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# Understanding The Use Of Enterprise Content Management Systems In Coordination Type Of Organizations

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# UNDERSTANDING THE USE OF ENTERPRISE CONTENT MANAGEMENT SYSTEMS IN COORDINATION TYPE OF ORGANIZATIONS

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## Abstract

*Today, information is increasingly becoming a key business resource and organizations begin to implement Enterprise Content Management Systems (ECMS) to share those information. ECMS is an emerging approach that enables efficient sharing of business-related information. However, there is still a significant lack of knowledge on how to efficiently make use of these technologies for sharing information that support organization's business operations. In this paper, we investigate the use of ECMS in organizations that emphasize high levels of process integration termed as Coordination. We use a qualitative research approach to illustrate that in Coordination type of organizations, ECMS is useful for (1) sharing unstructured information, (2) sharing information that supports integrated business processes and (3) internal and external sharing. Finally, to ensure that ECMS can be effectively used for information sharing, our findings suggest three elements to be taken into considerations namely (1) relevant information that needs to be shared, (2) the patterns of integrated business processes that requires information sharing and (3) users that involve in the process of sharing. The finding is significant for business and IT managers because it will guide them with ways to use ECMS and gain more benefits from it.*

**Keywords:** *Information sharing, Enterprise Content Management Systems (ECMS), Business Operating Model, business process.*

# 1 INTRODUCTION

In the course of daily business, organization shares enormous volumes of business-related information within and between business units and with stakeholders. Business-related information such as inventory list is often shared to complete end-to-end processes (Jenkins 2006). Failure to share this type of information during business process executions may affect a business for example it can delay a decision making process (Dilnutt 2006b; Gupta et al. 2001; Sprehe 2005). Because of this, organization finds it very important to efficiently share information during business process executions.

Realizing the importance of information sharing many organizations begin to implement Enterprise Content Management Systems (ECMS) (Dilnutt 2006a; Gupta et al. 2001; Munkvold et al. 2006; Tyrväinen et al. 2003). Many ECMS vendors have claimed that these technologies can facilitate the sharing of information that supports business operations, *“the technologies used to create, manage, customize, deliver and preserve information to support business process”* (Vom Brocke et al. 2010b). However, little academic work has been carried out so far that provide clear guidelines on how to use ECMS for information sharing during process executions (Andersen 2008). A number of authors also expressed their views that there are no sufficient case studies published in the IS literature that provide examples and report on ways in which ECMS are used for information sharing (Andersen 2008; Bianco and Michelino 2010; Munkvold et al. 2006; Nordheim and Paivarinta 2006; Paivarinta and Munkvold 2005; Tyrväinen et al. 2006; Vom Brocke et al. 2011). Related to this, Bouwman et al. (2005) highlight that the study of ICT (including ECMS) use is critical since *“... the use of ICT is not simply the result of the introduction of a new application in an organization.”* Hence, in this present paper, we claim that there is limited if any guidance for practitioners to understand how ECMS can actually be used for sharing information that support the way organizations conduct its business, and therefore it is significant to conduct a study on ECMS use.

Considering the lack of research on this topic, our study is focused primarily on understanding the way organizations use these technologies in their daily operational activities. It is also worth mentioning that the aim of our larger research project is to investigate how different types of organizations that emphasize certain business processes use ECMS to share information. In this paper, we explore the ways Coordination type of organizations use ECMS for information sharing. We use a qualitative, exploratory study to address the following research question: *“How does a Coordination type of business operating model influence the way in which ECMS is used to share information?”*

This paper makes one principle contribution. Drawing on the rich data of two Coordination types of organizations' experience, the paper generates understanding of the ways ECMS can be used to share information that support business process executions. Such an understanding has been absent from the research and practise discourses on ECM technologies.

In an attempt to find answers to this research question, we structure this paper as follows. Firstly, we explain ECMS and previous research on Enterprise Content Management (ECM). Following this, we present the business operating model of Ross et al. (2006) that explains how business-related information can be shared using IT (including ECMS) to support business operations. We then proposed a research model to guide our empirical study and followed by the method used to test this model. Next, we present our findings and discussions followed by a conclusion.

# 2 RESEARCH BACKGROUND

ECMS are *“the technologies, tools and methods used to capture, manage, store, preserve and deliver content across an enterprise”* (Blair 2004). From this definition, it first explains that ECMS exist as a combination of different technologies to manage content (Dilnutt 2006a; Dilnutt 2006b; Iverson and Burkart 2007; Jenkins 2006; Keyes 2006; Reimer 2002; Smith and McKeen 2003). Dilnutt (2006a)

and Jenkins (2006) describe a number of components of technologies that underpin ECMS, which are: content management systems, document management systems, records management systems, collaboration technologies, portal technologies, workflow systems and search and retrieval capabilities. Grahlmann et al. (2011) further explain that ECMS has four main functionalities, which are: (1) Access: interface functions to retrieve content, (2) Process: control and coordination functions, (3) Service: functions to capture, manipulate, use and publish content and (4) Repository: functions to store and preserve content. However, a list of ECM technologies and functionalities by its nature does not help business managers to critically understand how far ECMS can facilitate information sharing (Bouwman et al. 2005). Therefore, we decided to explore and explain how organizations can actually use ECMS for sharing information in ways that is supporting its business operations.

