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ADAPTING ADVANCED WORK PACKAGING IN CITEC

A Case Study

Unit of Technology and Communication

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Opinnäytetyön tarkoituksena on selvittää edistyneen työpakkauksen (AWP) käyttöönoton toteutettavuutta Citec-organisaatiossa ja haasteita, joihin on vastattava onnistuneen käyttöönoton kannalta.

Tutkimusmenetelmiä ovat kattava kirjallisuuskatsaus ja yhden tapaustukimuksen aikana tehdyt puolistrukturoidut haastattelut. Kirjallisuuskatsaus kattaa AWP:n yleiskatsauksen ja prosessit sekä tiedon keräämisen useista luotettavista lähteistä, mukaan lukien sisäiset lähteet Citec:in AWP-mestarilta. Kirjallisuuskatsauksen ja organisaation havaintojen perusteella muotoiltiin tapaustutkimukseen haastattelukysymykset.

Tutkimuksessa todetaan, että nykyiset prosessit ja toimintatavat säilyvät edelleen Citec:in organisaatiossa. Tämän opinnäytetyön havainnot antavat arvokasta oivallusta AWP:n käyttöönottoa harkitseville organisaatioille sekä tuovat esiin haasteita, joita ne voivat kohdata prosessissa.

Tämän tutkimuksen rajoituksena on se, että tutkimus tehtiin yhdessä organisaatiossa, mikä rajoitti tulosten ja johtopäätösten yleistämisen Citecin-näkökulmaan. Tutkimus tehtiin myös projektin alkuvaiheessa, mikä rajoitti haastateltujen odotuksia ja näkökulmia. Myös tutkimuksen laajuus rajoittui suunnittelutyön valmisteluun.

Citec:in organisaatio hyötyy tästä opinnäytetyökirjallisuudesta ja hyödyllisistä näkemyksistä AWP:stä.

Avainsanat Advance work packaging

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ABSTRACT

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The purpose of the thesis is to explore the feasibility of adopting advanced work packing (AWP) at the Citec organisation and the challenges that must be addressed for successful adoption.

The research methods include a comprehensive literature review and semi-structured interviews conducted during a single case study. The literature review covers the overview and processes of AWP and the collection of information from various reliable sources, including internal sources from a dedicated AWP champion at Citec. Based on the literature review and observations of the organisation, interview questions were formulated for the case study.

The study concludes that the current processes and ways of working remain unchanged at Citec organisation. The findings of this thesis provide valuable insights for organisations considering the adoption of AWP and highlight the challenges they may encounter in the process.

The study, it was conducted within a single organisation, limiting the generalising of the results and conclusions to the Citec perspective. Also, the study was conducted during the initial stages of a project, which limited the expectations and perspectives of the interviewees. Also, the scope of the study was limited to the preparation of engineering work packing only.

The Citec organization will benefit from this thesis literature and useful views on AWP.

Keywords Advance Work Packaging

LIST OF FIGURES AND TABLES

ABBREVIATIONS

AWP	Advanced Work Packaging
BOM	Bill of Materials
CM	Construction Manager
CII	Construction Industry Institute
COAA	Construction Owners Association of Alberta
CWA	Construction Work Area
CWP	Construction Work Package
CMP	Construction management plan
CMS	Cost management system
CPE	Chief project engineer
CDE	Chief design engineer
DE	Detail engineering
EWP	Engineering Work Package
EPC	Engineering procurement and construction
EQ	Engineering Equipment
EEQ	Extended Engineering Equipment
FEED	Front End Engineering Design
FEL	Front end loading
IWP	Installation work package
IFC	Industry foundation class
MRM	Material responsible matrix
POC	Path of construction
PWP	Procurement work package
PEP	Project execution plan
PDSA	Plan do study act
RAS	Request at site
RASCI	Responsible accountable, supporting, consulted, informed
WFP	WorkFace Planning
WBS	Work Breakdown Structure

CONTENTS

1 INTRODUCTION

Advance Work Package (AWP) is a methodology approved by Construction Industry Institute (CII). “AWP is a planned, executable process that encompasses the work on an EPC project beginning with initial planning and continuing through detailed design and construction execution. It provides the framework for productive and progressive construction, and assumes the existence of a construction execution plan.”(CII).

As a necessity today, most industries are implementing AWP to handle and manage big and complex projects to create disciplined process for project planning and execution. The AWP has been developed to address challenges in cost and schedule overruns in the industrial construction projects. The AWP processes gives project team a roadmap to create an execution plan that considers all aspects of Construction constrains and aligns the Engineering and procurement deliverables in support of that plan.

The most case studies conducted on AWP report a value benefits in the area of work productivity, cost, Safety and schedule.

The Company Wärtsilä is a substantial client for the Citec and buying multidisciplinary engineering services for building the power plant project for their end customers. The project scales were such as EPC & EEQ. Both organisations have been working together closely and typically use traditional Project management methods along with the support of self-developed Gate model.

In the recent years the growing demand of an AWP has been overwhelming mainly from the construction companies to improve its project labour proactivity and reduce the cost of the project.

As a result, the Client has decided and initiated an AWP process in practice in its first pilot project. The Citec has been awarded a partner in this project. Citec will provide Multidiscipline engineering to build this power plant project.

As a course of this change in managing the project using Advance Work Packaging at the client, the client would make more noteworthy changes to its practice and current way of operation to manage EPC projects and project related documents. As a result, Citec, as a partner likewise adopts the Advance work packaging processes in projects.

1.1 Objective and Scope

The Citec is using a traditional project management methodology according to PMBOK and thus, the project management process involves main five process groups. They are as follows:

- Initiation
- Planning
- Executing
- Monitoring & Controlling
- Closing

These, processes are mainly used in traditional project management. The Present methods of working in project management will be impacted by AWP, which is based on Construction Driven Engineering and has been adopted at Citec. The main goal of this research is to give Citec a foundation for AWP.

1.2 Research Questions

RQ1. What are the conditions leading to implementing AWP?

RQ2. What process upgrades or changes need to be made at Citec in order to adopt AWP?

RQ3. What challenges must be addressed in order to develop an AWP adaption plan or model?

1.3 Structure of the Thesis

The structure of the thesis is described in different paragraphs in this sub-chapter of the introduction.

Chapter 1 begins with an Introduction to the research topic describing the main objective and study scope, as well as introducing the three Research Questions.

The second chapter is a Literature review on Advance Work Packaging, and provides a concise overview of advance work packaging and illustrates Advance Work Packaging methodology.

Chapter 3 reviews the literature on change management, organizational behaviour, and Professor Kotter's eight stage approach to managing sustainable change. The seven Cs concept for business excellence in change management process is also covered in this chapter.

The fourth chapter contains the research case study followed by Interviews, analysis of interviews and summary and conclusion of the interviews.

The fifth chapter, discussion and conclusion include the theoretical and practical implications of the made study and limitations and further research.

2 LITERATURE REVIEW

AWP and Field Productivity: "Construction productivity has not increased in the past 70 years, and it is currently behind other industries in terms of development. In a typical industrial construction day of ten hours of work, one worker only completes less than four hours of productive work. To address this the Workface planning was the first effort to reverse this slide. During the building phase, workface planning is cantered on work packing. Workface planning has been evolved into advanced work packaging to assist in bringing work packaging to early project definition and development. AWP looks to pull the planning efforts earlier in the project cycle." (Hamdi, 2022)

2.1 Advanced Work Packaging

"AWP is a disciplined approach to improving project productivity and predictability. It is a planned, executable process that encompasses the work on an EPC project, beginning with initial planning and continuing through detailed design and construction execution. It has been introduced by the Institute COAA and CII." (CII/COAA, 2013)

The lifecycle of advance work packaging (AWP) is illustrated in Figure 1 below, with the Front-End Engineering Design (FEED), Detail Engineering (DE), and WorkFace Planning (WFP) overlapping in the second half.

STAGE I - Preliminary Planning - "The project management team pinpoints essential planning items and divides the scope of work into Construction Work Packages (CWP). These CWP are aligned with engineering deliverables, also known as Engineering Work Packages (EWPs), and the project execution plan. EWPs are enveloped within CWPs, and the construction work area boundaries are identified by providing Tie-in points for nozzles or valves in certain locations (CII, 2011)." Figure 3 below Stage 1 flowchart preliminary planning.

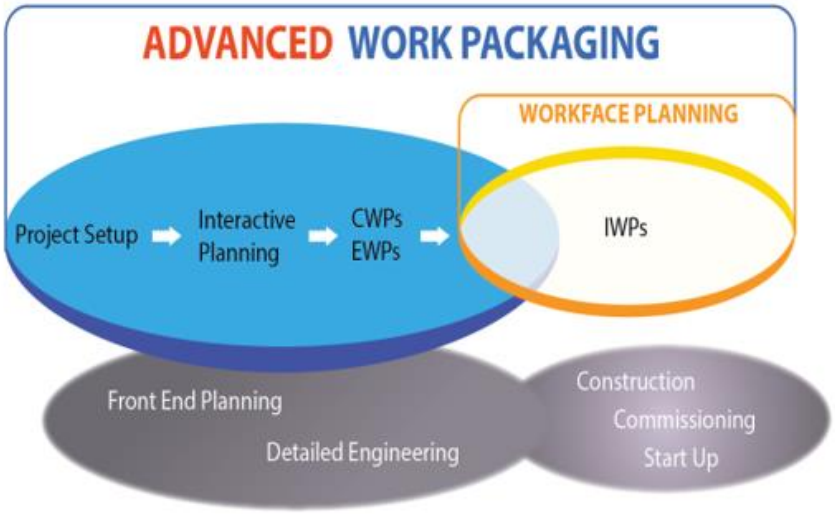

Figure 1. Advance Work Packaging model (CII IR 272-2013)

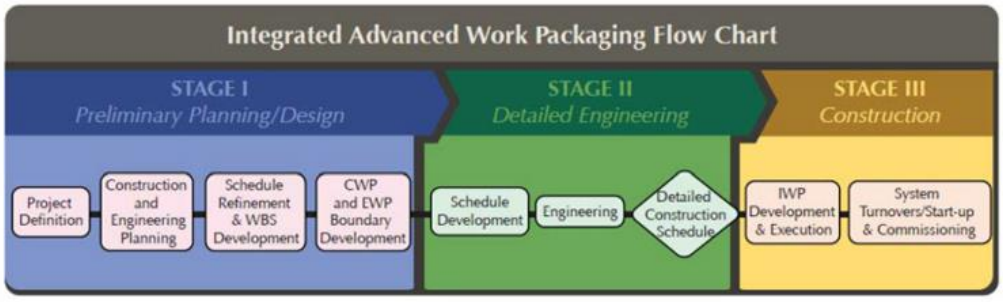

Figure 2. AWP Framework (CII IR 272-2013)

STAGE II - Detail Engineering - "This stage includes the specification of EWPs and breakout of construction work hours for each Construction Work Area (CWA). Resource scheduling by each discipline is discussed and aligned to ensure consistency (CII, 2011)." Figure 4 illustrates Stage 2 flowchart detailed engineering.

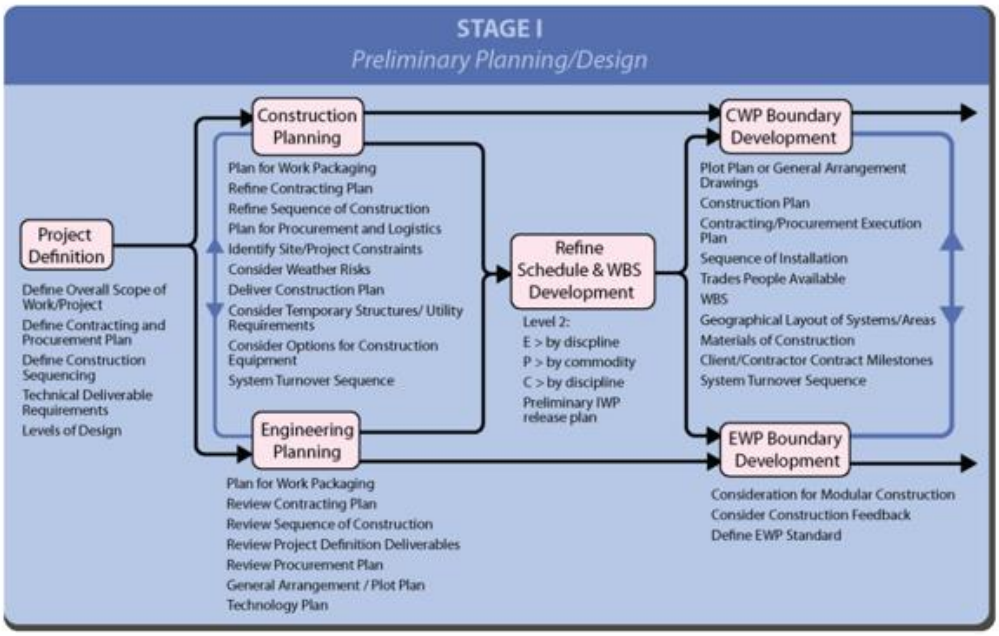

Figure 3. Stage 1 Flowchart - Preliminary planning/Design (CII, 2011b)

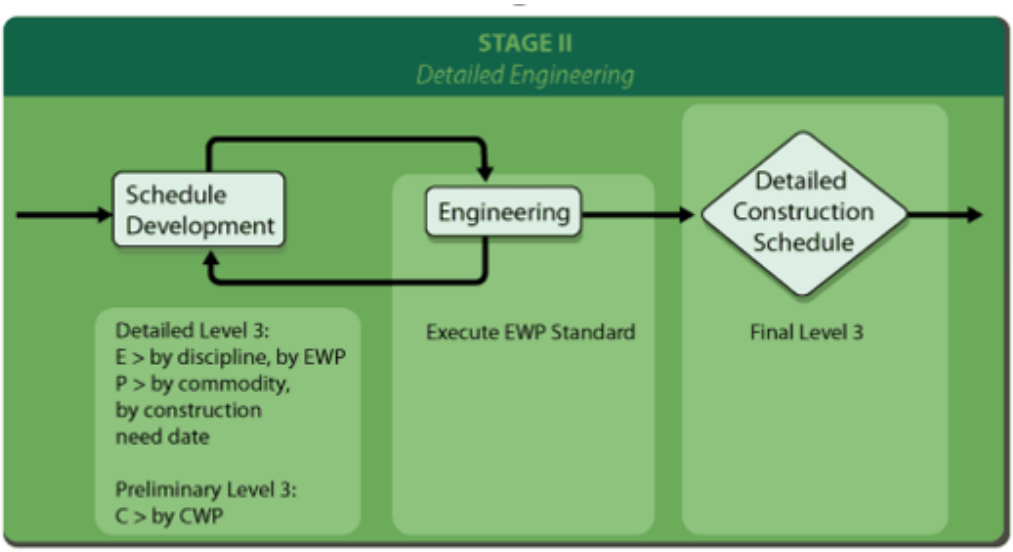

Figure 4. Stage 2 Flowchart - Detailed Engineering (CII,2011b)

STAGE III - Construction - "Installation Work Packages (IWPs) are operational work packages that must be carefully planned and carried out. They are created by a specialized AWP planner and distributed to the field three weeks prior to the start date. The accountable superintend/foreman pulls IWPs while adhering to project

standards in a dynamic way. IWPs are managed by owners' representatives after execution, who update project estimates and carry out a quality check (CII,2011)." In Figure 5 Stage 3 flowchart construction is shown.

