Implementation transmittal solutions at capital project to increase the effectiveness

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Abstract. The capital project is a construction project which has a large scale of documentation. Transmittal solutions as part of Enterprise Document Management Solution (EDMS) could be offered as the solution of document management inefficiency in the capital projects. EDMS processed the document content in a more detail way and had simple integration with another internal system. EDMS used for the implementation of the transmittal process during document distribution in every tier to improve the system performance to be faster based on the design configuration. This study focused on the implementation of transmittal solutions in capital projects.

1. Introduction

The capital project is a project planning, engineering, procurement, construction and operation of a petroleum refinery building, plant, facility and infrastructure [1]-[5]. Organizations who are engaged in the design, construction, and petroleum mining industries, aside from facing increasingly fierce competition, they must also be able to increase HSE (Health, Safety, and Environmental) supervision. In the six life cycle phases of the facility (Feasibility, Design, Construction, Operations, Renewal and Deactivation) such as petroleum refining, significant content and processes are shared between individuals and internal and external organizations. As a result, the organization faces several critical information problems. Information is often lost between Project phases, which delays completion and increases overall Project costs because of the lack of integration between specially created systems, thereby increasing IT costs. The risks and costs of non-compliance with HSE regulations are also very high.

Implementation of Transmittal solution is part of the EDMS (Enterprise Document Management System) solution that obliged to ensure compliance with applicable oil and gas industry regulations to avoid penalties from the government [6]-[7]. This solution provides safe and efficient access to AFC and Enterprise and Project-wide “As-Built” engineering drawings, as well as across Company boundaries, streamlining supplier’s interactions with internal Business Processes that rely on efficient access to Engineering content. As part of EDMS solutions, transparent solutions can enable interoperability between EDMS and other systems such as AutoCAD, Factory Maintenance and SAP.
Essentially the Transmittal process starts when the part that has the responsibility of controlling project documents (Document Controller) registers a new Incoming Transmittal and automatically bulk-loads the capital project documents sent by the Owner/Operators, Sub-Contractors, and the like. This is performed against the Transmittals Coversheet/Index the Owner/Operator, for example, sends. Documents associated with a Transmittal can be added directly from the EDM Repository (where relevant). This process is carried out on the Transmission Delivery Sheet/Index the Owner/Operator, for example, sends. EDMS permit the knowledge and the monitoring of the value of information and to decide the receiver (acceptor) and to manage the transmission of those data.

This research is an observation and analysis of the process of implementing a digital transmittal document solution in one company that has a capital project.

2. Literature study

2.1. The capital projects

Capital projects in the process industries involve the construction of physical plant facilities and materials processing equipment to produce a new product for expected profit or alternatively to maintain or develop operating-level capabilities. The construction industry involves diverse and complex information that flows between the various participants, much of which is conveyed using documents.

2.2. Document controller

The document controller is an employee of the project owner, lead designer, or lead contractor organization, or may work as an independent consultant/contractor. The document controller is responsible for reporting to the owner’s project representative and work with an information management committee consisting of project managers and information specialists from key project participants.

2.3. Transmittal solution

Registration of messages transmission and incoming/outgoing messages within the enterprise provided by the electronic document management system has grown in organizations. Transmission of e-mail messages, logging incoming/outgoing, as well as documents created by the user, control the movement of documents within the organization and storing information in databases. It is possible to consider with a high level of confidence that the transmitted data is authentic.

2.4. Document management system

Document management responsible for the efficient and systematic control of the creation, receipt, maintenance, use and disposition of records, including processes for capturing and maintaining evidence of and information about business activities and transactions in the form of records. Most of the documents are pdf files according to ICH. Other formats are possible: xml, gif, jpeg, etc.

2.5. EDMS

EDMS contains enhanced features related to the life-cycle and versioning of particular classes of documents [8]-[10]. EDMS has multiple roles of storage, archiving, management, approbation and flow-control of Integrated Management System documents to facilitate organizational workflows.
3. Methodology

3.1. Gathering user requirement: user the initial stage of the development of transmittal solution

The problem with a capital project is how information can be shared with each team involved, taking into account the effectiveness, efficiency and security of the information data. Information that needs to be distributed includes asset images, specifications, calculations and other information, usually for review, commentary, or approval purposes.