To study the ways ECMS is used for information sharing, Paivarinta and Munkvold (2005) highlight the need to consider an organization's enterprise model. They explain that the ways in which information is shared using ECMS is in turn driven by an organization's enterprise model, as discussed below.

## **2.1 Enterprise Model and ECMS Use for Information Sharing**

Paivarinta and Munkvold (2005) explain that the concept of enterprise model may serve as the basis to understand how ECMS can be used to suit organization way of doing its business. They further mentioned that an enterprise model is: (1) a shared idea about what needs to be done in an enterprise, (2) represents an idea of the business, (3) specifies required operations within the enterprise, (4) explains how the operations reach selected partners and customer networks and, (5) describes the user roles and rights in the operations.

Furthermore, Paivarinta and Munkvold (2005) found that different organizations may have different ideas about the central concepts needed for their enterprise model. Since organizations may employ different types of enterprise models, therefore, they found out that depending on the enterprise model organizations may use ECMS for sharing information in different ways. For example Paivarinta and Munkvold (2005) found that logistics organizations (such as FedEx) often emphasize standardization in their operations. They use ECMS as a tool to ensure that every business unit shares and reuses processes (for instance, following the same invoice management process). Other organizations (for example, BOC Gases) emphasize integration across their business units. BOC Gases is involved in managing intra-organizational projects to build plants. In their case, ECMS is specifically used as a tool for sharing documents and other types of information with its subcontractors and business partners to complete their plants.

However, a literature gap exists where there is no enterprise model identified in the ECM literature that can fully represent all types of organizations business processes (Paivarinta and Munkvold 2005; Tyrväinen et al. 2006). Thus, this has led us to find a representation of an enterprise model that is more focused on organizations business processes. Considering this gap, we select a mature model that highlights how IT underpins a firm's process architecture known as the business operating model of Ross et al. (2006) as the enterprise model for explaining how ECMS is used for sharing information that supports process executions.

## **2.2 The Business Operating Model**

Ross et al. (2006, p.25) explain that an operating model informs the necessary level of business process integration and standardization adopted by an organization for delivering goods and services to its customers. It describes how a company conducts its business. Standardization of business processes means defining exactly how a process will be executed. The result of standardization is a reduction in the variability of processes. On the other hand, the integration of business processes links the processes between business units through shared information. This sharing of information between processes enables end-to-end transaction processing.

Further, Ross et al. (2006) indicate that the operating model gives an organization a better guidance for developing and using IT based on its business needs. For example, high integration of business process is associated with the need to use IT to allow information sharing between processes or business units to enable end-to-end transaction processing. However, IT as mentioned by Ross et al. (2006) differ so widely (e.g., ERP, SCM and CRM). Therefore, it is our intent to narrow the focus to ECMS which is a relatively new field in academia (Brocke and Simons 2008; Grahlmann et al. 2010; Tyrväinen et al. 2006; Vom Brocke et al. 2010b) and which is have been receiving a significant uptake in modern organizations lately (Blair, 2004, Paivarinta and Munkvold, 2005).

The combination of the two business process dimensions (integration and standardization) represents a two-dimensional business operating model with four quadrants namely Replication, Coordination, Unification and Diversification. Every operating model has its unique characteristics that informs how an organization executes its business processes and may implement its IT (Ross et al. 2006). Relating to this, we argue that organizations falls under each types of operating model may use ECMS in unique ways for sharing information that supports its particular levels of business process standardization and integration. As indicated, in this paper we focus on one of the four operating model which is Coordination and is further explained in the following sub-section.

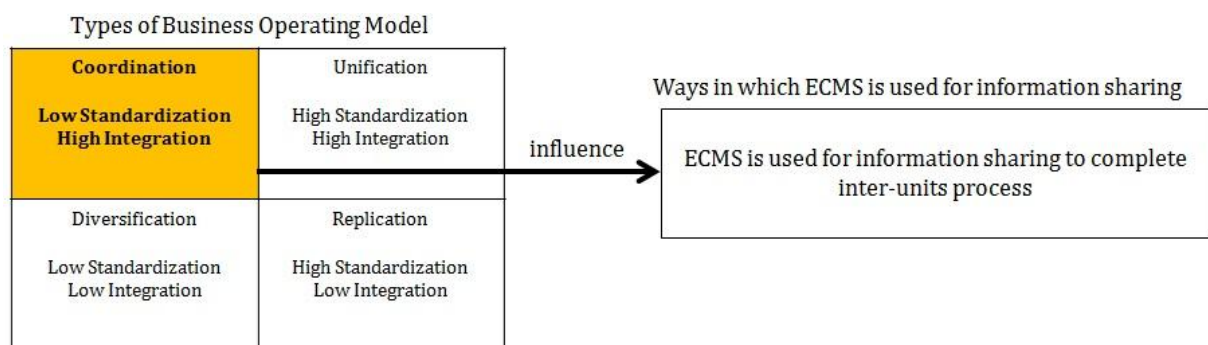
### 2.2.1 Coordination Operating Model

Coordination operating model calls for high levels of integration but low standardization of processes (Ross et al. 2006). High levels of integration means most key business processes are integrated and linked between units. The examples of integrated processes are integrated customer services and integrated supply chain processes. Due to the highly integrated business processes, business units often need to share information that relates to customers, products, suppliers and partners. On the other hand, low standardization of business process means every business unit has unique operations. Every unit manager often executes their unit processes independently, but there will be negotiation among them to ensure a smooth integrated service is delivered to customers. In this type of organizations, any technology that allows information sharing between units is crucial for completing the inter-units integrated processes.