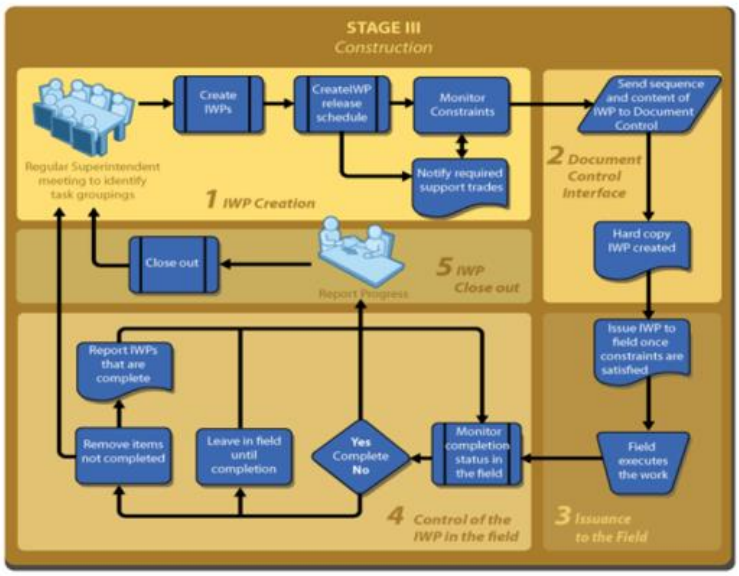

Figure 5. Flowchart - Construction (CII 2011b)

2.2 Construction Work Area (CWA)

"The first step in the AWP process is to define construction work areas (CWA's). These CWA's will act as the building block for the planning process for all trades, and will be a critical feature in aligning the Path of the Construction, Execution plan, schedule, estimate and AWP Work Breakdown Structure (AWBS)." (Hamdi, 2022)

CWAs are typically multi-trade, containing all the work scopes for all trades within their boundaries. Every component within a facility, whether being installed or demolished, belongs to a single CWA. CWA boundaries will be such that there is no overlap between work areas. The CWAs will form the basis of the Path of Construction, to provide priorities to the Engineering contractor, and to break up the scope of work into executable packages. (Ribeiro)

All projects will be required to break down the scope into CWAs. The breakdown is done early in Phase 2 once the facility siting has been completed and a preliminary plot plan is available. It is understood that the details of the layout can change as definition progresses. The CWA breakdown will be updated during Phase 3 as extended basic design progresses. The area breakdown needs to be final by the end of Phase 3. The Plot Plan may be updated during Phase 4. It is strongly recommended, however, that the CWAs remain unchanged throughout engineering Phases, as changes to these elements will cause substantial rework in the related deliverables, such as the estimate and schedule. If necessary, through lack of definition early in the project, it may be necessary to adjust the CWAs, the best approach is to create a greater number of CWAs during Phase 2 and merge them during Phase 3. This will simplify the process of aligning the CWAs to the estimate and schedule.

The primary input to the creation of the CWAs is the plot plan. The Employer Project Team, Construction Manager / Team, Engineering Contractor, depending on availability, will meet to review the site layout and determine the best locations for CWA breaks. Ideally, these breaks should be at logical locations, such as the boundaries of a tank farm or the end of a pipe rack as shown in Figure 6 below.

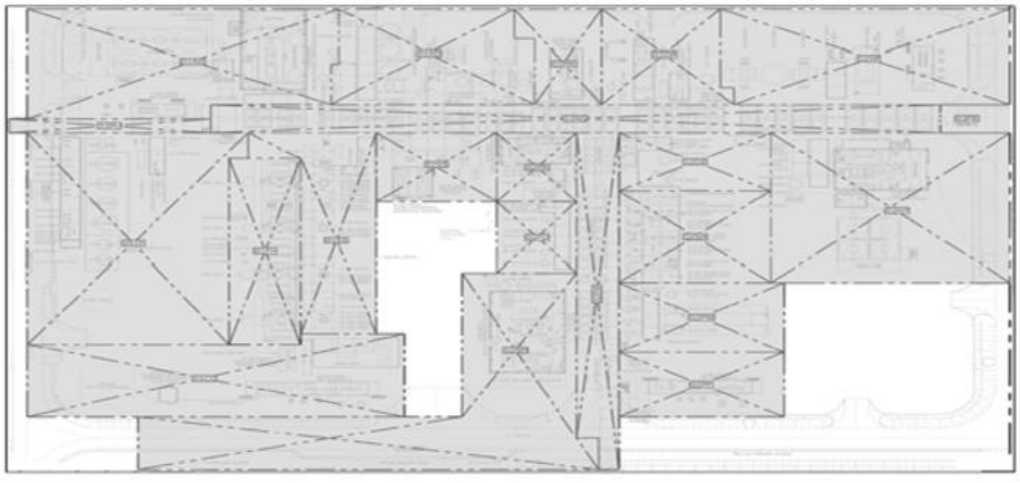

Figure 6. Example of CWA Creation for a Large Project

The plot should be divided up into areas that represent the various levels of priority for project execution. If, for example, the team believes that one area is low priority and can be executed last. This should be separated as a CWA and marked as low priority. Likewise, if there are areas that need to be completed first, these should be broken out as CWAs and marked as high priority.

Given that each project is different and unique, there are no definite rules on how to create the CWAs. The following should be taken as guidelines for consideration:

Priority. As in the example above, any areas with particularly high priority or low priority for filed execution.

Process. CWAs are not process areas but are rather geographical areas. The site will often have its own layout and process unit numbering system for the final product. The CWAs do not need to align these process units. It is not a detriment if they do, provided that the process units are arranged in a way that is executable for construction. It should be noted that, while process unit numbering is permanent, the CWA numbering will only be used during the construction Phase, so it is only intended to serve the needs of construction.

Contracting. If a particular area will be given to a specific contractor, creating a CWA for that area will provide a simple method of separating the work scope.

Pipe racks. large components such as pipe racks make an excellent delineation of space, particularly when used as the “backbone” of a project.

Field hours. Ideally, CWAs will have similar field execution hours. Areas where there will be significantly more or less hours should not be created, for example, three areas with 1,000 hours each and one area with 10,000 hrs. Given the early Phase of the project, the estimate will be high level, but it should be possible to identify the approximate density of field installation hours.

Size. CWAs do not need to be physically the same size. If there are several areas with low manhours, and one part of the plot with a high concentration of hours or priority work, the CWAs can be of varying sizes.

Function. Areas with a specific function, such as a tank farms or electrical substations or buildings, can be separated as a CWA.

Quantity. There is no set formula for knowing how many CWAs to create. The Quantity will vary by size and complexity of the work - smaller projects will have fewer CWAs than large projects. For a small project with minimal need for prioritization, it may be necessary to have only two or three CWAs. For larger projects, where Engineering attention is to be clearly prioritized to support construction, it may be necessary to have ten or more. As noted above, it is easier to create more CWAs initially and then merge them, than trying to split a CWA at a later Phase. Creating too few CWAs will limit the projects ability to drive priorities. Creating too many will put too much strain on Engineering and will create a vast number of small work packages.

Equipment. An early understanding of long lead or critical equipment may indicate a requirement to have various critical items in a single CWA, or split them across multiple CWAs for prioritization.

Contained. The CWA should be able to be clearly marked on the plot plan. Essentially, it should be possible to draw a box around it. to show its boundaries.

Common CWA. For some projects that are using CWAs, it will also be useful to create a single “Common” area, to cope with items such as earthworks and underground pipe that are generally issued and executed in a site-wide manner, rather than by area, as shown in Figure 7 below.

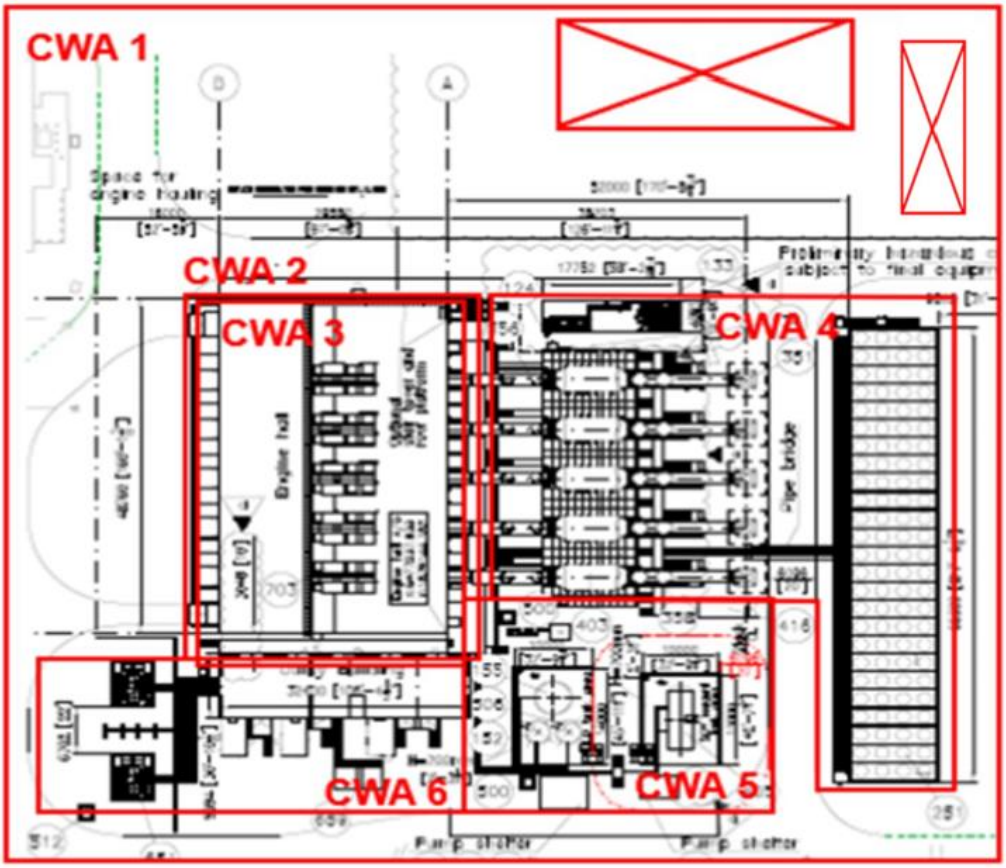

Figure 7. Example 1 of a Sample Basic Plot Plan

A geographical area can contain multiple CWAs executed at different times periods. For example, in Plot plan 1, shown above, CWA 1 looks as if it covers the same area of all CWAs within the plot plan, executed at different time periods. That is simply because CWA 1 may include site civil works - such as grading and paving which could be executed while other CWAs are being executed. Another example of how two CWAs can share the same geographical area is the example of CWA 2 and CWA 3; CWA 2 is a complex concreate structure with a massive amount of work and design requirements (earthquake, double walling, sound insulation); CWA 3 contains the scope of work of everything inside the building (engines, piping, electrical etc.), ss shown in Figure 8 below.

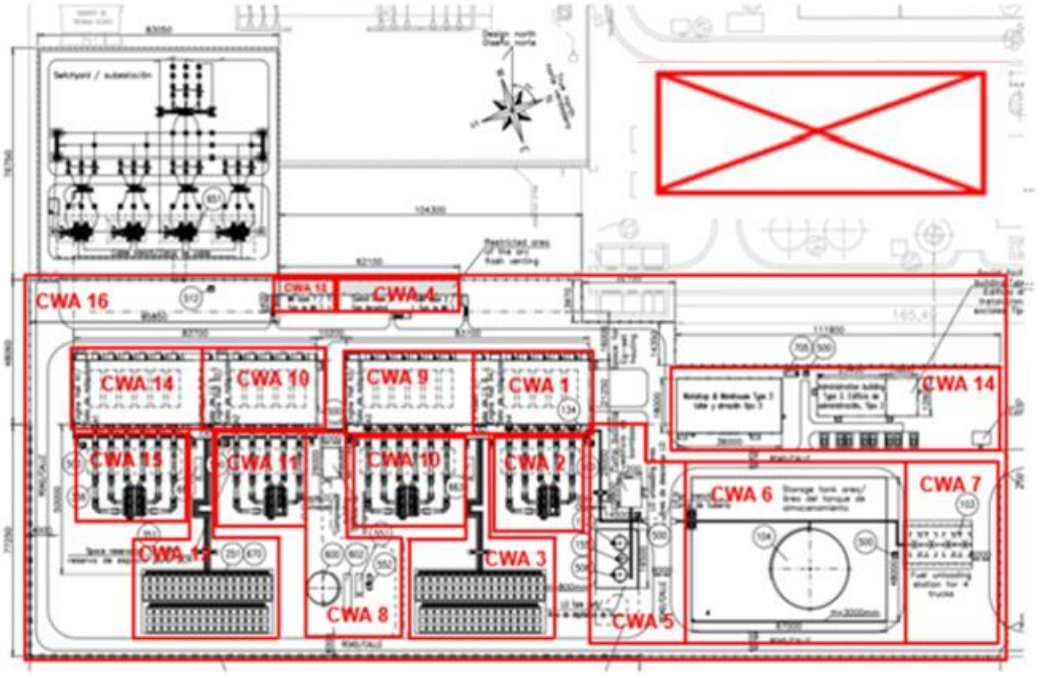

Figure 8. Sample 2 of a Complex Plot Plan

For a larger more complex plant, the plot plan shown in Figure 8, some CWAs may require execution in a specific sequence dependent on Constructability and Start-up requirements; for this example, requirements; for this example, CWA 1 may need to be completed and operational early to deliver a 100 MW of power to the customer, with the other CWA power blocks fast-tracked to have the complete plant operational for turnover to the customer.

CWA1 must be completed and operational before CWAs 9, 10, 14, but requires other CWAs be completed and operational that are necessary to support CWA 1 start-up and commissioning, such as CWA 5, 6, and 7 for example.

The process of defining the CWAs should be led by the Employer Construction Manager supported by Employer Project Team personnel and, Engineering Contractor, (depending on availability) in collaboration with the Project Manager. Once an initial draft is created it should be reviewed with other key project stakeholders (including engineering, procurement personnel and commissioning), who may provide input and suggestions for refinement before the CWAs are finalized.

All the feedback and input provided by stakeholders is to be documented and captured within the Path of Construction document. The Path of Construction contains sections associated with each of those element's procurement, operations etc. The Employer Construction Manager is ultimately responsible for issuing the final CWAs, using the marked-up plot plan.

2.3 Path of Construction (POC)

"The Path of Construction (POC) is a document that explains how to build a capital project in the field and how engineering and procurement deliverables will support that effort. It is the step-by-step guide to your construction delivery strategy, outlining the sequencing of your Construction Work Areas and Construction Work Packages. The POC is necessary because it is the only formal opportunity to align everybody around the construction-driven imperative, from procurement and engineering all the way to construction. Without it, the entire operation is likely to collapse." (Hamdi, 2022)

The 4 Steps to Building A Path Of Construction (POC),"The most important idea is to start a Path of Construction (POC) as early as possible and make it part of your phase 3 front-end definition. If you are already in detailed engineering or execution, PoC will yield little or no benefit." (Hamdi, 2022)

Follow below a step-by-step overview of what a PoC design and implementation process looks like.

