framework, which integrates the formal strategic planning (FSP) with the balanced scorecard (BSC), is a novel addition to the ECM body of knowledge. Implementing the framework in a real-world organization highlights the importance of linking strategies to performance measures in the ECM context. Secondly, practitioners can use the strategic framework to help them in more effectively deploying and evaluating ECM systems, and ultimately utilizing the decision support capabilities of ECM. Design science approach is used to propose and validate the suggested framework.

	Phase 1	Phase 2
Research Problem	• Current focus on operational benefits of ECM • Strategic decision-making benefits are rarely considered • There appears to be strong need to investigate the DS capabilities of ECM.	• A SMF would seem essential to effectively manage ECM strategy formulation, implementation, and performance evaluation • The literature lacks such a framework
Research Question	What are the strategic decision-making capabilities of ECM?	How can the ECM strategies be formulated, implemented, and evaluated in order to fully utilize the ECM strategic capabilities?
Research Objective	• To have an understanding of the association between ECM and DS • To identify the potential effects of ECM technology on DS activities	To have a SMF for ECM systems that supports the formulation, implementation, and evaluation of ECM strategies to fully utilize the ECM strategic capabilities
Methodology	PLS-SEM	Design Science
Contribution	• Prove (or refute) the less obvious strategic association between ECM & DS • Encourage practitioners to focus on the DS capabilities while implementing and using ECM.	• The proposed artifacts are novel addition to the ECM body of knowledge • Practitioners can use the SMF to help deploying and evaluating ECM systems and utilizing the DS capabilities of ECM

Table 1.1: Research questions, objectives and methodolgoy

2. LITERATURE REVIEW

All organizations create, classify, and archive information for it to be accessible when needed. The number of physical and virtual information artifacts created and stored in today's business world is increasing exponentially, including rapidly escalating unstructured content in organizations. Some studies show the rate of increase in the unstructured content to be in the order of 800 MB per person per year (Gingell 2006). As estimated by the Gartner Group, 75% to 80% of an organization's data is unstructured and not in a standard format that can easily be retrieved when needed (O'Callaghan and Smits 2005). "It is estimated that unstructured content is growing at anywhere between 65 percent and 200 percent per annum depending on the industry sector" (EMC Corporation, 2006 p. 5). This escalation in unstructured content has caused the emergence of different content management platforms that support various applications (Tramullas 2005). To deal with the increasing information overload and with the structured and unstructured data complexity, many organizations have implemented enterprise content management (ECM) systems. ECM is a term that was coined by AIIM International and is now widely used by vendors and users (Blair, 2004).

Although there is some confusion as to the precise definition of the term ECM, Smith and McKeen (2003) defined it as "the strategies, tools, processes and skills an organization needs to manage all its information assets regardless of type over their lifecycle." The ECM Association (AIIM International) defines ECM as "the strategies, methods and tools used to capture, manage, store, preserve, and deliver content and documents related to organizational processes. ECM tools and strategies allow the management of an organization's unstructured information,

wherever that information exists.1" According to Gartner, ECM includes the following core components: document management, web content management, records management, document imaging, document centric collaboration, and workflow (Woolley and Fletcher, 2007). ECM is also defined as "the technology that provides the means to create/capture, manage/secure, store/retain/destroy, publish/distribute, search, personalize and present/view/print any digital content" (Munkvold et al. 2006, p.71). Despite these definitional differences, there seems to be consensus on ECM processes (i.e. activities involved with ECM). Many researchers view ECM as the evolution of document management, records management, workflow (business process) management, and web content management systems that started in the 1980s.

ECM can be viewed as an evolution of information management that involves the management of structured and unstructured content through the complete content lifecycle (Boiko 2002). ECM allows organizations to simplify heterogeneous data and process structured, and unstructured information (O'Callaghan and Smits 2005). There is a consistent perception among researches that ECM is not only a practical set of technologies but also includes organizational concepts that involve various business perspectives (Blair, 2004; Munkvold et al., 2006; Tyrväinen et al., 2006; vom Brocke et al., 2009). Rockley (2006) reported that one of the main goals of ECM implementation is to have transparent content sharing by making different and disparate applications (e.g. web content management, records management) interoperable. By having shared transparent content that facilitates cross department collaboration, the capturing of knowledge and content can be made easier (Jenkins, 2004). In the same vein, many researchers believe that ECM overlaps with knowledge management (KM); Duffy (2001), Lee and Hong (2002), and Carvalho et al. (2001) suggested ECM as one type of KM. Some researchers

[1] www.aiim.org

consider ECM a subfield of KM (Nordheim and Päivärinta 2006), or that ECM is one tool among KM tools. Tyndale (2002) defined KM tools as the tools that "promote and enable the knowledge process in order to improve decision-making;" he mentioned the following as some examples of KM tools: intranet, content management, document management, and web portals.

Though the increased use of ECM makes it an important topic for information systems (IS) research (Päivärinta and Munkvold 2005), the ECM field lacks meta-analysis research that explains the current state of the field. Though there have been a few ECM reviews (Tyrväinen et al., 2006; Usman et al., 2009), they don't seem to be sufficiently comprehensive. Comprehensive literature reviews are valuable (Saunderlin, 1994), as they help researchers determine where there is particular need for further investigation, and they may point to specific problems in earlier studies. Literature reviews also help researchers in developing theoretical frameworks that can be used as a structure for future studies. Thus this chapter has two objectives: (1) to provide a reasonably comprehensive literature review of ECM research, (2) to develop a conceptual framework of areas of concern regarding ECM, and (3) to propose a research agenda needed in the ECM field based on the developed conceptual framework.

To gain full understanding of ECM literature, a structured research methodology is adopted, consisting of two phases. The first phase is searching for and selecting ECM research papers. The second phase is the analysis phase, where we categorize the current ECM research based on three structural pillars: system component dimensions, system lifecycle, and strategic managerial aspects.

2.1 SELECTION OF ECM PUBLICATIONS

We decided to include journal papers, conference papers, book chapters, as well as books in the review. We used the library website and Google scholar. Keywords used include Enterprise Content Management and ECM. The search was conducted in March 2011. Initially we found 3,360 publications (excluding patents). After refining our search to include only English language publications and to exclude citations, we still had 1,740 publications. After scanning through these, many of them were excluded because (1) ECM was not the main topic of the paper; (2) the paper was written by an ECM vendor and discussed the documentation and specification of a specific ECM system; (3) they were practitioner directed papers; (4) or the acronym "ECM" referred to something other than enterprise content management.

Publication types are categorized into: journal articles, conference proceedings (including workshops and symposia), books, book chapters, and academic theses or dissertations. Methodology applied in the articles is classified as case study research, theoretical or conceptual (i.e. the study is based mainly on literature and has no empirical testing), archival (i.e. study is based on ECM documentations), survey (Piccolo and Ives, 2005), descriptive (i.e. the study describes the ECM system or its impact), design science (i.e. the study designs and evaluates an artifact), and mixed methods (i.e. any combination of the previously listed methods). ECM component dimensions used for classification are tools (i.e. technology related to ECM), strategy (e.g. investment justification, implementation planning, stakeholders identification), process (e.g. ECM deployment), and people (e.g. training, stakeholder involvement) (Brock et al. 2010; Tyrväinen et al. 2006; Smith and McKeen 2003; Salminen et al. 2005; O'Callaghan and Smits 2005).

Ninety-one publications were included in this literature review (see appendix E). Microsoft Excel was used to tabulate and analyze the results. Table 2.1 shows the number of publications by publication type.

Publication Type	Number of Publications
Journals	33
Conference proceedings	35
Books	8
Book chapters	10
Master theses	5
Total	**91**

Table 2.1: Number of ECM publications

The time for the ECM publications in this literature review is from 2001 to 2011. The graph in Figure 2.1 shows the distribution of the articles by year. Except in 2006, 2009, and 2011, the trend for ECM publications is increasing. The perceived decrease of ECM publications for 2011 is misleading, as only the first quarter of the year (January through March) was included.

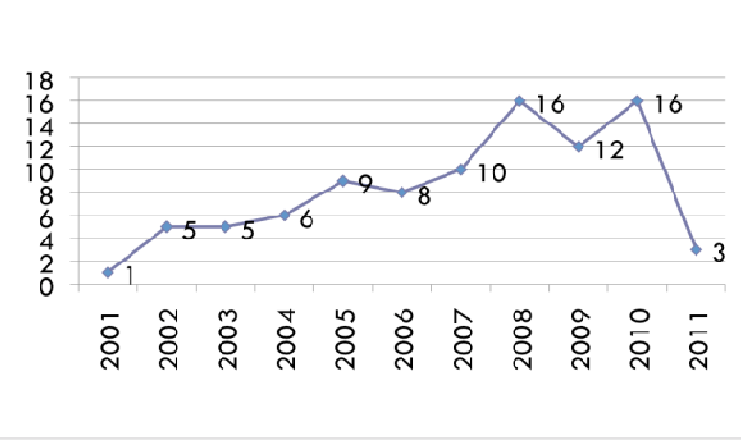

Figure 2.1: Distribution of ECM publications by year

Of the 33 journal articles, three appeared in Communications of the Association for Information Systems; two appeared in the European Journal of Information Systems; and one appeared in Communications of the ACM. Other than these, most of the journals are non-IS journals. One can conclude that IS researchers have only started to show interest in the ECM field. The 35 conference papers included two workshops paper and one symposium paper. Six of the others were presented at the Hawaii International Conference on Systems Sciences (HICSS), three at the Australian Conference on Information Systems (ACIS), and two at the European Conference on Information Systems (ECIS). The distribution of ECM papers by journal and conference names is shown in the appendices A and B. Wirth regard to research methodology, one-third of the publications is descriptive, which we mostly classified as belonging to tools dimension. Case study methodology was used in 22% of the publications; design science in 17%; survey papers made up 6%; and archival papers 5%.

2.2 LITERATURE ANALYSIS

ECM development is a continuous process that involves enterprise content resources, infrastructure, and managerial practices under the dynamic change of technology, organizations, and markets (Päivärinta and Munkvold 2005). ECM technology represents only a small part of ECM complexity. Therefore, ECM systems involve several sophisticated and interacting aspects including technical, social, organizational, and business aspects. In an attempt to comprise this complexity, we structured the ECM literature around three pillars. The first pillar consists of four ECM component dimensions (tools, strategy, process, and people). The second pillar is the enterprise system lifecycle. Esteves and Pastor (1999) suggested the following lifecycle phases for enterprise system: adoption, acquisition, implementation, use and maintenance, evaluation, and retirement. We adopt this lifecycle (excluding retirement, which we believe is not applicable

here, and implementation, because it overlaps with the process dimension) as the second pillar. The final pillar is the strategic managerial aspect (including change management and management commitment). Previous ECM research discusses the managerial aspects such as change management under the people dimension. However, we believe these managerial aspects should have a separate classification as they are also needed in the phases of the system lifecycle (e.g. adoption). Figure 2.2 shows the proposed analysis framework.

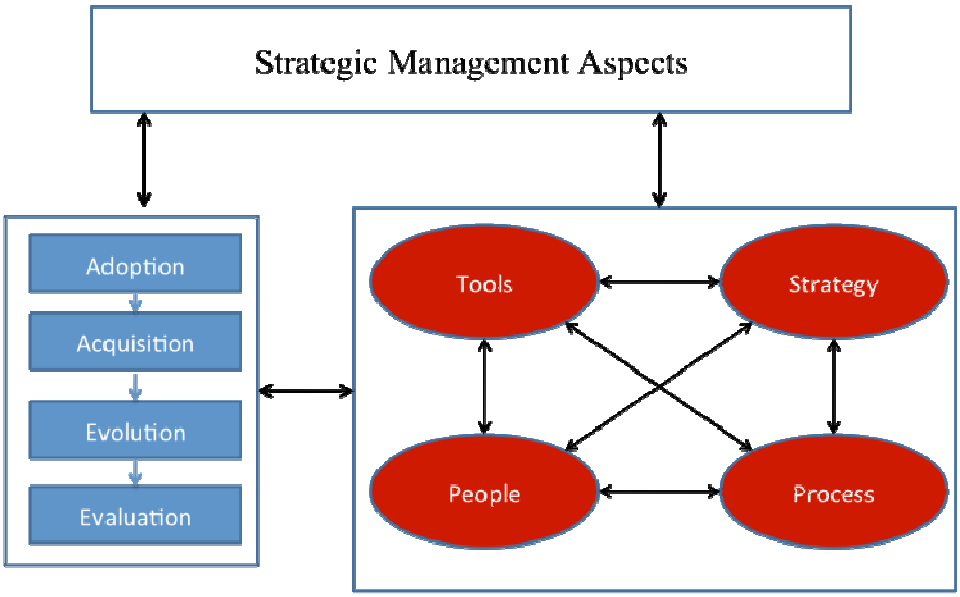

Figure 2.2: Main perspectives of ECM research

In the next subsections, we discuss the ECM papers as they relate to each of these three pillars.

2.2.1 The four ECM component dimensions

We start with the tools dimension. The majority of the articles (46%) focuses on the technical dimension and ignores other dimensions. For instance, Chiu et al. (2010) propose a financial enterprise content management framework that allows intra-enterprise and inter-enterprise interactions. Privacy and access control policies are demonstrated for internal content management, and for external access control. The authors demonstrate the achievement of

integration and control in a case study from the banking industry. In another example, Befa et al. (2010) utilize the benefits of Semantic Web technologies that include semantic interoperability and dramatic cost reduction, to extend the ECM system for automatically import and export ontologies. In her master's thesis, Saslaw (2009) used Microsoft SharePoint (one type of ECM) and inquiry-based design to construct a prototype for a resource portal for the University of North Carolina Healthcare System. She found that the method is useful in identifying the types of information in the ECM. By using design science methodology, Aziz et al. (2010) propose a grid-based content management system for multimedia data in the publishing industry; the authors argue that the system leads to better controlling of storage resources, and helps in matching the users' previous behavior to resource policies.

However, 22% of the articles discuss other dimensions in addition to the tools dimension. Pérez-Montoro (2011) presents different types of content management systems including document management, record management, and learning content management; the features of each system are defined to show the applications of these systems in e-learning and knowledge management. McNabb (2005) claims that compliance, governance, and process efficiency are the main drivers of ECM adoption. Large IT infrastructure vendors (e.g. IBM, EMC, Oracle) view ECM as a growth opportunity while smaller vendors (e.g. Laserfiche) that provide specific parts of ECM such as web content management, may find themselves obsolete unless they are able to distinguish themselves. Also, the author makes two important suggestions: organizations should adopt the ECM suite that aligns with the corporate objectives, and ECM vendors should be evaluated based on their long-run strategy.

18% of the papers discuss mainly the strategy dimension. For instance, Allen (2008) discusses in his book the common strategies to solve the "legacy problem domains" that are traditionally

addressed in different ECM modules. It also discusses the converting strategies from traditional content to digital content. The benefits and barriers of ECM adoption are discussed by Kunstova (2010). This author found that the most important barrier is the lack of technological, human, and financial resources, and the most important benefit is productivity increase. Alalwan and Weistroffer (2011) propose a framework to link ECM to decision-making activities, and present five propositions based on published literature to identify the potential effects of ECM technology on decision support activities.

Another 24% of the papers discuss the strategy dimension in addition to one or more other dimensions. As a case in point, Smith and McKeen (2003) investigate how organizations implement and develop ECM in order to manage information by having a focus group of knowledge managers. They discuss the reasons that lead to ECM adoption. Although the authors conclude that ECM systems enhance the organizational processes by providing essential services such as capturing, creating, indexing, searching, accessing, organizing, and maintaining content, they also find that the operational benefits (i.e. cost reduction and work process simplification) are the primary drivers for ECM adoption. They argue that organizational performance may be affected significantly by the right practices of content stewardship and the right information technology and behavior. They claim that managers have more value to gain from ECM systems if they follow a more strategic approach. In another example, Munkvold et al. (2006) aim to build an understanding of ECM based on a major ECM project in the oil industry. They claim that in order to gain effective and efficient electronic collaboration, three types of management are crucial: management of content, management of infrastructure, and change management. They include change management as one of the major categories of ECM; according to their case study, user-related issues require change management such as motivating users for administrative

and technological changes, and improving user skills to deal with ECM technology. To solve this problem, training programs and active user support are crucial. Finally, the authors conclude that research is needed in the following areas: ECM personalization and customization, utilizing content metadata and corporate taxonomy, and justifying the investment of ECM and evaluating the impact of ECM systems.

Only 7% of the papers discuss process as the main dimension. For instance, vom Brocke and Simons (2008) and Brocke et al. (2009) claim that business process management and ECM are two strongly related fields of research; they proposed the ECM-blueprinting framework that systematizes ECM adoption. Their framework consists of five phases: business process analysis, content analysis, ECM analysis, ECM-blueprint adaptation, and business process redesign. The proposed framework is evaluated in the context of a research project accomplished in a large-scale international cooperation. Based on the evaluation results, the framework provided valuable insights that can deal with the challenges of ECM. Fennell (2007) discusses the deployment of an open source content management system, named Drupal, in the libraries of University of Minnesota.

On the other hand, process is a common dimension along with others in 15% of the papers. Nordheim and Päivärinta (2004; 2006) concentrate on ECM implementation issues and present a framework for ECM customization based on an ERP literature review, and a case study from the oil industry. The authors try to determine the issues that emerge during the process of developing an ECM system. They summarized four motors of development and change: teleological, evolutionary, life cycle, and dialectical motors. The authors also discuss the challenges of ECM and found that content management challenges include lack of management attention and commitment. Scheepers (2006) proposes a conceptual framework to help in the implementation

of enterprise information portals, which is considered as a key component of ECM infrastructure. The suggested framework is based on marketing fundamentals. In that framework, the users of the portals should be viewed as segments and for each segment the following certain factors should be considered: content, distribution, promotion, and price. O'Callaghan and Smits (2005) propose a framework to implement ECM that helps in selecting the content brought under ECM; the authors claim that the proposed framework can guide IT investment and create business value. By using a portal-based IS design, Zykov (2006) discusses the implementation and maintenance of ECM systems. The author argues that his new method can help information resource management by providing consistent and adequate metadata manipulation.

Only one paper was centered solely on the people dimension. Scott (2011) discusses the user perceptions of ECM systems as one of the determinants of technology acceptance. The research evaluates the elements that lead to ECM system acceptance. The results reveal that cognitive engagement is an essential construct of technology acceptance. Also the research emphasizes the importance of metadata and taxonomy in structuring the content.

In addition, around 12% of the papers were in the people dimension along with other dimensions. Nordheim and Päivärinta (2004, 2006) suggest that ECM capabilities should satisfy the user needs and preferences through personalization and customization. They argue that ECM should facilitate increasing the quality of the content, providing easy-to-use systems, and meeting the security requirements through authentication and encryption. Smith and McKeen (2003) emphasize the importance of hiring and training people with analytic skills (viz. technology skills, statistical modeling and analytic skills, knowledge of the data, knowledge of the business, communication and partnering). Through a study of ten Italian cases, Bianco and Michelino (2010) explore the interaction between organizational and technological factors by

studying the impact of content management systems on publishing firms; the authors identify the organizational factors that are affected by the technology use. The socio-technical context that favors the adoption of technology is also specified.

2.2.2 ECM system lifecycle

In the adoption phase, the initial needs for ECM system are questioned; the impact of the system on the organization is analyzed, and the goals and benefits of the system are determined. In conducting this literature review, we did not find any paper that focuses on ECM adoption as the main topic. However, looking at the literature, we found that there are complicated and interrelated adoption problems that involve management (i.e. strategy planning, organizational culture), technology (i.e. tools and practices), and stakeholders (i.e. training and resistance). Kemp (2007) noted that many barriers such as organizational culture and user resistance usually face the adoption of ECM. Dillnut (2006) explores the emergence of the ECM discipline. Also, he explains the reasons for the increasing demand of document-based information management, and the reasons behind ECM adoption. He claims that "moving toward smarter knowledge platforms, and the adoption of common standards and protocols" are the main reasons behind ECM convergence. The benefits of ECM can be summarized as: compliance, efficiency, consistency, customer service, consolidation, and risk alleviation.

With regard to the acquisition phase, the ECM system is selected by comparing its features to the business requirements. Benevolo and Negri (2007) discuss the mismatch between the organizations' needs and the functions of information management products including document and records management systems, web content management systems, and ECM systems. The authors compare the characteristics of 22 international products to the following organizational

needs: information collection, management, and publication. The results show that the content management products can deal with three areas (collection, management, publication); however, the product is generally specialized only in one area. The authors conclude "…there is no standard and commonly accepted definition for Content Management." The vendors of content management systems (CMS) often offer different systems and the organizations should evaluate the CMS functionalities according to their specified needs. After classifying content management systems into: digital asset management (DAM), web content management (WCM), source configuration management (SCM), document management (DM), enterprise content management (ECM), and knowledge management (KM). Votsch (2001) highlights the problem that organizational needs usually do not match the solutions offered by vendors, so the author gives important advise for executives who plan to purchase and implement content management systems. Vitari et al. (2006) purport that choosing the most suitable CMS for organizational needs is a complicated task. The authors claim that there are difficulties in pre-purchasing evaluations of CMS because there is no analysis framework. They proposed two tools based on the analysis of 23 CMS. One tool is for analyzing CMS and the second is for understanding the strategy of CMS vendors. The applications of their tools to analyzing CMS and identifying strategies are also discussed in the paper.

The evolution phase, which overlaps with the tools dimension, includes integrating ECM systems with existing information sources and IT systems. Reimer (2002) especially focuses on the structure and functions of ECM systems. He suggests that business process efficiency may be enhanced greatly by applying integrated ECM. He also suggests that the legacy systems in the organization need to be considered when implementing ECM. Reimer (2002) argues that consolidation of existing disparate data into a single enterprise depository is not possible, so he

suggests a federation or warehousing of these data, which can lead to a single logical view. Also, he argues that ECM functions, after ECM implementation, should be superior to any individual solution such as documents management, reports management, or records management. Kunkelmann and Brunelli (2002) describe the integration of advanced retrieval and indexing modules into a media archive system, which is one type of ECM. The authors claim that the system supports customizable structure and also supports the content during the whole content lifecycle.

In the evaluation phase, performance, benefits, and features of the system are assessed based on the required objectives that are designed in the adoption phase. In this phase, one can ask: does the system satisfy the needs of the organization? Päivärinta and Munkvold (2005) found that there is a mismatch between their observation and the actual measurement; they conclude that the actual ECM evaluation practices bear shortcomings. Norrfors (2007) evaluated the usability of Platina, which is one of the ECM systems in Sweden; the author provides suggestions to redesign the user interface based on Microsoft Windows standards.