Based on the preceding discussions, we intend to explore how Coordination operating model influence the way in which ECMS is used for sharing information. Therefore, we build a research model to explain the link and are discussed in the next section.

## 3 RESEARCH MODEL AND METHOD OF STUDY

Based on the preceding key concepts discussed in the previous sections, an initial research model in Figure 1 is developed to guide our empirical study. The model is used to explore the relationship and to explain the link between Coordination operating model and the ways in which ECMS is used for sharing information that supports this type of organizations way of doing business.



*Figure 1: Influence of Coordination Operating Model on ECMS Use*

### 3.1 Research Method

Given that ECMS use is the phenomenon under study and it is hardly separable from its context, case study approach as detailed by Miles and Huberman (1994) and Yin (2009) was employed. In this study, ECMS use refers to the phase after ECMS implementation or termed as post-implementation period. According to Yin (2009, p.33) the unit of analysis in a case study can be concrete (e.g., individuals, organizations) or less concrete (e.g., decisions, relationships). The unit of analysis in this study falls into the less concrete category which is the use of ECMS to support organizational business processes during the post-implementation period.

Since we were interested in gaining a deeper understanding on how ECMS is used to share information in Coordination type of organizations, case studies were conducted in two selected organizations. The two case organizations were selected based on the following criteria: (1) is a large organization, (2) employs a Coordination operating model, (3) is using ECMS for sharing information to support at least one primary business process and (4) the ECMS in use is Microsoft SharePoint. We select Microsoft SharePoint as to minimize the varying functionalities and features offered by different type of ECMS products (Grahmann et al. 2011; Stig and Tero 2008). Before conducting the case study, the researcher has assured that the case organizations met the criteria of a Coordination model as outlined by Ross et al. (2006) and presented in Table 1.

The first case study was conducted in January 2011 at Organization A, a solution integrator. While the second case study took place at Organization B, a consulting company in November 2011. Table 2 gives some background information on each of the case organization. The organizations were named Organization A and Organization B to preserve anonymity. The two sites were from different types of organizations namely solution integrator and consulting type of organization (see the second column of Table 2). This study intends to see the similarities and contrast in the use of ECMS in various industries, hence the selection of different business sectors. Referring to the third column of Table 2, both organizations had different motivations for implementing ECM system. This is inline with the work of Paivarinta and Munkvold (2005) who analyzed 58 cases and found that organizations implement ECMS for different reasons. This study also found that the implementation and post-implementation support of ECM systems were handled in different ways (see the 4<sup>th</sup> and 5<sup>th</sup> column of Table 2). Both organizations had more than 4 years of experience with the ECM system (see the last two columns of Table 2).

Visits at each organization consisted of four to eight semi-structured interviews, a few follow-up interviews, documentation review and observations with selected participants as summarized in Table 3 and Table 4. Each interview lasted between 30 minutes to 1 hour. Interviews were tape recorded while field notes were taken during observations. These data gathering concentrated on ways in which ECMS is used for sharing information that support business process executions within these two organizations. In particular, data collection focused on the topics of experiences with the ECM technologies, work processes that associated with the use of ECMS, the way ECMS is used for information sharing, the challenges associated with the use of these technologies and previous experiences in completing their work process before ECMS was introduced. We also sought information on, among other topics: organization's core business, business processes, business units, other technologies in-use and the rationale for adopting ECMS.

All interviews were transcribed and individual case study reports were created. Each case study report is reviewed by one selected participants (one of the project manager at Organization A and the IT administrator at Organization B) who have proven to be reliable and who are in the position to reflect on the case study (Miles and Huberman 1994). The data analysis followed the open and axial coding techniques as identified by Strauss and Corbin (1990). Particular attention was paid to coding separately the categories of ECMS use (open coding) and then identifying and linking them to organization business process (axial coding). In this process triangulation of data sources between interviews, documents and participant observations played an important role in ensuring validity of the results and limiting the effect of respondent bias (Yin 2009).