Step 1 Commitment. "The first thing you need to build an effective Path of Construction is a buy-in into the importance of construction-driven planning and construction-driven engineering, and the key to buy-in is understanding. That means everyone from leadership all the way down to front-line members of the project team must have a solid understanding of Advanced Work Packaging (AWP) principles and protocols. Because your team won't understand the benefits of a PoC unless they first understand the benefits and value of AWP. Understanding is the precursor to commitment, and commitment is critical to the success of your PoC,

remember that the PoC is a formal deliverable and putting it together will require extensive preparation followed by a series of collaborative meetings your team will have to be dedicated to do it well. If your team isn't on board with AWP, and doesn't understand why a PoC is necessary, you're setting yourself up for failure." (Hamdi, 2022)

Step 2 Preparation. "The length of the preparation phase varies, depending on the size and scope of the project. Preparation for building a path of construction begins with collection of relevant data, constraints, and project execution information, from across the entire project, including but not exclusive to:

- Scope Statement
- Schedule
- Plot Plan
- Project Execution Plan (PEP)
- Construction Management Plan (CMP)
- Constraints Assessment(s)
- Heavy lift requirements
- Long leads

This and other multi-disciplinary information will be used to prepare a list of the Construction Work Areas that are right for your project. To make sense of it all you will need to have a scheduler on board, with an early Level 3 schedule in hand. With this preparatory work in place, you'll have all your key data, a resource-loaded schedule broken out by weeks, and a sense of your Critical Path all of which is required to develop a comprehensive Path of Construction." (Hamdi, 2022)

Step 3 Collaboration. "Here's the key to meaningful collaboration: Get the right people in the room. Your construction team will lead the discussion, and your engineering team must be there, too. Your project manager, scheduler, estimator, procurement representative and AWP champion must be in the room, too, along with anyone else who plays a critical role on your unique project. If the right people aren't in the room, you're setting your PoC up to fail.

You'll also want to ensure that these collaborative planning sessions are facilitated by someone who understands interactive planning." (Hamdi, 2022)

Step 4 Communication. "The final, critical step to building a path of construction is to put it all together and communicate it to the entire project team. A Path of Construction document does little good if it's left to gather dust on a shelf somewhere, and it's useless if the people who receive it don't understand what it's for.

The construction manager owns the Path of Construction, but it's leadership's responsibility to make certain that anyone who is expected to leverage the PoC has a solid understanding of what it is and how to use it. At the very least, your team will need to revisit the PoC each time there is a major change to scope, design or project objectives. It is a living document and should remain so until handoff."

"Having a Path of Construction in place is like having a GPS in your car, you know your Critical Path, but the PoC shows you precisely how you'll get there." (Hamdi, 2022)

2.4 Engineering Work Package (EWP)

An Engineering Work Package (EWP) is a diverse set of engineering deliverables that are assembled to support a specified scope of construction work. Engineering Work Packages typically form the basis of Construction Work Packages (CWP), and ideally contain everything a workface planner needs to create Installation Work Packages for the specified scopes of work. As such, EWPs are a foundational component of the Advanced Work Packaging process and must be composed with due consideration and care. It's important for capital project teams to be aware of engineering work package fundamentals to help ensure predictable project delivery.

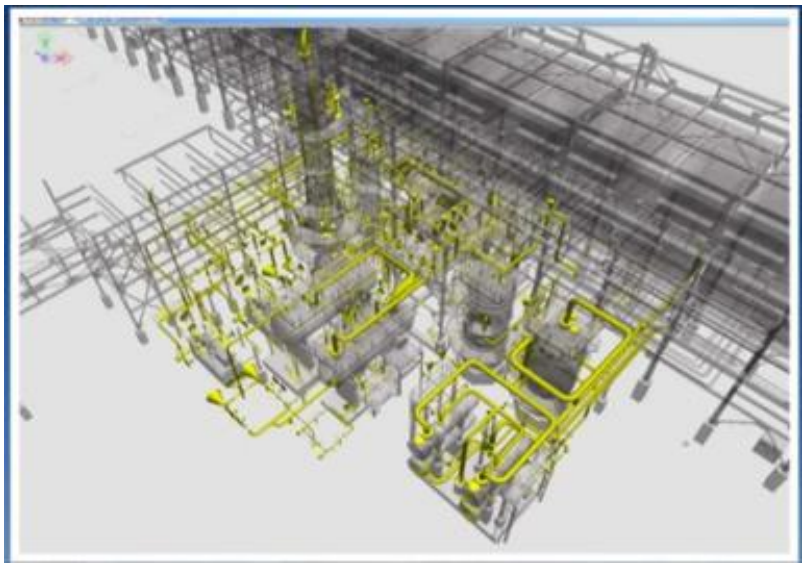

Figure 09. Engineering Work Package (Hamdi, 2022)

Each project will have multiple EWPs, separated according to the AWBS for the project as defined by the Path of Construction (POC). The EWPs will be coded by CWA, trade and, if needed, sequence number. EWPs will contain all the Engineering information relating to a single discipline in a single CWA. This will include scope of work, drawings, material lists and 3D model shots, EWP also include information about requirements and procurements.

Features of an EWP:

- EWPs represent a scope of work for a single discipline within a given Construction Work Area. They exist on a 1:1 basis with CWPs.
- The scope elements within EWPs do not cross a CWA boundary, except in exceptional circumstances, such as the installation of long cables that cannot be broken down.
- The standard components of an EWP are:
  - Scope of work
  - Owner supplied equipment material
  - Vendor Drawing list
  - Work Excluded
  - Contractor supplied equipment / material
  - Vendor support
  - Terminal points

- Specification and standards
- Purchase order schedule
- EWP Reference list
- Engineering Drawing list
- 3D model shots

EWP Document content recommendations. Avoid the use of boilerplate wording. If it is said somewhere else (like a specification), don't repeat it. Don't include contractual language in an EWP. It is not the right place for it. Focus on providing details of what the work is, rather than how it should be executed. There is no need to be verbose. Say what needs to be said, but no more.

Time, Size and Applicability of EWP. There is no set size for an EWP, in terms of field manhours or the physical size of the document. Typically, EWPs will range from 5,000 to 20,000 manhours of field labour. But some can be much smaller. It is more important to avoid large EWPs (>50,000 manhours) as these will be harder to track and control. During the phase 2 (FEL2), the EWPs /CWPs are shown in a matrix, representing the CWAs and disciplines. Initially, every discipline (trade) is shown in each area. As the scope definition improves, during phase 3 (FEL3) this matrix is refined. Finally, during the execute phase, the EWPs become the full Engineering deliverable with all associated documents.

2.5 Construction Work Package

"A construction work package (CWP) is a logical and manageable division of work within the construction scope, aligned with the project plan and WBS. It is measurable and aligned with project controls and can contain one or more EWPs. It is typically aligned with a bid package." (Hamdi, 2022). As shown in figure 10 below.

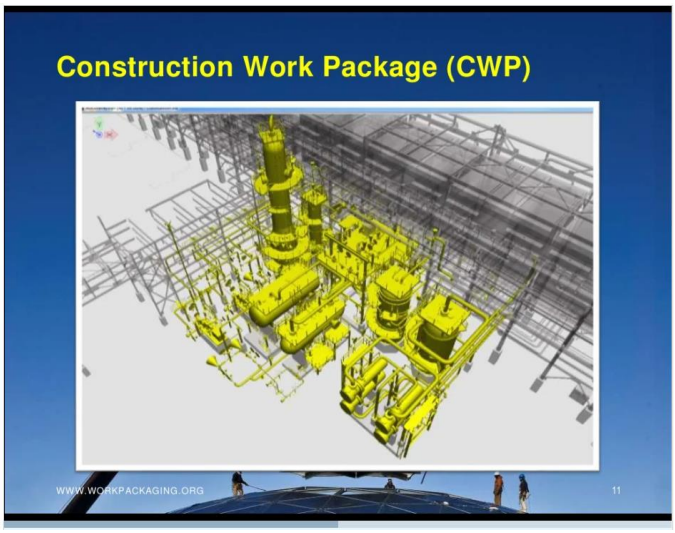

Figure 10. Construction work package (CWP) (Hamdi, 2022)

Development of the CWP framework the process involves:

- Establishing the CWA breakdown
- Creating the WBS for the Project
- Developing the CWP Matrix

During the execute stage, the CWPs will become the final Construction deliverable for the project, issued by area and discipline same will be used as a basis for the scope of work for Construction contractors on the project. it is crucial as to be effective CWP in conveying information to the contractor, they must consider:

- Include complete scope of work with clearly identify scope limits
- Contain Engineering deliverables with no holds
- Clearly identify the split in material supply - who provides what
- Stipulate any conditions that might impact the Contractor's bid

Release Plan. It is important to track and manage of the CWPs, it will be done using Release Plan, with the EWP release date as the starting point however, it can also be tracked/followed with other tools/templates, such as progress reporting in Microsoft Projects (MS). These will record the planned dates for issuing each package. The actual release dates are than recorded for each package, to show performance against the plan. The below Figure 11 illustrate the CWP release plan.

CWP Release Plan

CWP Development	?	Review / Update	?	Data Date	7/22/2020							
		PLANNED DATES				ACTUAL DATES				PERFORMANCE		
CWP	Discipline	EWP Final Issue Date	CWP Draft Issue Date	Review Complete Date	CWP Final Issue Date	EWP Final Issue Date	CWP Draft Issue Date	Review Complete Date	CWP Final Issue Date	EWP Issued On Time (Days Early/Late)	CWP Draft On Time (Days Early/Late)	Review Compl. On Time (Days Early/Late)	CWP Final Issued On Time (Days Early/Late)
Example - Late	Pipe	25-Feb-20	3-Mar-20	10-Mar-20	17-Mar-20	28-Feb-20	7-Mar-20	15-Mar-20	19-Mar-20	-3	-4	-5	-2
Example - Early	Steel	1-Mar-20	8-Mar-20	15-Mar-20	22-Mar-20	26-Feb-20	5-Mar-20	10-Mar-20	16-Mar-20	4	3	5	6
Example - Not Issued	Electrical	9-Apr-20	16-Apr-20	23-Apr-20	30-Apr-20					-104	-97	-90	-83

Figure 11. CWP release plan (Hamdi, 2022)

Who Prepares CWPs. The party responsible for creating the CWPs will greatly depend on the contracting methodology being used for the project.

- Where the Owner will act as the CM, construction personnel within the Owner organization will prepare the CWPs
- If the work is being performed on an EPC basis, the EPC contractor will prepare both the EWPs and the CWPs
- If the Owner retains a separate contractor to act as CM, that contractor will prepare the CWPs.
- For small projects with limited resources, it may be possible to have the Engineering Contractor also produce the CWP
- This will combine these two steps, which will shorten the process
- To do this, the Engineering contractor must have personnel familiar with construction execution in the field
- This should be clearly recognized on the schedule, to reflect the plan
- The EWP and CWP Release plans can be combined
- Doing this will put a greater emphasis on review and approval by Owner

CWP Preparation Schedule. As the EWP will be the starting point for developing the CWP, it is critical that the Engineering information is released on time and this information needs to be identified in the schedule, as an interface as (Example) shown in Figure 12 below.

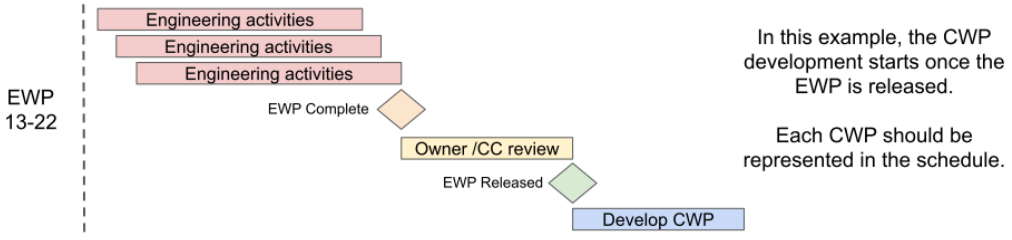

Figure 12. Construction Work Package preparation schedule (Hamdi, 2022)

However, prior to developing the CWP, the Construction team should review the EWP, to check for any issues, this includes

- The scope is clearly defined and understandable
- All appropriate Engineering interfaces have been identified
- The document list is accurate and there are no drawing holds
- A compete material list is provided, identifying who is responsible for purchasing all items.
- Vendor information is included for all relevant items

CWP Monitoring / Showing Progress. CWP development will be tracked and progressed using agreed Rules of Credit (see example table 1 below). These rules of the Credit will be proposed by the contractor responsible for creating the CWPs and reviewed / accepted by the Owner.

Table 1. Showing example of monitoring EWP progress (Hamdi, 2022)

Stage	Weighted Factor	
	Incremental	Cumulative
Review EWP	10%	10%
Import engineering information into CWP	10%	20%
Compile CWP - all sections	40%	60%
Internal review and approval	10%	70%
Client review and approval	20%	90%
Issued for Construction	10%	100%

As the CWPs will typically be used as scoping documents for contractors, they should be written considering these key elements.

- In a way that supports the contracting strategy - This may be different for lumpsum, versus reimbursable, for example.
- With enough detail that the contractor gets a complete understanding of the scope of work to be performed.
- On the assumption that the contractor has No prior knowledge of the project.
- With a clear understanding of what will be done by others - before, during and after the scope listed in the CWP.

Features of an CWP

- CWPs represent a scope of work for a single discipline within a given Construction Work Area, to facilitate construction planning and periodization of construction activities.
- CWPs will be delivered in the form of a document which lists all relevant construction information, including scope of work, technical documents, safety, quality, and execution aspects.
- CWP are area-based, not system based. They include elements from multiple systems and will typically not include systems in their entirely.
- The scope elements within CWPs do not cross a CWA boundary, except in exceptional circumstances, such as the installation of long cables that cannot be broken down.
- The standard components of a CWP
    - Scope of work, Terminal points, Engineering information, Equipment and material supply, Craft manpower, IFC Drawings
    - Safety, Quality, Construction permits, Critical lifts/crane schedule, Scaffolding, Special equipment and consumables, Submittals
    - Site service subcontracts, Waste Management, Service providers, Project controls, Turnover documents, Critical lifts/crane/schedule

CWP Document content recommendation. The EWP will form the technical basis of the CWP, but the EWP will not be given the contractor. So, make sure all relevant information is in the CWP. Instruction could be in simple and clear language. That could be interpret as in instruction. Include clear definition of the limit of the scope, and what work will be done by others. Avoid the use of boilerplate wording. If it is said somewhere else, don't repeat it. Don't include contractual language in a CWP. It is not the right place for it. For supplied items, such as vendor equipment, identify scope remaining to be done at site. Through CWP phase the matrix of CWA Vs trade (of EWP/CWP) which represents the scope in each CWA and disciplines. (This to be done using Client Trade and code list).

Initially, every trade is shown in each area. As the scope definition improves, during detail engineering phase define, this matrix is refined Finally, during the execute phase, the CWPs become the full Construction deliverable with all associated

documents and information. The good CWP bring excellent results such as Improved pricing, more accurate schedules, Reduced change orders.

Table 2. CWP Matrix of CWA Vs Trade

Unique ID	Trade	CWA1	CWA2	CWA3	CWA4	CWA5	CWA6	CWA7	CWA8	CWA9	CWA10	CWA11	CWA12	CWA13	EWP Document no.
01	Bulk Earthworks	x								(x)	(x)		(x)		xxx0001
															xxx0002
															xxx0003
															xxx0004
02	Paving and Landscaping													x	
03	Fencing & Gates					x		(x)						x	
04	Civil Underground Utilities (stormwater, sewage, water)	x	x	x		x	x	x							
05	Electrical underground systems (Earthing, conduits)	x	x	x	x	x	x	x	x						
06	Mechanical underground systems (fire protection, oily water)	x	x	x	x	x	x	x							
07	Piling	x													
08	Foundations	x	x	x	x	x	x	x	x						
09	Auxiliary Structures (Civil steels)		x	x		x			x						
10	Buildings		x			x									

2.6 Procurement and Advance Work Packaging

The effective procurement planning is an important component of the AWP process. However, it is important to know who supplies what? The EWPs will provide material lists that are grouped by Owner-supplied and Contractor-supplied. This breakdown will be established early in the project using a Material Responsibility Matrix (MRM). Below table is an example of MRM matrix.