2.2.3 Strategic managerial aspects

Two predominant strategic aspects that are discussed widely in ECM literature are change management and management commitment.

With regard to change management, vom Brocke and Simons (2008) and Brocke et al. (2009) propose an ECM-blueprinting framework, which manages process change in the organization. In the strategy and people change, Päivärinta and Munkvold (2005) present a content model for ECM providing an integrated perspective on information management; they conclude that change management is necessary to optimize fit among the type of content, enterprise,

infrastructure, and administration. They find that change management is crucial to gain management support by justifying ECM investment, and to deal with users' resistance. Munkvold et al. (2006) include change management as one of the major categories of ECM; according to their case study, user-related issues require change management such as motivating users for administrative and technological changes, and improving user skills to deal with the ECM technology. To solve this problem, they suggest that training programs and active user support are crucial. Based on Joha and Janssen (2010) several suggestions are used to manage change while implementing content management, such as continuous user involvement in the system design, providing post-implementation training, and pursuing funding and leadership engagement.

In addition, management commitment is also considered an important factor in ECM literature. For example, Nordheim and Paivarinta (2006) found that content management challenges include lack of management attention and commitment. Top management (and other employees) commitment is required to ensure that the new business processes and the new types of content are integrated into the system to benefit the whole organization (Kemp, 2007). Vidgen et al. (2001) found that lack of senior management commitment was a problem in adopting SiteScape as web content management.

2.3 CONCLUSION FROM LITERATURE ANALYSIS

From this literature review, we conclude that more research is needed in the three structural pillars of ECM. Although the tools dimension is the most discussed area in the ECM literature, there is still a need to discuss emerging technology topics such as cloud computing and enterprise mobile computing. Table 2.2 summarizes the proposed ECM research agenda.

The Four ECM Dimensions
Tools • Are the leading ECM systems suitable for the cloud computing platform? • What are the requirements of cloud computing architectural for ECM? • How can the existing IT infrastructure be integrated into the enterprise mobile solution? Strategy • Empirical proving of ECM strategic capabilities • How the investment of ECM can be justified? • How can organizations achieve the strategic capabilities of ECM? Process • More empirical ECM implementation • What are the potential tools, practices, guidelines that help in ECM implementation? People • How can different stakeholders be involved in ECM implementation? • What are the best training strategies that ensure higher workers' efficiency?
ECM System Lifecycle
Adoption • What is the impact of ECM adoption on the organizational performance? • What are the factors that affect ECM adoption? Acquisition • How can organizations select the ECM system that matches their needs? • What is the optimal acquisition planning methodology that organizations need to follow? Evolution • What are the challenges of ECM integration and how can they be solved? • What are the critical success factors for integrating ECM systems with existing information sources? Evaluation • How can the performance of ECM system be evaluated? • What are the different performance measures that match with different ECM perspectives?
Strategic Managerial Aspects
Change Management • What are the change management strategies that can handle different perspectives of ECM? How can these strategies be utilized? Management Commitment • How can the commitment of management to adopt ECM system be assured for the whole system lifecycle?

Table 2.2: Proposed ECM research agenda

In the strategy dimension, the literature lacks the empirical testing of the strategic effectiveness of ECM. Empirical research is needed to prove that the adoption of ECM has short-term and long-term effects. After proving the strategic effectiveness of ECM, researchers need to also focus on how that effectiveness can be achieved.

In the process dimension, we found that the ECM field lacks academic guidelines for successful implementation; empirical research that discusses ECM implementation is scarce. Gottlieb

(2005) concludes that "Full and successful ECM implementations are rare, if any exist at all"; he suggested several strategies for successful ECM implementation.

For instance, the author suggested utilizing the corporate metadata and taxonomy to have a holistic view of content. Also he suggested integrating content throughout the enterprise by establishing a federated content architecture. Usman et al. (2009) conclude, "…ECM domain is currently lacking the set of tools, techniques, practices and guideline for successful ECM implementations". In the people dimension, although stakeholders are discussed as a critical part of change management driver, research is needed to study the effects of involving different stakeholders in ECM implementation, how different stakeholders can be involved in ECM implementation, and what the best training strategies would be that ensure higher workers' efficiency.

In the adoption phase, although understanding the organizations' adoption of an idea, product, or technology is important to the success of the implementation of that idea or technology (Thompson, 1969; Pierce and Delbecq, 1977; Rogers, 1983), research in the adoption phase is still very scarce. Research is needed to analyze the impact of ECM adoption on organizational performance, and to determine the factors that affect that adoption.

In the acquisition phase, there is scarce academic research that investigates acquiring the right ECM system to match the specific needs of the organizations, although there are major practitioners' tools (i.e. Magic Quadrant from Gartner, and Forrester Wave report) that provide useful information about ECM acquisition. Research can focus on the methods of acquiring ECM systems as well as discussing the optimal acquisition planning methodology that organizations need to follow.

In the evolution phase, research is required to determine different challenges and solutions of ECM integration. Also, there is a need to specify the critical success factors of ECM integration with the existing information sources. For the evaluation phase, as mentioned in the previous sections, little research has been published, as also pointed out in (Tyrväinen et al. 2006). Research is needed to address how the performance of ECM can be evaluated, and what the different performance measures should be that correspond to different ECM perspectives.

In change management, a broader view is required to consider the strategies that can handle various perspectives (human and organizational) of ECM, and how these strategies can best be utilized. Management commitment is a critical success factor not only for ECM systems but also for other enterprise systems. Management commitment is required before, during, and after system implementation. Thus, research is needed to determine the best ways to assure management commitment for the whole system lifecycle.

2.4 SUMMARY

Although ECM can be viewed as an evolution of information management and its importance is becoming rapidly more evident, the ECM field lacks sufficient meta-analysis research that explains the current state of the field. Previous ECM reviews (Tyrväinen et al., 2006; Usman et al., 2009) do not adequately cover the diverse interacting aspects of the ECM field. In this chapter, we have reviewed and classified ninety-one ECM publications. We conclude that ECM systems involve several sophisticated and interacting aspects such as technical, social, organizational, and business. We believe that the current ECM literature is congregated around three pillars. The first pillar consists of the four ECM component dimensions (tools, strategy, process, and people). The second pillar is the enterprise system lifecycle (adoption, acquisition, evolution, and evaluation). The final pillar is the strategic managerial aspect (change

management, and management commitment). Based on the review, we suggested a research agenda around the aforementioned three pillars. We believe this chapter contributes to IS research by highlighting the significance of the ECM field and by assisting researchers in determining what has been done and what needs to be done in ECM research. The proposed research agenda helps in identifying problems in earlier studies, and draws the researchers' attention to the research gaps in the ECM field.

3. RESEARCH METHODOLOGY

This dissertation has mainly two research objectives, each of which will be accomplished by different methodology. The first objective is determining the decision support capabilities of ECM. This objective will be achieved by using structural equation modeling. The second objective is specifying how the decision support capabilities can be achieved. This objective will be accomplished by following design science guidelines.

3.1 PHASE 1: STRATEGIC CAPABILITIES OF ECM

The existing ECM literature indicates that many organizations seem to focus on operational benefits of ECM, while the strategic long-term benefits are rarely considered. Some research has analyzed the impact of ECM on organizational performance based on efficiency and content availability (vom Brocke et al., 2010); however, long-term benefits (i.e. supporting decision making and competitive intelligence) are not major drivers for ECM. A more strategic approach may result in better business value from ECM as organizations desire to do more with the accumulated information content. Therefore, the first objective is to determine the decision support capabilities of ECM.

Structural equation modeling (SEM) technique will be adopted to analyze the proposed hypotheses that are shown in figure 4.2. SEM is a statistical method used for simultaneous estimating and testing causal relationship among multiple dependent and independent variables (Gefen et al., 2000). SEM can be considered “second generational” multivariate analysis technique since it allows analyzing a group of interrelated research questions in a single comprehensive analysis (ibid).

Specifically, the proposed research model will be analyzed by using the partial least squares (PLS) technique as an approach of SEM. PLS is a component-based methodology that examines the structural equation models (Urbach and Ahlemann, 2010). We have selected PLS approach because it has the following characteristics. First, PLS can be described as "distribution free" since it has no assumptions (e.g. normality, independence of observation, sample size) regarding the data distribution (Chin, 1998). Also, sample size usually is not a problem in PLS because PLS can work with relatively small sample size (Cassel et al., 1999). PLS analysis avoids both factor indeterminacy and improper solutions that may happen when using other approaches (e.g. Covariance-based SEM) (Fornell and Bookstein 1982). Finally, PLS is considered a good causal predictive analysis approach when we have low theoretical information (Jöreskog and Wold 1982). As we discussed in literature review, we have low theoretical information regarding ECM and decision support capabilities.

We will conduct a web survey with the users of ImageNow system. ImageNow, which is manufactured by Perceptive Software Inc., is commercial ECM system for capturing, organizing, and managing content. The survey questionnaire consists of questions taken from other studies. Appendix C shows each measure and its related literature. The survey questionnaire consists of nine sections which includes 33 questions related to the hypotheses, one questions asking for general feedback, and 6 demographic questions. A five point Likert scale, where 1= strongly disagree and 5 = strongly agree, is used in the survey. The survey questionnaire is shown in appendix D.

The survey is reviewed and approved by the Virginia Commonwealth University Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. The survey will be sent to 626 users from

different departments at large research university, and SmartPLS software will be used to analyze the dataset.

3.2 PHASE 2: STRATEGIC MANAGEMENT FRAMEWORK

As we note from the previous chapters, the capacity for decision-making support of ECM is not utilized to any great extent, and there appears to be strong need to investigate the DS capabilities of ECM. In addition, the literature lacks a strategic management framework that links strategies, business objectives, and performance management. A strategic management framework would seem essential to effectively manage ECM strategy formulation, implementation, and performance evaluation (Ittner and Larcker, 1997; Kaplan and Norton, 1996). The absence of an appropriate strategic management framework will limit organizations from reaping the benefits of ECM capabilities. Therefore, the second objective of this study is to determine how the ECM strategies can be formulated, implemented, and evaluated in order to fully utilize the ECM strategic capabilities.

To achieve this objective, design science approach is adopted since it can provide us with a methodology to design and evaluate the proposed framework with the appropriate relevance and scientific rigor. Design science is considered a problem-solving process that "addresses research through the building and evaluation of artifacts designed to meet the identified business need". These artifacts are considered innovations that "define the ideas, practices, technical capabilities, and products through which the analysis, design, implementation, and use of information systems can be effectively and efficiently accomplished" (Hevner et al., 2004). The goal of design science is not the same as that of the behavioral science. Design science seeks utility which enlightens design while behavioral science seeks truth which enlightens theory. Design science approach is an accepted methodology in IS, and the main contribution of design science

research is its utility. The artifact is considered the core of the IS field (Orlikowski and Iaconno, 2001).

Rigor and relevance are essential requirements in design science. To ensure rigor, the designed artifacts are based on the literature of ECM, formal strategic planning (Thune and House, 1970; Greenley, 1994; Cohen and Cyert 1973; Steiner 1997), balanced scorecard, and strategy map (see next chapter). To ensure relevance, the construction of the artifacts is based on cyclical iteration of design, implement, feedback, and redesign. Also, evaluation of the artifact will be based on rigor methods (see table 3.2). Table 3.1 summarizes the design science guidelines, and the related points from this research.

Guideline	Description	Related points from this research
Guideline 1: Design as an Artifact	Design-science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation.	We have designed the following artifacts: • the strategic management framework • ECM balanced-scorecard • the ECM balanced scorecard-based strategy map
Guideline 2: Problem Relevance	The objective of design-science research is to develop technology-based solutions to important and relevant business problems.	• The capacity for decision-making support of ECM is not utilized to any great extent • The literature lacks a strategic management framework that links strategies, business objectives, and performance management. • A strategic management framework would seem essential to effectively manage ECM strategy formulation, implementation, and performance evaluation. • The absence of an appropriate strategic management framework will limit organizations from reaping the benefits of ECM capabilities.
Guideline 3: Design Evaluation	The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods.	Design evaluation will be (see table 5): • Observational (case study) • Descriptive (scenarios)
Guideline 4: Research Contributions	Effective design-science research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies.	Academic contribution: • The designed artifacts, which integrates the formal strategic planning (FSP) with the balanced scorecard (BSC), is a novel addition to the ECM body of knowledge • Implementing the artifacts in a real-world organization highlights the importance of linking strategies to performance measures in the ECM context Practical contribution: • Practitioners can use the artifacts to help them in more effectively deploying and evaluating ECM systems, and ultimately utilizing the decision support capabilities of ECM
Guideline 5: Research Rigor	Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.	Construction of the artifacts is based on the following literature: • Formal strategic planning literature • ECM literature • Balanced scorecard and strategy map literature Evaluation of the artifact will be based on the following methods: • Observational (case study) • Descriptive (scenarios)
Guideline 6: Design as a Search Process	The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment.	The artifact design will be based on cyclical iteration of design, implement, feedback, and redesign.
Guideline 7: Communication of Research	Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences.	• The results will be presented in related conferences and journals in a way that fellow researchers can comprehend • The results will be communicated to practitioners through the instantiation of the artifact in a case study in a police department at a large research university

Table 3.1: Design-science research guidelines (Hevner et al. 2004), and related points from this research

To evaluate the design science artifact, Hevner et al. (2004) suggested several evaluation methods that are shown in table 3.2. Observational evaluation (case study) and descriptive evaluation (scenarios) methods will be adopted in this research to evaluate the designed artifacts by studying the use of these artifacts in a practical case study setting. Specifically, we will evaluate the three artifacts in the implantation of ImageNow system (which is one type of ECM systems) in the police department of Virginia Commonwealth University. The evaluation methods that we plan to use in our research are checked in the last column of table 3.2.

Evaluation method	Description	Methods used in this research
1. Observational	Case Study – Study artifact in depth in business environment	
	Field Study – Monitor use of artifact in multiple projects	
2. Analytical	Static Analysis – Examine structure of artifact for static qualities (e.g., complexity)	
	Architecture Analysis – Study fit of artifact into technical IS architecture	
	Optimization – Demonstrate inherent optimal properties of artifact or provide optimality bounds on artifact behavior	
	Dynamic Analysis – Study artifact in use for dynamic qualities (e.g., performance)	
3. Experimental	Controlled Experiment – Study artifact in controlled environment for qualities (e.g., usability)	
	Simulation – Execute artifact with artificial data	
4. Testing	Functional (Black Box) Testing – Execute artifact interfaces to discover failures and identify defects	
	Structural (White Box) Testing – Perform coverage testing of some metric (e.g., execution paths) in the artifact implementation	
5. Descriptive	Informed Argument – Use information from the knowledge base (e.g., relevant research) to build a convincing argument for the artifact's utility	
	Scenarios – Construct detailed scenarios around the artifact to demonstrate its utility	

Table 3.2: Evaluation methods of design science artifacts

The artifact can be in four forms including: constructs, models, methods, and instantiations (March and Smith, 1995). In this research, the artifacts that we will design are: (1) the strategic management framework, (2) ECM balanced-scorecard, and (3) the ECM balanced scorecard-based strategy map. The combination of these three artifacts forms a *method* that "provide[s] guidance on how to solve problems, that is, how to search the solution space. These can range from formal, mathematical algorithms that explicitly define the search process to informal, textual descriptions of "best practice" approaches, or some combination" (Hevner et al., 2004). This method consists of constructs and models. *Constructs* can be defined as the vocabularies that "provide the language in which problems and solutions are defined and communicated" (ibid). Based on this definition, these four types of artifices are included in the proposed strategic management framework as shown in figure 3.1.

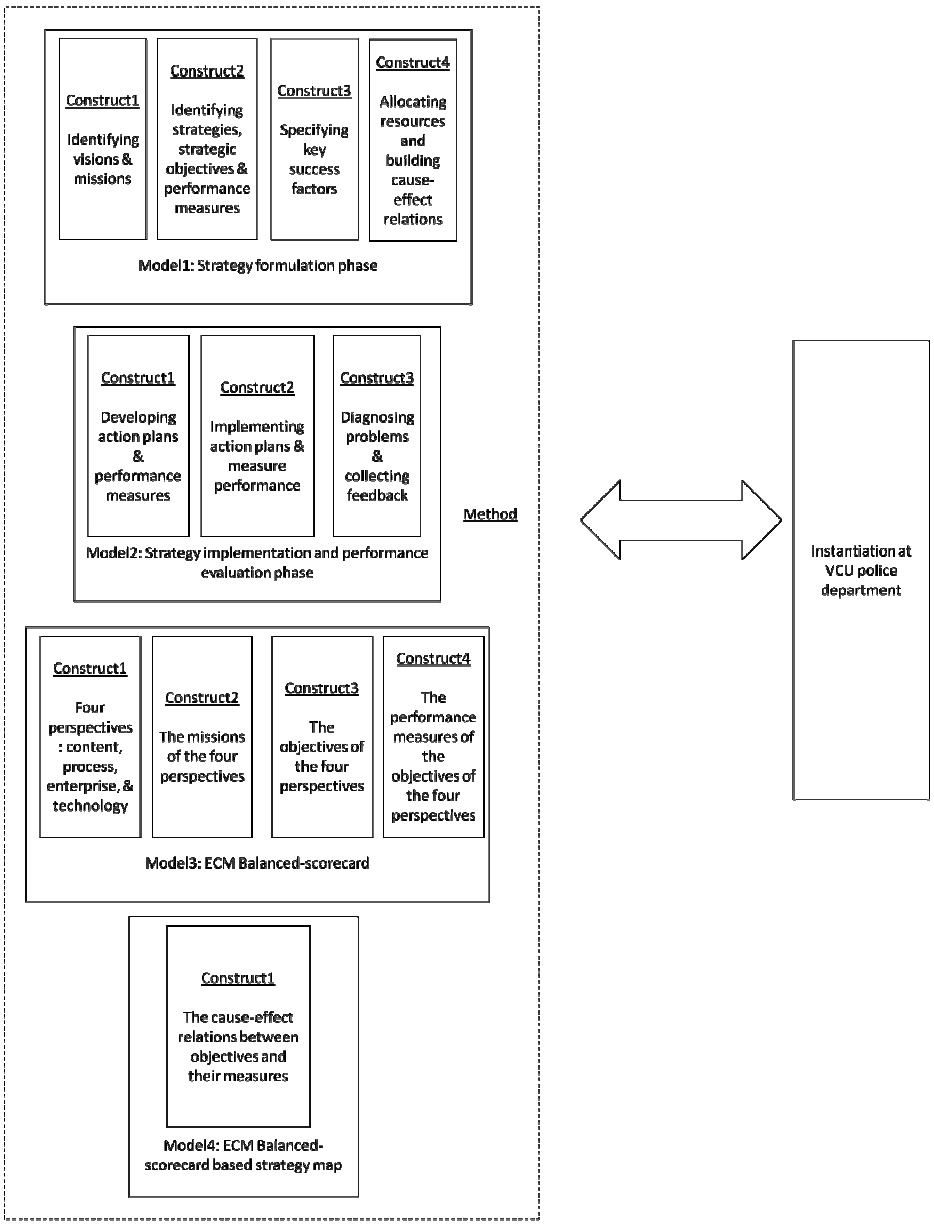

Figure 3.1: Designed artifacts and their types in the terms of Hevner et al. (2004)

As shown in the above figure, the seven steps of the strategic management framework, the four perspectives, their mission, objectives, and measures of the BSC, and the cause-effect relationship between the objectives and their measures can form the constructs. Also, Hevner et al. (2004) define *models* as follows: "Models use constructs to represent a real world situation …Models aid problem and solution understanding and frequently represent the connection

between problem and solution components enabling exploration of the effects of design decisions and changes in the real world." Therefore, the strategy formulation phase (Model 1), the strategy implementation phase (Model 2), BSC (Model 3), and strategy map (Model 4) can represent the models. We plan to demonstrate the utility of the constructs, models, and method by implementing them in a police department at a large research university. This demonstration represents the *instantiation* (the right side of figure 3.1) which "show[s] that constructs, models or methods can be implemented in a working system" (ibid).

4. HYPOTHESES AND MODEL DEVELOPMENT

From the above comprehensive literature review, the scope of this dissertation is the strategy dimension. Specifically, we attempt to answer the following two strategic questions:

1. What are the strategic (decision-making) capabilities of ECM?
2. How can the ECM strategies be formulated, implemented, and evaluated in order to fully utilize the ECM strategic capabilities?

In order to answer these two questions, we discuss in this chapter the proposed research models and their theoretical background. This section consists of two subsections: one for each research question

4.1 HYPOTHESE DEVELOPMENT: INVESTIGATING THE STRATEGIC (DECISION-MAKING) CAPABILITIES OF ECM

ECM systems enhance organizational processes by providing essential services such as capturing, creating, indexing, searching and accessing, organizing, and maintaining content (Reimer 2002; Smith and Mckeen 2003). An organization's performance is significantly impacted by effective "content stewardship" using the right information technology (Marchand et al. 2000). Looking at ECM as content stewardship, activities start with collecting the content (capture). According to Marchand et al. (2000), organizations should capture not only the content that facilitates operational activities, but also the content that may be used for business intelligence (i.e. market shifts, competitive innovation, economic changes, potential problems). The next activity of content stewardship is organizing the content to make it easily navigable (organize). The third stewardship activity is analyzing the content to help in decision-making (process), however only few firms analyze the content to improve decision-making. "In the rush

to use computers for all transactions, most organizations have neglected the most important step … the human realm of analyzing and interpreting data and acting on the insights" (Davenport et al. 2001, p.121). The fourth content stewardship activity is keeping content up-to-date (maintain); the content should be assessed regularly by humans to determine whether it continues to meet the dynamic needs of the organization (Meyers 2002; Arnold 2003). The 'maintain' activity is important to the other three activities because it is responsible for updating the content that allows for another content lifecycle. The last activity of content stewardship may include establishing standards for retention and disposal. The left side of figure 4.1 shows the content lifecycle with some of the ECM components. DS activities involve getting useful information to decision makers to help them in making decisions. DS activities are widely discussed in the literature. For example, Walker et al. (2003) investigated those activities from the 'uncertainty' point of view and specified policy analysis, integrated assessment, and risk assessment as DS activities. Howard (1988) defines three essential decision activities and calls them the decision base: choice, information, and value. In this part of the chapter, we adopt the sequential framework of Mintzberg et al. (1976), as it appears to be most useful for investigating the decision process (Molloy and Schwenk 1995), is widely accepted, and has much empirical support (Mazzolini 1981; Shrivastava and Grant 1985). The sequential framework consists of three phases: identification, development, and selection. Each phase is described in terms of several 'routines'. The right side of figure 4.1 shows these three phases, with the dotted arrows on the far right indicating that the decision maker may return to a previous phase as needed.