Coordination Criteria (Ross et al. 2006)	How Organization A Satisfies the Coordination Criteria	How Organization B Satisfies the Coordination Criteria
To what extent is the successful completion of one business unit's transaction dependent on the availability, accuracy, and timeliness of other business units' data?	Specialized business units (e.g., business development, client management and SAP unit) work together to complete end-to-end ICT services. Every unit heads meet regularly to discuss on how to provide smooth and integrated service to clients (i.e. business process are highly integrated).	Specialized business units (e.g., civil, mechanical and electrical engineering unit) collaborate to deliver an integrated engineering project management and consultation services that include engineering design, procurement, construction management and commissioning and asset management (i.e. business process are highly integrated).
To what extent does the company benefit by having business units run their operations in the same way?	During project execution, every specialized unit is responsible to complete and delivers unique services (low standardization).	In any project, each business unit delivers unique products and handle different services (low standardization). From our observation it was evident that the way one unit conduct their work is different from another.
Shared customers, products or suppliers and data/information	Business units deal with the same customers and trusted suppliers to get similar products, <i>"I have to deal with our previous suppliers and get the same products that we procured in our last VoIP project. Since I was not in the team before, I have to dig out info from Co_Sharing [ECMS]."</i>	From our observation it was evident that in a project every unit is working for a particular (same) client and the output is to be delivered to a particular (same) contractor. It was also seen that they share customer data.
Impact on other business unit transaction	A unit can only starts to work on their part by referring to another unit's output, <i>"Project management unit shares the project requirements approved by clients with the network and telecommunication unit. The network unit then design the virtual land based on client's requirements. The solution architect unit then refers to the design to come out with project plan..."</i>	It is very crucial for every unit to share its drawings with other units as explained by an engineer, <i>"When my boss did not receive email from the architecture unit, he thought that there are no more revisions. So he directed us to refer to the architecture drawings that he received last Thursday. We spent a week working on our part not knowing that the architecture unit has done so many changes! It was a waste of time."</i>
Operationally unique business units or functions	Every business unit provide and deliver unique services that include operation, corporate services, business development and client management, corporate planning and strategy, project service delivery, application delivery and SAP unit.	From our observation it was evident that every unit are specialized and they design different part of the project drawing.
Autonomous business management	Every business unit head made their own decision and plan, however they discuss with other unit's head on how to provide smooth and integrated services to clients.	One of the project manager explained that although every unit collaborate in projects, however, the way each unit conducts and manage their work is different. For example, each unit's engineer has to attend different kinds of trainings and deal with different regulatory compliance.
Business unit control over business process design	Every unit head control their unit business process design, <i>"Some unit enforce staff to submit documents in SharePoint [ECMS], use the timesheet to key-in man-days and man-hours, report to unit heads on every Monday.... Most units have their own policies."</i>	One of the unit head explained the way they manage their unit work process, <i>"It is totally up to us [unit head] how we want to manage our unit. We can meet weekly or use the Co_Sharing [ECMS] or appoint lead engineer to review or whatever. As long as we submit our [unit] drawing before the deadline, that is what matter most."</i>

*Table 1. Organization A and Organization B employ Coordination operating model*

Case	Type of Business	Initial goal for implementing ECMS	Who handle the implementation	Who maintain and support	When was ECMS implemented	When were interviews conducted
OrganizationA	Solution Integrator	(1) For information sharing, (2) For project collaboration and (3) To retain employees' knowledge.	Internal - Corporate integration unit set-up the ECMS, studied the old EDMS structure, data and current IP work processes, user requirements and then designed the ECMS.	Internal - Technical and support unit	2006 (exact month not available)	January 2011 ~ 4 - 5 years after deployment
OrganizationB	Engineering Consulting	(1) For sharing project drawings internally and externally (clients, contractors), and (2) For engineers to collaborate on the design of their project drawings.	Vendor set-up the ECMS and then 2 internal IT staff was assigned to study, design and implement process workflows.	Internal - Maintained by 2 IT staff	June 2006	Nov-Dec 2011 5 years and 5 months after deployment

*Table 2. Background data for case study sites*

## 4 CASE STUDY FINDINGS

In this section, we first present the case study findings at Organization A and followed by the case of Organization B. We also include some exemplary statements to facilitate understanding of the conclusion drawn.

### 4.1 Case 1: The case of a solution integrator, Organization A

Organization A's core business is to manage and deliver end-to-end ICT services. Its services include ICT-related consultancy, ICT project management, SAP implementation and support, business systems and solutions integration, ICT services management, software and solutions development, licensed commercial applications and business intelligence. It is headquartered in Kuala Lumpur, Malaysia and it has 17 offices country-wide. Organization A comprises of many business units that include operation, corporate services, business development and client management, corporate planning and strategy, project service delivery, application delivery and SAP unit. The actual personal interviewed in this case is shown in Table 3.

Business Unit	Job Title	Interview Duration	Other Sources of Data
Human Resources	HR Manager	45 minutes	-
	HR Executive	37 minutes	Observation and informal discussion
	HR Clerk	30 minutes	Observation and informal discussion
CEO Office	Chief Information Officer (CIO)	35 minutes	-
Network & Telecommunications	Senior Engineer	30 minutes	Observation and informal discussion
	Engineer	30 minutes	Observation and informal discussion
Project and Service Delivery	Project Manager	47 minutes	Observation and informal discussion
	Project Manager	30 minutes	-

*Table 3. Organization A interview details*

This organization employs a Coordination operating model as shown in Table 1 (column 2). When there is a project to be delivered to clients, related units work together to complete the end-to-end services. For example, in a SAP project, the business development and client management, project service delivery and the SAP unit collaborate to complete the project. In completing the SAP project, each unit delivers unique services but every unit heads often meet and discuss to provide a smooth and integrated service to its customers. Every unit also share information and monitor each other's progress through ECMS, known as the Co\_Sharing.