Table 3. Material Responsible Matrix (MRM) (Hamdi, 2022)

MATERIAL DESCRIPTION	Vendor Data	Material Take Off	REQ.	RFQ	Bid Summary	Purchase	Expedite	Supplier QA Surveillance	Logistics	Receive	Store & Issue	Install
PIPING												
Aboveground Bulk Valves												
Butt-Weld Valves	PDDM	PE	PE	MM	MM	MM	MM	N/A	MM	CM	CM	SC
Flanged Valves	PDDM	PE	PE	MM	MM	MM	MM	N/A	MM	CM	CM	SC
Socketweld Valves	PDDM	PE	PE	MM	MM	MM	MM	N/A	MM	CM	CM	SC
Screwed Valves	PDDM	PE	PE	MM	MM	MM	MM	N/A	MM	CM	CM	SC
A/G & U/G Stem Extensions	PDDM	PE	PE	MM	MM	MM	MM	N/A	MM	CM	CM	SC
Chain Operators	PDDM	PE	PE	MM	MM	MM	MM	N/A	MM	CM	CM	SC
Aboveground Field Fabricated Bulk Piping												
Buttweld, Screwed, & Socketweld												
Pipe, Fittings & Flanges Alloy	PDDM	PE	PE	MM	MM	MM	MM	N/A	MM	CM	CM	SC
Pipe, Fittings & Flanges Alloy - Shorts	PDDM	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC
Pipe, Fittings & Flanges CS	PDDM	PE	PE	MM	MM	MM	MM	N/A	MM	CM	CM	SC
Pipe, Fittings & Flanges CS - Shorts	PDDM	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC
Pipe, Fittings & Flanges LTCS	PDDM	PE	PE	MM	MM	MM	MM	N/A	MM	CM	CM	SC
Pipe, Fittings & Flanges LTCS - Shorts	PDDM	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC
Special Pipe, Fittings & Flanges	PDDM	PE	PE	MM	MM	MM	MM	N/A	MM	CM	CM	SC
Induction Bends	PDDM	PE	PE	MM	MM	MM	MM	N/A	MM	CM	CM	SC
Pipe for Welders qualification testing	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC
Temporary Pipe Supports	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC
Misc Bulk Pipe Support Material - Field Fab	PDDM	PE	PE	MM	MM	MM	MM	N/A	MM	CM	CM	SC
Module Interface Material	PDDM	PE	PE	MM	MM	MM	MM	N/A	MM	CM	CM	SC

Procurement Roles and Responsibilities: The Procurement contractor will be responsible for purchasing all Owner-supplied material listed on the MTO for each

EWP. They will also be responsible for working with the vendors/suppliers to ensure that the documentation and information provided by the vendors/suppliers supports the AWP process for the project. The construction contractor is typically responsible for receipt, inspection, storage, and preservation of all material.

Timing. The MTOs for bulks are not purchased by EWP, but are aggregated to create large orders, and provide greater value. This can create an issue of timing. To alleviate this, the procurement contractor shall:

Ensure that items are delivered when needed to support the Required at Site (RAS) dates established in the project schedule for the EWPs. If multiple MTOs are being combined, the RAS date used should be for the earliest EWP. If the combining of MTOs will cause the RAS date to be missed, consider creating separate orders. If deliveries from the supplier are being split, ensure that the required quantity for the first EWP will arrive by the EWP RAS date. Verify for each EWP.

To support effective work packaging in the field, Procurement should work with suppliers to provide the following information.

- Any shipping components that are to be removed, and what is to be done with those items.
- Any spare parts that are shipped with the item, which are not intended for immediate use.
- Testing requirements for the item.
- Storage and preservation requirements for the item.
- Any ship-loose materials, including detail on how such materials will be shipped and how many cases / creates will accompany the primary item.
- Details of any assembly or work required on site to complete the item, including the installation of any ship-loose items.
- All work to be completed at site by the supplier, including work relating to those items detailed above.

This above information shall be included in the EWP, and therefore the CWP, to ensure that the Construction contractor bidding the work is fully aware of all scope items that shall be included in their bid.

Procurement Work Number or Code. The key to procurement and material management, from an AWP perspective, is the use of coding to assign the various components to the relevant EWP/CWP. This is known as the Procurement work Number. The main three types of procurement for construction they are as shown in figures 13, 14, 15 below.

- **Tagged Items.** The tagged items are those elements of material or equipment that are unique and are given a specific name (or "tag") for the project.

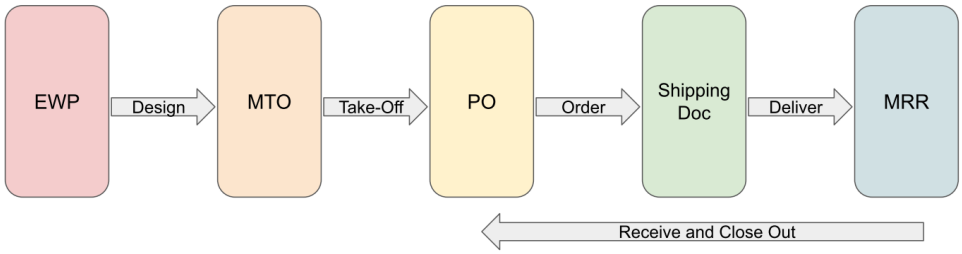

Figure 13. Example of Tag Items (Hamdi, 2022)

- **Bulks Items.** The bulk items are any elements that are ordered in large quantities, are not unique, and can be used across multiple EWPS.

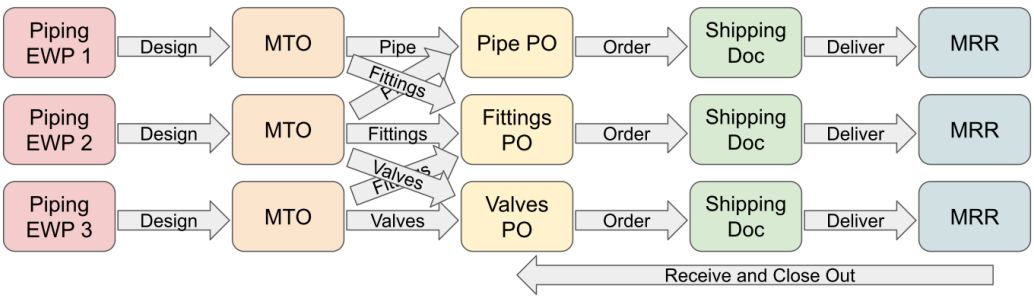

Figure 14. Example of Bulks Items (Hamdi, 2022)

- **Fabricated Items**. The fabricated they also known as prefabricated items are assembled off-site, typically at a third-party supplier facility, and shipped to site for installation. They are managed in the same way as tagged items. (Ex: pipe spools and structural steel).

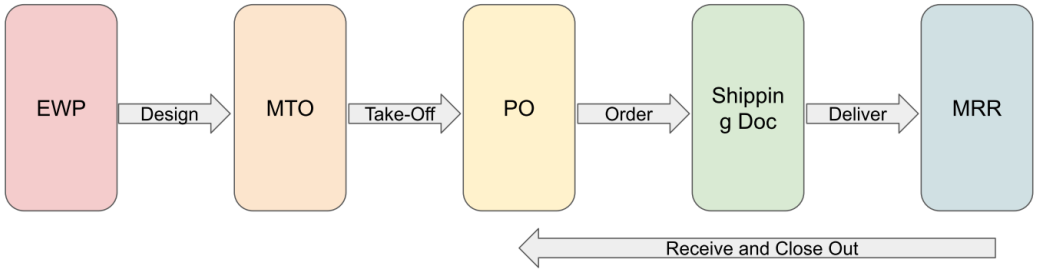

Figure 15. Example of Fabricated items (Hamdi, 2022)

Procurement Issue in AWP: While the procurement of unique, tagged items is relatively simple, from a coding perspective, the ordering and receipts of bulks is more complex.

- Bulks are aggregated, and MTOs combined. They are not purchased by EWP.
- It is not practical to order, receive or store bulks by EWP.
- The problem then is being able to determine if you have all the materials needed for the work in the field.

Procurement Control. A good material management system is needed for the receipt, storage, and allocation of materials on site. There are two important methods used for controlling material procurement, to alleviate the issues mentioned above.

- Traceability of the material from the packing list to the PO, to the requisition, to the MRR, to the EWP.
- A good materials management system for site, which can be used to draw down bulk materials and allocate them to the IWPs.

2.7 WorkFace Planning (WFP)

WorkFace Planning (WFP) is "about getting the right things to the right people at the right time to save money and improve productivity in large-scale construction projects." (COAA, 2005).

"WorkFace Planning (WFP) is the process of organizing and delivering all the elements necessary for a work package before the work is started. The basic concept of WorkFace planning is the reduction of construction schedules by improving the

coordination of information, tools, and materials at the work face, where the work is performed" (Ryan, 2009). The intent of Workface Planning is to improve efficiency in the field, by ensuring that installation crews have all the information and resources needed to complete the task.

"Important to Note: Many contractors already perform some elements of work packaging, to prepare work for field crews so that it can be efficiency executed. Nothing in this process should be taken to imply that this process is not already being done, either formally or informally" (Hamdi, 2022).

WorkFace Planner. The Work WorkFace planning needs a new fully dedicated role in the project team. The person in this role gives his or her full attention to the creation and management of IWPs. Depending on the size of the project, there may be several Workface Planners, who are typically experienced in a particular discipline. He/she to report to the Construction Manager, and responsible for the list below shows. (Hamdi, 2022)

- Breaks Construction Work Packages into IWPs
- Identifies and eliminates constraints
- Issues IWPs to the foremen in the agreed order
- Monitors IWP execution and performance
- Provides ongoing feedback to the Construction Manager

2.8 Installation Work Package (IWP)

An Installation work package (IWP) is the deliverable to a construction work crew that enables a crew to perform quality work in a safe, predictable, measurable, and efficient manner. An IWP is scoped to be manageable and progress able, typically of limited size such that a crew can complete the work in about a week. An IWP contains necessary documentation supporting work face execution. An IWP has been approved by the responsible stakeholders and constraints have been mitigated before being issued to the field.

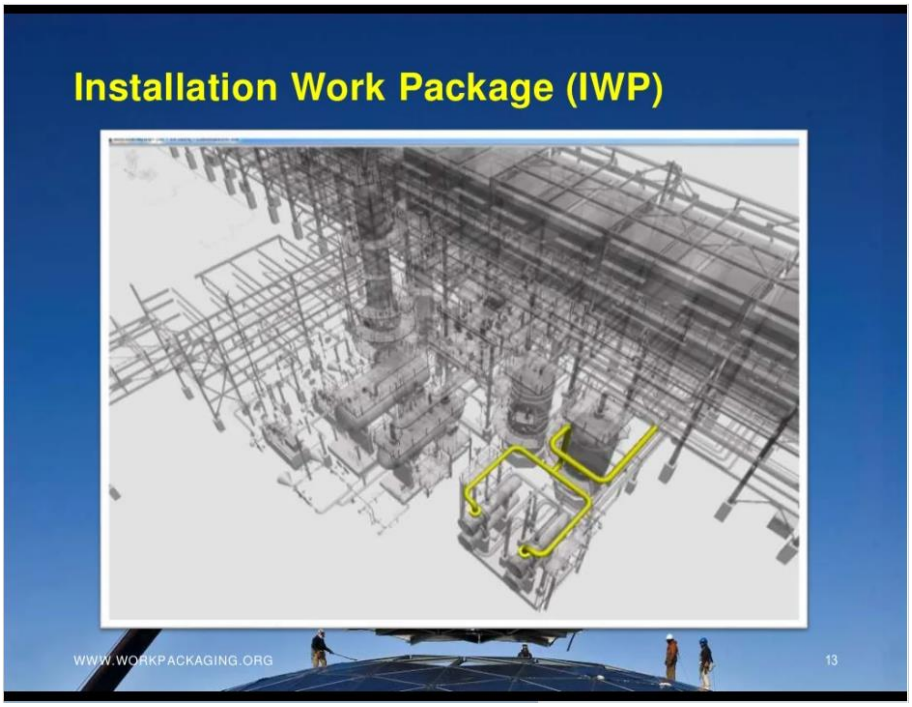

Figure 16. Installation work Package (IWP) (Hamdi, 2022)

The Installation work packages are developed by a dedicated Workface Planner. He gives his full attention to creation and management of IWPs closing working construction Manager. The contents of an IWP vary by discipline and scope and package, but most IWPs include some or all the following:

- Scope of the IWP
- Description of the work plan
- Engineering data
- Estimation of site hours
- List of required tools and equipment
- List of required resources
- Unique safety considerations
- Comprehensive engineering data

3 ADOPTING CHANGE MANAGEMENT

Adopting or implementing a change in an organization can be a difficult task that must be approached with caution, as it may end up causing more harm than good. This chapter focuses on and explains business excellence through sustainable change management four key areas and Professor Kotter's eight stage method for successful sustainable change management. The chapter also discusses general model for developing organizational strategies for implementing the Advance Work Packaging, which can be used to achieve better results and objectives in the long run.

3.1 Business Excellence

Business excellence, "The Malcolm National Quality Award was established in 1987 to recognize the best-in-class organization. In the last few years, the name was changed to the Baldrige Performance Award Program (USNIST, 2014). Business excellence is achieved by addressing seven categories of the program." (Vora, 2005) Figure 20 shows the framework.

Figure 17. Framework showing seven categories of business excellence (Baldrige, 2014)

To achieve business excellence, it is crucial to have change management process in place. In the research paper "Business excellence through sustainable change

management" by Manu K. Vora (2005), he emphasizes the change management principles addition to this he gives an insight into Professor John Kotter's eight stage method that would help to achieve successful sustainable change management.

3.2 Change Management

The Change Management Foundation requires leadership to set direction, the management to take care of technical aspects of change, and people to implement the change. Figure 21 represents the change management model with following four key process steps.

- Determine need for change
- Prepare and plan for change
- Execute the change
- Sustain the change

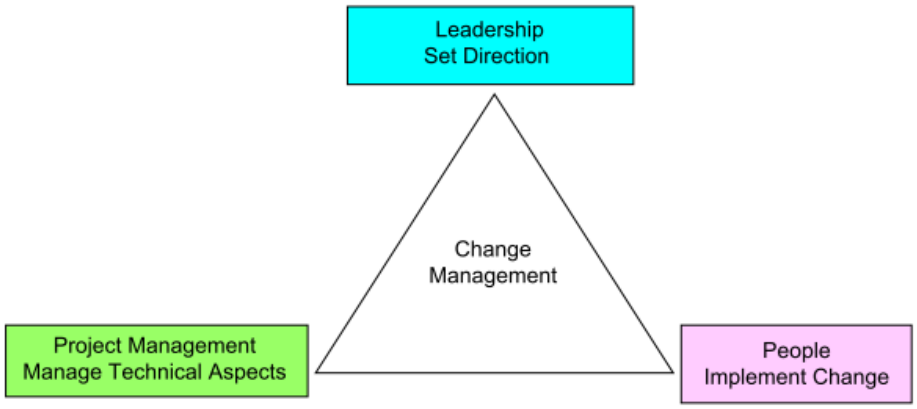

Figure 18. Change management foundation (Vora, 2005)

In the change management field, Professor John Kotter (2012) suggested eight stages that provide a systematic method to travel the change journey and achieve business excellence through sustainable change management. These are being listed in Table 23 below where the action needed and expected new behavior expected for each stage are also mentioned.