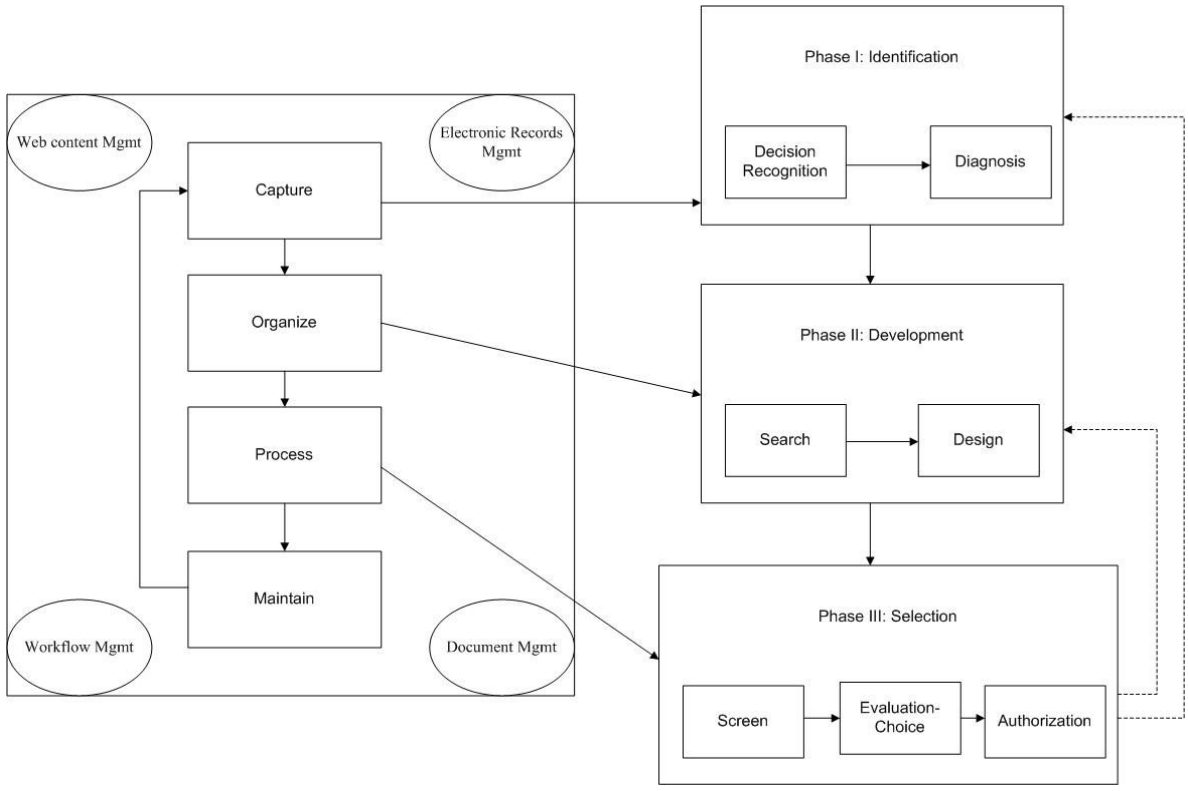

Figure 4.1: Content lifecycle and DS activities (the figure is based on ECM literature and Mintzberg et al. 1976)

4.1.1 Identification phase and capturing content

The identification phase consists of two routines, the first one being 'decision recognition,' which initiates the DS process by recognizing problems, opportunities, and crises. The second routine is 'diagnosis,' which refers to collecting the needed data or information to define and clarify the previously recognized problem, opportunity, or crisis. The content lifecycle plays a major role in this stage. Vital information about the enterprise can be gained through capturing the unstructured data (Reimer, 2002). For example, data collection through 'capturing' the content is essential to define the problem; ECM components such as web portals, are very useful in recognizing and defining the problem (Ackland et al. 2006). According to Marchand et al. (2000), content capturing includes collecting business intelligence that involves identifying crucial economic, political, and social problems, changes in customer demands, changes of

market trends, and potential problems that may occur with business partners. Such information will come from a variety of internal and external sources rather than a single source. Thus we state the following hypothesis:

H1a: the use of ECM systems in the DS identification phase has a positive impact on problem definition

H1b: the use of ECM systems is positively associated with the speed of problem identification

4.1.2 Development phase and organizing activity

The development phase also has two routines. The first one is the search routine where the decision makers apply different search activities to explore alternative solutions to the recognized problem. The second is the design routine where a new solution is suggested, or solutions that are identified in the search routine are modified to fit the specific problem situation. One type or component of ECM is information searching (Smith and McKeen 2003), which facilitates getting the right information to find potential solutions to the problem. The 'organize' activity of ECM also facilitates searching since it involves indexing and connecting content to databases (Marchand et al. 2000). Organizing content is accomplished through taxonomy and metadata, which facilitate variable analysis. As an ECM strategy, taxonomy allows users to find relevant data quickly (Kemp 2007). Corcoran (2002) suggested that taxonomy, which involves classifying content by keywords, is an essential step in organizing content. Metadata, which is data about content and its location, provides the pathway to the content, similar to a 'card catalog' that specifies the location of a library book (Lee et al. 2001). Sykes et al. (2009) argued that content management systems are able not only to organize but also to create better information access. Thus, we state the following hypotheses:

H2: the use of ECM systems in the development phase is positively associated with the decision making analysis

4.1.3 Selection phase and processing activity

The selection phase starts with a screening routine, which is activated to eliminate any impractical alternatives. Next, the best alternative is selected through a process of analysis in the evaluation-choice routine. Finally, the decision goes through the authorization routine, involving an authorized decision maker, in case the individual controlling the DS process does not have the required authority to take the organization to a specific course of action. On the ECM side, the definition of 'process' activity includes analyzing the content, which helps in selecting the best alternative in the shortest possible time. For example, Kettinger et al. (2003) reported that one company, Skandia Group, did very well in analyzing the content to select the best decision alternative by using ECM systems that helps in turning human capital (i.e. skills and experience) into structural capital (i.e. customer relationships). Processes of content management systems, such as defining, standardizing, storing, and delivering, usually enable more effective management (Guenther 2001; Sykes et al. 2009). Kemp (2007) reported that respondents found the primary benefit of ECM in reducing the time looking for content. The content management systems (CMS) at Volvo Group enhance the efficiency of business processes (Karlsson and Gennas 2005). The shared-service content management system in Virginia helped in reducing the time and cost of solving 'records retention issues' (Joha and Jannssen 2010). Thus, we state the following hypotheses:

H3a: the use of ECM systems is positively associated with decision quality

H3b: the use of ECM systems is positively associated with the speed of decision making

The user plays a major role in ECM systems (Davenport et al. 2001) as well as in DS activities (DeSanctis and Gallupe 1987). Shang and Seddon (2002) argue that ECM systems have a potential impact on improving employees' satisfaction due to better work efficiency. ECM adoption is one method that can improve the organization's efficiency and increase workers' satisfaction (Andersen 2008). ECM technology is also applied in the medical field: Päivärinta and Munkvold (2005) found that ECM implemented at Johns Hopkins University Hospital satisfies both physicians and patients. So we may assume that ECM positively affects the decision makers' satisfaction, and we postulate:

H4: the use of ECM systems is positively associated with decision maker satisfaction

Figure 4.2 summarizes the hypotheses, and appendix C summarizes the development of these measures.

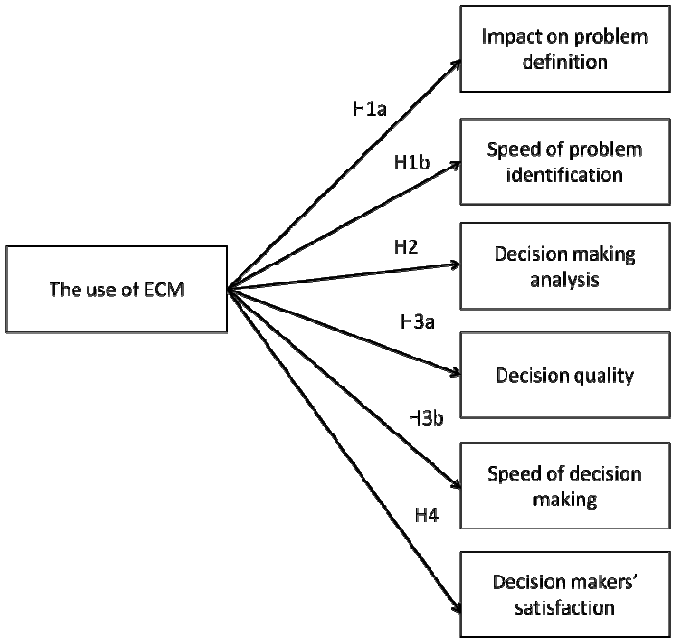

Figure 4.2: The proposed hypotheses

4.2 DEVELOPMENT OF THE STRATEGIC MANAGEMENT FRAMEWORK

Before the 1990s, files and databases were the most common methods to organize information (Sprague, 1995). With the emergence of Internet technologies, organizations have experienced a tremendous growth in information assets in intranets, extranets, and websites. The solution that is used to manage the content of these assets are the enterprise content management systems. Many prominent software vendors have jumped on this bandwagon. ECM systems enhance the organizational processes by providing essential services such as capturing, creating, indexing, searching, accessing, organizing, and maintaining content (Reimer, 2002; Smith and McKeen, 2003). Arnold (2003) found that many localized content management projects end up with cost overruns and scope confusion due to a lack of strategic insights.

Several studies focus on ECM strategy development. They include justifying ECM investment, information audit, and implementing ECM technologies. Rockley et al. (2003) proposed standard guidelines to develop content management strategies. O'Callaghan and Smits (2005) proposed an approach for creating business value by guiding IT investments and selecting content objects for ECM. Smith and McKeen (2003) found that organizational performance may be affected significantly by prescribing the right practices of content stewardship, and the right information technology and behavior. Literature also discusses ECM implementation and customization (Nordheim and Paivarinta, 2004; 2006). To provide an integrated perspective on information management, a content model for ECM was put forth by Päivärinta and Munkvold (2005); they found that there was a mismatch between their observation and the actual measurement, and they concluded that the there are shortcomings in the actual evaluation practices.

The Balanced Scorecard (BSC) is a management instrument that provides a framework for linking performance measures with strategic goals. It was developed by Kaplan and Norton

(1996) and uses four perspectives for performance assessment - financial, customer, internal process, and learning and growth. One important concept of BSC is the expression of cause-and-effect links between strategic objectives and performance measures (Banker et al., 2004). Strategy maps are used to depict the linkages between the goals (i.e. strategic objectives) and the desired target (i.e. performance measures). It is used as a communication method to help explain the strategies to all parties in an organization, and to detect major gaps in implemented strategies. Kaplan and Norton (2003) suggested that a strategy map should be developed starting from the strategic objective (destination) and end with the strategies (methods) that lead to this destination. For example, if the organization wants to achieve the financial objectives (financial perspective), it should accomplish the following: the customer objectives (customer perspective) by delivering high quality products, the internal process objectives (internal process perspective) by improving the production efficiency, and the learning and growth objectives (learning and growth perspective) by building organizational capabilities.

BSC is implemented widely in the information systems (IS) field. For example, Martinsons et al. (1999) adopted a special information technology (IT) balanced scorecard for the strategic management process in IT. The justification behind suggesting the IT balanced scorecard was that IT is typically handled by an internal unit that benefits end users and organizations rather than external customers in the large marketplace. The four perspectives of the IT balanced scorecard are - user orientation, business value, internal processes, and future readiness (Martinsons et al., 1999). Herath et al. (2010) implemented BSC to propose a framework for IT security strategy, and Chien-Chih (2007) designed a BCS value-based strategic management framework for electronic government that supports planning and implementation of e-government strategies. Huang and Hu (2007) used BSC to align four key elements of IT-business

alignment, namely, integrated planning, effective communication, active relationship management, and institutionalized culture of alignment.

From reviewing the BSC literature, we conclude three important points. First, BSC is an accepted strategy formulator, not only among practitioners, but also among IS and management academics. Second, while BSC can be used to design strategic management systems applicable at the corporate level, it can also be used to design strategic management for functional and system levels. Third, BSC, with its capability of determining strategies, strategic objectives, and performance measures of a system can be utilized to design and evaluate a strategic management framework. Thus, the issue of adopting BSC to the ECM domain deserves further investigation.

4.2.1 Theoretical Background

The proposed framework (see figure 4.3) is based on the strategic management literature that investigates the relationship between formal strategic planning (FSP) and organizational performance. As one of the first papers that examine this relationship, Thune and House (1970) conclude that formal planners get better economic benefits than non-planners. Generally, strategic management literature implies that there is a positive relationship between FSP and performance (Greenley, 1994). Two phases are considered essential in FSP, namely a phase for strategy formulation, and a phase for strategy implementation and performance evaluation (Cohen and Cyert 1973; Steiner 1997).

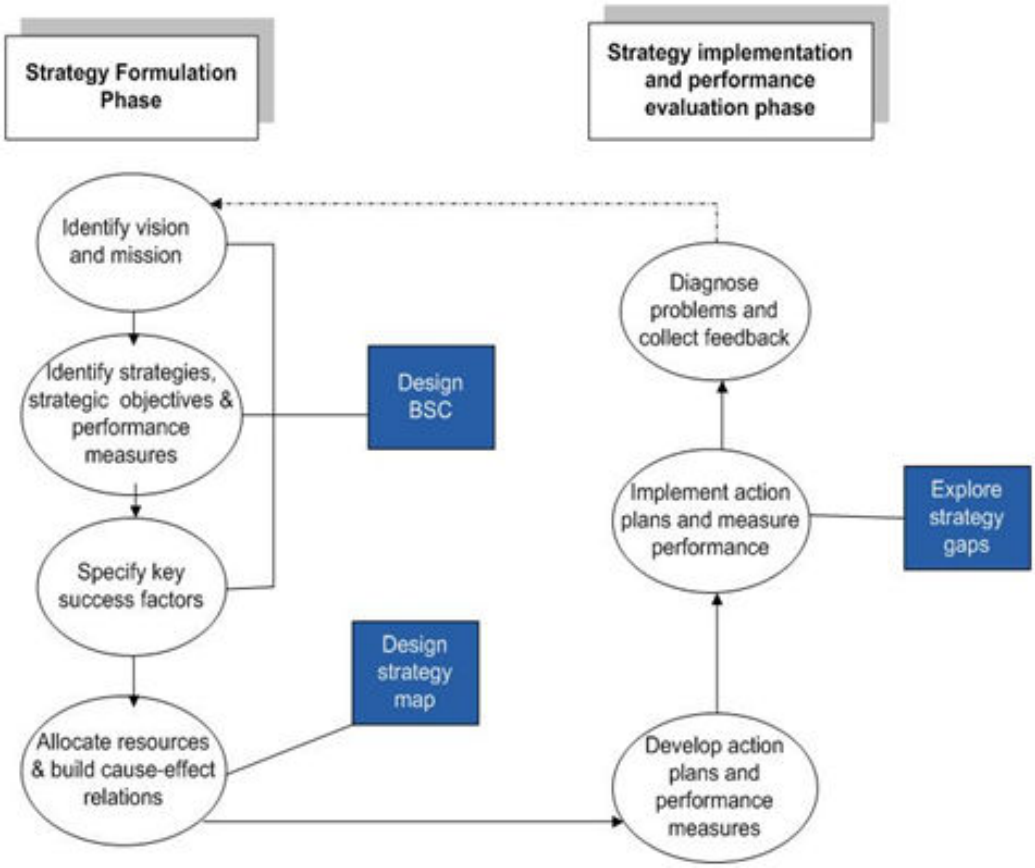

Figure 4.3: Formal strategic planning for ECM

The proposed framework integrates the formal strategic planning (FSP), with the balanced scorecard (BSC). Tyrvainen et al. (2006) proposed a framework (see figure 4.4) for ECM research that consists of the following four perspectives: content, technology, process, and enterprise. The content perspective is related to information about content (i.e. dealing with the semantics of the content, content presentation), users and their relationship with content, and systems where content resides. The technology perspective pertains to hardware, software, and standards. Although Tyrvainen et al. (2006) considered technology as an important perspective, they insisted that ECM research should focus more on systems rather than technologies because systems encompass several technologies. The process perspective includes development (implementation and maintaining ECM systems) and deployment processes (implementation of

content lifecycle activities). The enterprise perspective addresses the economic, organizational, and social aspects.

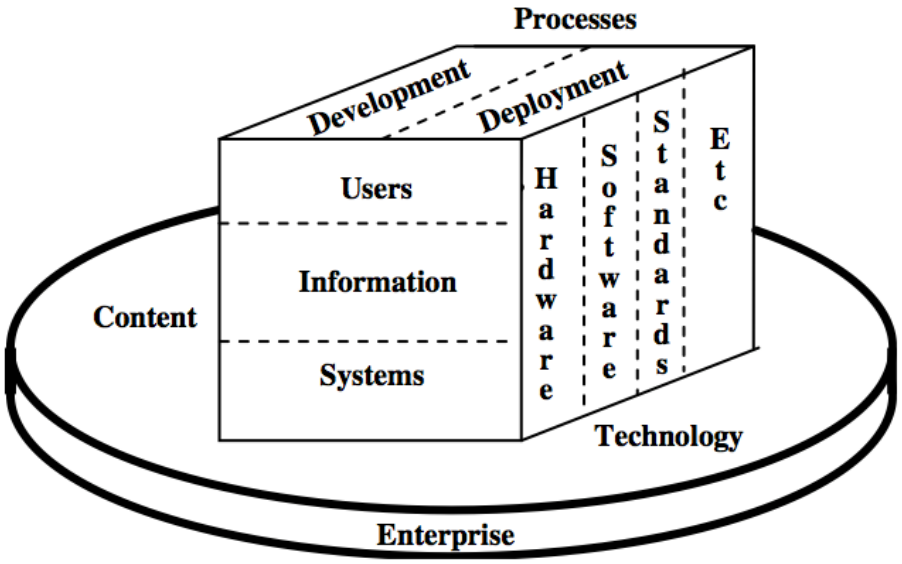

Figure 4.4: Four perspectives (Tyrvainen et al. 2006)

This theoretical background is an accepted theoretical basis in ECM field. For instance, vom Brocke et al. (2009) adopted this framework to associate between business process management and ECM; they proposed the ECM-blueprinting framework, which is a process-oriented framework, to organize the adoption of ECM system.

We propose that these four perspectives can be used to form a specialized balanced-scorecard for ECM as depicted in figure 4.5. The content perspective, which consists of users, information, and systems views, is equivalent to Customer perspective. The ECM process perspective, which includes development and deployment, can be compared to the perspective of Internal Process. The Technology perspective, that combines hardware, software, and standards, can be

correspondent to Learning & Growth perspective. Finally, The Enterprise perspective, that includes economic and social aspects, can be parallel to the Financial perspective.

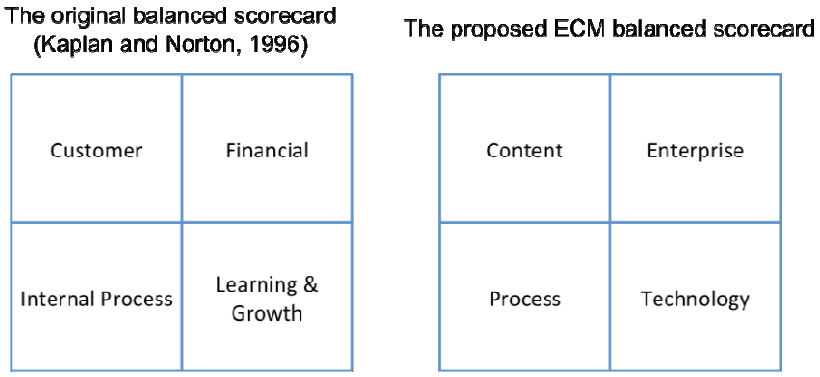

Figure 4.5: The ECM balanced scorecard versus the original balanced scorecard

4.2.2 Description of the Proposed Framework

As shown in figure 4.3, two phases are considered essential in strategic management, namely a phase for strategy formulation, and a phase for strategy implementation and performance evaluation (Cohen and Cyert, 1973).

The strategic management process starts with the strategy formulation phase. The first step in that phase is identifying the vision and mission. The vision suggests the future probable outcomes and positions associated with the ECM system, while the mission articulates what needs to be done in order to reach the future outcomes. Whatever the vision may be, top management commitment should always be included, since management commitment is a key success factor of information systems strategic management (Aladwani, 2001). ECM systems are no exception in this regard. In the second step, strategies and strategic objectives need to be identified. Also, performance indicators, which measure the accomplishments of strategic objectives, need to be determined and categorized. The identification of key success factors comes next in the third step. The key factors for system success should be determined based on

management experience and research. Strategies will help in undertaking the missions and strategic objectives that have been identified earlier. The key success factors will ensure the plan includes the right actions required to accomplish the goals. The balanced scorecard should be designed after completing the first three steps (the design of the BSC is discussed in the next section). The fourth step consists of allocating the required resources (i.e. skilled workers) that are necessary for achieving the specified strategies. Also, cause-and-effect relations should be defined at this juncture. Once all activities that help in achieving the strategic objectives are explored, the cause-and effect relationships can be built among strategies, strategic objectives, and performance indicators. The cause-and-effect relationships can be depicted in the strategic map (an example of strategic map is shown in figure 4.6).

After building the cause-and-effect relations, we move to the second phase of the strategic management process, namely strategy implementation. Action plans and performance measures are developed first. Then the action plans are implemented by the responsible team and/or vendor. After deployment, data for the performance measures are collected and analyzed to reveal the actual performance. Strategy gaps, i.e. missing links between strategies, strategic objectives, and performance measures, should be explored at this step. Any difference between the expected performance and the actual performance may be indicative of a problem that will require investigation and corrective action. The corrective action, in addition to any feedback from the strategy formulation and implementation can be utilized to close the strategic gaps by modifying the vision and mission. The dotted arrow shows that the newly modified vision and mission will trigger a new cycle for the process of strategic management.