| Functionalities | Non Functionalities |
|-----------------|---------------------|
| Auto number generation when uploaded document loading file. | Could have interfaced with another system |
| Manage all common file formats ex: Autocad | The data location is not allowed to store on the cloud |
| Transmittal process, i.e: | Usability, i.e: |
| a. Manage, create, send, receive, and view transmittals. | Provide an intuitive, friendly GUI, Microsoft ‘Look and Feel’ |
| b. Apply distribution matrices. | |
| c. Acknowledge receipt capture. | |
| d. Hyperlinks to items on a transmittal from the transmittal document | |
| Distribution lists, i.e: | Scalability, i.e: |
| a. Create and maintain distribution lists. | Scalable to encompass larger volumes and different types of documents into the future. |
| b. Security to distribution lists | Performance, i.e: |
| Workflow, i.e: | Could be accessible from all geographic locations with acceptable response time. |
| a. Could have tasks presented in an ‘inbox’ or ‘work area’. | Security |
| b. Monitor the progress/status of a workflow. | |
| c. Send bulk documents on workflow and approve bulk workflows. | |
| d. Email notification when the workflow stopped. | |
| Mark-up & commenting, i.e: | |
| a. Review comments in real-time. | |
| b. Ability to do side by side overlay compare. | |
| c. Ability for multiple user to edit a document in a native format and add review comments. | |
| Searching, indexing & retrieval, i.e: | Security |
| a. Search document based on its content, metadata, and advanced criteria. | |
| b. Search for textual data using a full-text engine. | |
| c. Search across MS.Office documents, CAS drawings, PDF Files. | |
| d. Ability to save and share searches. | |
The initial stage of the transmittal solution implementation process is conducting an assessment relating to the features needed by the user in the process of distributing the project documents undertaken. It is discuss related how the features of a transmittal solution can be according to user needs and still be able to maintain good data security standards.

From the results of the assessment conducted, the user requires several functions available in a transmittal solution, namely functional and non-functional as shown in Table 1.

### 3.2. Transmittal solution design: the speed increasing of transmittal delivery

To be able to provide increased delivery of correspondence and information to users who need it, design an infrastructure architecture as a basic EDMS deployment that typically consists of the following tiers:

- **Client Tier**: Browser/Client Machine
- **Application Tier**: Application Server
- **Content Tier**: Content Server
- **Service Tier**: LDAP System, 3rd Party System, Library/Workflow Services, SMTP System
- **Storage Tier**: Storage Server, Database Server, Full Text Index Server.

The transmittal solution high-level design application can be described in Figure 1.

![Transmittal Solution](image1.png)

**Figure 1.** Transmittal solution high level design

Transmittal solution provide the standard basic feature as shown on the image above. If the customization required, solution provide the SDK file which can be used by the solution administrators/developers to start customizing the system.

For the integration part, this solution provides some extensions with the 3rd party application which can be used based on customer’s requirement.

Based on available information, a logical scenario is designed from a transmittal solution, the logical scenario for designing the appropriate transmittal solution is shown in Figure 2.

![Transmittal Solution Logical Scenario](image2.png)

**Figure 2.** Transmittal solution logical scenario
Logical scenario description:

a) Clients will access a web server using a framework.
b) Web will respond request from the client and interconnected with the content server.
c) Note: content server is a server that stores soft copies of all project documents classified by the project.
d) The content consists of a content server in which organization can store, manage, and deploy all types of content, including HTML & XML, graphic, multimedia, other types of rich media and traditional documents.
e) Service, at this level there are the application servers that provide web services interface, example integration with other software solution. This solution will be deployed on the application server (application entry point for users).
f) Storage, these solutions integrated networked storage technologies, storage systems, software and services

3.3. Environments Specification

To get a good performance solution based on Best Practice, we need the following environment requirements (see Table 2).

| Table 2. Environment specification (best practice) |
|-----------------------------------------------|
| **Server** | **Microsoft Windows Server 2016** |
| Machine       | CPU  | RAM | HDD    |
| Database Server | 12 Core | 16 GB | 250 GB |
| Content Server  | 12 Core | 16 GB | 250 GB |
| Full Text Server | 8 Core | 8 GB  | 250 GB |
| Web Server     | 12 Core | 16 GB | 150 GB |
| Total          | 44 Core | 56 GB | 900 GB |

4. Results and Discussion

The implementation of the distribution system in the section that handles capital projects requires all the teams involved in managing the capital project.

4.1. Use Case Transmittal Solution

Figure 3 is the use case diagram for general system functionality in transmittal solution.
Figure 3. Use case general system transmittal solution

The following is an explanation of the DMS & Transmittal Systems use case:

4.1.1. Login

Table 3. Login to transmittal system group use case description

| Name of Use Case | Login to Transmittal System |
|------------------|-----------------------------|
| Created By:      | Herdiansah & Team           |
| Date Created:    | 21-Jan-2020                 |
| Description:     | User who has privileged logs in to the system |
| Actors           | User, System                |
| Pre-conditions   | User who logs in to system has to be registered in the system |
| Post-conditions  | User successfully logged in to the system |
| Flow             | 1. User accesses the link to log in to the system.  
                 | 2. Login page of the system will be displayed.  
                 | 3. User enters name and password then clicks on “Sign In” button.  
                 | 4. Home of the system will be displayed. |
| Alternative Flows: | -                          |
| Exceptions       | -                          |
| Requirements     | -                          |

4.1.2. Create new project domain

Table 4. Create new project group use case description

| Name of Use Case | Create New Project/Domin |
|------------------|-------------------------|
| Created By:      | Herdiansah & Team       |
Date Created: 21-Jan-2020
Description: Administrator creates a new project/domain by ‘copying’ project template.
Actors: Administrator, System
Pre-conditions: 1. Administrator already logged in to the system.
2. Administrator has the capability to create new project/domain.
Post-conditions: Administrator successfully creates a new project/domain.
Flow: 1. Administrator selects an existing project and then selects Tools > Actions.
2. System will show a page to initiate new project.
3. Administrator clicks on Initiate New Project button and must fill out Project Reference and Project Name field. Administrator optionally enters values for other fields.
4. Administrator clicks on Perform Action & Close button.
5. New project folder structure will be generated automatically.