### The way ECMS is used for information sharing at Organization A

From the interviews we understand that Co\_Sharing is used for sharing project-related information among related units that involve in a particular project. The examples of project-related information



are project timelines, back-up plans and list of project activities. Business units that involve in every project vary as it depends on the type of project. For example, ICT network projects may involve the project service delivery and the network operation unit. While ICT consultation projects may involve the corporate services, corporate planning and strategy and project management unit.

We studied how business units used the Co\_Sharing for sharing information in handling one ICT network project. At the early stage of the project, the project management unit shared the project description that explained about the overall project requirements, as one of the project manager explained, *“During the initiation stage we share description about our clients, description about our vendor and our client site description. Normally, we at the project management office will work on these documents with our client. Other teams can only start doing their job after the project description is approved by our clients.”*

Once the client approved the project description, project management unit shared this information in the Co\_Sharing. From our observation, it was seen that the network and telecommunication unit used the project description as a guideline to design the virtual land. The virtual land design contained network specification that included the IP range, optimizer, firewalls, segments and more. The completed virtual land design was then shared in the Co\_Sharing, as one of the project engineer said, *“This is the design of the virtual land. Here is where we are going to build the firewalls and create new segments. We will share this information in Co\_Sharing so that the solution architect unit can start doing their job.”*

At the next stage, the solution architect unit referred to the virtual land design and examined the network requirements to come out with a detail project plan, as one of the project engineer explained, *“I have to first find out the number of users at our client’s site. Then, I refer to this virtual land design and determine how many firewalls needed. This is the site, this is the links and to make it more stable we need this much of firewalls. I will include all this details in our project plan.”* Once the project plan was finalized, the unit head uploaded them in Co\_Sharing. Next, we noticed that the procurement unit referred to the detail project plan to procure the listed items such as the switches and firewalls.

During the execution stage, the network operation unit referred to the virtual plan and the project plan and conducted a study at the client’s site. Once the study at the client’s site was completed, they shared a network operation plan in the Co\_Sharing. The network operation plan has information on how to avoid downtime, the impact, the back-up plans and other activities involved. The network operation plan was one of the most crucial project information that needed to be shared, as one of the project manager said, *“The network operation plan needs to be shared with all units that involve in this project. The network operation plan include information such as the expected downtime period, back-up plans, network freeze period and other activities involved. Other units will go through this network operation plan and come out with the necessary actions. For example, the helpdesk unit is interested to know when is the expected downtime period to be prepared to troubleshoot during this time. The risk management unit will evaluate the risk of that downtime at our client site. They will inform our customer about the downtime period and be prepared to manage the consequences.”*

From the interviews we learnt that the Co\_Sharing can only be accessed by units that involved in projects. The Co\_Sharing was not accessible to clients. We noticed that most information was shared with their client via emails or documents are printed out and shared during face-to-face meetings.

From our observations, we noticed that staff working in projects utilized Co\_Sharing without any hesitation. One of the human resource managers explained how they introduced Co\_Sharing to staff, *“Initially, we had to educate people and that is when we tell people to use Co\_Sharing. It was a bit difficult during the first year. Most people are used to handouts and papers and not information in digital formats. Anyway, after sometimes people are quite used to it, so they just look up for information in Co\_Sharing. It makes our life easier to have everything online. After all we are an IT company and most of our staff are IT graduates, so I guess that is why we prefer to use Co\_Sharing rather than working conventionally.”*

In summary, at Organization A, we noticed that every unit executed unique work processes, but all units focused on providing an integrated end-to-end ICT services to clients. Therefore, to ensure their works were integrated well, every unit utilized Co\_Sharing for sharing project information.

#### 4.2 Case 2: The case of a consulting company, Organization B

The second case study was conducted at Organization B, a consulting company that provides consultation and project management services in multidisciplinary engineering fields. The consultation and project management services include process, mechanical, instrumentation, electrical, civil, structural, pipeline dynamics, safety and environmental and other engineering fields. Organization B is composed of multidiscipline engineering units that includes process, mechanical, instrumentation, electrical, civil, structural, architectural, pipeline dynamics, safety and environmental, and more. The actual personal interviewed in this case is shown in Table 4.

Business Unit	Job Title	Duration of Interview	Other Sources of Data
Project Management Office	Project Secretary	35 minutes	Follow up (via emails)
Document Control	Document Controller	1 hour 5 minutes	Observation, informal discussion, emails
IT	IT Executive	44 minutes	Observation, informal discussion, emails
Architectural	Architect	51 minutes	Follow up interview and email

*Table 4. Organization B interview details*

Organization B satisfies the criteria of a Coordination model (See Table 1, last column). Specialized business units collaborate to deliver integrated engineering project management and consultation services that include trouble-shooting, procurement and construction projects. While the aim is to provide integrated services to its clients, every business unit (e.g., pipeline, electrical) delivers unique products (e.g., pipeline AutoCAD drawings, electrical drawings) and handles unique services.