4.2.3 Description of ECM balanced-scorecard

As indicated in the introduction of this section, BSC can be applied both at the corporate level and the functional and project level (Martinsons et al., 1999). We adopt Tyrvainen et al. (2006) framework to develop the framework of ECM balanced scorecard. Consistent with Tyrvainen et al. (2006), the four perspectives of the suggested ECM balanced scorecard are Content perspective, Process perspective, Enterprise perspective, and Technology perspective. The ECM balanced scorecard with the mission, strategic objectives, and performance indicators are depicted in table 4.1. Before discussing the proposed ECM BSC, it is important to highlight two points. First, the proposed objectives and their performance measures are by no means comprehensive. We give only some examples based on ECM literature review. Objectives and performance measures should be modified according to the organizations needs. Second, two organizations may differ in adopting the objectives and their measures based on their organizational goals and priorities.

For the Content perspective, it includes information view and user view (i.e. internal and external beneficiaries) that receive services from the ECM system. Internal beneficiaries are the intranet users, and the external beneficiaries are the corporate portal users. The mission here is providing ECM value-adding services to the internal and external beneficiaries. Strategic objectives include improving internal and external collaboration, providing new (or modified) customer products and/or services that involve digital content, reducing work load by streamlining tedious routines (Päivärinta and Munkvold, 2005), enhancing content quality and consistency (Rockley et al., 2003), information traceability, enabling secure, easy, and correct access to information, provisioning legal requirements, limiting duplication (Nordheim and Paivarinta, 2006), improving the speed of search and retrieval (Seeley, 2002), and providing effective training to raise the efficiency of employees. The associated performance measures may include degree of

participation and collaboration, degree of end-users satisfaction, degree of confidence and trust, degree of accessibility, number of new (or modified) products/services that involve digital content, number of registered users, search to retrieval ratio, number of training courses that match each employee's training plan, and employees' skills and productivity ratio.

Content perspective	Enterprise perspective
Mission: Implementing ECM services to provide content value to the internal and external beneficiaries **Objectives** Improve internal and external collaboration Enhance content quality and consistency Search and retrieval function Provide new (or modified) customer products and/or services that involve digital content Make the work easier for workers by reducing the tedious routines Having information traceability Having secure, easy, and correct access to information Provide effective training that raises the efficiency of employees **Performance measures** Degree of participation and collaboration Degree of users' satisfaction Degree of confidence and trust Degree of accessibility Search to retrieval ratio Number of new digital products and services Number of courses that match employees' training plan Employees' skills and productivity ratio	**Mission:** Contribution of ECM to the value of the business by enabling corporate communication at all strategic levels **Objectives** Cost savings in information processing Enhance decision making process Satisfy governmental regulations and standards (compliance) Having professional representation of the enterprise in the eyes of its stakeholders Diversify revenue streams Improve the efficiency of the organization Improve the quality of all organization activities Increase the flexibility of dealing with disasters **Performance measures** Return on investment Speed of problem identification Speed of decision making Quality of decisions Percent of cost saving Degree of budget efficiency Degree of fulfilling legal requirements Disaster recovery ratio
Process perspective	**Technology perspective**
Mission: Implementing and maintaining ECM system, and implementing ECM activities (i.e. create, capture, store) effectively **Objectives** Enhance the organization business processes Enhance metadata flow throughout organization Expect and influence (if possible) the requests of ECM services from end-users and management Maintain an effective content lifecycle among different users Ensure that business processes match legislative requirements **Performance measures** The reuse ratio of previously created content, templates, metadata, and navigation aids The number of simplified business process Cost and time of demanding and delivering services	**Mission:** Developing and operating ECM applications while ensuring continuous enhancement and being ready for future challenges **Objectives** Integrate ECM applications with the current and new applications Provide security techniques to ensure content is secure Develop the required platforms and capabilities Manage software updates and revisions Ensure that applications are able to simplify the collaboration and content management process Having customizable tools to support new work processes **Performance measures** Integration success to integration problem ratio ECM application to simplified process ratio Degree of application customizability related to supporting business process

Table 4.1: ECM balanced-scorecard

With regard to the ECM Process perspective, the mission is to implement and maintain ECM system, and ECM activities (i.e. create, capture, store) effectively. The strategic objectives include enhancing the organizational business processes (vom Brocke et al., 2010), enhancing metadata flow throughout the organization (Nordheim and Paivarinta, 2006), expecting and influencing the requests of ECM services from end-users and management, maintaining an effective content lifecycle among different users, and ensuring that business processes match legislative requirements. The performance measures can be the following. The reuse percentage of previously created content, templates, metadata, and navigation aids, the number of simplified business process, and the cost and time of demanding and delivering services.

For the Enterprise perspective, the mission is the ability of ECM to contribute to the organizations' business value by enabling corporate communication at all strategic levels. Strategic objectives include cost savings in information processing (Rockley et al., 2003; Päivärinta and Munkvold, 2005), enhancing decision making (Kettinger et al., 2003), satisfying governmental regulations and standards (compliance), enhancing professional representation of the enterprise in the eyes of its stakeholders (Päivärinta and Munkvold, 2005), and increasing the efficiency and the flexibility of business processes (Reimer, 2002). The associated performance measures may include return on investment, speed of problem identification, speed of decision making, quality of decisions, percent of cost saving, degree of budget efficiency, and percent of redesigned business processes.

For innovation and learning related to Technology perspective, the mission is developing and operating ECM applications while ensuring continuous enhancement and being ready for future

challenges. The specified strategic objectives include integrating ECM applications with the current and new applications, developing the required platforms and capabilities, managing software updates and revisions (Päivärinta and Munkvold, 2005), ensuring that applications are able to simplify the collaboration and content management process, having customizable tools to support new work processes (Nordheim and Paivarinta 2006), and planning hardware and software upgrades as needed. The following performance measures are applicable in this regard. Integration success to integration problem ratio, ECM application to process simplifying initiatives, and degree of application customizability related to supporting the business process.

Determining the key success factors is crucial to ensure that the design addresses the correct and necessary actions required to accomplish the goal. The key success factors (KSF) are the extent to which usable services and systems, high security, privacy and trust can be provided. KSF can include top management commitment, stakeholders' involvement, and adopting effective change management strategies. Additional success factors can also be specified based on experience, established literature or industry guidelines.

4.2.4 Description of the ECM balanced scorecard-based strategy map

Strategy maps depict the cause-and-effect relationships among strategic objectives and performance measures (Kaplan and Norton, 1996; 2003). After determining the strategies, strategic objectives, the performance indicators, and the key success factors, the strategy map can be drawn. Figure 4.6 illustrates an example of a strategy map. For instance, a cause-and-effect link can be drawn between the "Enhance content quality and consistency" strategic objective in the Content perspective and its performance measures. In this case, the strategy is Content strategy; the strategic objective is to enhance content quality and consistency, and the

performance measure is the degree of beneficiary's confidence and trust. A sequence of cause-and-effect links can be drawn from all strategic objectives in all BSC perspectives. It is expected that multiple strategic objectives may share one or more key success factors and performance measures.

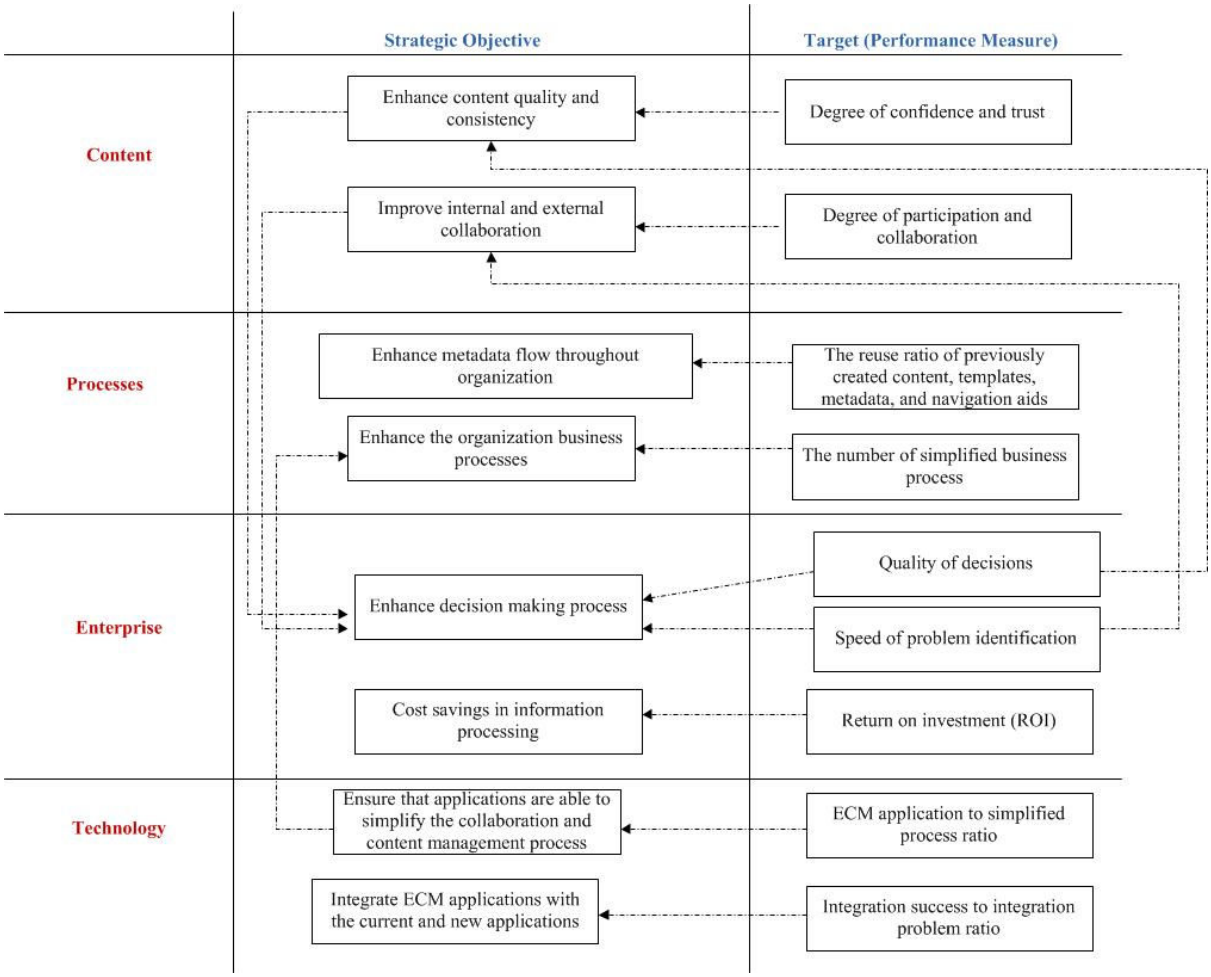

Figure 4.6: ECM balanced scorecard-strategy Map

Based on the strategy map and steps mentioned above, action plans can then be developed. Strategic gaps occur when there are missing links among strategies, strategic objectives, and performance measures. They highlight strategic objectives that are not supportive of each other. For instance, if the objective "Provide security techniques to ensure content is secure", and the

objective “maintain an effective content lifecycle among different users” are not included in the ECM-balanced scorecard, then the objectives “having secure, easy, and correct access to information”, and the objective “satisfy governmental regulations and standards” may not be successfully accomplished. Conversely, any strategic gaps that may be present will have a negative impact on performance measures. In this case, a thorough analysis of the cause-and-effect link has to be conducted, the results of which will be inputs to the strategy formulation phase. The iterative process is repeated until the strategic gaps are minimized or eliminated.

4.3 SUMMARY

Understanding the relationship between ECM and DS is crucial to identifying and utilizing the potential benefits of ECM technologies for DS activities. The first part of this chapter is an attempt to analyze this relationship. Based on ECM literature and Mintzberg et al. (1976), this chapter calls attention to the DS capabilities of ECM. A framework that describes the relationship, as well as several hypotheses are presented, to prove (or refute) the association between ECM and decision support capabilities.

In this chapter, we also propose a strategic ECM management framework based on balanced scorecard and strategy map. We also discuss the theoretical background for the proposed framework. From this chapter, we propose three artifacts: (1) the strategic management framework, (2), ECM balanced-scorecard, and (3) the ECM balanced scorecard-based strategy map.

The proposed artifacts will serve both academics and practitioners. For the academics, the designed artifacts, which integrates the formal strategic planning (FSP) with the balanced scorecard (BSC), is a novel addition to the ECM body of knowledge. Implementing the artifacts

in a real-world organization highlights the importance of linking strategies to performance measures in the ECM context. For practitioners, focusing on the four perspectives of the ECM-balanced scorecard, provides practical tools (i.e. BSC, and strategy map) to help align ECM strategies with performance measures. Practitioners can use the artifacts to help them in more effectively deploying and evaluating ECM systems, and ultimately utilizing the decision support capabilities of ECM.

5. RESULTS OF PHASE I: STRATEGIC CAPABILITIES OF ECM

To examine the proposed hypotheses in chapter 4, we have conducted a web survey with the users of ImageNow system. ImageNow, which is manufactured by Perceptive Software Inc., is a commercial ECM system for capturing, organizing, and managing content. The survey questionnaire consists of questions taken from other studies. Appendix C shows each measure and its related literature. The survey questionnaire consists of nine sections which includes 33 questions related to the hypotheses, one questions asking for general feedback, and 6 demographic questions. A five point Likert scale, where 1= strongly disagree and 5 = strongly agree, is used in the survey. The survey questionnaire is shown in appendix D. Data were collected and managed using REDCap (Research Electronic Data Capture) software hosted at a large research university. REDCap is a web-based application designed to support data management for research studies. REDCap provides the following: 1) a validated data entry through an intuitive interface; 2) tracking data manipulation and export procedures by having audit trails; 3) allowing data downloads to common statistical packages by having an automated export procedures; and 4) allowing data importing from external sources (Harris et al., 2009).

In the pilot phase, the committee members have evaluated the usability and the language of the survey. Based on their feedback, the survey was slightly modified. We sent the survey to 618 ImageNow users. In the collection phase, we received 157 responses; 111 of these were usable. Table 5.1 shows the distribution of the respondents by department.

Department	Number of Respondents
Budget and Resource Analysis	1
Business Operations	1
Business Services	2
Department of Psychology	1
Facilities Management	4
Faculty Affairs	1
Financial Aid	6
Global Education Office	7
Graduate School	5
Grants and Contracts	6
Human Resources	7
International Admissions	2
Massey Cancer Center	3
payroll services	3
Planning & Design	1
Procurement Services	4
Records and Registration	2
School of Business	1
School of Dentistry	1
School of government and public affairs	1
School of medicine	4
School of Nursing	1
School of pharmacy	1
School of Social Work	3
Student Accounting	2
Technology services	3
Transfer Center	1
Undergraduate Admissions	9
Unspecified	28
Total	111

Table 5.1: The distribution of respondents by department

Table 5.2 shows the descriptive statistics of the respondents. The proposed research model is analyzed using a PLS structural equation modeling tool, which evaluates the psychometric properties of the measurement model and estimates the parameters of the structural model (Chin, 1998). SmartPLS software is used to analyze the dataset. The results of the PLS analysis are presented in two sections: the results of the measurement model, and the results of the structural model.

Measure	Value	Frequency	Percentage
Gender	Male	26	24%
	Female	69	62%
	Unspecified	16	14%
Age	20-29	18	16%
	30-39	18	16%
	40-49	19	17%
	> 50	22	20%
	Unspecified	34	31%
Education	Bachelor degree	42	38%
	Masters degree	25	23%
	Doctorate degree	9	8%
	Unspecified	35	31%
Ethnicity	White, Euro-American	51	46%
	Black, African American	27	24%
	Asian, Pacific Islander	2	2%
	Native American	2	2%
	Unspecified	29	26%

Table 5.2: Descriptive statistics of respondents

5.1 THE MEASUREMENT MODEL

Reliability results are shown in Table 5.3. As indicated by the composite reliability, the measures of the internal consistency reliability are robust because the values exceed the recommended threshold value of 0.70 (Nunnally, 1978). In addition, the average variance extracted (AVE) for each measure exceeds 0.50, which is consistent with the recommendations of Fornell and Larcker (1981).

Variable constructs	The composite reliability (internal consistency reliability)	Average variance extracted/explained
1. Decision making analysis	0.90	0.75
2. Decision making speed	0.96	0.93
3. Decision quality	0.93	0.78
4. The use of ECM	0.85	0.66
5. Impact on problem definition	0.90	0.66
6. Problem identification speed	0.91	0.83
7. Satisfaction	0.95	0.61

Table 5.3: Reliability results

The discriminant validity of the variable constructs is reported in Table 5.4. The discriminant validity means that the construct is different from other constructs. The square roots of the AVEs, which are the numbers in the matrix diagonal, are greater than the off-diagonal elements in all rows and columns. This result, which matches the recommendation of Hair et al. (2006), supports the discriminant validity of the scale used.

Latent variables	1	2	3	4	5	6	7
1. Decision making analysis	**0.87**						
2. Decision making speed	0.48	**0.97**					
3. Decision quality	0.59	0.63	**0.89**				
4. The use of ECM	0.31	0.43	0.41	**0.81**			
5. Impact on problem definition	0.62	0.55	0.64	0.57	**0.81**		
6. Problem identification speed	0.49	0.57	0.51	0.59	0.67	**0.92**	
7. Satisfaction	0.57	0.74	0.71	0.64	0.73	0.74	**0.78**

Table 5.4: Discriminant validity results

We have extracted the factor loadings and the cross loadings of the variables in order to test the convergent validity. The factor loadings and the cross loadings are shown in table 5.5. All factor loadings on their assigned latent variables are higher than their cross loadings on all other latent variables. In addition, the T-statistics of the outer model loadings range from a low value of 11 to a high value of 151, which demonstrates that each item's factor loading is highly significant. In summary, the results of the validity and reliability tests are satisfactory.

	DMA	DMS	DQ	IPD	PIS	SATS	USE
DMA1	**0.90**	0.41	0.54	0.53	0.43	0.52	0.28
DMA2	**0.88**	0.44	0.56	0.52	0.40	0.50	0.28
DMA3	**0.83**	0.41	0.44	0.57	0.45	0.45	0.26
DMS1	0.50	**0.96**	0.61	0.53	0.53	0.71	0.37
DMS2	0.44	**0.98**	0.61	0.54	0.58	0.73	0.45
DQ1	0.55	0.56	**0.90**	0.60	0.49	0.63	0.40
DQ2	0.51	0.53	**0.89**	0.51	0.42	0.60	0.32
DQ3	0.55	0.55	**0.87**	0.61	0.46	0.62	0.33
DQ4	0.47	0.59	**0.90**	0.55	0.45	0.67	0.39
IPD1	0.41	0.51	0.46	**0.75**	0.58	0.58	0.49
IPD2	0.53	0.51	0.59	**0.81**	0.56	0.63	0.47
IPD3	0.52	0.42	0.54	**0.88**	0.56	0.67	0.47
IPD4	0.51	0.41	0.51	**0.82**	0.47	0.51	0.37
IPD5	0.54	0.40	0.50	**0.82**	0.56	0.57	0.51
PIS1	0.51	0.50	0.47	0.62	**0.92**	0.74	0.54
PIS2	0.38	0.56	0.47	0.61	**0.91**	0.62	0.54
SATS1	0.35	0.57	0.56	0.53	0.63	**0.83**	0.66
SATS2	0.44	0.46	0.44	0.58	0.59	**0.77**	0.43
SATS3	0.38	0.50	0.51	0.56	0.52	**0.79**	0.55
SATS4	0.27	0.52	0.47	0.50	0.57	**0.79**	0.60
SATS5	0.38	0.49	0.47	0.46	0.48	**0.72**	0.43
SATS6	0.51	0.55	0.58	0.57	0.53	**0.77**	0.55
SATS7	0.43	0.58	0.66	0.57	0.58	**0.77**	0.45
SATS8	0.53	0.58	0.60	0.69	0.71	**0.82**	0.54
SATS9	0.52	0.54	0.59	0.62	0.55	**0.74**	0.38
SATS10	0.50	0.63	0.65	0.66	0.61	**0.83**	0.46
SATS11	0.45	0.87	0.59	0.55	0.61	**0.79**	0.42
SATS12	0.53	0.76	0.58	0.58	0.57	**0.77**	0.42
SATS13	0.58	0.63	0.60	0.68	0.63	**0.78**	0.50
USE1	0.24	0.35	0.33	0.47	0.51	0.53	**0.87**
USE2	0.25	0.32	0.29	0.48	0.46	0.49	**0.86**
USE3	0.27	0.37	0.38	0.44	0.46	0.54	**0.69**

Table 5.5: Results of factor loadings and cross loadings

5.2 THE STRUCTURAL MODEL

The path coefficients and significance of each hypothesis and the variance explained (R2) are shown in Figure 5.1. The beta path coefficients are positive and statistically significant at $P < 0.001$.