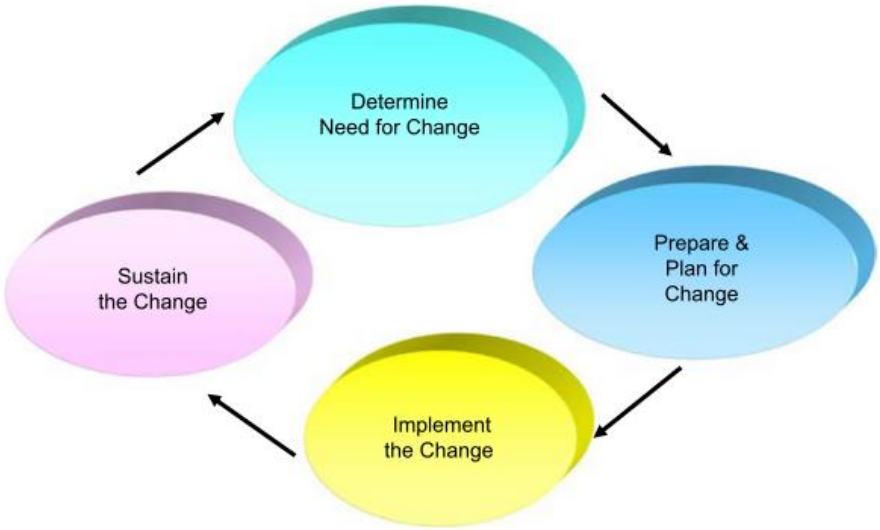

Figure 19. Change management model (Vora, 2005)

Table 4. Kotter's Eight Stages For Change Management (Kotter, 2012)

Stage	Action	New Behavior
1. Establish a Sense of Urgency	Increase urgency among relevant people	People start telling each other, "Let's go, we need change things!
2. Create the Guiding Coalition	Build the guiding team with credibility, skills, connections and formal authority	A group powerful enough to guide a big change is formed and they start to work together well
3. Develop a vision and Strategy	Get the vision right - create sensible, clear simple and uplifting vision and sets of strategies	The guiding team develops the right vision and strategy or the change effort

4. Communicate the change vision	Communicate for buy in simple, heartfelt messages sent through many un-clogged channels	People begin to buy into the change and this shows in their behavior
5. Empower employees for broad-based action	Empower action by removing key obstacles that stop people from acting on the vision	More people feel able to act and do act on the vision
6. Generate short-term wins	Create short-term wins by providing credibility, resources and momentum to the overall effort	Momentum builds as people try to fulfill the vision while fewer and fewer resist change
7. Consolidate gains and produce More change	Don't let up by creating wave after wave of change until the vision is a reality	People make wave after wave of changes until the vision fulfilled.
8. Anchor new approaches in the culture	Make change stick by nurturing a new culture	New and winning behavior continues despite the pull of tradition, turnover of leaders etc.

Also, when we are looking for continuous improvement, it is worth to mention the Deming cycle model of Plan, Do, Study and Act which is a fundamental process of an continuous improvement.

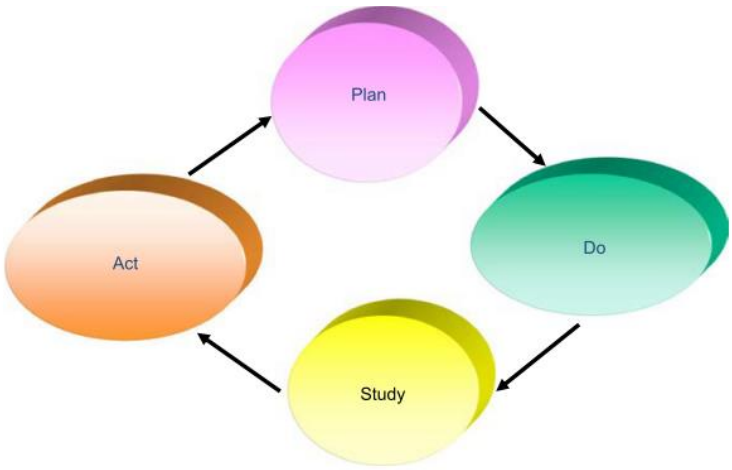

Figure 20. Denim cycle - (PDSA) continuous improvement (Kotter, 2012)

3.3 Seven C's model and AWP

During the lecturer review It came across an article that is significantly well inscribed about developing a general behavioral and organizational strategies model for implementing for instance system change in the organizations. Originally model has been developed for CMS implementation program. However, the model has been utilized in this study with a focus on the AWP. (Shields and Young, 1989)

The seven Cs model emphasizes seven variables that are important and must be considered to implement an AWP program successfully. The chapter cover the general perspective of each variable of the seven Cs in the view to project of AWP program.

For Sure, the organization can find it beneficial, and value added in their AWP Pilot program activities to monitor and to maintain the spirit towards commitment towards continuous improvement. The below figure 25 showing the seven Cs Model.

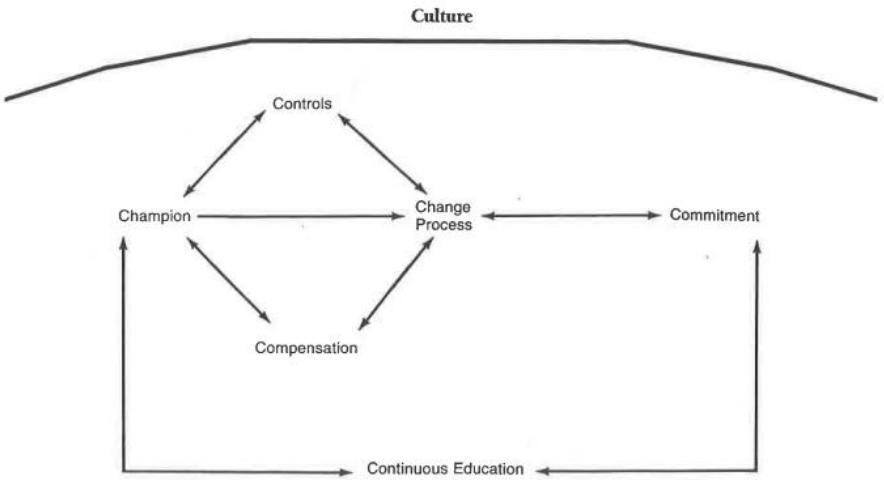

Figure 21. The Seven Cs Model (Shields and Young, 1989)

Culture - "Focusing on corporate culture is important for two reasons: research shows that it affects performance and fostering the most appropriate culture accelerates the rate of continuous improvement. Definitions of culture range from

the abstract to the commonsensical, with Stanley Davis defining it as “the pattern of shared beliefs and values” and Marvin Bower stating it is simple “the way we do things around here”. (Shields and Young, 1989)

An elaboration of the first of these definitions yields the following definition: “Corporate culture is the mindset of employees, including their shared beliefs, values and goals” For instance, shared goals include an emphasis on products and process, high quality, and reliability. Shared values and beliefs include trust, collaboration, and honesty.

Types of cultures: Research indicates that there are three broad types of corporate cultures: 1) functional, 2) dysfunctional and 3) ill-defined.

“A strong functional culture is characterized by clearly articulated beliefs, values and goals that can be expressed qualitatively or quantitatively. Qualitative expressions such as company mission statements or slogans are rallying points to sustain and increase motivation. Quantitative expressions include specific financial goals and norms of behavior. Other characteristics of strong cultures include members who are considered organizational heroes and collaborative communication networks.” (Shields and Young, 1989)

A strong functional culture is nurtured by high worker involvement and participation, long-term employment (in many instances), goal congruence between employees and management, and a persive feeling of teamwork. Overall, employees feel that performing their work well benefits both them and the firm. In contrast, a strong dysfunctional culture is run by management fiat, which causes employees to have poor attitudes and low commitment towards the firm, which ultimately leads to a high turnover of employees. An ill-defined culture is one whose members do not have similar values, beliefs, and goals. Such an organization is simply a collection of individuals who happen to be employed by the same firm.

Both strong functional and strong dysfunctional cultures are often associated with higher performance than ill-defined cultures. Strong functional and strong dysfunctional culture may lead to better performance than ill-defined cultures, but there are differences between their short and long term performance. In the short term, strong dysfunctional cultures may produce better performance (at least on paper) than strong functional ones, because individuals who manage by the numbers attempt to maximize short-term indicators. In the long term, though, a strong functional culture should foster a healthier organization. Its focus on continuous improvement should ultimately result in better performance (Shields and Young, 1989).

Champion - Most all of the successful innovations are initiated and implemented by dedicated persons also be known as champion. Similarly, In AWP program implementation the key contact person is a AWP champion. AWP champion is main central point of contact person in Advance Work Packaging implementation program. He is main driver who supports and initiates for fostering a spirit of collaboration that encourage the entire team during project life cycle. However, such as in EPC projects there can be several champions in the same project, for example if engineering or part of engineering is done by a subcontractor the subcontractor can also have its own Champion for their part of the engineering work and AWP champion should have the overall picture of the whole project scope and be involved and informed about the overall activities during the project lifecycle.

Some other characteristics of champions include.

- Resource of information and practical assistance
- A skilled motivator and true servant leader
- AWP Champion could be a PM, CM or experienced member of the engineering team
- AWP Champion cannot be simple as advisor who recommendations, but person should have real formal authority across the entire project team throughout the entire project lifecycle to achieve good success results in the end.

Change process - The Change process consists of the following key elements that are vital for the success of the AWP implementation program. (Shields and Young, 1989)

- Financial resources: Changing to a AWP cannot succeed without the necessary financial support. Funding is necessary for the development and implementation of new technology for example new software and continuing education of those.
- Resistance to Change: it is biggest challenge for many of the organizations when it comes to new way of working change in their routine job or than new technology implementation. Thus, it is important to take consideration of resistance to change and do well prepared plan in such situations. One way to let people know the change well in advance explain them the change not threat for them or involve them from beginning change implementation process program. Be openness in the communication.
- Time Frame: There was No such rules to decide the time frame for implementing AWP. But by looking the AWP and its process and involvement of stake holders the idealist time frame would be 3-5 years is a good estimate that has to be allowed.
- Strategy: The strategy for implementing AWP could be evolutionary, revolutionary, and green field/pilot. In this case the organization is using the pilot strategy with the partnering project owning company.

Commitment - While implementing the AWP, the organization should promote the new attitude idea of continuous improvement. The philosophy of managing by commitment to continuous improvement should be made the new way of thinking at AWP with support and dedication to top management and every employee.

Controls - A proper control system be designed by the organization to monitor the implementation of the AWP program. Control system make it possible to track ongoing progress and probability and ensures that the firm's strategy for achieving its objectives is being followed.

Compensation - The AWP champion can use compensation to control behavior and motivate employees to crease the rate of continuous improvement. The most five change compensations factors should be considered in compensation process.

- Bonus compensation tied to reductions in the number of parts per product, process variability, cycle time, engineering change order, and increase manufacturing cycle efficiency. This compensation system mostly used in manufacturing industries.
- Compensation should be contingent on both team performance and individual skills.
- The emphasis on current performance should be replaced by an emphasis on longer-term performance.
- The compensation system must encourage employees to be innovative by allowing them to take some risks.
- Companies must increase their use of nonfinancial compensation to create an atmosphere of positive reinforcement. For example, giving appreciation certificate, medals, dinners celebrations.

Continuous education - The continuous education, or "training" as it is referred in the industry and it is all round training process program for many firms. Education or training is more commonly linked with ongoing education and the advancement of each employee's competence, which is typically conducted on a periodic or annual basis. Training sessions are conducted as part of system upgrades from existing technologies, the introduction of fresh application software, other technical education, or any new implementation, for instance the AWP program. Each employee whom whether directly or indirectly engages in the AWP program should undergo training. The formal groups will be formed to promote more productive training sessions; for instance, the project's core team forms the first group, followed by the remaining members.

However, The AWP training should cover the key technical aspects of AWP, dedication, continuous improvement, and potential of seven Cs variable model.

3.4 Adopting Advance Work Packaging & Research Framework

It was explained in the literature analysis for chapter 3 above about how to effectively present business excellence by making use of Malcolm Baldrige's framework model. Additionally, change management and its foundation plan, organize, carry out, and sustain a process for bringing about the change. Further, the seven Cs

model, which organizes change program activities into seven variables that are used to track and sustain activities throughout the project lifecycle.

Additionally, the Research frame Model for Case Study is established using adopting the advance work packaging process and based on a literature review. Further through interviews with project concerned people in citec organization and with carefully detailed analysis, and a case study, the success of the program's goal will be evaluated. This work will be based on a theoretical framework model. The conceptual framework is show in the figure below.

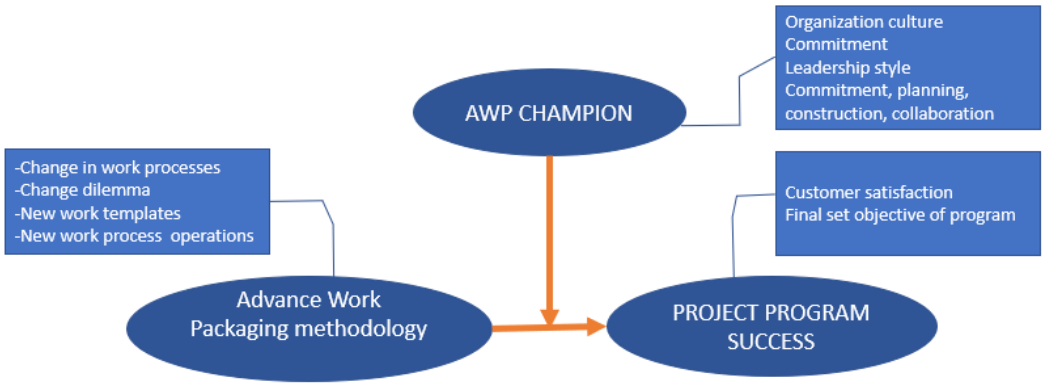

Figure 22. Therotical framework model

The therotical framework model along with the literature review in this thesis will be used to form a interview questions. The details summary for the findings will be presented in research case study chapter 4 below.

3.5 Citec gate model

The Citec gate model is a project execution gate-concept, which allows timely delivery quality and on time by:

- Each gate checks the Time quality assurance and progress control
- Supporting planning and coordination of simultaneous activities prepared by multiple disciplines.
- Each gate Allows to make decision for the following gate actions and next planning on time.

- The model created from traditional basic and detail, further it sub-divided in 6 phases as shown below including concept or sales phase it makes total 7 gates model.