##### **The way ECMS is used for information sharing at Organization B**

From the interviews we understand that at Organization B, ECMS were used for two types of sharing namely internal sharing and external sharing. Internal sharing occurred at the early stage of a project, i.e. when drawings were shared among engineering units. Once drawings were finalized, they were then shared with the clients (external sharing).

From our observations, we noticed that during the early stage of a project it was important for every unit to share their drawings (e.g. electrical drawings, pipeline drawings) in the ECMS. Sharing units' drawings in the ECMS allowed other units to refer to the newly designed, previous versions and revised drawings. It was deemed crucial to share drawings inter-units as one of the architect explained, *"It is important for me to view the drawings shared by the structural unit because I have to incorporate their drawings into my drawings. It is also important for me to share my drawings with other units such as the electrical unit, because they design the position of the lightings. Before they can position the lightings they have to refer to my architectural drawings because we design things like walls and doors. They have to fix the lights to be at the right place for example in a room, or else some rooms might end up with no lightings at all."*

From the interviews, we also found that it was extremely important to share any updates and revisions made to a drawing with other units, as one engineer said, *"If we at the architectural department make changes to our drawings, we have to share our latest drawing updates with other units like electrical, mechanical and pipeline. Let say we don't want to build a wall and wanted to have an opening instead. We need to share our revised drawings so that other departments can modify their drawings and put nothing at that opening. Same goes to our department, if there are changes made by other departments that affect our drawings, we need to modify ours."*

Further, we noticed that in every project, there is one or two dedicated document controller who is responsible for uploading all drawings in the ECMS. One of the document controllers explained about her role, *"Engineers can't simply share their drawings in the SharePoint. Any drawings to be shared in the SharePoint have to go through the document controller. Document controller is the person who is responsible for uploading all drawings into the SharePoint for sharing. Just imagine if everyone is*

*allowed to share their drawings, it will be haywire! So that is why a document controller is there to manage the sharing of new, revised and updated drawings.”*

During observation, we have seen the document controller issued a reference number and tagged it to a drawing and then uploaded that drawing for internal sharing. Engineers from all disciplines then reviewed the drawings and the lead engineers from every unit were seen giving inputs and comments to drawings produced by other engineering disciplines. The comments were then shared in the ECMS. Based on the comments and feedbacks every unit re-worked on their drawings to produce a finalized version.

Finalized drawings were then shared with the clients (external sharing) through the ECMS. At this stage, it was important for the project team to make sure that all units' drawings were finalized and ready for client review. To make sure that all drawings are finalized, the document controller has to get approvers to sign the drawings, *“When the lead engineers submit their finalized drawings, I will make sure that the project manager and project director sign and approve the drawings [through the ECMS]. Once the drawings are approved, I will create a transmittal number. The transmittal number is a number that we issue before any drawing is shared with our client. I will then send a notification email to our clients to inform them that I have uploaded the drawings with the exact transmittal number for their reference and provide them with the SharePoint link. Clients can then access the finalized drawings shared in the SharePoint.”*

Most participants agreed that ECMS improved the process of sharing drawings inter-units. One of the participants explained how difficult it was to share drawings before the ECMS was introduced, *“Before SharePoint was introduced, all drawings were kept, maintained and shared manually. Comments and feedbacks were written on the drawings. When the document controller received the hardcopies, he or she will be running around to get signatures. Once drawings were signed, they will be scanned and shared in our project folder in our network server. The AutoCAD drawing files sizes were huge, so it was difficult to share these drawings with our clients via emails. Since our clients were not allowed to access our network server, we often had to compress the files size or used the ftp file sharing or any other modes to share drawings with our client. That is when our management decided to use SharePoint and that was when staff were forced to use SharePoint.”*

From the interviews, we also learnt that two internal IT staff were assigned to study and implement the internal and external sharing process workflows in the ECMS. They took a year to understand the process workflows and to make the internal and external sharing process worked smoothly in the ECMS. One of the IT staff admitted that their first challenge was to handle the sharing of untold number of revised drawings among business units. Their second challenge was to integrate the untold number of drawings from different units for external sharing. There were also other problems that include trying to incorporate new processes for sharing other documents in the ECMS such as (1) handling drawings rejected by clients and (2) handling drawings rejected by contractors.

To summarize, we understand that Organization B focuses on providing integrated multidisciplinary engineering project management and consultation services to its clients. Therefore, ECMS was seen to be used as a platform that enable all project-related information to be centrally available for internal sharing (among multidiscipline engineering business units) and external sharing (with selected clients and contractors).

## **5 DISCUSSIONS**

The purpose of our research is to investigate how Coordination operating model influence the way in which ECMS is used for information sharing within an organization. It is also our intend to understand (1) what type of information that is shared that supports integrated business process, (2) the patterns of integrated business process that requires information sharing and (3) the users that involve in that sharing activities.