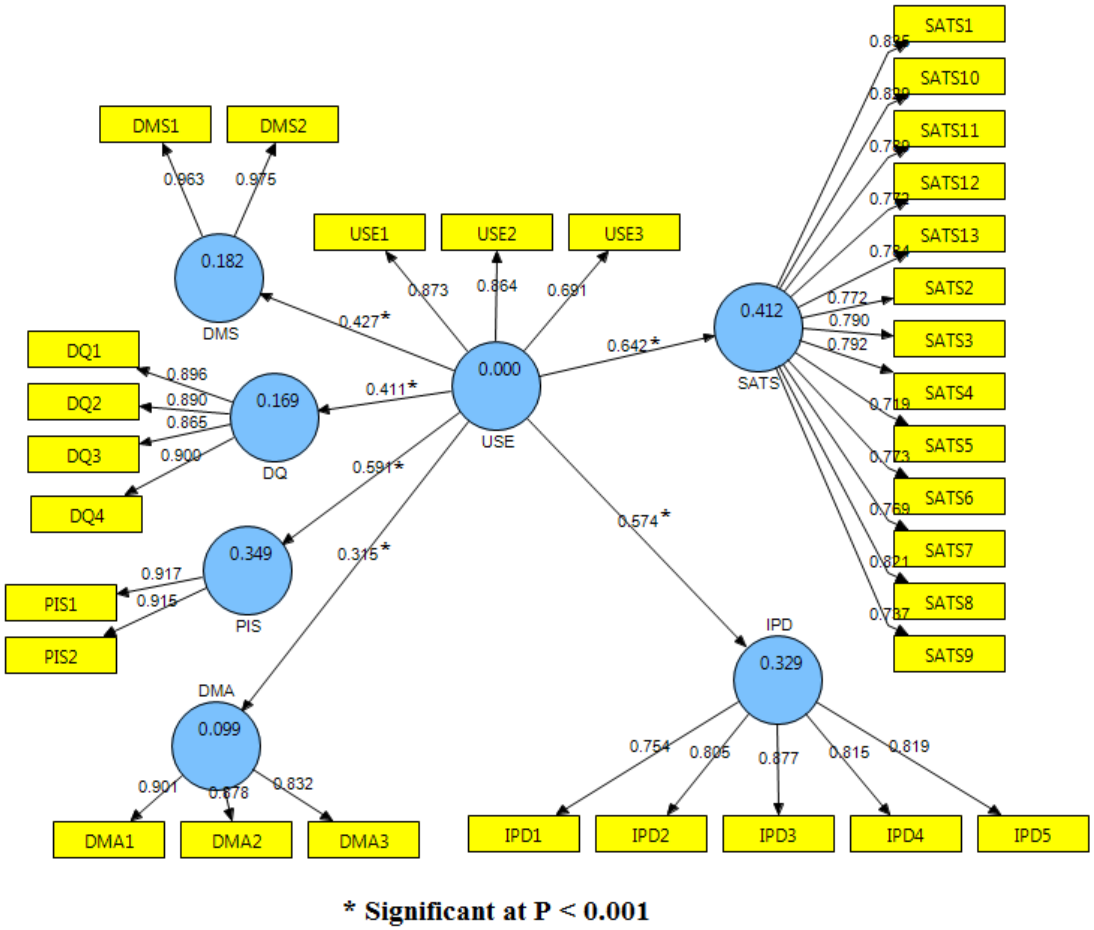

Figure 5.1: The structural model

The ECM use has a positive influence on decision making speed (beta = 0.427, P < 0.001), decision quality (beta = 0.411, P < 0.001), problem identification speed (beta = 0.591, P < 0.001), decision making analysis (beta = 0.315, P < 0.001), impact on problem definition (beta = 0.574, P < 0.001), and decision makers' satisfaction (beta = 0.642, P < 0.001). The model explains 32.9% of the variance in impact on problem definition, 9.9% of the variance in decision making analysis, 34.9% of the variance in problem identification speed, 16.9% of the variance in decision quality, 18.2% of the variance in decision making speed, and 41.2% of the variance in satisfactions of decision makers.

Therefore, all six hypotheses that are proposed in this study (shown in table 5.6) are statistically significant.

	Hypotheses	Results
H1a	the use of ECM systems in the DS identification phase has a positive impact on problem definition	All hypotheses are supported
H1b	the use of ECM systems is positively associated with the speed of problem identification	
H2	the use of ECM systems in the development phase is positively associated with the decision making analysis	
H3a	the use of ECM systems is positively associated with decisions quality	
H3b	the use of ECM systems is positively associated with the speed of decision making	
H4	the use of ECM systems is positively associated with satisfaction of decision makers	

Table 5.6: Results of hypotheses testing

5.3 SUMMARY

In this chapter, we have empirically examined six hypotheses that propose the association between the use of ECM and the capabilities of decision making. By using PLS structural equation modeling method, we have analyzed the answers of 111 ImageNow users from different departments of a large research university. In the measurement model, we have found that the results of the validity and reliability tests, and factor loadings and cross loadings are satisfactory, and match with the statisticians' recommendations. Also, all path coefficients are significant at $P < 0.001$. In the structural model, we use R^2 to measure the model validity and to determine the explained variance. Three latent variables have moderate R^2 values as follows: problem identification speed (34.9%), impact on problem definition (32.9), and decision makers' satisfaction (41.2%). The other three latent variables have weak R^2 values including decision making speed (18.2%), decision quality (16.9%), and decision making analysis (9.9%). The main

conclusion is that the use of ImageNow can lead to strategic (decision-making) benefits such as positive influence on decision making speed, decision quality, decision making analysis, problem identification speed, impact on problem definition, and decision makers' satisfaction.

6. RESULTS OF PHASE II: EVALUATION OF THE PROPOSED FRAMEWORK

In this study, we have proposed three artifacts: (1) the strategic management framework that is shown in figure 4.3, (2), ECM balanced-scorecard that is depicted in table 4.1, and (3) the ECM balanced scorecard-based strategy map which is shown in figure 4.6. Based on Hevner et al. (2004), observational evaluation (case study) and descriptive evaluation (scenarios) methods are adopted in this research to evaluate the proposed artifacts. A brief description of each evaluation method is shown in table 6.1. The details of each evaluation method are discussed in the coming subsections.

Evaluation method	Type	Description
Descriptive	Scenarios	Demonstrating the utility of the artifacts by proposing scenarios
Observational	Case study	Studying and monitoring the use of the artifact in the project

Table 6.1: Description of the evaluation methods

6.1 DESCRIPTIVE ANALYSIS (SCENARIOS)

We analyze the implantation of an ECM system in the Graduate Admissions (GA) department of a large research university. ImageNow, which is manufactured by Perceptive Software Inc., is a commercial ECM system for capturing, organizing, and managing content. The GA department receives extensive amount of document (8 documents for each of 6000 applications in 2008) during the regular university admission time. Until the implementation of the ECM solution in 2008/2009, the GA department used software with limited ECM capabilities (i.e. Lotus Notes and SCT Banner) in its routine processes, The director of recruitment and admissions, in one of the project document, stated "*For each graduate application, we typically receive two or more*

college transcripts, at least one test score, three reference letters, and a personal statement. We plan on imaging transcripts and any other of these materials we receive." ImageNow was implemented to handle this extensive number of documents in order to assist in the applicants' admission decisions. The admission decision will be either admit or reject decision. Two teams are involved in the implementation of ImageNow, one from Perceptive Software Inc. and the other from the research institution.

The discussion in this section is based on data synthesized from multiple perspectives. We conducted a structured interview of the manager of business application services at the department of technology services who oversaw the software implementation. We also performed a detailed analysis of the documentation that was maintained throughout the lifecycle of the project. The scenarios of the strategic management process framework (figure 4.3) was applied to the ImageNow project and elaborated in the following subsections.

6.1.1 Strategy formulation phase

In this subsection, we discuss the strategy formulation phase, which is the left side of the figure 4.3. Based on the documentation analysis, we conclude that the project vision is to provide the GA department with an efficient, accessible, collaborative, and secure information resource to support the business processes. Also, we conclude that the mission is to establish an easier and more advanced method to search, find, use, share, store, and keep high quality information. Although the frameworks recommends that mission statements be established for every perspective (content, technology, enterprise, and technology), our analysis did not provide us with enough details to identify a mission statement for each perspective.

The implemented system in GA is accessed by two business functions, recruiting and graduate admission programs. The objectives (step 2 of the framework) were synthesized by evaluating

multiple forms of documentation associated with the ImageNow implementation. They include Project Questionnaire, Project Kick-off Call, Imaging Requirement Survey, and the Project Charter. According to the Project Charter, the main goal is "to image all relevant application documents to ensure more timely delivery to Graduate Program Directors and Admission Committees". The followings are the detailed objectives of ImageNow:

- To make the application documents available for more than 80 program directors without the need to copy and mail the time-sensitive documents
- To reduce the storage of paper files by having a long term storage of electronic documents
- To allow multiple users to access the system simultaneously
- To enable document tracking
- To have secured access to electronic documents
- To have compliance support
- To allow annotation of electronic documents
- To be able to capture, route, and view the internally generated documents
- To be able to integrate with the current software applications (i.e. Lotus Notes, SCT Banner), and to enhance the reputation of the institution

The analysis did not reveal any performance measures for the objectives. Instead, the Project Charter mentions, "This project's success will be measured by the following criteria: full engagement of the Program Directors via use of the ImageNow product, document retrieval of the stored images is virtually immediate upon scanning and linking, quicker search, archiving, and retrieval of documents in ImageNow compared to current methods, and completion of "train the trainer" sessions to empower the research institution project team to manage ImageNow."

Thus, we believe that these four measures can be matched to the objectives of three perspectives: Enterprise, Content, and Process perspective as shown in table 6.2. In this case, the objectives in Technology perspectives have no performance measure. Moreover, no further information is provided on how these performance measures are assessed and what the final results are.

The manager of business application services emphasized that the implementation team should understand the users' exact needs, the expectations of ImageNow system, and to involve the stakeholders in the planning process. This corresponds to three key success factors (KSF) to accomplish the project successfully. The first KSF is top management commitment from both the research institution and Perceptive Software Inc. Two teams from both sides cooperated to implement and develop the project. The research institution team was sponsored by the dean of the graduate school, and was guided by the director of recruitment and admission. The two teams arranged weekly meetings to follow up on the updates, and to assess the progress of the project implementation. The second KSF was the involvement of different stakeholders such as the staff, the program directors, and the students. In order to understand the stakeholder needs, a comprehensive discussion was carried out with the stakeholders that included surveys, interviews, and contextual observation. The third KSF is adopting change management in the early stages of the project. The culture of information management in the GA department was changed to a new model through consensus negotiation with the different stakeholders. In addition, the system implementation undertaken in incremental stages which facilitated ease of adoption and long-term acceptance of the system. Ongoing training, support, and guidance were also provided to accustom the users with the new practices.

Content perspective	Enterprise perspective
Objectives Collaboration & Accessibility: To make the application documents available electronically for more than 80 program directors To allow multiple users access the system simultaneously To be able to track documents To have secure and easy access to documents Search and navigation To be able to capture, route, and view the internally generated documents To be able to import and export the needed documents Users' objectives To reduce the employees' time and efforts that are done in routine activities To give the right authority to the right role To Train users: Perceptive Software trains customers using a "train the trainer" approach **Performance measures** Time of search, archiving, and retrieval of documents Completion of "train the trainer" sessions	**Objectives** Efficiency To improve quality of the admission activates To enhance the efficiency and effectiveness of the daily admission activities To diversify revenue streams and undertake efficiency reforms resulting in financial viability and sustainability To reduce the storage of paper files by having a long term storage of electronic documents Reputation To improve and protect reputation of the research institution Compliance To have compliance support: Meeting legislative requirements (FERPA and the Virginia Public Records Act) **Performance measures** Engagement of program directors
Process perspective	**Technology perspective**
Objectives Workflow Process To enhance the workflow of the GA activities Content Lifecycle Process To maintain an effective content lifecycle among different users To help in metadata management, auditing, and reporting To have annotation to electronic documents **Performance measures** Document retrieval of the stored images is virtually immediate upon scanning and linking	**Objectives** Accessibility: to provide continuing access to content Customization: to have customizable tools that help in simplifying the workflow of GA activities Integration To be Compatible with existing architecture To be able to integrate with the current software applications (i.e. Lotus Notes, SCT Banner) To ensure having the ability of "data migration" Security: to provide the security level that matches with different groups of users **Performance measures** No identifiable performance measures were used

Table 6.2: BSC of ImageNow system in the Graduate Admission department

After specifying the KFS, the ECM-BSC should be designed. We have designed the ECM balanced scorecard as shown in table 6.2. The objectives of content perspective are classified into collaboration and accessibility, search and navigation, and users' objectives. For example, sending electronic documents to program directors reduce the employees' time and effort in searching, classifying, and mailing the documents.

Perceptive Software Inc. trains customers using a "train the trainer" approach. In this approach, a core group of users (typically no more than five people) are trained who then train remaining users. Training, in addition to integration with other applications, is ranked high in terms of the importance to the system adoption decision. The objectives of the enterprise perspective are categorized into efficiency, reputation, and compliance. As a case in point, the research institution hopes to improve the quality and efficiency of admission activities. The ECM solution also helps in achieving the sustainability objectives by going paperless and reducing the storage of paper. Keeping electronic documents is essential to satisfy compliance requirements (i.e. Family Educational Rights and Privacy Act (FERPA) and the Virginia Public Records Act). The objectives of process perspective are classified into workflow process, and content lifecycle process. The workflow chart, for instance, has been changed significantly from the initial stage to the end stage of the project. Finally, the objectives of technology perspective can be classified into accessibility, customization, integration, and security. The main security objective is to provide the security level that matches with different groups of users. The users are grouped into five types: power users, workflow users, scanners/linkers, viewers, and program directors.

In terms of allocating hardware, software and human resources, the project document mentions the following:

- "The employees [of the research institution] will attend training as early as possible after the project kickoff."
- "All hardware, software, and network components provided by the research institution will be delivered and made available prior to implementation of ImageNow software."
- "Deliverables requested by both parties will be received on time to keep the project moving forward."
- "Both parties will need to spend additional time outside of joint conference calls and meetings to ensure that objectives and deliverables are met."
- "Post install tune-up services must be used within 60-days after the onsite implementation."

After allocating the resources, cause-and-effect relationship can be established among strategies, strategic objectives, and performance measures. These relationships can be used to build the strategic map that is shown in figure 6.1. For instance, the strategic objective "To provide the correct security level for each group of users" in the technology perspective can be linked to the following objective "To give the right authority to the right role" in the content perspective, and both objectives will be related to the following performance measure in the content perspective: "Quicker search, archiving, and retrieval of documents."

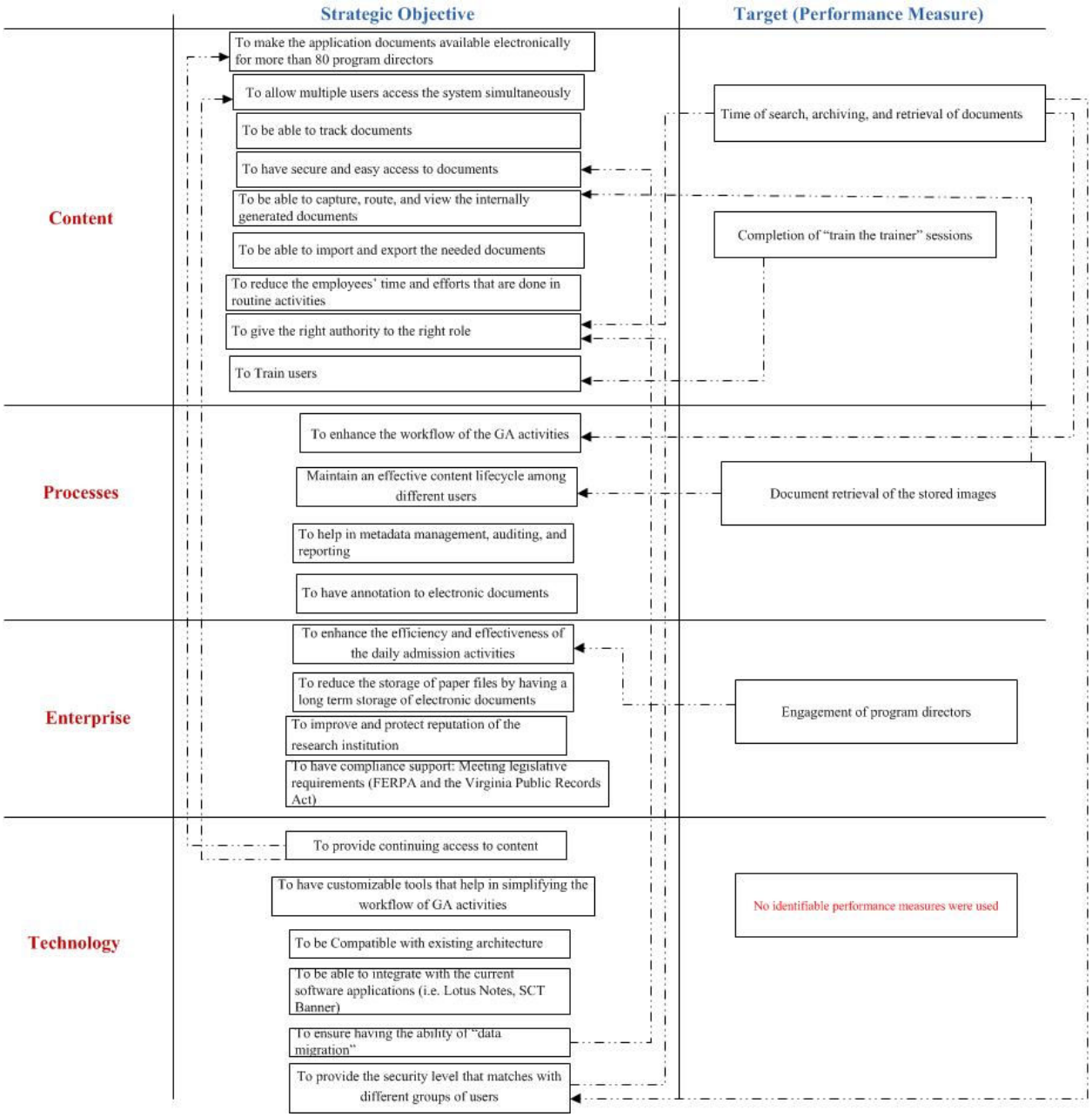

Figure 6.1: ImageNow balanced Scorecard-strategy map for Graduate Admission department

6.1.2. Strategy implementation and performance evaluation phase

This phase is depicted in the right side of figure 4.3. In developing the action plans and performance measures, three stages are specified – the analyze/design stage, the implement/verify stage, and the deploy/support stage. In the analyze/design stage, the teams plan to perform product demonstration, review existing process and workflow, identify and develop script requirements, identify users and their permissions, and perform script Q/A testing. In implement/verify stage, the teams propose to develop hardware and software, conduct configuration and components implementation, train the trainer, and have the scripts ready to install. In the deploy/support stage, the teams plan to perform internal system testing, create training materials, project wrap-up meetings, highlight transition issues that will require support, and send project closure announcement.

The analysis of the documentation reveals that the implementation of the action plans and the strategy gap assessment are addressed at three specific stages of the project - analyze/design, implement/verify, and deploy/support. After the implementation of action plan, any strategy gaps that are identified should be explored by analyzing the designed strategy map. Strategy gaps highlight any difference between the expected performance and the actual performance. For example, in the case of the GA department, the analysis helped to determine strategy gaps in the process perspective. The research institution team notices that the GA workflow processes are not achieved perfectly. This brought to light the missing link between the objectives of workflow process and its performance measures. The feedback from the diagnosis is used to determine the corrective action. The corrective action is suggested after determining the need for several additional scripts to support the workflow process.

By definition, scenario-based evaluation is not perfect. The extensive documentation and the structured interview that are used for validation in this part did not entirely provide the comprehensive information needed to assess the framework. To be more specific, we had limited information especially about the last three steps in the second phase of the framework. For instance, the project documentation does not provide any performance measure for the technology perspective objectives. Although the descriptive evaluation has the aforementioned limitations, we noticed that using the SMF to configure the ImageNow BSC and design the strategy map is straightforward process, which can facilitate exploring the strategy gaps and taking corrective actions in the GA department.

Therefore, the information that we currently have from this evaluation leads us to conclude the practicality and the applicability of the proposed framework.

6.2 OBSERVATIONAL EVALUATION (CASE STUDY)

A police department at a large research university has implemented ImageNow system as one type of ECM systems. We have evaluated the proposed artifacts in this project. In order to gather information, we have followed Yin's (2009) case study protocol. The case study protocol guides the researchers in gathering data. It provides the procedures and rules that need to be followed in order to conduct the case study. It also increases the reliability of case study research. The protocol is shown in table 6.3.

Protocol Stage	Description
Over view of the case study project	Background information Project objectives
Field procedures	Gaining access to an organization Making a clear schedule for the data collection activities
Case study data gathering	Table shells are used to collect the data
A guide for the case study report	The writing format of the classic single-case study: in order to analyze and describe the case, a single narrative will be used

Table 6.3: Case study protocol (Yin, 2009)

Because they are practical in gathering data, "table shells" will be used to collect the case study data. Table shells are outlines of tables without actual data (Yin, 2009). Examples of the table shells that are used in this study are shown in appendix F.

The police department has more than 400 employees including dispatchers, campus security officers (CSO), sworn officers, business staff, and others. The police department consists of four divisions as shown in figure 6.2: division of Investigation and Security Services, division of Patrol Operations, division of Support Services, and division of Administration and Business Operations (ABO). ImageNow system will be implemented only in the division of ABO. ABO has four units: payroll and personnel, records management, procurement, and IT unit.

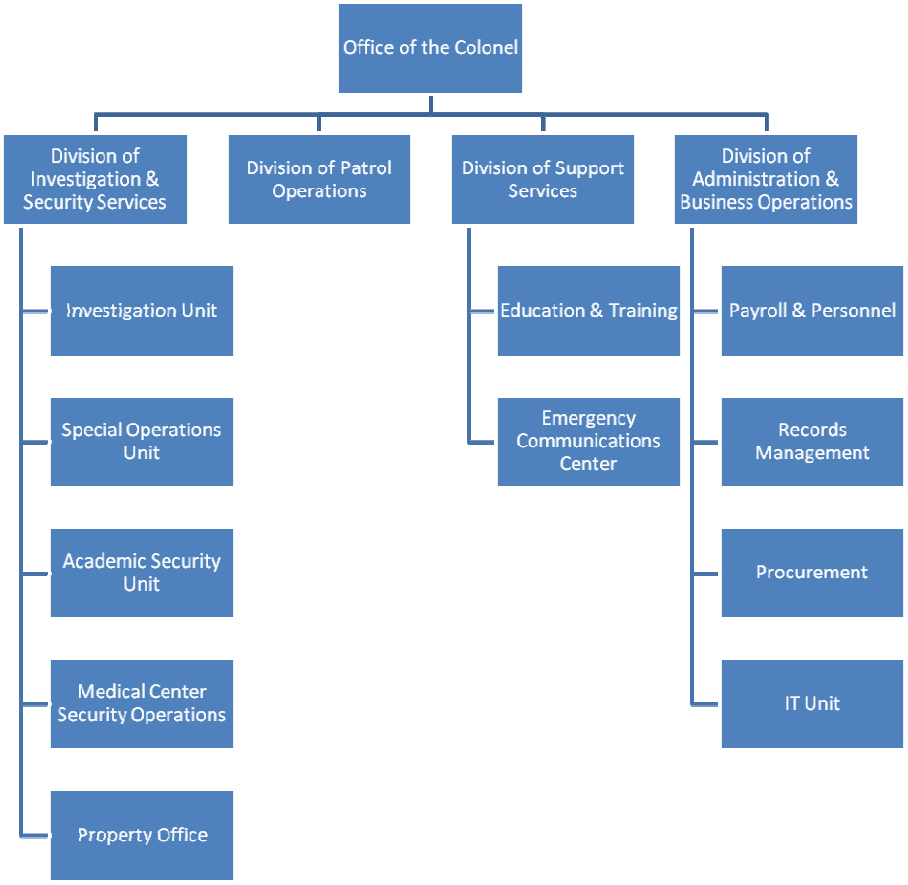

Figure 6.2: Divisions of the police department

Although the ABO division uses other computer systems (e.g. Lotus Notes, SCT Banner, CAD) most of the operations in the ABO division are paper based which leads to having the following problems:

1. A huge amount of paper: Payroll and Personnel unit, for instance, has several operations such as hiring and training. Taking the high turnover of the employees into account, the procedures of hiring and training each employee requires different amount of forms to be routed from one department to another which leads to accumulating a huge amount of paper.