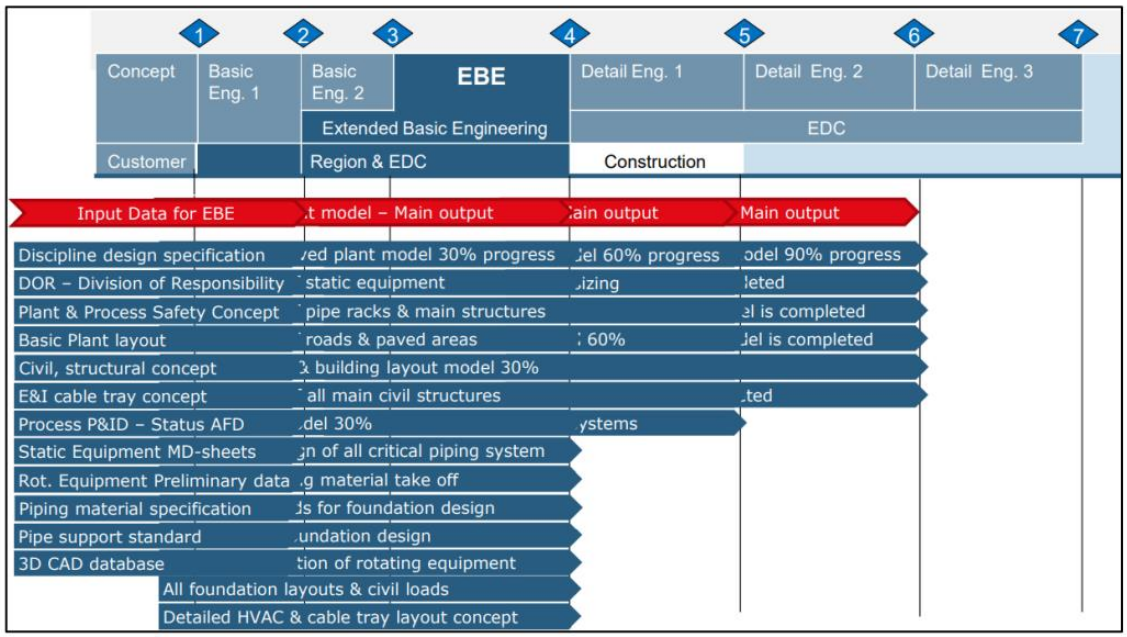

Figure 23. Citec gate model (Citec Oy, 2018)

4 RESEARCH CASE STUDY

Recently, Citec has its first AWP pilot project team kickoff. Meanwhile, Identification of the current template documents used at Citec in traditional / standard project Management was started, There are several templates that have been identified as being the most important ones in terms of how they are influencing the AWP requirements. These document template needs to be updated or new to be created.

The document evaluation process has begun, and the project owner company's counterpart has been consulted. However, Client, a key partner for Citec, an engineering firm, owns the entire project, and the project itself is owned by Client. In such a case, the demand for all mandatory documents required by AWP will be shared, which will be difficult due to the large number of project stakeholders. However, Client and Citec businesses will have to decide what, were and who will be responsible for each document. The best way to develop a RASCI matrix chart to identify the responsible owners for the specific documents.

Currently, it has now been agreed that this case study would limit to identify the essential requirements of template documents that the AWP would demand to adapt for Engineering Work Packing at Citec. Furthermore, it is considered the Project owner company Wärtsilä will take care of the further required documentation and preparation needed documentation of AWP.

4.1 Data Collection and Sampling

The majority of the information was gathered through virtual interviews. The interviews were carried out through the Microsoft Teams application. Each interview member was given information about the questions before the actual interview. The interviews are semi-structured. Each interview was recorded and transcribed using Microsoft Teams with the consent of the interviewees in advance. This allowed the collection of data in recorded form and transcribing it by manually rewriting and decoding it for analysis purpose.

Seven interviews were done within pilot project team members, which are listed in the table below. All are highly experienced persons, six of them are from the Citec organization and one from the Client organization and all had experience in project management field. All of them are team members for a pilot project for Advance Work Packaging.

Table 5. Summary of interviewed people

Company name	Interviewee Name	Total Work experience in years	Designation (2022)	Date of interview	Time of interview
Citec Oy Vaasa	Interviewee-A	29 years	Senior Expert, Project management	23-12-22	1 hr.
Citec Oy Vaasa	Interviewee-B	23 years	Project Management Head, /Enterprise Champion of AWP at Citec	27-12-22	1 hr.
Citec Oy Vaasa	Interviewee-C	17 years	Chief Design Engineer	28-12-22	50 min.
Citec Oy Vaasa	Interviewee-D	18 years	Electrical, Head	13-01-23	1 hr.
Citec Oy Vaasa	Interviewee-E	15 years	Engineering Manager	19-01-23	50 min.
Citec Oy Vaasa	Interviewee-F	15 years	Chief Design Engineer, Civil	19-01-23	50 min.
Wartsila Vaasa	Interviewee-G	21 years	General Manager (PMO) / Enterprise Champion of AWP at Wartsila	27-01-23	45 min.

4.2 Data Validation

The data collection in this research was made through interviews conducted in the organization within the team members of AWP pilot project with semi-structured

questions, the interview questions are listed in Appendix 7.1, the conducted interview's recording details are given in the below table 29.

Table 6. The details of recording interviews

Name	Status	Date	Type	Size
Thesis research Interview-20221223_090816-Meeting Recording		12/23/2022 9:08 AM	MP4 Video	227,041 KB
AWP thesis questions discussion-20221227_120752-Meeting Recording		12/27/2022 12:41 PM	MP4 Video	253,807 KB
Advance Work Packaging - Thesis interview-20221228_144313-Meeting Recording		12/28/2022 3:23 PM	MP4 Video	99,405 KB
Advance Work Packaging - study interview-20230113_140903-Meeting Recording		1/13/2023 3:00 PM	MP4 Video	116,800 KB
AWP discussion-20230119_121448-Meeting Recording		1/19/2023 12:14 PM	MP4 Video	82,451 KB
AWP Discussion-20230119_153254-Meeting Recording		1/19/2023 3:33 PM	MP4 Video	108,353 KB
Advance Work Packaging - Discussion-20230127_141337-Meeting Recording		1/27/2023 2:56 PM	MP4 Video	312,217 KB

4.3 Interviews and Summaries

4.3.1 Interview A

Interviewee A is a senior expert project manager with excellent project management experience. Interviewee A is currently serving as an engineering manager for the AWP pilot project. Before starting this pilot project assignment, he had also finished his AWP training. He emphasized the need for AWP and shared his awareness of the technological and economic factors that would help an organisation adopt an advanced work package method or strategy. Interviewee A emphasises the significance of an advanced work packaging method from a technological and Citec perspective.

"Basically, from the Citec point of view. The main motivation behind it is, of course, that our client, with whom we work on projects, requires it for their construction project work activity, so that is driving the need for Citec to do it according to the AWP…."

Interviewee A clarifies the package work for them: "The most important details are that it is important to package engineering area wise to facilitate construction planning and follow up, and that customers need to organize construction work more effectively than they have in the past. Client evaluated past projects

and concluded that they had not had a good plan for the construction to follow up. This suggests that there is not a good plan to follow up on successful projects."

Interviewee A emphasises the various practical aspects of work packages and the reasons why AWP is more commonly used in large and mega projects: "The world has seen that not having area-wise planning on huge construction sites makes it difficult to control and monitor the progress of the project. To improve construction Planning and follow-up, it is important to have it well planned. This will lead to more efficient work, more resources, and easier scheduling…."

Interviewee A explains the benefit of using AWP: "You can, of course, estimate the work in smaller pieces and also have this like the backlog of work at the site, so you know which work packages are ready to start, where do you have all materials at the site. Where do you have all the drawings and everything that is needed for the construction…."

It is important to think about the company's readiness to adopt this methodology in addition to implementing this organisational change. In his explanation of how organisations are prepared for this change, he said: “Basically, the client has decided to use concord as a facilitator or consultant to build a system that would work for them. Citec is part of this change, as it is related to how they package engineering. The concord company has looked at what they have today and identified areas to improve on to be able to execute a project in AWP….."

As part of the project owner's initiative, “Client has hired a dedicated construction manager to prepare a method for AWP and prepare a statement. After that, a pilot project will be conducted to evaluate the results. After completing all project process cycles from start to final closing, the evaluation will be made.”

Citec's involvement is limited to the AWP method since they are responsible through until the engineering phase, although Client involvement increases once they receive the engineering package and go on to procurement, logistics, and construction: "If we look at it from our customer Client standpoint, -***there are, of course, a lot of changes in the way of working for the people through this new process-*** that it goes but "***for Citec portion that we package the engineering drawings to make drawing area-wise is quite simple and known to us from earlier and getting like material list for that one construction work area is also not anything unusual as such***. The design model allows for material take-offs from each area, but the Client must purchase materials for per-day areas and tag the material as per the areas. This requires a change in purchasing methods and material logistics to the site per the area. what they need to implement..."

The Citec gate model is a phase gate structure project execution concept that they use in the majority of projects. An explanation of the basic to detailed engineering process is provided by interviewee A : "***Basically, I don't see any major change in the way of working."*** The pilot project has followed that when it comes to basic engineering, the first gate is generic over the full site. Still, when extended basic engineering is done, 3D modelling areas can be adopted. When it comes to the model 30% gate review, area-by-area reviews can be conducted to conclude that a site has achieved the 30% model and we have all the information needed to able to continue with it and design further detailing engineering, so the way ***"I see it is that the Citec gate model fits very well to this Advance work packaging already as it is So I don't see major changes as such.."***

Interviewee A further points out the possible changes in the performance indicator and progress report from Citec's point of view: "…The reporting methods for package levels of engineering progress and estimate at completion will differ from those traditionally reported to the customer. This is because the customer will also follow it up on the package level...."

Furthermore, interviewee A explains the roles of the team members and emphasises the differences between traditional and AWP responsibilities and said:
“I don't see any major differences there; a little bit of change, but it has the method that we have designed before is the same. I don't see any major issues with that. Of course, we are in the running in the current period with this, and so ***"people need to get used to this that they really need to report the work hours and so on and the progress to the correct areas."***

Interviewee A shared his thoughts from a current project regarding the roles of project manager and champion in the advanced work package pilot project:
"The way I see it have seen it now in the pilot project is that there from a company and management perspective, there needs to be this "***AWP champion is kind of stairs***." In the pilot project, the AWP champion's primary responsibility is to introduce the new way of working to the organization and make decisions on how those techniques of the procedure will be employed in conjunction with this AWP approach. Although this is a novel approach for all project participants, whether they are involved in engineering, proactive logistics, buying, or contractor-assisted installation, their role should support the project."

Interviewee A, adopting an AWP method depends on the size and scope of the project: “Of course, it depends on the size of the project you have, and perhaps I see the restriction there that if you have a project, for instance, Client Service Organization where they perform smaller upgrades of various equipment on the site or perform fuel conversions that are a little work, Control system updates, and such, it might be that ***"the amount of that work is not a critical size that it would not require to have AWP or let's say you wouldn't gain anything by using AWP….”***

Interviewee A puts great importance on collaboration in the ongoing pilot project. According to interviewee A, there are many elements that may be difficult to forecast at this point in the project's development but will become visible as the cycle of the project proceeds: " Of course, now Client is heavily discussing with Citec as the engineering partner. How the packaging of the areas shall be and how this all should work out, and the method, is such that "***the buyer's construction organisation shall dictate how those engineering packages are divided***…."

The construction contractor is a crucial stakeholder who then accepts and approves the final work packages that they will need to perform on-site: “The most important details in this context are the pilot between Client and Citec, which involves the Client developing packages and bringing the installation contractor into the picture. The client needs to have a construction manager and construction people who have knowledge about it and can plan these packages that make sense for the construction site or construction contractor. When the packages are given to the construction contractor, they will agree that this is a good split. Off course, there may be some comments from the contractors that need to be taken into the project and potentially some additional changes to that package based on contractor comments….."

It is challenging to include people from the construction site for their requirements already in the early planning stages, but one solution would be to cooperate with construction businesses to get them on board as early as the sales phase:
"***I think this collaboration in as such is a little bit interesting, that the collaboration with really the doers for the installation packages or the construction packages are not really possible to get into the discussion early in the initial stage but*** I do realise that when you have companies that have, let's say, if you partner up with the construction company, for example, our Client would have a partner

which would do most of their construction sites, then, of course, that organisation could be collaborating in this AWP setup, and planning in the early phase even in sales phase decide on the schedule and cost of the construction and so on..."

It is crucial to keep in mind that effective collaboration is necessary for developing successful planning and scheduling: "…I think that it is just a very important thing to remember that you cannot make this let's say "***AWP the Client project manager or a single person cannot make this AWP planning, and it will be perfect you need to collaborate with the various parties that are needed to have their impact to this as well..."***

Analysis of interview A: Interviewee A has clear fundamental of AWP method, he is a core team member in AWP method from Citec and describes the benefits of using AWP method in projects he also mention that method is construction driven and faciliate the construction planning and follow up at construction site also planning and organizing is done in advance. Interviewee A says the method makes it easier to control and monitor cost and performance at the site and provides the right information at the right time for site use. A better plan for the project will help reduce rework and change orders. (Chapter 2.1 - 2.2)

Interviewee A said the work packages improves productivity and safety at site, which leads total contruction cost reducation. He notices in the fast projects difficulties without AWP method would difficult to control and monitor to arrange the right information in right time and so on. Thus, with the AWP method, it is easier to work in a smaller area with a smaller work area, which is much better for control and monitoring purposes.(Chapter 2.3)

Interviewee A was happy with the training on the AWP method; however, he highlighted the concerns from Wartsila's perspective on construction. Interveiwee A points out that the AWP's applicability for different wartsila

projects shall be each wartsila's own decision. Further, he recommends or finds that the training would be needed for key contractors and subvendors from Wartsila (Chapter 3.3.7).

Interviewe A notices and confirms that there would not be any major difference in the way of working for engineering and producing deliverable documents from Citec concern; it’s only those that have to be submitted as work area wise deliverables instead having it in one delivery.(Chapter 2.5)

At the end, he sees the concerns about the reporting point of view from the Citec side. This will enable area-based reporting rather than just reporting on a single task. He mentions this as something that needs development and improvement for Citec to do.

4.3.2 Interview B

Interviewee B is the head of project management and has several years of experience in project and line management. Before starting this AWP Pilot project program, he had also completed AWP training. Interviewee B emphasized the significance of AWP and shared his awareness of the organizational and technological aspects that go into why an organization would need an advanced work package method.

"We need to have an AWP in an organization when dealing with the bigger EPC projects. To ensure that we can fully control the schedule and budget.… The AWP methodology will help to maintain the time scale and budget of an EPC project. It connects all the faces and parties working on the project, allowing them to make a better plan for it from the beginning. This will help to shorten the site’s time and reduce the cost of site work efforts."

Interviewee B shared more real-world examples of how the AWP method could be beneficial and eventually save money: "In a normal project, from an engineering point of view, we don't have information about all the conditions on the site. So that leads to focusing on doing the design on the wrong end. Because if they need to be able to start within a certain terrain and we have designed for another area, then it's a waste of time on the site. Also, when the EPC contractor is making Subcontracting with installation work, they will have better materials to ask for a quotation on, so they may squeeze the installation work price more than with this AWP methodology."

Interviewee B emphasizes the organization's AWP preparedness, the training of the key members of the project team, and the need for this change: "A company needs to have an AWP to handle the larger EPC projects. To guarantee that we have total control over the schedule and budget. The AWP technique will assist us in upholding that. Since the EPC project is a whole project, it includes the portion that Citec is working on and the entire project. With larger EPC projects, keeping the time frame and budget is difficult, which practically applies to all businesses worldwide. The AWP method ensures the improvement of our project construction planning…."