As indicated, Ross et al. (2006) posit that organizations that emphasize high business process integration (Coordination) will certainly gain benefits from technologies such as ECMS. This is because the nature of Coordination model which is highly integrated requires extensive data and information sharing to complete end-to-end process. Grounded in this perception, our study found supporting evidences that demonstrate that ECMS are useful to Coordination organizations as these technologies can facilitate: (1) the sharing of unstructured types of business-related information, (2) the sharing of information that supports integrated business processes and (3) internal and external information sharing, as discussed below.

### **ECMS is used for sharing unstructured information**

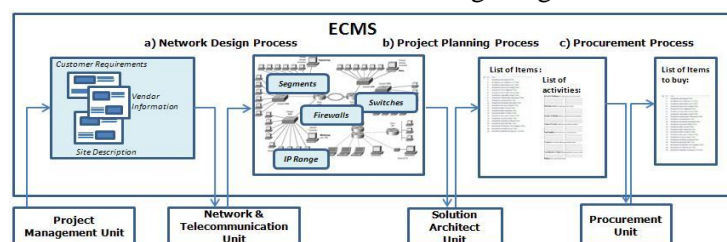
Previous research explain that ECMS is about managing unstructured (e.g.: business forms, invoices) and structured (information that exists in databases) business-related information (Blair 2004; Nordheim and Paivarinta 2004; O'Callaghan and Smits 2005; Scott 2011; Tyrväinen et al. 2006; Vom Brocke et al. 2011). However, our evidences show that ECMS is mainly used for sharing unstructured types of information. This may be because in the case of Organization A and Organization B, structured information remains in its 'native' systems (e.g., ERP) and is only linked to unstructured information stored in the ECMS when needed (Grahlmann et al. 2011; Paivarinta and Munkvold 2005; Scott 2011).

Further, it was evident that both organizations utilized ECMS for sharing different unstructured types of information to supports its key business processes. First, at Organization A, staff were trained to use ECMS for sharing all project-related information. Therefore, business units shared most project-related documentations for example project descriptions, project plans and activities in the ECMS. Second, at Organization B, staff used ECMS for sharing new, revised and updated engineering drawings. Comments made to drawings were also shared in the ECMS. While drawing histories were kept in the ECMS for future references. At both organizations, staff were made clear that sharing of information via other mediums such as ftp file sharing, email attachments and hardcopies were no longer accepted.

### **ECMS is used for sharing information that supports integrated business processes**

O'Callaghan and Smits (2005) found ECMS to be useful in managing 'collaborative processes', close enough, we also found that ECMS is useful for sharing information that supports 'integrated processes'. Interestingly, our findings reveal that ECMS may be used to share information that support 'linear' and 'non-linear' integrated processes as further explained below.

At Organization A, we found that ECMS is used for sharing information that supports 'linear' integrated processes as shown in Figure 2. 'Linear' integrated process happens when a process starts at one unit and completes at another. For example, as illustrated in Figure 2a, the network design process starts at the project management unit and ends at the network and telecommunication unit. At the initial stage, the project management unit prepares the project description that includes information about customer's requirements, site description and vendor information. This information is then shared in the ECMS. The network and telecommunication unit uses this information to design the network specification that contains information about IP range, segments, firewalls and switches.



*Figure 2. ECMS for sharing information that supports 'linear' integrated processes*

On the other hand, at Organization B, we found that ECMS is used for sharing information that supports 'non-linear' integrated processes. 'Non-linear' integrated process happens when there are (1)

uncertain numbers of units involves, and (2) unknown number of documents needs to be shared to complete a process. For example, at Organization B, during the detail design stage, ECMS are used for sharing numerous numbers of engineering drawings among business units as depicted in Figure 3. This happens since every unit needs to refer to other units' drawings to come out with a detail design drawing. For instance to design the detail arrangement of lightings the electrical unit has to refer to architectural drawings. At the same time, the safety unit also needs to refer to the architectural drawings to design the arrangements of safety equipments (e.g. fire extinguishers). Consequently, the IT staff at Organization B mentioned that they had to customize the ECMS to cater for these 'flexible' ways of sharing. On top of that, they also highlighted the importance of having a dedicated document controller role to handle these 'unpredictable' ways of sharing across units.

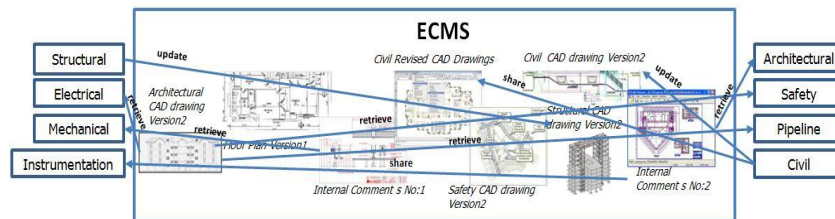


Figure 3. ECMS for sharing information that supports 'non-linear' integrated processes

### ECMS is used for internal and external sharing

Tyrväinen et al. (2006, p.630) mention that it is important to 'anticipate' potential users and user communities that will share information using ECMS. In line with their research, we found that it is in fact important to identify who actually involve in the information sharing activities using ECMS. When ECMS users are identified, organizations can then organize their ECMS infrastructure and make decisions (1) whether to use internet or intranet platform, (2) set the access rights according to user types and (3) arrange other security measures.