2. Difficulties in auditing and in complying with government regulations: the police department is required by law to satisfy government regulations and standards regarding records

management. Paper-based records are insufficient to comply with the government regulations. For instance, record retention policies (e.g. keeping records for certain amount of years after job termination) are mandatory. Examples of these regulations are: the Public Records Act and the regulations of the Library of Virginia.

3. Traceability: document tracking is done manually based on the location of the document in the file cabinets. If a security officer is transferred from one department to another, for example, tracking of this action is based on paper filing, and procedures dictate the time/location of transfer and the responsibilities that are specified for a certain officer.

4. Document duplication: several hardcopies from the same document can be found which complicates the problem. Tracking a version of a hardcopy is also done manually which can be time consuming and inaccurate.

5. Document security: using file cabinet does not ensure complete document security. Security is required since some employees should have full access to all documents while other should have only limited access. Currently, department security procedures (locked file cabinets/rooms with restricted access; keys/card access) dictate the security level for each group of employees.

The above mentioned problems affect the efficiency of the department. For instance, utilization of the employees' time is not efficient since the manual searching and retrieving of documents takes long time. In addition, high costs are incurred in purchasing paper, paper cabinets, locks, access keys/cards, and in providing file space in the department. Ultimately, the quality and the consistency of the information are influenced, and the internal and external collaboration are affected which influence the ability of making the right decisions (e.g. budget decisions, procurement decisions) at the right time.

6.2.1 Strategy Formulation Phase

The first step in this phase is to identify the project vision and mission. Based on the discussion with the director of the division of Administration and Business Operations, and with the implementation team, we have identified the project vision and mission. The project vision is that "the ImageNow solution for the Campus Police provides an efficient, traceable and secure content management resource to enhance the campus security processes that support safety services to all university's students, faculty and staff to enable the university to achieve its vision to become a premier urban, public research university focused on student success." The project mission is that "Technology Services with assistance from Campus Police will design, develop and implement an ImageNow solution to minimize paper file storage and cost; enhance document accessibility and sharing; streamline the business processes and satisfy legal requirements specific to Campus Security."

Also in this step, the mission of each perspective (content, enterprise, technology, process) should be identified. The mission of the content perspective is "Implementing ImageNow services to provide content value to the internal and external beneficiaries;" the mission of the enterprise perspective is "Contribution of ImageNow to the value of the business by enabling corporate communication at all strategic levels;" the mission of the process perspective is "Implementing and maintaining ImageNow system, and implementing ImageNow activities (i.e. create, capture, store) effectively;" the mission of the technology perspective is "Developing and operating ImageNow applications while ensuring continuous enhancement and being ready for future challenges."

In the second step of this phase, objectives, and performance measures need to be determined for each perspective. The division of ABO has many objectives that would like to be achieved from ImageNow implementation. The following objectives are classified under content perspective:

- Enhance content quality and consistency
- Having information traceability
- Having secure, easy, and correct access to information

The performance measures for these objectives will be as follows:

- Fitness to the purpose of use
- Degree of accessibility
- Search to retrieval ratio

Although the strategic decision making capabilities are not the main driver of implementing ImageNow in the ABO division, we have included a strategic decision making objective, and its related performance measures in order to determine the influence of ImageNow on decision making. We have added the following strategic decision making objective: "Enhance decision making process", and the following performance measures:

- Speed of problem identification
- Speed of decision making

Also, the director of ABO division has determined the following as the objectives of ImageNow implementation that can be classified under enterprise perspective:

- Cost savings in information processing
- Satisfy governmental regulations and standards (compliance)
- Improve the efficiency of the organization

- Increase the flexibility of dealing with disasters

The following can be the performance measures of these objectives:

- Percent of cost saving
- Degree of fulfilling legal requirements
- Disaster recovery ratio

With regard to process perspective, the division of ABO has only one objective, which is to "Enhance the organization business processes", and this objective can be measured by "the number of simplified business process." Also, technology perspective should have the following objectives:

- Provide security techniques to ensure content is secure
- Ensure that applications are able to simplify the collaboration and content management process

The performance measure will be the "Degree of application customizability related to supporting business process."

The third step of this phase is to specify the key success factors (KSF) for implementing ImageNow system. The implementation team and the director of ABO division agree that there are three KSF that are most important. The first KSF is top management commitment from both the police department and Technology Services department. Two teams from both sides cooperated to implement and develop the project. The police department team was sponsored by the director of the ABO division. The two teams arranged weekly meetings to follow up on the updates, and to assess the progress of the project implementation. The second KSF is adopting change management in the early stages of the project. The culture of information management in

the ABO division was changed to a new model through consensus negotiation with the different stakeholders. In addition, the system implementation undertaken in incremental stages which facilitated ease of adoption and long-term acceptance of the system. Ongoing training, support, and guidance were also provided to accustom the users with the new practices. The third KSF is the involvement of different stakeholders such as the staff and officers. A comprehensive discussion was carried out with the stakeholders in order to understand the stakeholder needs.

After finishing the first three steps, the BSC needs to be designed. The first version of the BSC is shown in the following table:

Content perspective	Enterprise perspective
Mission: Implementing ImageNow services to provide content value to the internal and external beneficiaries **Objectives** Enhance content quality and consistency Having information traceability Having secure, easy, and correct access to information **Performance measures** Fitness to the purpose of use Degree of accessibility Search to retrieval ratio	**Mission:** Contribution of ImageNow to the value of the business by enabling corporate communication at all strategic levels **Objectives** Enhance decision making process Cost savings in information processing Satisfy governmental regulations and standards (compliance) Improve the efficiency of the organization Increase the flexibility of dealing with disasters **Performance measures** Speed of problem identification Speed of decision making Percent of cost saving Degree of fulfilling legal requirements Disaster recovery ratio
Process perspective	**Technology perspective**
Mission: Implementing and maintaining ImageNow system, and implementing ImageNow activities (i.e. create, capture, store) effectively **Objectives** Enhance the organization business processes **Performance measures** The number of simplified business process	**Mission:** Developing and operating ImageNow applications while ensuring continuous enhancement and being ready for future challenges **Objectives** Provide security techniques to ensure content is secure Ensure that applications are able to simplify the collaboration and content management process **Performance measures** Degree of application customizability related to supporting business process

Table 6.4: ImageNow BSC for ABO division in the Police department

In the last step of this phase, we have allocated the resources that are necessary for ImageNow implementation. The main hardware resource is a Fujitsu FI-6230 Scanner. The software resources are one ImageNow Client (desktop) Seat License, one WebNow (web) Concurrent License, and one CaptureNow (scanner) License. The human resources will be three employees from the ABO division, including the director of the division, and two from the Technology Services, including the manager of the Technology Services. In this step, we have also built cause-effect relationships that are required to design the strategy map. For example, the strategic objective "Provide security techniques to ensure content is secure" in the technology perspective can be linked to the following objective "Having secure, easy, and correct access to information" in the content perspective, and both objectives will be related to the following performance measure in the content perspective: "Degree of accessibility." In another example, the strategic objective in the process perspective "Enhance organization business process", which can be measured by "Number of simplified business process," can be linked to "Improve efficiency of the organization", which can be measured by "Percent of cost savings" in the enterprise perspective. The ImageNow strategic map of ABO division is shown in figure 6.3.

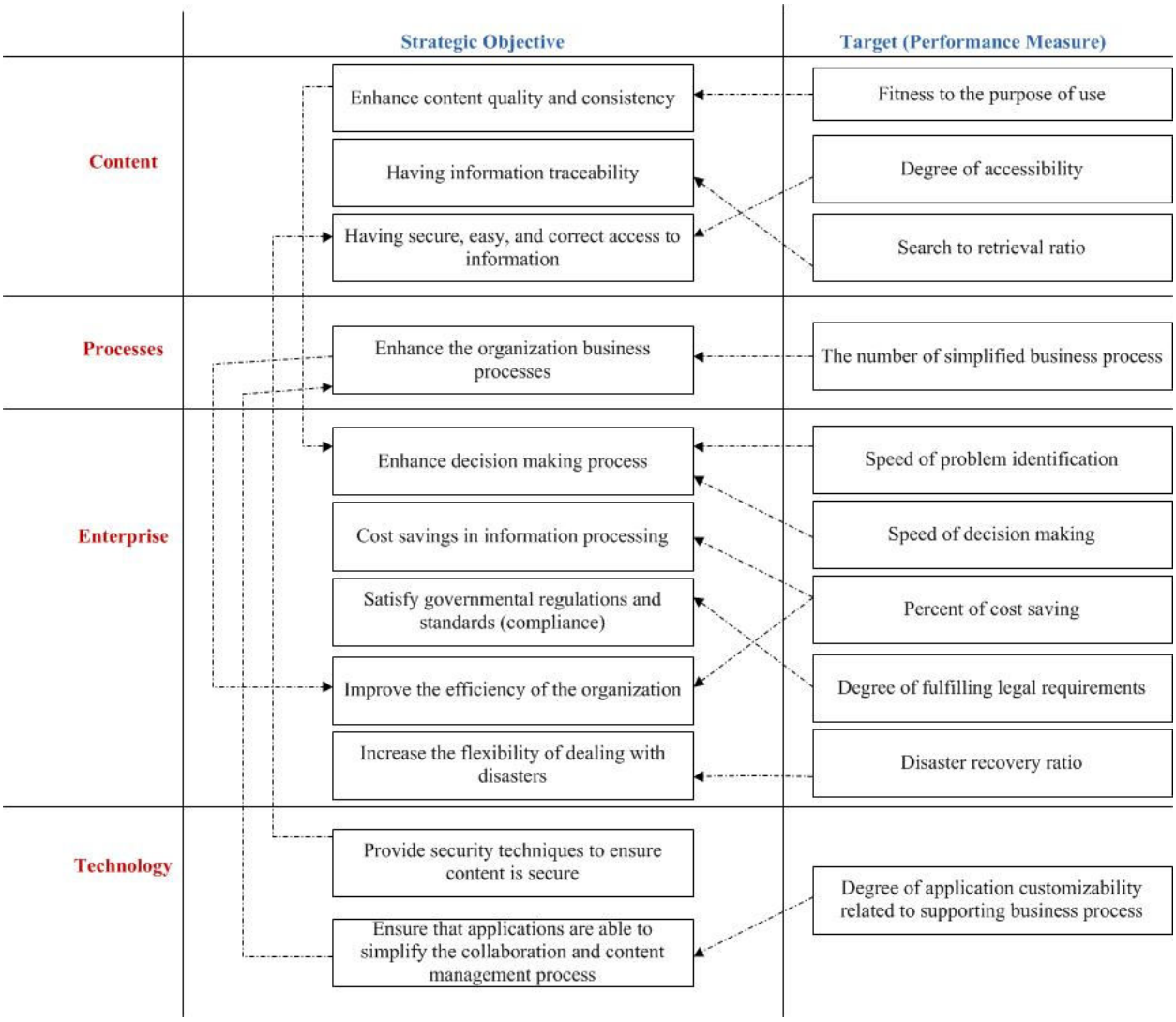

Figure 6.3: ImageNow strategy map of ABO division

6.2.2 Strategy implementation and performance evaluation phase

In this phase, the table shell in appendix F is used to collect the required information. In developing the action plans and performance measures, three stages are specified – the analyze and design stage, the implement and verify stage, and the deploy and support stage. In the analyze and design stage, the implementation team performs the following: product demonstration, review existing process and workflow, identify and develop script requirements,

identify users and their permissions. In the implement and verify stage, the team has conducted configuration and components implementation, performed component testing, installed client-side hardware and software, and trained the trainer. In the deploy and support stage, the following has been accomplished: internal system testing, create training materials, project wrap-up meetings, highlight transition issues that will require support, and send project closure announcement.

In the implementation of the action plans step, the details of the three specific stages of the project – analyze and design, implement and verify, and deploy and support are addressed. In the analyze and design stage, the implementation team has performed a *product demonstration* in order to explain the functionality of ImageNow system to the director and staff of ABO division. The product demonstration shows the ability of ImageNow to solve the primary problems that ABO division has such as huge amount of paper, traceability, security, and the difficulties in adhering to government regulations. Also, the product demonstration shows the ability of ImageNow to enhance the content quality and consistency which will enhance the decision making process in the long run.

The implementation team has also *reviewed the existing process and workflow*. The initial discussion revealed that the ABO division does not have major business processes and workflows; rather it has several limited workflow and processes in every unit. Therefore, the team has proposed a four-step procedure to process every document in the ABO division. These steps are: start, purge, audit, and complete as shown in figure 6.4. Also, digital drawers have been proposed to have the document that can be classified into category (i.e. Training, Employment forms), and in each category, every document should have a certain document type. For example, under Training category, document type can be First Aid, Test, and Quiz.

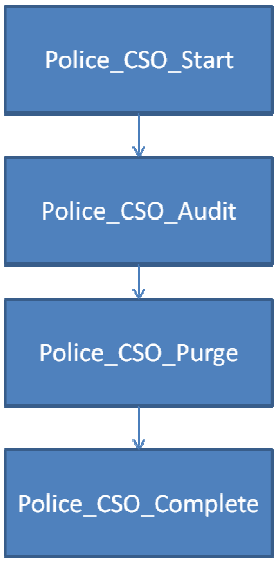

Figure 6.4: ImageNow workflow in ABO division

After that the team should *identify and develop script requirements*. However, the team has agreed that there are no scripts that need to be identified in this stage. The team emphasized that scripts will be identified and developed based on the users unique needs after the initial use of the system.

As one of the key success factors, *identifying users and their permissions* in order to get the involvement of different stakeholders is accomplished next. A comprehensive discussion was carried out understand the stakeholder needs. The police department has more than 400 employees including dispatchers, campus security officers (CSO), sworn officers, business staff, and others. The staff of the ABO division deals with the other staff in the three divisions in the police department (division of Investigation and Security Services, division of Patrol Operations, division of Support Services) as well as dealing with other department at the university (i.e. Human Resources, Procurement Services). Different permission levels are given to the staff in the ABO division. For example, the director of the division can access any digital drawer; she also can add, view, edit, or delete any document type in any document category. On the other

hand, staff in the Records Management unit, and in the IT unit do not have access to all digital drawers.

In the implement and verify stage, the team has *conducted configuration and components implementation* based on reviewing the existing processes and workflows. The software has been configured to include digital drawers (i.e. sworn officers, CSO), name, campus (Monroe, MCV), document category (i.e. employment forms, communications, training), and document type under each documents category (i.e. 1-9 form, evaluation, first aid, test) as shown in figure 6.5. Also, the software has been configured to include the four-step procedure that is required to process every document in the ABO division. These steps are: start, purge, audit, and complete.

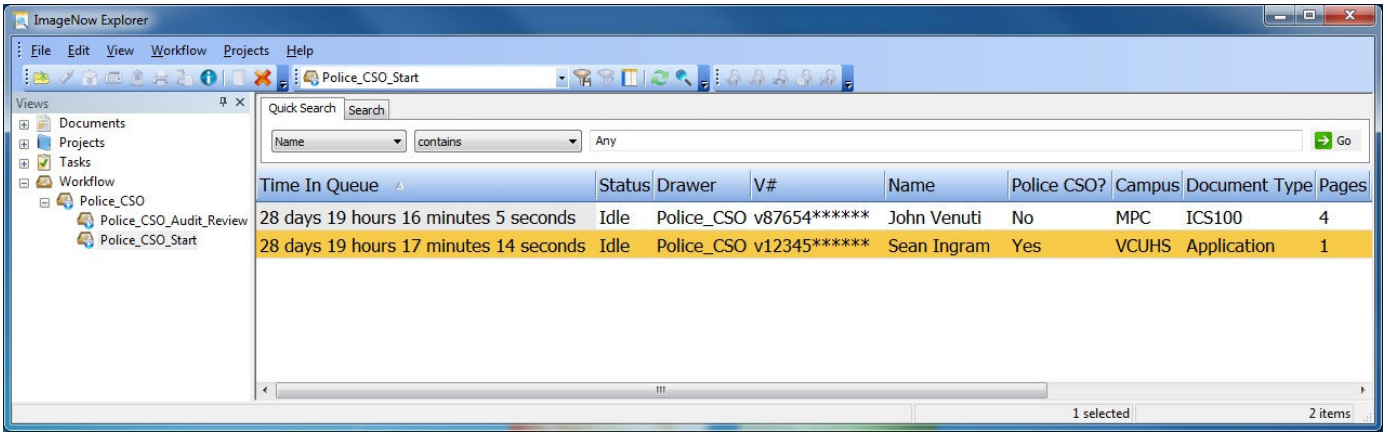

Figure 6.5: ImageNow configuration in ABO division

The team has also *performed component testing*. Component testing is accomplished by uploading a new document to the CSO drawer. The document is assigned to a particular CSO who works in Monroe campus. The team has also demonstrated how to transfer the new document from start queue to the complete queue. After that the team has *installed the client-side hardware and software*. The hardware resource (Fujitsu FI-6230 Scanner), and the software

resources (ImageNow Client (desktop) Seat License, one WebNow (web) Concurrent License, and one CaptureNow (scanner) License) have been implemented in the ABO division.

Training is accomplished by adopting *train the trainer* approach. In this approach, a core group of users (typically no more than five people) are trained who then train remaining users.

In the deploy and support stage, the users are given the chance to have an *internal system testing*. Users are given a week to try the new system. Users have requested several changes to the new system such as adding more document categories and document types. After that the official *training materials*, which explains the use of ImageNow system, are developed and given to the director of the ABO division. Then we had a *project wrap-up meeting* to highlight transition issues that will require support. Even after the project accomplishment, the users can contact Technology Services if they face any difficulties regarding the use of ImageNow. Finally, the *project closure announcement* has been sent to officially announce the end of the project.

6.2.2.1 Exploring Strategy Gaps

After the implementation of action plans, any strategy gaps that are identified should be explored by analyzing the designed strategy map (figure 6.3). Strategy gaps highlight any difference between the expected performance and the actual performance. The details of the expected and the actual performance are as follows.

In the content perspective, the objective "Enhance content quality and consistency" is measured by the "fitness to the purpose of use" which has three levels: poor fitness, fair fitness, and good fitness. The ABO division expects to have "good fitness" after implementing ImageNow system. In fact, the users acknowledge that the content output from ImageNow system fits the purposes

of its use. This objective has also a cause-effect relation with the objective of "Enhance decision making process" in the enterprise perspective which will be discussed later.

The objective of "Having secure, easy, and correct access to information" is measured by the "Degree of accessibility" which has three levels: poor accessibility, fair accessibility, and good accessibility. The ABO division expects to have "good accessibility" after implementing ImageNow system. The users rated the actual accessibility performance as "good" since the needed document can be accessed by the right employee at the right time. The third objective is "Having information traceability", which is measured by "search to retrieval ratio". This ratio has also three levels: poor, fair, and good. The users rated the actual retrieval ratio in the ABO division as "good" which matches with the expected ratio.

In the enterprise perspective, the objective "enhance decision making process" is measured by the "Speed of problem identification" and the "Speed of decision making". The speed of the *routine* decision making process is enhanced in the ABO division, but we could not verify the enhancement of the *non-routine* decision making process because the ABO division was not involved in an abnormal decision making process directly after the implementation of the system. Two objectives, which are "Cost savings in information processing" and "Improve the efficiency of the organization", are measured by "percent of cost saving." After implementing the ImageNow system, the ABO division gets rid of the high costs that are incurred in purchasing paper, paper cabinets, locks, access keys/cards, and in providing file space. The objective of "Satisfy governmental regulations and standards (compliance)" is measured by the "Degree of fulfilling legal requirements" which has three levels: poor, fair, and good. The ABO division seeks to have "good" degree of fulfilling legal requirements. The division has achieved this good degree of fulfilling legal requirements because two of the four-step procedure, which

are purge and audit, in ImageNow system are designed to ensure the adherence to the legal requirements. ImageNow system will improve the "Disaster recovery ratio" that measures the objective of "Increase the flexibility of dealing with disasters." ImageNow system reduces the number of paper cabinets at risk of potential water flood or fire. The ImageNow system also supports having online and offline document backups.

In the technology perspective, the objective of "Provide security techniques to ensure content is secure" has a cause-effect relation with the objective of "Having secure, easy, and correct access to information", which is measured by "Degree of accessibility" as discussed above. The objective of "Ensure that applications are able to simplify collaboration and content management process" is measured by the "Degree of application customizability related to supporting business process", which also has three levels: poor, fair, and good. The users rate the degree of customizability "good" from their experience in customizing the applications (by adding more document categories and document types) during the system testing, which was a straight forward process.

In the processes perspective, the objective of "Enhance the organization business process" is measured by "The number of simplified business process", which has three levels: zero, few, or several. Few simplified business processes is an accepted measure in the ABO division. The users of the ImageNow system believe that "few" simplified business processes have been achieved by using the system since the ABO has limited number of workflows and processes. Also, this objective has a cause-effect linkage to two other objectives, which are "Improve the efficiency of the organization" in the enterprise perspective, and "Ensure that applications are able to simplify the collaboration and content management process" in the technology perspective.

The above details were observed after one-month of the system implementation. As shown in the above discussion, we did not counter any strategy gaps after the system implementation in the ABO division. To a certain extent, the system expectation matches the actual system performance. After the use of the system for more few months, the ABO division may need to add more objectives and objective measures based on the division's dynamic needs. The ABO management can monitor the objectives performance as we have shown how the objectives are monitored in the above section. If mismatch occurs between the actual and expected performance, strategy gaps are detected and feedback is collected to trigger a new cycle of the strategic management process, which is depicted by the dotted arrow in figure 4.3.