Interviewee B says the AWP method is more about improving construction site performances and minimizing labour costs and expenses: "***it is cost saving to get better control of the cost and reduce the number of change orders in this kind of bigger and EPC projects.***" Hopefully, we'll have better planning for the whole project than not only focusing on the engineering part; in this case, now we are working together with the construction manager about in what order we should do it and how we should pack the engineering packages. Nothing has changed in how we do engineering; it's only how we deliver it in what package and how we break it up. But "***the design itself is not impacted as such.***" So, the expected result is to cost saving and time-saving …."

Interviewee B considers that the roles of the current project team members and the Citec gate model remain unchanged. ***"No change in current roles"*** As we work with our client during the development. We also reviewed the Citec gate model, and "***actually, the gate model supports this AWP methodology.***" So, we don't need to change anything in the indicated model. But of course, "***every project is unique, and the details in the gate model needs to be adjust for each project depending on the scope and size of the project."*** however, the gate model is very well in line with AWP Methodology."

Deliverables for engineering documents will be different due to the AWP method. They were previously delivered all at once, system by system, but they are now produced in work area package. Interviewee B ***"thinks that the role of the CDEs will be even more Visible."*** the CDEs will have a bigger or better understanding of the whole project.

Interviewee B is leading and responsible for AWP at the Citec Organisation; he emphasized the significance of the roles of the engineering manager and AWP champion in the organization and Project specific context: "The project manager's role is to lead the project, while the champion is responsible for taking questions, bringing them forward, and finding solutions. The champion is also responsible for supporting the whole organization or enterprise level with AWP-related items."

Interviewee B shares his thoughts as to whether the AWP method can be used for all forms of standard projects, but he continues by stating: "Interviewee B thinks this can be used as a standard project method for all EPC projects in the future, but if we are talking about equipment delivery projects EEQ projects, then "***it will not bring the added value as such***."

Interviewee B explains a few valuable aspects of stakeholder collaboration. He explains that the engineering manager was involved from the project's sales stage and explains stakeholder engagement he says: "We will be more involved already during the sales stage. So, from that point, it has already been planned that there will be appointed an "***engineering manager for the project already during the sales stage to secure that we have the full outcome from the AWP Methodology.***" for the stakeholder management, I see that everything will remain the same compared to what we have today and basically, No changes…."

Analysis of interview B: Interviewee B is aware of the AWP method; he said the AWP method is essential for bigger EPC projects to ensure better control of schedule and budget. He says the bigger projects the more involvement of parties and if we think of the traditional project way of doing things at the construction site is different than the AWP method suggests. So, with the AWP method, it is possible to get several stakeholders from the initial planning phase to set the plan. He says it is even in the sales phase we can predict and plan to reduce site time and cost.

Interviewee B said Normal project process as an engineering provider they would not have the site information and condition shared with them and this could lead to miscommunication and wrong design, however the AWP method avoids this by involving the parties already in the planning stage with the collaboration contractor or procurement people will have then better information from the engineering side to do the planning. (Figure 03)

From past project experience, he thinks the best approach would be the AWP method to show better performance during the construction of the site. He said the current pilot project is well planned with cooperation with the customer. He thinks may be a lot of things will probably be changed during piloting. He thinks the AWP method will improve overall project performance from planning to the closing of the project. Interviewee B also mentioned nothing has changed for us in how we do engineering, it is only how we are delivering it in what package and

how we construction work breakup of the site else there is no change as such. (Chapter 2.5)

Further, Interviewee B describe the roles of the current project team members and the Citec gate model remain unchanged. He said the current Citec gate model (Chapter 3.5) is very much supporting this AWP method. However, he thinks every project is unique and would need the details in the gate model needs to be adjust as per the project requirements. (Chapter 3.3)

Interviewee B thinks the role of CDEs will be more visible in AWP due to the fact he will be responsible for his dedicated areas also he thinks the members will get a bigger understanding of the whole project process and will have more information relating to procurement and construction than before.

Interviewee B said the AWP Champion be the person who is only interfering and promoting the process to get this AWP methodology to go through at the enterprise level and deciding the critical and measure decisions from an organizational perspective to adopt the AWP method. He said the project manager role is in the centre at the project level as it was before. However, he says in the project specifically AWP champion would be any person who has matured experience with the AWP method. (Chapter 3.3.2)

Interviewee B agrees that this method can be used as a standard project method for all big EPC projects in the future. However, he points out that the EEQ project will not bring this method any added value to it because the limited scope and duration for EEQ is too short. But for Bigger EPC projects he thinks there are no limitations to using it as the standard method.

Finally, the interviewee B sees the benefits and added value of using the AWP method for Citec and the customer, he said from Citec the Project engineering manager for this pilot project is already involved during the sales stage to secure the outcome from the AWP method in this project.

4.3.3 Interview C

Interviewee C has over 15 years of experience as a Chief Design Engineer in Piping and layout. He is one of the members of the Citec AWP pilot project team. The Piping and layout team oversees all piping engineering and project deliverables for plant mechanical engineering. I heard about his thoughts on the AWP method and his practical experience with AWP, mainly from a mechanical perspective. He shared his technological and practical experience in his area of work at Citec with the AWP pilot project and emphasized the importance of the AWP method.

"The engineering planning was done in close collaboration with the construction team or construction manager at the beginning of the project planning stage to improve the performance at the construction site and, ultimately, to save time and money on the project. This is more of a site construction-driven method."

Interviewee C explains what the AWP method is for him in his work: "***The focus will be given on one area rather than to work the whole site at once, and this help to report the progress cost and resourcing in a better way because each area will be worked out separately***."

Interviewee C discusses his opinion about using the AWP method in projects from Citec's perspective and his experience in managing projects as a member of the pilot project team for the AWP pilot project. He continues, "Mainly Citec's point of view, it is because ***our customer is implementing the AWP and have this pilot project with us at Citec for an engineering partner. This thing led us to adapt AWP at Citec***."

Interviewee C describes how, together with other team members for the AWP project, he participated in induction training from experts during the start of the pilot project. He continues saying: “We have an introductory training session at the beginning of this pilot project on AWP. We have a core team of key persons

who are helping and trained for this method at Citec, and from Client side, they have been helping us to know more about this method at the pilot project. Currently, I cannot see any, let's say, change in the normal process or by way of working nothing till now. So, no change to the work, and so far, it feels like what we are doing is the same way than used to be in earlier days."

Interviewee C emphasizes that the Citec gate model is still the same. And it follows and fits very well with the current Citec gate model, He explains: "No change in the Citec gate model as such. However, we have quite good split work areas given by the construction manager at the beginning of the project to follow and work with. Also, there is the standard area distribution made by Wartsila that we need to follow for our engineering after 30% of all engineering is done. So, the change we have is to deliver documents according to split construction work area-wise instead of system-wise, which was what we used to do normally. So ***as of today, No drastic change in the way of working***."

Interviewee C talks about the current role of his own, and he expresses his recommendations to have training for the members involved in this AWP project, for example, the designer level and end users who prepare mostly the deliverables he says: "Of course, to get to an understanding of this method, in the beginning, it would need time and also some training for others, for example, designers, to know more about this method and what any special requirements to be filled in while preparing the documents and so on. That is the only thing I can see, and the role and job remain the same; I see no current change currently…."

Interviewee C emphasizes the roles of champion and project manager; he considers that: "Having a champion in this pilot project would be good from an enterprise perspective, but when we have done several similar projects, that might be manageable without a champion. Then, of course, the project manager is always

during the project. Thus, the champion is then the person who can only help in needed projects."

Interviewee C continues by explaining his thoughts on using the AWP method in different project types: "Yes, we can use it for all the projects, but I can see the problem might be with equipment delivery projects were, let's say, for example, Wartsila may not have construction scope; in such case, it might purely depend on ECP contractor or owner how they would need to go with the project and also similar with the smaller project were is limited scope this may not benefit from using AWP because this does not bring the value since this is construction driven method."

Analysis of interview C: Interviewee C has undergone basic training on the AWP method beginning of the start of the pilot project. He said it is a construction-driving process for us because the construction team or construction manager sets the requirement of the engineering, they need to perform at the construction site (Chapter 2.3)

He said the AWP method from his Mechanical and piping perspective, the focus will be given on one area rather than working the whole site at once. He sees the benefits of this he said it will help to report the progress cost and importantly re-sourcing in a better way and it is possible due to each area will be worked out separately. (Chapter 2.3.2)

Interviewee C said from Citec's perspective the main demand to have this method is our customer who is implementing the AWP and this pilot project. However, he did not comment.

Interviewee C said the introduction training received for pilot team members also should or he recommended it for those also involves in other design processes (Chapter 3.3.7). However, he agrees they are getting help from the AWP champion and engineering manager.

While having this interview they are not that far with engineering he said they have done very little work on the project however so far, he sees and exclaimed there is no change in way of working or work and I feel what we are doing is the same way that we use to do earlier. Also, he said the Citec gate model fits very well (Chapter 3.5) . However, he said the change we have is to delivering of documents to be made as per splitter work area wise instead of the system wise which we use to do normally (Chapter 2.3).

The interviewee said in his current role and job remains the same and there is no drastic change that I see currently. Interviewee C said that the AWP method can be used for all projects however he noticed it can be a problem with EEQ projects where customers may not have construction scope.

4.3.4 Interview D

Interviewee D is an Electrical Head and has extensive project management experience. He is a project team member for the AWP pilot project from the electrical discipline. He emphasized the practical implications and challenges of electrical engineering and the production of deliverables from an electrical perspective, shared his experience from a technological and Citec organizational perspective, and emphasized the AWP method from an electrical perspective.

Interviewee D started with the basics of the AWP method. "Well, the Project point of view is basically to take it to a construction area-wise advanced work package method for the pilot project. Initially, it will handle and deliver all engineering in construction work area packages: “So, the project planning from the initial till the end is changed completely to construction work area-wise planning… I think it will help Client in several ways, but **"*the problem with us is we are not into the complete cycle of the project. We are only into the engineering side of the project."*** *A* small part of the project. So, if you do construction area-wise engineering, this will help up to the construction and commissioning time for the project. Also, another motive for AWP because of Citec's major partner

customer is piloting this method in their project. Where we are the engineering partner for them."

Interviewee D emphasizes the preparedness for the change and the willingness of use AWP for this pilot project; he says: "To start with the pilot project, Citec, a key person from the core team, has had training on AWP. We are preparing and working on the changes. The changes we have seen are Starting from the reporting of finances like budgeting and spending. We are now making all these systems for cost follow-up for regular hours reporting as per construction work area-wise. So, we have changed our approach to adapt to it. Our document management system is also updated to match the needs of the construction work packaging."

Since the AWP method is construction driven and the expected results might not be seen during the engineering stage, he expressed his thoughts on this: "We will not be able to predict the success of this pilot project, as it is construction driven and focused on construction. The process is slightly changing to adapt to these new ways, but the results should be the same from our point of view, especially from the electrical perspective."

Interviewee D expressed concerns about how the electrical perspective and performance, particularly in this pilot project, would be impacted: "The performance point of view. ***The pilot project's performance may not be efficient, creating a lot of work in planning and monitoring and requirement management. However, when the system is used to it after three or four projects, there will be better performance, and AWP requirements will be clear."***

Interviewee D shares his thoughts on the current Citec gate model and the way of producing engineering: ***"The Citec Gate model has no change.*** The only difference is that it goes to this construction work area-wise work packaging to be

done; aside from that, the gate model is fine. This is because the Citec gate model is defined as gates and advanced work packaging following the same sequence of basic, extended, and detail engineering. Then, specifically for electrical, it has only been observed that the CDE jobs have increased in the Pilot project. Since this is the first time, we have had such an actual project, the workload has increased."

Interviewee D, In an Electrical context, explains the difficulties of the AWP method: "In electrical, we don't split material list as per area wise" because the cables, we cannot cut cables lines area wise when it jumps from engine hall to any other areas than the conduits are going underground, they are not in one area either, so in electrical we have difficulties and challenges with working to do area wise planning for electrical, It's very hard. ***It does not work logically for electrical like for civils.***"

Interviewee D shared his thoughts on the team member's roles in the AWP pilot project; he sees no change in current roles: "There is no change in the chief engineer role as such. It's just some additional work; as I said, now comes about document deliveries will be done construction work area-wise. And cost follows up area wise and so on it is just a new change for us. Depending on project size, it takes a bit more time; from each discipline...."

Interviewee D thinks that the project manager role in the AWP method is more demanding than it is in traditional projects because the planning of the project is much more detailed: "The cost follow-up, the delivery schedule follow-up, and the planning are changed to construction work area-wise. These things are new, so it's a lot of work in the beginning for our traditional project manager, and AWP demands quite a lot in a very detailed level of planning."

Interviewee D shares his thoughts on using the AWP method as a standard project method in future all projects he thinks that AWP is a time consumed process that would need more time to complete the projects and may not be benefited from shorter deadline project: "Well, it is initiated by our partner customer. The client uses this method in their EPC pilot projects and its customer drives for us. ***The AWP looks to be is more time consumed work it needed time for than that traditionally,*** *So*, we need a project with time, and that's the project limitation which is having this A-classification or similar one. Then the customer must drive this AWP. Which is our limitation, I would say…. Also, Interviewee D said collaboration is very important irrespective of the method used in the project for project success. If we don't have the stakeholders in line in any projects, it will be different because expectations are not fulfilled."

Analysis of interview D: Interviewee D is aware of this method already however undergone basic training on the AWP method before the start of the pilot project.

He said adopting AWP method for instance in pilot project I see the from initial planning till the end the delivery process is changed completely it will be delivered according to construction work area package (Chapter 2.3). He strongly agrees it will help to procurement and construction than in engineering that he sees as a limitation from citec point of view. However, Citec need to adapt this due to partner customer Wartsila is implementing it in their projects perhaps to other customers we are not follow for them. He said in the future it is up to customers to decide if the AWP would be applied in all bigger size projects not.

Interviewee D said they did not prepare anything until get the help from key persons from Citec and from Enterprise champion. So, he said they still getting start and preparation is under way in pilot project for us. He mentions the change that impacted to them he remembers to mention it here. The budgeting of project and reporting and cost follow for engineering process needs the mapping needs to up-

date to work for area wise reporting. Also, he said for document management system also is now updated to match up the needs of the construction work packaging (Chapter 2.6).

Interviewee D said the predict of the success would be difficult to comment. However, he said this is construction focused and results will be seen during construction. Basically, there is No change for engineering and electrical perspective we focus to deliver the quality.

Interviewee D strongly says in pilot project from electrical point of view this is bad effect for them lot of work such as planning and monitoring and requirement management so this impact our performance I believe this would improve in future projects when there will more hand on projects done and more clear inputs expected.

Interviewee D according to him or he sees no changes in the Citec gate model (Chapter 3.5). He finds that AWP also follows the same ideas as Citec gate model has. However, he said especially for electrical he sees more efforts than before because they are new to it but he agrees it is just in beginning in adoption process. Also, he notices there would be more work from engineering and drawing creation because they need to follow construction work area wise packages otherwise rest would remain same.

Interviewee D said for electrical there are good and bad things with AWP method (Chapter 2.1). He exclaimed good things to have design in areas wise and drawing for those however, the challenge for us how we divide standard components and drawing for in areas its difficult and in electrical they don't split material list also in area wise. He explains big thing with the cables, the cables they can't cut cable area wise when it jumps from engine hall to any other area than the conduits are going underground, they are not in one area either. He finds this is difficulties and challenges in electrical and he afraid the AWP method it is very hard with electrical because it is not work logically for electrical, he says (Chapter 2.7).

according to interviewee D sees there is No change in CDE's role however he said there would be little more work with documents deliverables and reporting to follow as construction work area. Further interviewee said the roles for engineering manager and he things the engineering manager role will remain same however in this pilot project he would need to ensure the objective to meet as per AWP method in project specific. He things it would be more work for him since there would need much more detailed level planning than traditionally, he says.