Finding from this study reveals that ECMS users may involve internal and external parties. As in the case of Organization A, the ECMS is used by internal users (between business units) for sharing project related information. Therefore, access rights are given to business units that involve in that project. On the other hand, at Organization B, the sharing using ECMS involves the internal business units as well as their clients and some contractors. Therefore, access to the ECMS is given to the internal users (business units) and selected external users (clients and contractors). One of the business managers confirmed that limited access rights were given to their external users. For example, clients can only view finalized drawings and not other previous versions unless they requested.

Based on the preceding discussions, we realized that although we know that ECMS is useful for information sharing in Coordination type of organizations, we found three elements related to ECMS that needs to be considered. Therefore, we recommend organizations to consider these three elements to ensure that ECMS can be used for the effective sharing of information that supports their integrated business process. These elements are discussed as follows:

- *Identify what information needs to shared in ECMS* - It is important to first identify what information that is relevant to organizations' key business processes that needs to be shared (Brocke et al. 2008; Nordheim and Paivarinta 2004; Vom Brocke et al. 2010a). Next, staff needs to be informed with (1) information they should share and (2) information that is available in the ECMS. From our findings, we realized that if staff knows what information is shared and needs to be shared in the ECMS; this information will be frequently used and shared in important decision making and process executions.
- *Understand the way in which information is shared using ECMS* – Organizations should understand the actual process of sharing and retrieving e.g., linear (starts at one unit and ends at another unit, See Figure 2) or nonlinear (the sharing is 'unpredictable' and 'flexible', See Figure 3) that occurs between and across business units. The workflows in the ECMS should then be customized in such that it follows the sharing and retrieving patterns that occur (Iverson and Burkart 2007; Nordheim and Paivarinta 2004; Reimer 2002).

Further, we also strongly suggest for organizations that require sharing across units and need to handle non-linear way of information sharing using ECMS to have a dedicated document controller. A document controller will be responsible in (1) managing the 'flexible' way of sharing that happens across units, (2) handling the sharing of unknown numbers of revised information, and (3) handling the sharing of information histories (previous versions). In contrast, a role of a document controller may not be critical in organizations that are using ECMS for sharing information that supports 'linear' integrated processes (as seen in the case of Organization A). This is because 'linear' kind of sharing is rather predictable and often can be managed by units' head (Gupta et al. 2001). However, although having a dedicated document controller makes the process of sharing information using ECMS efficient, organizations must be willing to pay the cost of hiring and training an extra staff.

- *Identify users that share information using ECMS* – Organizations should identify whether the information sharing will involve internal users (e.g. business units within an organization) or external parties (e.g. clients and contractors). The workflows in the ECMS should then be extended to include internal and external parties involved (Iverson and Burkart 2007). Other ECMS related features should also be considered that include access rights (e.g. full access rights, limited access rights) (Vom Brocke et al. 2010b) and security features (Munkvold et al. 2006; Paivarinta and Munkvold 2005).

## 6 CONCLUSION

In this paper, the research question, "*How does a Coordination type of business operating model influence the way in which ECMS is used to share information?*" is addressed. In an attempt to answer this question, two case studies were conducted. Findings indicate that ECMS would certainly benefit Coordination type of organizations, in such that these technologies can facilitate (1) the sharing of unstructured types of business-related information, (2) the sharing of information that supports integrated business processes and (3) internal and external information sharing. However, to ensure that ECMS can be used effectively for information sharing that overall supports integrated process executions, we recommend Coordination organizations to (1) identify what information that is relevant to organizations' key business processes that need to be shared, (2) understand the pattern of business process integration that requires information sharing and (3) identify the community of users that needs to share and retrieve information.

Our findings contribute to the ECM literature in three ways. First, we introduce the business operating model of Ross et al. (2006) for explaining how ECMS can be used for information sharing that overall supports business process executions, extending previous ECM studies (Paivarinta and Munkvold 2005; Tyrväinen et al. 2006). Second, the case studies provide a rich description and evidence on the ways two Coordination organizations use ECM systems. Third, this study explains the use of ECMS for information sharing and how it is largely determined by the nature of the organizational business processes. In this paper, we highlight that certain demands are made by the characteristics of business processes (depending on the levels of integration and standardization requirements) and ECMS can be used in certain ways to meet those demands.

It is hoped that our findings may help IS researchers to understand about the use of ECMS in the context of information sharing that overall support organizations business process executions. We also hoped that practitioners can better understand and then plan the ways to use ECMS for sharing business-related information during any important management decisions or key business process executions. Practitioners may also use our findings to understand why ECMS is underutilized and thus solve the problems.

However, this paper has some limitations. First, data was collected from only two ECM-adopting Coordination organizations. Consequently, our findings may not necessarily apply to other Coordination type of organizations in different business environments other than presented in this paper. It is also important to note that this paper has not covered other types of organizations that emphasize different levels of process standardization and integration. Since this paper is part of a larger research project, future research will address these shortcomings.

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