6.3 SUMMARY

In this chapter, we have evaluated the three proposed artifacts: (1) the strategic management framework that is shown in figure 4.3, (2), ECM balanced-scorecard that is depict in table 4.1, and (3) the ECM balanced scorecard-based strategy map which is shown in figure 4.6. Two evaluation approaches are used to assess these artifacts, namely, descriptive evaluation (scenarios) and observational evaluation (case study) (Hevner et al., 2004).

In order to accomplish the descriptive evaluation, we analyze the implantation of an ECM system in the Graduate Admissions (GA) department of the university. Data has been synthesized from multiple perspectives; we conducted a structured interview of the manager of business application services at the department of technology services who oversaw the software implementation. We also performed a detailed analysis of the documentation that was maintained throughout the lifecycle of the project. The extensive documentation that is used for validation in this part did not entirely provide the comprehensive information needed to assess the framework. The project document gives limited information especially about the last three

steps in the second phase of the framework. For instance, the project documentation does not provide any performance measure for the technology perspective objectives. Although the descriptive evaluation has the aforementioned limitations, we noticed that configuring the ImageNow BSC and designing the strategy map is a straight forward process, which can facilitate exploring the strategy gaps and taking corrective actions in the GA department.

In order to avoid the limitations of the descriptive evaluation, we have conducted an observational evaluation by implementing the proposed artifacts in a real-world organization. The division of Administration and Business Operations in the police department has implemented ImageNow system as on type of ECM systems. The proposed artifacts have been adopted to implement ImageNow system in this project. In order to gather information, we have followed Yin's (2009) case study protocol. The ABO department has several problems (i.e. huge amount of paper, difficulties in auditing, document security, and traceability) that affect the efficiency of the department. The quality and the consistency of the information are influenced, and the internal and external collaboration are affected which influence the ability of making the right decisions (e.g. budget decisions, procurement decisions) at the right time. The details of the project implementation show that the proposed artifacts are practical means to deploy ImageNow system. The SMF provides the big picture for the decision makers by having two main phases: strategy formulation phase, and strategy implementation and performance evaluation phase. For example, the decision makers need to specify the project vision, mission, objectives, and performance measures. Specifying this information at the beginning of the project helps the decision makers to determine where he is now, and where he wants to get. In addition, the BSC helps in associating the project objectives to the suitable ECM perspective (content, process, enterprise, and technology). The decision makers can trace the objectives achievement by using

the strategy map, which helps in comparing the objectives actual status to the expected status. Corrective actions can be taken based on the comparison results. All in all, adopting the proposed artifacts to implement the ImageNow system helps in improving the quality and the consistency of the information. The internal and external collaboration are positively affected, and the ability of making the right decisions (e.g. budget decisions, procurement decisions) at the right time is also developed.

With regard to the criteria of judging the quality of the case study, Yin (2009) suggests the following four tests that are commonly used: construct validity, internal validity, external validity, and reliability.

Construct validity ensures that the correct operational measures for the concepts are used. One tactic that ensures the construct validity in case study is to have the key informants review the draft of the case study. The implementation team has reviewed the draft of the case study report in order to ensure the construct validity in this study. Internal validity is essential for explanatory studies (causal relationships), but it is not applicable for this study because the case study in this research is not explanatory research.

External validity answers whether the case study findings are generalizable beyond this case study. Replication logic allows replicating the study in other context to ensure that the findings of the replicated studies are similar to the results of the original study. Because of the required long time to conduct a case study, replication of this study is impractical in this case, but it can be achieved as a future research goal.

Reliability test ensures that if another investigator conducts the same case study and follows the same procedures described in this research, he will get similar findings and conclusion to those

described in this study. Minimizing bias and errors is the goal of reliability test. Yin (2009) suggests using a case study protocol to document the procedures followed in a case study, and to allow other researchers to repeat the same case study. We have followed Yin's suggestion by using a case study protocol as described in table 6.3. The summary of the four tests of the quality of the case study, and their related information are shown in table 6.5.

Test	Related Information
Construct validity	The implementation team has reviewed the draft of the case study report
Internal validity	Not applicable for this study because the case study in this research is not explanatory research
External validity	Replication logic can be used to answer the concerns of generalizability
Reliability	A case study protocol is used to facilitate repeating the same case study.

Table 6.5: Four quality tests of the case study

7. CONCLUSION

7.1 SUMMARY AND CONTRIBUTION

The requirement of good and timely decision-making is becoming increasingly evident, and the employment of decision support (DS) technology is becoming not only desirable but also essential as the business environment is getting ever more complex and competitive. Enterprise content management (ECM) systems are implemented in many organizations to deal with the increasing information overload and with the complexity of the structured and unstructured organizational data. The existing ECM literature indicates that many organizations seem to focus on operational benefits (i.e. cost reduction and work process simplification) of ECM, while the strategic long-term benefits (i.e. supporting decision making and competitive intelligence) are rarely considered.

As potential long-term benefits of ECM, the capacity for decision-making support is not utilized to any great extent, and there appears to be strong need to investigate the DS capabilities of ECM. Smith and Mckeen (20003) write that 'very few' firms utilize ECM to analyze the content to provide decision-making information to be used to make informed decision, and thus to help in generating business value. In addition, the literature lacks a strategic management framework (SMF) that links strategies, business objectives, and performance management. A strategic management framework would seem essential to effectively manage ECM strategy formulation, implementation, and performance evaluation (Ittner and Larcker, 1997; Kaplan and Norton, 1996). The absence of an appropriate strategic management framework will limit organizations from reaping the benefits of ECM capabilities.

The first objective of this dissertation was to better understand the association between ECM and decision support, and to identify the potential effects of ECM technology on decision support (DS) activities. This objective is achieved by linking ECM to decision support activities based on the sequential framework of Mintzberg et al. (1976). Several hypotheses are proposed, and the Partial Lease Square (PLS) technique is used to test the hypotheses. We analyzed the answers of 111 ImageNow users from different departments of the university. In the measurement model, we found that the results of the validity and reliability tests, and factor loadings and cross loadings are satisfactory, and match with the statisticians' recommendations. Also, all path coefficients are significant at $P < 0.001$. In the structural model, we use R2 to measure the model validity and to determine the explained variance. Three latent variables have moderate R2 values as follows: problem identification speed (34.9%), impact on problem definition (32.9), and decision makers' satisfaction (41.2%). The other three latent variables have weak R2 values including decision making speed (18.2%), decision quality (16.9%), and decision making analysis (9.9%). The main conclusion is that the use of ImageNow can lead to strategic (decision-making) benefits such as positive influence on decision making speed, decision quality, decision making analysis, problem identification speed, impact on problem definition, and decision makers' satisfaction. The contribution of this part is to prove the less obvious strategic association between ECM and decision support. Based on the findings, the use of ImageNow system can help in improving the investigated decision support activities. Therefore, these findings can encourage practitioners to focus on the DS capabilities while implementing and using ECM.

The second objective is to have a strategic management framework for ECM systems that supports the formulation, implementation, and evaluation of ECM strategies in order to fully

utilize the ECM strategic capabilities. To achieve the second objectives, several methodologies, including balanced scorecard (BSC) and strategy map are integrated to drive the strategic perspective. Design science approach is used to propose and validate the suggested framework. Two evaluation approaches are used to assess the proposed artifacts, namely, descriptive evaluation (scenarios) and observational evaluation (case study) (Hevner's et al., 2004). In order to accomplish the descriptive evaluation, we analyze the implantation of an ECM system in the Graduate Admissions (GA) department of the university. Data has been synthesized from multiple perspectives; we conducted a structured interview of the manager of business application services at the department of technology services who oversaw the software implementation. We also performed a detailed analysis of the documentation that was maintained throughout the lifecycle of the project. Although the descriptive evaluation has some limitations, we noticed the straightforwardness of configuring the ImageNow BSC and designing the strategy map, which can facilitate exploring the strategy gaps and taking corrective actions in the GA department. In order to avoid the limitations of the descriptive evaluation, we have conducted an observational evaluation by implementing the proposed artifacts in a real-world organization. The division of Administration and Business Operations in the police department has implemented ImageNow system as on type of ECM systems. The proposed artifacts have been adopted to implement ImageNow system in this project. All in all, adopting the proposed artifacts to implement the ImageNow system helps in improving the quality and the consistency of the information. The internal and external collaboration are positively affected, and the ability of making the right decisions (e.g. budget decisions, procurement decisions) at the right time is also developed. The contribution of this work is twofold. Firstly, an ECM strategic framework, which integrates the formal strategic planning (FSP) with the balanced scorecard (BSC), is a

novel addition to the ECM body of knowledge. Implementing the framework in a real-world organization highlights the importance of linking strategies to performance measures in the ECM context. This research also opens the door for new research opportunities to understand the integration of formal strategic planning and other enterprise systems. Secondly, practitioners can use the strategic framework to help them in more effectively deploying and evaluating ECM systems, and ultimately utilizing the decision support capabilities of ECM.

7.2 LIMITATIONS AND FUTURE RESEARCH DIRECTION

This study has some limitations. First, the proposed framework cannot be applied as-is, since every organization varies in what constitutes their internal and external objectives. The framework may need to be adapted according to the organization's strategies, objectives, performance measures, and key success factors. Second, it is important to note that ECM systems differ with respect to the installed components (i.e. web content management, workflow management), and DS capabilities of ECM systems may vary according to specific components that are implemented. In this research, we focus only on the DS capabilities of ImageNow system. Also, generalizability is always questioned in case study research. Replicating the study in other contexts can solve the generalizablity concerns. The study can be replicated in other contexts. If the findings of the replicated studies are similar to the findings in this study, the results of the case study can be generalized to a certain limit.

Third, the PLS method assumes linear relationship between independent and dependent variables. Non-linear estimation may provide alternative models with better estimation. Moreover, this study has two variables that have only two items: problem identification speed, and decision making speed, which are adopted from Leidner and Elam (1993-1994, 1995). SEM literature recommends that each construct should have at least three items (Bollen, 1989).

However, Nunnally (1978) as well as Gerbing and Anderson (1988) mention that each construct can be measured with at least two items in order to evaluate the construct validity and measurement reliability.

Since ImageNow system is not one of the ECM leaders of the commercial ECMs, the decision support capabilities to the leaders of ECM systems such as EMC Documentum can be investigated in future research. Replication logic can also be implemented to answer the generalizability concerns. In addition, this study is limited to investigating the basic decision support capabilities such as decision quality, decision making analysis, speed of problem identification and decision making, and impact on problem identification. The ability of ECM systems to support more advanced decision support capabilities, such as decision modeling methods, structured group methods, and group discussion directing rules, can be investigated in future research. Finally, the new ECM techniques (i.e. cloud, mobile) are not investigated in this study. A promising future research direction can be about the topic of cloud/mobile enterprise content management system and their abilities to support decision making.

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APPENDICES

A: Number of ECM publications in journals

Journal Name	Number Of Publications
Communications Of The Association For Information Systems	2
European Journal Of Information Systems	3
Communications Of The ACM	1
Communications Of The IIMA	1
Datenbank-Spektrum	1
Computer Applications And Software	1
Computer Of Engineering	1
Computer Of Engineering And Applications	1
Computer Science Journal Of Moldova	1
Government Information Quarterly	1
IEEE Congress On Services Part II	1
IFIP Advances In Information	1
Information Systems And E-Business Management	1
Information Systems: People, Organizations, Institutions, And Technologies	1
International Journal Of Automation And Computing	1
International Journal Of Information Management	1
International Journal Of Knowledge, Culture And Change Management	1
International Journal Of Systems And Service-Oriented Engineering	1
International Water Power & Dam Construction	1
Journal Of Digital Information Management	1
Journal Of Industrial Technology	1
Knowledge-Based Systems	1
Medical Reference Services Quarterly	1
Microcomputer Information	1
Modern Electronics Technique	1
Nonprofit Management & Leadership	1
Organizacija	1
Scandinavian Journal Of Information Systems	1
Security & Privacy, IEEE	1
Technical Communication Quarterly	1
The Electronic Journal Information Systems Evaluation	1

B: Number of ECM publications in conferences

Conference Name	Number of Publications
1. IEEE Conference on E-Commerce Technology and the Fifth IEEE Conference on Enterprise Computing	1
2. East European Conference, ADBIS	1
3. Australasian Conference on Information Systems (ACIS)	3
4. Bled eConference	1
5. IEEE International Conference on Computer Science and Information Technology	1
6. International Conference on Computer Science and Education (ICCSE)	1
7. International CALIBER	1
8. AMCIS	1
9. Datenbanksysteme in Business, Technologie und Web	1
10. ECIS	2
11. EDUCAUSE Australasia 2009: Innovate - Collaborate - Sustain	1
12. HICSS	6
13. the 2009 conference on Hot topics in cloud computing	1
14. IEEE GCC	1
15. IEEE International Conference on Service Operations and Logistics, and Informatics	1
16. IEEE International Conference on e-Business Engineering	1
17. IEEE International Conference on Software Engineering and Service Sciences	1
18. International Conference on Availability, Reliability and Security	1
19. International Workshop on Dynamic and Adaptive Hypertext: Generic Frameworks, Approaches and Techniques (DAH'09)	1
20. International Professional Communication Conference	1
21. the 2010 conference on Bridging the Socio-technical Gap in Decision Support Systems: Challenges for the Next Decade	1
22. the 7th International Conference on Preservation of Digital Objects	1
23. Professional Communication Conference	1
24. Southern AIS Conference	1
25. The Conference for Unix, Linux, and Open Source Professionals	1
26. IEEE Symposium on Computer-Based Medical Systems (CBMS'06)	1
27. International Workshop on Computer Science and Information Technologies	1

C: Survey variables, their measures, and related literature

Variables		Items	Source
The Use of ECM System	USE1	Actual daily use: time spent using ECM	Zain et al. 2005
	USE2	Frequency of use of ECM system	
	USE3	Number of business tasks for which the computer systems were used (i.e. the extent to which respondents use a computer in their work)	
Satisfaction	SATS1	I have become dependent on ECM	Sanders and Courtney (1985)
	SATS2	As a result of ECM, I am seen as more valuable in this organization	
	SATS3	I personally benefitted from the existence of ECM in this organization	
	SATS4	I have come to rely on ECM in performing my job	
	SATS5	All in all I think that ECM is an important system for this organization	
	SATS6	ECM is extremely useful	
	SATS7	Utilization of ECM has enabled me to make better decisions	
	SATS8	As a result of ECM, I am better able to set my priorities in decision making	
	SATS9	Use of data generated by ECM has enabled me to present my arguments more convincingly	
	SATS10	ECM has improved the quality of decisions I make in this organization	
	SATS11	As a result of ECM, the speed at which I analyze decisions has increased	
	SATS12	As a result of ECM, more relevant information has been available to me for decision making	
	SATS13	ECM has led me to greater use of analytical aids in my decision making	
Problem Identification Speed	PIS1	ECM helps me sense key factors impacting my area of responsibility	Leidner and Elam (1993-1994, 1995)
	PIS2	ECM helps me notice potential problems before they become serious crises	
Decision Making speed	DMS1	ECM helps me make decisions quicker	
	DMS2	ECM helps me shorten the time frame for making decisions	

Variables		Items	Source
Decision Making Analysis	DMA1	ECM helped the organization evaluate more alternatives,	Leidner and Elam (1993-1994, 1995)
	DMA2	ECM helped the organization increase the number of information sources,	
	DMA3	ECM helped the organization test assumptions and spend more time before making a decision.	
Decision Quality	DQ1	Based on the information from ECM, the outcome of the decision that I make is usually correct (the outcome may have minor errors)	Jarupathirun and Zahedi (2007)
	DQ2	Based on the information from ECM, the outcome of the decision that I make is usually accurate (the outcome has no errors at all)	
	DQ3	Based on the information from ECM, the outcome of the decision that I make is usually precise (the ECM will lead to the same outcome every time I face the same problem)	
	DQ4	Based on the information from ECM, the outcome of the decision that I make is usually dependable	
Impact on problem definition	IPD1	How much do you think ECM is helpful in addressing existing and anticipated needs in your department?	Oh (1998)
	IPD2	How much do you think ECM is helpful in assessing your manager's familiarity with the problem in your department?	
	IPD3	How much do you think ECM is helpful in clearly delineating the desired change in your department?	
	IPD4	How much do you think ECM is helpful in assessing the extent in which the change (that is proposed by ECM) enhances the public image of the organization?	
	IPD5	How much do you think ECM is helpful in assessing the extent to which successful implementation of the change (that is proposed by ECM) poses risks to individuals or the organization?	

D: Survey instrument

Hello,

You are invited to participate in an online survey conducted by researchers at the Virginia Commonwealth University. This study is being conducted to examine the decision support capabilities of the ImageNow/WebNow system, as an example of an Enterprise Content Management (ECM) system, and to investigate the potential application of ECM technology for decision-making activities. We hope to learn from your professional experience so as to help others in the ECM field to better utilize ECM systems to their full potential.

We would greatly appreciate your completing the online survey, which will take no more than 20 minutes. Your participation is crucial to the success of this study. Please be assured that your responses will be held in the strictest confidence, and your inputs will remain anonymous.

Since only limited evidence exists about the effectiveness of the ImageNow/WebNow system for decision support, the potential benefit to you from participating in the study is to increase your understanding of important strategic capabilities of the ImageNow/WebNow system. We expect that the findings of this research will help information technology professionals to focus more on these capabilities in order to achieve additional business value from the ImageNow/WebNow system.

{INSERT SURVEY WEBLINK}

This study has been reviewed and approved by the Virginia Commonwealth University Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have questions or concerns regarding this study please contact:

Jaffar Alalwan or H. Roland Weistroffer
Information Systems Department, Virginia Commonwealth University
School of Business, PO Box 844000
Snead Hall, 301 W. Main Street
Richmond, VA 23284-4000
804-517-4198 (Alalwan) or 804-828-7118 (Weistroffer)
alalwanja@vcu.edu or hrweistr@vcu.edu

We hope that you will be able to participate in this study.

Sincerely,

Jaffar Alalwan and H. Roland Weistroffer

Part 1: General Information

Is ImageNow implemented in your department?	☐ Yes	☐ No
Please continue with the survey ONLY if your answer is yes		

Part 2: Use of the ImageNow System

	Less than once per week (1)	One to three times per week (2)	Three to six times per week (3)	Once a day (4)	Several times a day (5)
1. How frequently do you use the ImageNow system?	☐	☐	☐	☐	☐

	One to two hours (1)	Two to three hours (2)	Three to four hours (3)	Four to five hours (4)	More than five hours (5)
2. If you use ImageNow everyday, how many hours do you use ImageNow per day?	☐	☐	☐	☐	☐

	One task (1)	Two to four tasks (2)	Four to six tasks (3)	Six to eight tasks (4)	More than eight tasks (5)
3. For how many different types of tasks do you use ImageNow?	☐	☐	☐	☐	☐

Part 3: based on your experience, please check one box, where 1 = strongly disagree, and 5 = strongly agree, that best indicates **how you agree or disagree with each of the following items** describing your satisfaction with the ImageNow system.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Users Satisfaction with ImageNow System	1	2	3	4	5
1. I have become dependent on ImageNow	☐	☐	☐	☐	☐
2. As a result of ImageNow, I am seen as more valuable in this organization	☐	☐	☐	☐	☐
3. I personally benefitted from the existence of ImageNow in this organization	☐	☐	☐	☐	☐
4. I have come to rely on ImageNow in performing my job	☐	☐	☐	☐	☐
5. All in all I think that ImageNow is an important system for the university	☐	☐	☐	☐	☐
6. ImageNow is extremely useful	☐	☐	☐	☐	☐
7. Utilization of ImageNow has enabled me to make better decisions	☐	☐	☐	☐	☐
8. As a result of ImageNow, I am better able to set my priorities in decision making	☐	☐	☐	☐	☐
9. Use of data generated by ImageNow has enabled me to present my arguments more convincingly	☐	☐	☐	☐	☐
10. ImageNow has improved the quality of decisions I make in this organization	☐	☐	☐	☐	☐
11. As a result of ImageNow, the speed at which I analyze decisions has increased	☐	☐	☐	☐	☐
12. As a result of ImageNow, more relevant information has been available to me for decision making	☐	☐	☐	☐	☐
13. ImageNow has led me to greater use of analytical aids in my decision making	☐	☐	☐	☐	☐

Part 4: based on your experience, please check one box, where 1 = strongly disagree, and 5 = strongly agree, that best indicates **how you agree or disagree with each of the following items** describing the speed of problem identification and decision making.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Speed of problem identification and decision making	1	2	3	4	5
1. ImageNow helps me sense key factors impacting my area of responsibility	☐	☐	☐	☐	☐
2. ImageNow helps me notice potential problems before they become serious crises	☐	☐	☐	☐	☐
3. ImageNow helps me make decisions quicker	☐	☐	☐	☐	☐
4. ImageNow helps me shorten the time frame for making decisions	☐	☐	☐	☐	☐

Part 5: based on your experience, please check one box, where 1 = strongly disagree, and 5 = strongly agree, that best indicates **how you agree or disagree with each of the following items** describing the decision making analysis.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Decision making analysis	1	2	3	4	5
1. ImageNow helps my department evaluate more alternatives	☐	☐	☐	☐	☐
2. ImageNow helps my department increase the number of information sources	☐	☐	☐	☐	☐
3. ImageNow helps my department test assumptions and spends more time before making a decision.	☐	☐	☐	☐	☐

Part 6: based on your experience, please check one box, where 1 = strongly disagree, and 5 = strongly agree, that best indicates **how you agree or disagree with each of the following items** describing the perceived decision quality.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Perceived decision quality	1	2	3	4	5
1. Based on the information from ImageNow, the outcome of the decision that I make is usually correct (the outcome may have minor errors)	☐	☐	☐	☐	☐
2. Based on the information from ImageNow, the outcome of the decision that I make is usually accurate (the outcome has no errors at all)	☐	☐	☐	☐	☐
3. Based on the information from ImageNow, the outcome of the decision that I make is usually precise (ImageNow will lead to the same outcome every time I face the same problem)	☐	☐	☐	☐	☐
4. Based on the information from ImageNow, the outcome of the decision that I make is usually dependable	☐	☐	☐	☐	☐

Part 7: based on your experience, please check one box, where 1 = strongly disagree, and 5 = strongly agree, that best indicates **how you agree or disagree with each of the following items** describing the impact on problem identification.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Impact on problem identification	1	2	3	4	5
1. The information from ImageNow is helpful in addressing existing and anticipated needs in my department	☐	☐	☐	☐	☐
2. The information from ImageNow is helpful in assessing my manager's familiarity with the problem in my department	☐	☐	☐	☐	☐
3. The information from ImageNow is helpful in clearly delineating the desired change in my department	☐	☐	☐	☐	☐
4. The information from ImageNow is helpful in assessing the extent in which the change (that is proposed by ImageNow) enhances the public image of the university	☐	☐	☐	☐	☐
5. The information from ImageNow is helpful in assessing the extent to which successful implementation of the change (that is proposed by ImageNow) poses risks to individuals or the organization	☐	☐	☐	☐	☐

Part 8: Users' Feedback

1. What is one change to ImageNow/WebNow that you feel would improve decision support?

_____

Part 9: Demographics

1. What is the name of your department? _____

2. What is your job title? _____

3. What is the highest level of education you have achieved?

    A. Bachelor degree

    B. Master's degree

    C. Doctorate degree

    D. Other (please specify) _____

4. Gender:

    A. Male

    B. Female

5. Age: _____

6. Ethnicity:

    A. White, Euro-American

    B. Black, African American

    C. Hispanic, Latino

    D. Asian, Pacific Islander

    E. Native American

    F. Other (please specify) _____

You have completed the survey; thank you very much for your participation!