Alternative Flows: -
Exceptions: -
Requirements: -

4.1.3. Add member to project/domain group

| Name of Use Case | Add Members to Project/Domain Group |
|------------------|------------------------------------|
| Created By:      | Herdiansah & Team                  |
| Date Created:    | 21-Jan-2020                        |
| Description:     | Administrator adds members to project/domain group. |
| Actors:          | Administrator, System              |
| Pre-conditions:  | 1. Administrator already logged in to the system.  
|                  | 2. Project folder structure is successfully initiated. |
| Post-conditions: | The new members are successfully added to the new project/domain group. |
| Flow:            | 1. Administrator selects Project Groups node first on the left navigation then select the project group name.  
|                  | 2. Administrator double click on the roles from the selected project group then click on File >> Add Member(s).  
|                  | 3. System will show a page to choose the user.  
|                  | 4. Administrator chooses the user to be added then click OK button.  
|                  | 5. New member was successfully added to the group. |
| Alternative Flows: | -                                  |
| Exceptions:      | -                                  |
| Requirements:    | -                                  |
4.1.4. Document number generation from creating/importing document use case description

Table 6. Document number generation from creating/importing document

| Name of Use Case: | Document Number Generation from Creating/Importing Document |
|------------------|-------------------------------------------------------------|
| Created By:      | Herdiansah & Team                                           |
| Date Created:    | 21-Jan-2020                                                 |
| Description:     | The document controller creates/imports the document to the system, and the document number will be generated automatically. |
| Actors:          | The document controller                                     |
| Pre-conditions:  | 1. The document controller already logged in to the system. |
| Post-conditions: | The system successfully generates the document number.     |
| Flow:            | 1. The document controller clicks on File >> New >> Document. |
|                  | 2. **New Document: Create** a webpage dialogue will be displayed. |
|                  | 3. Select a document type from the provided list. Field name (Auto numbered) will be filled automatically. |
|                  | 4. Click on **Next** button.                                |
|                  | 5. Fill out some of the required metadata to generate the document number following the standard document numbering. |
|                  | 6. Click on **Finish** button.                              |
|                  | 7. The document is successfully created in the system with the generated document number following standard document numbering. |

Alternative Flows: -
Exceptions: -
Requirements: -

4.2. Administrator Module

Transmittal solution system administrators can perform several functions, including:

a. User management
b. Documents configuration
c. Document loading configuration
d. Distribution matrices configuration: Distribution matrices is a function of managing users access rights to documents distributed through the system. Figure 4 shows the distribution matrices module.

Figure 4. Create distribution matrices menu
4.3. Document Controller Module

The document management standard features and some features related to the shipping management process are explained in Table 7.

| No | Role in System         | Responsibility                                    |
|----|------------------------|---------------------------------------------------|
| 1  | Document Controller    | - Distribution Matrices Management               |
|    |                        | - Transmittal Management                         |
|    |                        | - Document Management                            |
|    |                        | - Project Management                             |
| 2  | Contractor             | - Transmittal Management                         |
|    |                        | - Document Management                            |
| 3  | Reviewer               | - Commenting and Mark-up Document                 |
|    |                        | - Document Management                            |
| 4  | Responsible            | - Consolidate Comments from Reviewers            |
|    |                        | - Document Management                            |
| 5  | Approver               | - Approve Document                                |
|    |                        | - Document Management                            |

Document Control is the user in charge of the initial distribution of project documents to all teams involved following the permissions of the user. Figure 5 shows the menu of a transmittal review process.

![Create Transmittal Review Process](image)

**Figure 5.** Create Transmittal Review Process

4.4. User Module

Transmittal system users can perform several functions ranging from reviewing project/transmittal documents, giving annotations to the reviewed documents, distributing project/transmittal documents to other users, to searching documents stored in the system. Figure 6 is a menu display for the project/transmittal document search process stored in the system.
Figure 6. Searching module

5. Conclusion

This study tries to share experiences in implementing the use of transmittal solutions in a company that has a capital project. The use of this transmittal solution can also be implemented in companies that handle large-scale of projects where the involvement of users in the project team is quite large, and the process of document distribution/transmittal is quite high, thus requiring a system to regulate the traffic distribution of project documents.

The implementation using transmittal solution as EDMS deployment solution is a problem-solving solution for the capital project. The author concludes that transmittal solution has created distribution, revision process and information delivery to everyone in the team become more effective, efficient and controlled, specifically from the data security.

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