E: The reviewed ECM papers and books

No.	Year	Authors	Publication Title	Paper/book Title	Publication type	Method.	ECM Dimension	Domain
1.	2002	Reimer J.A.	Datenbank-Spektrum	Enterprise Content Management	Journal	Descriptive	Tools	N/A
2.	2010	Malik S	Microsoft SharePoint 2010, 2010 - Springer	Enterprise Content Management	Book chapter	Descriptive	Tools	N/A
3.	2002	Rockley A, Kostur P, Manning S	Pearson Education	Managing enterprise content: A unified content strategy	Book		All	
4.	2003	Smith, H. A. and McKeen, J. D.	Communications of the Association for Information Systems	Developments in Practice VIII: Enterprise Content Management	Journal	Combined	Strategies Tools	N/A
5.	2005	Päivärinta T, Munkvold, B.E	HICSS	Enterprise Content Management: an integrated perspective on information management	Conference	Case Study	Tools Strategies People	N/A
6.	2006	Tyrväinen P, Päivärinta T, Salminen A, Iivari J	European Journal of Information Systems	Guest Editorial: Characterizing the evolving research on enterprise content management	Journal	Theoretical	All	N/A
7.	2006	Nordheim S, Päivärinta T	European Journal of Information Systems	Implementing enterprise content management: from evolution through strategy to contradictions out-of-the-box	Journal	Case Study	Processes	Oil industry
8.	2006	Munkvold BE, Päivärinta T, Hodne AK, Stangeland E	Scandinavian Journal of Information Systems	Contemporary Issues of Enterprise Content Management	Journal	Case Study	Tools Strategies People	Oil industry

No.	Year	Authors	Publication Title	Paper/book Title	Publication type	Method.	ECM Dimension	Domain
9.	2002	McNay HE	Professional Communication Conference	Enterprise content management: an overview	Conference	Descriptive	Tools	N/A
10.	2004	Nordheim S, Paivarinta T	HICSS	Customization of enterprise content management systems: an exploratory case study	Conference	Case Study	Tools Processes	Oil Company
11.	2005	Chiu DKW, Hung, P.C.K	HICSS	Privacy and access control issues in financial enterprise content management	Conference	Case Study	Tools Processes	Financial - Security
12.	2005	Sprehe JT	Government Information Quarterly	The positive benefits of electronic records management in the context of enterprise content management,	Journal	Case Study	Tools Strategies	N/A
13.	2004	Kwok KHS, Chiu, D.K.W	HICSS	A web services implementation framework for financial enterprise content management	Conference	Combined (Descriptive & Theoretical)	Tools Processes	Financial
14.	2005	Jenkins T	Open Text Corporation	Enterprise content management: what you need to know	Book		All	N/A
15.	2004	Fisher M, Sheth A	Practical Handbook of Internet Computing, CRC Press	Semantic Enterprise Content Management	Book chapter	Design science	Tools	N/A
16.	2005	O'Callaghan R, Smits M	ECIS	A Strategy Development Process for Enterprise Content Management	Conference	Design science	Strategies Processes	Tech industry
17.	2008	Brocke J, Simons A	21st Bled eConference	Towards a Process Model for Digital Content Analysis – The Case of Hilti	Conference	Design science	Tools Strategies	Construction
18.	2003	Jinwen S, Jianguo X	Computer Engineering	Web Services-based Modern Enterprise Content Management and Knowledge Integration Technology	Journal	Descriptive	Tools	N/A

No.	Year	Authors	Publication Title	Paper/book Title	Publication type	Method.	ECM Dimension	Domain
19.	2003	Asprey L, Middleton, M	Idea Group Publishing	Integrative document & content management: strategies for exploiting enterprise knowledge	Book		All	N/A
20.	2008	Brocke J, Simons A, Cleven A	ECIS	A Business Process Perspective on Enterprise Content Management: Towards a Framework for Organisational Change	Conference	Design science	Tools Strategies	N/A
21.	2004	Mauthe A, Thomas P	John Wiley and Sons	Professional content management systems: handling digital media assets	Book		All	N/A
22.	2006	Zykov S.	8th International Workshop on Computer Science and Information Technologies	Enterprise Content Management: Theory and Engineering for Entire Lifecycle Support	Workshop	Combined (Theoretical/Design science)	Tools Process	Oil industry
23.	2001	Zhongfan S	Computer Engineering and Applications	From Data Management to Content Management——the study of core technology of Enterprise Portals	Journal	Combined (Descriptive/Theoretical)	Tools	N/A
24.	2005	Dilnutt R	International Journal of Knowledge, Culture and Change Management	Enterprise Content Management: Supporting Knowledge Management Capability	Journal	Descriptive	Tools	N/A
25.	2009	Broadbent R.E.	Brigham Young University	Broadbent, R.E. (2009) A FUNCTIONAL FRAMEWORK FOR CONTENT MANAGEMENT	Master Thesis	Archival Study	Tools	N/A
26.	2007	Nguyen L. T., Swatman, P.M.C., Fraunholz B.	ACIS	EDMS, ERMS, ECMS or EDRMS: Fighting through the Acronyms towards a Strategy for Effective Corporate Records Management	Conference	Archival Study	Tools	N/A
27.	2006	Vitari C., Ravarini A., Rodhain F.	Communications of the Association for Information Systems	An Analysis Framework for the Evaluation of Content Management Systems	Journal	Combined	Tools Strategy	N/A

No.	Year	Authors	Publication Title	Paper/book Title	Publication type	Method.	ECM Dimension	Domain
28.	2009	Brocke J.V., Simons A., Cleven A.	Information Systems and E-Business Management	Towards a business process-oriented approach to enterprise content management: the ECM-blueprinting framework	Journal	Design science	Process	N/A
29.	2010	Arshad N. I., Bosua R., Milton S. K.	ACIS	Facilitating Information Sharing in Organizations using Electronic Content Management Systems (ECMS): Towards a Model	Conference	Theoretical	Strategy	N/A
30.	2010	Brocke J.V., Seidel S., Simons A.	HICSS	Bridging the gap between enterprise content management and creativity: A research framework	Conference	Theoretical	Strategy	N/A
31.	2008	Fowler D.	University of Oregon	Implementing Enterprise Content Management Using Microsoft SharePoint	Master Thesis	Archival	Tools	N/A
32.	2010	Joha A., Janssen M.	IFIP Advances in Information and Communication Technology	Content Management Implemented as Shared Service: A Public Sector Case Study	Journal	Case study	Strategy	Government organization
33.	2009	Usman M., Muzaffar A., Abdul Rauf	2nd IEEE International Conference on Computer Science and Information Technology	Enterprise Content Management (ECM): Needs, challenges and recommendations	Conference	Theoretical	Tools Strategy	N/A
34.	2010	Brocke J.V., Simons A., Sonnenberg C., Agostini P.L., Zardini A.	INFORMATION SYSTEMS: PEOPLE, ORGANIZATIONS, INSTITUTIONS, AND TECHNOLOGIES	Value Assessment of Enterprise Content Management Systems: A Process-oriented Approach	Book chapter	Design science	Strategy	N/A
35.	2008	Chieu T.C., Liangzhao Z., Mohindra A.	IEEE International Conference	An extensible enterprise content management system with Service Component Architecture	Conference	Design science	Tools	N/A

No.	Year	Authors	Publication Title	Paper/book Title	Publication type	Method.	ECM Dimension	Domain
36.	2005	Mega C., Wagner F., Mitschang B.	Datenbanksysteme in Business, Technologie und Web	From Content Management to Enterprise Content Management	Conference	Descriptive	Tools	N/A
37.	2007	Chieu T.C., Nguyen T.; Liangzhao Z.	IEEE International Conference	Secure Search of Private Documents in an Enterprise Content Management System	Conference	Design Science	Tools	
38.	2002	Fowell S.	DIGITAL LIBRARIES: PEOPLE, KNOWLEDGE, AND TECHNOLOGY Lecture Notes in Computer Science	Bridging the Gap between Information Resource Design and Enterprise Content Management	Book chapter	Theoretical	Strategy	N/A
39.	2004	Junco, N.L., Bailie, R.A	IPCC 2004	A case study of content management	Conference	Case study	Process	Medical (dental) field
40.	2010	Laleci G.B., Aluc G., Dogac A., Sinaci A., Kilic O., Tuncer F.	Knowledge-Based Systems	A Semantic Backend for Content Management Systems	Journal	Design science	Tools	N/A
41.	2008	Chieu T.C., Liangzhao Z.	IEEE Congress on Services Part II	Service-Oriented Approach for Implementing an Extensible Content Management System	Journal	Design science	Tools	N/A
42.	2009	Chao S., Luo Z.	Modern Electronics Technique	Design and Implementation of Content Management System Based on .NET Platform [J]	Journal	Design science	Tools	N/A
43.	2008	Eden B. L.	Scarecrow Press	Content management systems in libraries	Book	Case Study	All	Library

No.	Year	Authors	Publication Title	Paper/book Title	Publication type	Method.	ECM Dimension	Domain
44.	2006	Scheepers R.	European Journal of Information Systems	A conceptual framework for the implementation of enterprise information portals in large organizations	Journal	Case Study	Strategy Processes	N/A
45.	2007	Benevolo C., Negri S.	The Electronic Journal Information Systems Evaluation	Evaluation of Content Management Systems (CMS): a Supply Analysis	Journal	Survey	Tools	N/A
46.	2006	Krechel D., Hartbauer M., Maximini K.,	19th IEEE Symposium on Computer-Based Medical Systems (CBMS'06)	LENUS - The Hospital Content Management System	Symposium	Descriptive	Tools	Medical
47.	2008	Carvalho R.A.	RESEARCH AND PRACTICAL ISSUES OF ENTERPRISE INFORMATION SYSTEMS II VOLUME 1 IFIP International Federation for Information Processing	An Enterprise Content Management Solution Based on Open Source	Book Chapter	Descriptive	Tools	N/A
48.	2007	Liu S., McMahon C., Darlington M., Culley S. Wild P.	INTERNATIONAL JOURNAL OF AUTOMATION AND COMPUTING	EDCMS: A content management system for engineering documents	Journal	Descriptive	Tools	Engineering
49.	2011	Scott J.	HICSS	User Perceptions of an Enterprise Content Management System	Conference	Survey	People	N/A
50.	2003	Burlaca O.	Computer Science Journal of Moldova	NeoSite: A simple Content Management System	Journal	Descriptive	Tools	N/A
51.	2002	Kelley J.	Barnes & Noble	Knowledge Nirvana: Achieving The Competitive Advantage Through Enterprise Content Management and Optimizing Team Collaboration	Book	Descriptive	All	N/A

No.	Year	Authors	Publication Title	Paper/book Title	Publication type	Method.	ECM Dimension	Domain
52.	2008	Brocke J., Becker J., Simons A., Fleischer S.	AMCIS	Towards the Specification of Digital Content - The Enterprise Content Modeling Language (ECML)	Conference	Design science	Tools	N/A
53.	2009	Naak A., Hage H., Aïmeur E.	E-TECHNOLOGIES: INNOVATION IN AN OPEN WORLD Lecture Notes in Business Information Processing	A Multi-criteria Collaborative Filtering Approach for Research Paper Recommendation in Papyres	Book chapter	Descriptive	Tools	Research
54.	2008	Naak A., Hage H., Esma A.	10th IEEE Conference on E-Commerce Technology and the Fifth IEEE Conference on Enterprise Computing	Papyres: A Research Paper Management System	Conference	Descriptive	Tools	Research
55.	2010	Befa M., Kontopoulos E., Bassiliades N., Berberidis C., Vlahavas L.	ELECTRONIC GOVERNMENT AND THE INFORMATION SYSTEMS PERSPECTIVE Lecture Notes in Computer Science	Deploying a Semantically-Enabled Content Management System in a State University	Book chapter	Descriptive	Tools	N/A
56.	2010	Aziz B., Arenas A., Cortese G., Crispo B., Causetti S.	International Conference on Availability, Reliability and Security	A Secure and Scalable Grid-Based Content Management System	Conference	Design science	Tools	N/A
57.	2003	Pachet F.,	Communications of the ACM	Content Management for Electronic Music Distribution: What Are the Issues?	Journal	Case study	Tools Strategy	Music industry
58.	2008	Souer J.,	Journal of Digital Information Management	A Framework for Web Content Management System Operations and Maintenance	Journal	Design science	Tools Strategy	N/A

No.	Year	Authors	Publication Title	Paper/book Title	Publication type	Method.	ECM Dimension	Domain
59.	2008	Wagner F., Krebs K., Mega C., Mitschang B., Ritter N.	12th East European Conference, ADBIS 2008	Towards the Design of a Scalable Email Archiving and Discovery Solution	Conference	Descriptive	Tools	N/A
60.	2007	TALLOJU M.	KANSAS STATE UNIVERSITY	USABILITY OF WEB CONTENT MANAGEMENT SYSTEMS	Master Thesis	Survey	Tools	N/A
61.	2009	Banks D., Erickson J., Rhodes M.	HotCloud'09 Proceedings of the 2009 conference on Hot topics in cloud computing	Toward Cloud-based Collaboration Services	Conference	Descriptive	Tools	N/A
62.	2005	Yu H.,	Information Science Publishing	Content and Workflow Management for Library Web Sites	Book	Case Studies	All	Library
63.	2009	Koidl K., Conlan O., Wade V.	International Workshop on Dynamic and Adaptive Hypertext: Generic Frameworks, Approaches and Techniques (DAH'09)	Non-Invasive Adaptation Service for Web-based Content Management Systems	Conference	Descriptive	Tools	N/A
64.	2010	Bianco F., Michelino F.	International Journal of Information Management	The role of content management systems in publishing firms	Journal	Case study	Tools Strategy People	N/A
65.	2010	Zardini A., Mola L., Brocke J.V., Rossignoli C.	Proceeding of the 2010 conference on Bridging the Socio-technical Gap in Decision Support Systems: Challenges for the Next Decade	The Shadow of ECM: The Hidden Side of Decision Processes	Conference	Case Study	Strategy	N/A
66.	2008	Yan G., Wu J.,	RESEARCH AND PRACTICAL ISSUES OF ENTERPRISE INFORMATION SYSTEMS II IFIP International Federation for Information Processing	A New Approach to Implement Enterprise Content Management System Using RSS and Folksonomy	Book chapter	Descriptive	Tools	N/A

No.	Year	Authors	Publication Title	Paper/book Title	Publication type	Method.	ECM Dimension	Domain
67.	2010	Chiu D.K.W., Hung P.C.K., Kwok K	International Journal of Systems and Service-Oriented Engineering (IJSSOE)	Engineering Financial Enterprise Content Management Services : Integration and Control	Journal	Case Study	Tools	N/A
68.	2008	Allen D.		Enterprise Content Management Best Practices: Ecm Strategy 100 Most Asked Questions	Book	Descriptive	Strategy	
69.	2008	Koo J.	Governance, Risk, and Compliance Handbook: Technology, Finance, Environmental, and International Guidance and Best Practices	WHAT TO LOOK FOR IN ENTERPRISE CONTENT MANAGEMENT FOR COMPLIANCE	Book chapter	Descriptive	Tools	N/A
70.	2011	Alalwan J., Weistroffer R.	Southern AIS Conference	Decision Support Capabilities of Enterprise Content Management: A Framework	Conference	Theoretical	Strategy	N/A
71.	2010	Kunstova R.	Organizacija	Barriers and Benefits of Investments into Enterprise Content Management Systems	Journal	Survey	Strategy	N/A
72.	2009	Kun M., Kaiyue Q., Jianbo C.	Computer Application and Software	WEB2.0 CONTENT MANAGEMENT SYSTEM	Journal	Descriptive	Tools	N/A
73.	2007	Norrfors T.	Ume˚a University	Platina examined - usability evaluation of an Enterprise Content Management system	Master Thesis	Survey	Tools Strategy	N/A
74.	2005	Math J.C.B.C	The Conference for Unix, Linux, and Open Source Professionals	Content Management System Strategies for Business and Government	Conference	Descriptive	Strategy	N/A
75.	2010	Xin-qiang M.A.	Microcomputer Information	Research on Multiple Security Models of Content Management System	Journal	Descriptive	Tools	N/A
76.	2010	Korb J., Strodl S.	Proceedings of the 7th International Conference on Preservation of Digital Objects	DIGITAL PRESERVATION FOR ENTERPRISE CONTENT: A GAP-ANALYSIS BETWEEN ECM AND OAIS	Conference	Descriptive	Strategy	N/A

No.	Year	Authors	Publication Title	Paper/book Title	Publication type	Method.	ECM Dimension	Domain
77.	2006	Obermier T.	Journal of Industrial Technology	Accreditation Self-Study Management Using a Website Content Management System	Journal	Descriptive	Strategy	Education
78.	2010	Zhang s., Chen X., Fu J.	5th International Conference on Computer Science and Education (ICCSE)	Construction of course-education website based on content management system	Conference	Descriptive	Tools	Education
79.	2009	Hopkins P.	EDUCAUSE Australasia 2009: Innovate - Collaborate - Sustain.	Engaging with 'Web 2.0' technologies: Implementing enterprise content management at Bond University.	Conference	Case study	Process	Education
80.	2009	Saslaw L.	University of North Carolina	THE EFFECTIVENESS OF INQUIRY-BASED DESIGN AS A TOOL FOR CREATING A CONTENT MANAGEMENT SYSTEM IN A HEALTHCARE BILLING ENVIRONMENT	Master thesis	Combined	Tools	Healthcare
81.	2008	Brocke J.V., Simons A., Schenk B.	19th Australasian Conference on Information Systems	Transforming Design Science Research into Practical Application: Experiences from Two ECM Teaching Cases	Conference	Design science	Process	N/A
82.	2009	Meike M., Sametinger J., Wiesauer A.	Security & Privacy, IEEE	Security in Open Source Web Content Management Systems	Journal	Descriptive	Tools	N/A
83.	2007	Goings D., Johnson J., Marshall B., Goette T.	Communications of the IIMA	The Influence of Government Regulations on Content Management Systems: An Exploratory Study	Journal	Case study	Strategy	N/A
84.	2004	Taylor T.	International Water Power & Dam	Avoiding downtime: [improving content	Journal	Descriptive	Strategy	Water

No.	Year	Authors	Publication Title	Paper/book Title	Publication type	Method.	ECM Dimension	Domain
			Construction	management of hydro operations]				Industry
85.	2009	Naik U., Shivalingaiah D.	7th International CALIBER	Open Source Software for Content Management System	Conference	Archival	Tools	N/A
86.	2007	Bawazir S., BenSeddeek H.	IEEE GCC	Web Content Management (WCM): Overview and Specifications	Conference	Descriptive	Tools	N/A
87.	2011	Pérez-Montoro M.	CONTENT MANAGEMENT FOR E-LEARNING	Theoretical Perspectives on Content Management	Book chapter	Theoretical	Tools	N/A
88.	2007	Fennell C.M.	Medical Reference Services Quarterly	Content Management and Web 2.0 with Drupal	Journal	Case study	Process	Healthcare
89.	2010	Nath M., Arora A.	IEEE International Conference on Software Engineering and Service Sciences (ICSESS	Content management system : Comparative case study	Conference	Case study	Tools	N/A
90.	2007	Iverson J., Burkart P.	NONPROFIT MANAGEMENT & LEADERSHIP	Managing Electronic Documents and Work Flows Enterprise Content Management at Work in Nonprofit Organizations	Journal	Theoretical	Strategy	Nonprofit
91.	2008	Pullman G, Baotong G.	Technical Communication Quarterly	Guest Editors' Introduction: Rationalizing and Rhetoricizing Content Management.	Journal	Theoretical	Strategy	N/A

F: Table shells that are used to gather the case study data

Strategy Formulation Phase	
<u>Step 1: Identify vision & mission</u>	
Vision: the future probable outcomes and positions associated with the ECM system (e.g. providing an efficient, accessible, collaborative, and secure information resource to support the business processes).	
Mission: what needs to be done in order to reach the future outcomes (e.g. establishing an easier and more advanced method to search, find, use, share, store, and keep high quality information).	

Strategy Formulation Phase			
Step 2: Identify strategies, strategic objectives, and performance measures			
Strategies	**Mission**	**Strategic objectives**	**Performance measures**
1.Content strategy (e.g. content and users)			
2. Enterprise strategy (e.g. organizational, economic, social)			
3. Process strategy (e..g. implementation of content lifecycle activities)			
4. Technology strategy (e.g. hardware, software)			

Strategy Formulation Phase	
Step 3: Specify key success factors	
1. Change management	
2. Top management commitment	
3. Stakeholders' Involvement	
4.	
5.	
6.	

Strategy Formulation Phase	
Step 4-1: Allocate resources	
Allocating hardware	
Allocating software	
Allocating human resources	

Step 4-2 Building cause-and-effect relations: (see step 2)

	Strategic Objective	Target (Performance Measure)
Content		
Processes		
Enterprise		
Technology		

Strategy Implementation and Performance Evaluation Phase		
Step 5: Develop action plans and performance measures		
Stage	**Actions**	**Details**
1.Analyze & Design	product demonstration	
	review existing process and workflow	
	identify and develop script requirements	
	identify users and their permissions	
2. Implement & Verify	conduct configuration and components implementation	
	Develop and install script	
	perform component and script Q/A testing	
	Install client-side hardware and software	

	train the trainer	
3. Deploy & Support	Perform internal system testing	
	create training materials	
	have a project wrap-up meeting	
	highlight transition issues to support	
	send project closure announcement	