At the end interviewee said the AWP method it is customer drives for us. However, I think this would use in EPC or Client A-class project because of it is construction driven method also he says the reason why can't be used in for EEQ project is AWP looks to be is more time consumed work process it really needed time for than that in traditionally he says.

He said the stakeholder's collaboration is very important irrespectively if AWP in use or not in the project because the expectations may not fulfill without collaboration (Chapter 3.3.4).

4.3.5 Interview E

Interviewee E, Is Working as an Engineering Manager and has worked on several different industrial projects as a project manager. He is an engineering manager for the AWP pilot project from the Citec organization. He shared his so far experience on the AWP pilot project from a technological and Citec organizational perspective.

Interviewee E emphasized his thoughts on having the AWP method; he continued by saying: "Advance Work Packaging is needed for Complex projects, which we can target in the given construction work areas. In a complex project, one must not get every input simultaneously. All inputs may vary, and they take their time to get them in different schedules. From a construction viewpoint, it will allow seeing which area is first to build or prioritize; for example, in the Clients

projects like powerhouse and Utility building are the most critical areas that need to be priorities, and so on; due to this, several reason and constraints, the AWP method is necessary to improve performance of construction at the site and reduce the engineering rework or change orders in the end."

Interviewee E states that based on the project class, the AWP method may be used: "I see it is project classification. The simple type of project or complex project, for example, in the case of Client EPC, are most A class and big size projects, and then B and C classes were don't have scope for construction involved. then the AWP method is not needed as such. In Citec's perspective, I would be recommended we go with the AWP method, but for EPC type projects. The AWP method with the path of construction gives better planning and performance at the site to reduce cost."

The interviewee stated about the preparedness for the AWP method for his team since it is new to the organization; he continued: "The AWP method It is new for us, and we have started a pilot project with one day of induction training about AWP method with our customer; the training was held by the external consultant; apart from this, we have a core team members from Citec and Client as enterprise AWP champions who have been undergone intensive AWP training they are supporting and guiding us in this pilot project in case of any difficulties or challenges."

Further, The AWP method from the Citec and engineering perspective interviewee E do not see a major change as such: "I have noticed from Citec's perspective there is no major change technically or from an organisational point of view. As we are working on a pilot project, it will take more time; many new templates are under work, and the work process is under development and should be ready very soon; after that, for further future projects, the performance must

be better. Then, Of course, at this moment, we are still determining what challenges we will expect from the site since this will be a first pilot project. We aim to provide all detailed information documents needed at the site to perform the work without any issues. Performance-wise, we look forward to saving construction time and cost at the site...."

Interviewee E stated there was no change in the Citec gate model, and then he shared his thoughts: "No drastic Change that I see; currently, we have been following the Citec gate model as we use in our normal projects, and it fits perfectly with it, and the current way of working with this method is developed based on the existing Citec gate model in cooperation between the Client and the Citec, and they are continuing been working together to get this in working in practice"

Interviewee E shared his observations about the roles and efforts of the team members for him and the other members of the project team. He thinks there won't be any major changes to the job; he says: "Team members' roles remained the same, for example, project CDEs. However, we have some changes in processes, for example, making engineering documents and delivering work packages in predefined construction work areas; for this, there would be new templates in use to give clear information to site personnel. Also, I see the Engineering manager / Project manager's work has increased at the beginning of the project planning stage"

The importance of having close collaboration for different stakeholders is vital for project success regardless of the method being used; he says: "***The AWP method is also terms as construction driven engineering, and the Construction manager is who is giving his input to us to prepare engineering.*** "

Analysis of interview E: Interviewee E engineering manager from citec. He received basic training on the AWP method before the pilot project began however they are receiving a guidance from enterprise champion in this pilot project.

He said the AWP method is required for more complex projects because in big complex project getting all inputs needed are not happens at in the same time and inputs may receive in different intervals with AWP method we can priorities the areas and they can plan the engineering based on its critical and urgency with input constraints he says (Chapter 2.1). He also sees the benefits of using AWP method this will improve overall performance of construction at site and help to reduce the rework and change orders.

Interviewee E strongly agrees to use the AWP method from Wartsila or citec perspective to all A class or EPC projects and he don't see the need of AWP to be used in the B or C class projects where construction is not in customer scope. He finds the AWP method with path of construction (Chapter 2.4) improves better planning and performance at the site to reduce cost.

interviewee E said the AWP method is new for them and he had one day training on this however he said they are receiving the support from dedicated AWP champion in pilot project. Further he confirms that from citec perspective there is No major changes technologically or in organizational point of view. However, he sees during this pilot project it will initially take more time for preparation. They are preparing new templates which he said under work, but this will be one time process to go through which will help to future needs.

He said at this stage we are expecting from site contractor the requirements to be made ready and our target is to provide all detailed documents with full of information needed at site to perform work without any issue. He exclaimed his expectation would than the improved overall performance from site.

Engineering manager sees there would not be any change in citec gate model (Chapter 3.5) and they are following it and they see it fits perfect with AWP

method. He mentioned also about project stage gates for AWP is developed based on citec gate model in cooperation with Wartsila. He also mentions the roles and efforts from the team members he said there is no major change in project team members role however, only change from engineering concerns is to delivering of documents will be done as per construction work areas (Chapter 2.3). He mentions for his own work is increased he thinks it's due to new processes.

In the end he emphasizes the importance of collaboration between stakeholders. He said in pilot project the construction manager is with us from the starting stage of project who is important and helping and providing to us information for engineering. Because AWP is an construction driven and contractor or construction manager who is giving his inputs to us to prepare work engineering packages (Chapter 2.3).

4.3.6 Interview F

Interviewee F, Is a professional Civil Engineer Working as Chief Design Engineer. He has experience in several different industrial projects over the past 15-plus years. He is a member of the team working on the AWP pilot project from Citec organization from Civil discipline. He shared his observations from the technological and Citec organizational perspective from the ongoing AWP pilot project: "The AWP would need Basically Breakdown of the works. Better control of the projects. Better quality since everyone is working in the same area at once. ***We can't build everywhere at once at large construction site, so at some point need to start at one area at a time. and utilize the resources efficiently at site…*** Also, The AWP benefit I see in case any of the areas is delaying installation work at the site due to some reason, the teams can start with other areas where they have all inputs available at the site."

Interviewee F explains other conditions that were observed in past projects from the Clients perspective that leading it to consider the adoption of the AWP

method: "From Citec's perspective and our partner customer view point, ***they have seen in the past bigger EPC projects are failed, and the study found and showed the same conclusion the projects failed due to reasons they did not have proper instruction or missing the integration between engineering and site construction planning due to this they do not have proper planning for construction. So it's a lesson learned and leads to adopting the AWP method, also known as construction-driven engineering, to have better predictability…*** Also, of course, because of the customer, the method in EPC projects as ***we are partnering in engineering, so we also need to adopt this method for serving them in projects.***"

Interviewee F, a team member for a pilot project, stated by sharing his own and Citec's perspective on the AWP method preparedness: "From Citec organization point of view, they had training for core team members key persons from Citec and Client on AWP method. The training is given by professional consultant company… However, for ***the pilot project team members, there was an introduction session held by an AWP expert at the Citec office***… So, currently we are in an ongoing process for updates for documents and creation of new document templates needed for AWP."

Interviewee F emphasizes the results that might be expected using AWP in engineering and at the construction site: "Measuring the performance against the budget for each work area package effectively ensures that the project stays on track financially. Breaking down the project into smaller, more manageable packages makes it easier to monitor and control costs and identify potential overruns or cost-saving opportunities. Additionally, having easy access to the relevant documents and drawings will streamline the construction process and reduce the likelihood of errors or delays. Finally, delivering the project in work area packages can help to improve efficiency, reduce costs, and minimize errors and delays, all of which contribute to a successful project outcome."

Interviewee F, ***his observation of the current project, stated that the current team members' roles remain unchanged***. ***I don't see any major changes in roles currently. He did not comment on the champion role."***

Interviewee F expressed his viewpoint on of AWP method that would limit this method to use in customers' projects: "The AWP, ***it can be used in many different kinds of projects which, especially as the construction however, if we talk about clients projects this could be used in EPC project and may not great useful for Equipment delivery projects or smaller service projects were is small work package as this method is based on construction driven method***"

Interviewee F emphasizes the importance of teamwork in the AWP method; he says: "I see that ***all the stakeholders must be a willingness to involve from the beginning meaning from the planning phase and during the whole project lifecycle to help each other and share the information between inter discipline Also, better communication will help integrate for better collaboration***... However, we do have the Citec gate model in place to see and follow up the project progress; this also helps to achieve the final goals for an organization with better efficiency and cost and quality at the end."

Analysis of interview F: Interviewee F Chief Design Engineer civil, Citec. A team member for AWP pilot project he also has been undergone a one-day training on AWP method.

Interviewee F emphasizes the benefit of using the AWP method (Chapter 2.1), he said working in all areas at ones won't work efficiently and would need to breakdown of the works in smaller and manageable areas (Chapter 2.3) and this add the benefit to better control on the project, quality and better performance, and planning and resourcing will be made much better way at site. Additionally, he says good thing with AWP also that in case of any of the site area is delayed installation

work at site due to unknown reason perhaps teams can start with other area were they have all inputs available at site.

Interviewee F, The factors that leads this AWP method to be adopted he emphasizes from Citec and Wartsila perspective, he highlighted the practical reasons in his views he says in EPC projects were failed due to improper integration between engineering and site construction planning. He said as the AWP method is construction driven and it gives better predictability. He agrees and says since Wartsila is implementing this method, so Citec has since we are partnering in engineering and needs to follow and adopt this method at Citec too.

Interviewee F said about preparedness of AWP method at citec, He said at organization point they have the key persons are being in extensive trainings made for those along with Wartsila key persons. However, for us in pilot project team members there was an introduction session held from AWP expert at citec office. But he also said they did not have previous knowledge of this method and reporting point of view, and this would need to be done as per work area wise.

during this interview the pilot project is in progressing, so he gave some current updates progress on the project he said AWP method needs some document templates to made and it is currently under process.

Interviewee F, express his expectations about pilot project and break down work area packaging, he said the performance would be better since they will have access more easily the documents drawings for that work area and he thinks this would help a lot since it will be a right information at right time.

Interviewee F, as other interviewees he agrees that there is no change in Citec gate model (Chapter 3.5) and it remains unchanged. However, he sees from civil perspective said No major change as such but delivering method and number of drawings would be more than before. He sees more work to do for them.

he also exclaimed it gives much clearer within interdisciplinary areas and do not see measure change in way of working for us during engineering he said: from his current observation about team member role, he thinks there is no major change as such in members roles. However, he did not comment on champion role.

Interviewee F, in his opinion the AWP method can be used in many kinds of projects which specifically has the construction involved in it. he said on Wartsila perspective the EPC would be the project to use this method, but I see for EEQ, or small service projects may not be great useful.

In the end he emphasizes on the stakeholder collaboration (Chapter 3.3.4) he said all the stakeholders must be willingness to involve from the beginning meaning from planning phase up to the end to help each other and share the information between inter disciplines. However, he highlights the better communication would help to integrate teams and stakeholders.

4.3.7 Interview G

Interviewee G, General Manager, Project Management Office at Wartsila. He has long experience in project management. He is also responsible for an AWP enterprises Champion role for Wartsila and currently leading and assisting in a pilot project where Citec has been a partner and working together with close cooperation by providing multi-disciplinary Engineering. However, Wartsila is an owner of the project and initiator of the AWP programme. The Interviewee emphasised the importance of the AWP today and shared his expertise on the organisational and technological aspects of the business from the Wartsila perspective:

Interviewee G shared an example of industries and timing of the failure: "***This method was developed for big complex projects such as large process plants and oil and gas plants,*** which are billion-dollar scale projects. These projects tend to fail during the construction phase, which is the project's most intensive resourcing and highest-risk phase. ***To improve the construction probability and***

reduce the risk of failure, a method was developed to secure and improve the construction process. The AWP method is a cleverly developed approach that emphasizes the importance of starting to impact the construction phase very early in the project chain. This means bringing the construction into the project's early planning and engineering phases. By doing so, it becomes possible to ensure that the construction is productive and to minimize the risk of failure during the construction of the plant."

Interviewee G talks about the importance of sequencing in relation to the project's scheduled start date to start construction: "The timing of construction is crucial, and it's important to have a proper plan and flow towards meeting the construction needs. If the plan doesn't support the construction needs, it can have negative impacts on the project, causing delays and misleading engineering efforts. Ideally, construction should begin when engineering is matured enough, typically at the point when 30% to 50% of engineering is complete. Therefore, it may be necessary to postpone the start of construction until engineering has progressed to this stage."

Interviewee G emphasises the AWP method and its preparation within the own organisation and with their main key service providers, for example, Citec as an engineering partner; before launching this pilot project, he adds: " The organisation decided to use the AWP method and started a pilot project. We received training from a specific supplier to learn more about the AWP method. Since we didn't have in-house engineering, we engaged engineering supplier, Citec, to help us understand and develop a strategy for packaging the engineering to support the construction site. The involvement of Citec was crucial because AWP is closely related to how engineering is packaged to support construction."

The Interviewee explains his expectations for the AWP method from the perspective of the organisation, stating it's about to increase performance at construction sites and eventually save costs and time and improve the quality: "***We want our organization to be predictable,*** so when we accept an EPC, we must adhere to a specific schedule and pay a specific cost. We want to be able to do that for the outcomes of expectations to be predictable. When the construction-driven planning is already pulled back to our sales phase, the method ensures that we will remain within budget and on schedule."

Interviewee G exclaimed about gate model: " Actually when we are building up the method for our organization and Citec. We utilised those existing gate models we have as background for AWP method and follows during implementation referring to those models. So, they will not need to change. ***I think we already tied it to the existing gate model***."

Interviewee G shares his opinion on implementing AWP method and people's behaviour: "***This method requires a mindset shift in how tasks are prioritized***. Rather than starting with easy tasks, one must centre their work on a different logic based on the hierarchy of importance. This may mean starting with less convenient but essential tasks that are more natural for the project. The technique connects construction and engineering work packages, requiring consideration of what construction needs to execute the project effectively. Overall, it emphasizes the importance of considering what construction requires to avoid limitations in the project execution."

Interviewee G emphasised the roles of the engineering manager and champion in the AWP method and shared his experience from the pilot project: "In the AWP method, there are three important roles: the project manager, the construction manager, and the AWP champion. The project manager is responsible for overall project planning and management. While the construction manager is

engaged in planning and setting engineering sequencing for construction. The AWP champion, on the other hand, advice and coaches the team on the AWP method and helps with its implementation on enterprise level. There may also be an AWP champion within the project team for project specific purpose, who helps the team to implement AWP essential steps. In some cases, the AWP champion can be the construction manager or a CPE. "

Interviewee G shares his opinions on using the AWP method in different projects: "AWP method is developed for the complex and bigger project. It is no use to do it in a project where you, by default, have a small package already and no need to break it down further. It is better to stay based on the normal processes and not go into the additional complexity of an AWP package. One factor is that the time and building and implementing AWP at the enterprise level must project by project, step by step, to implement it. So, it is not a method that you give short training, and everybody knows it. So, you need naturally go step by step with team and ***this would need more time."***

Interviewee G has given an overview of the collaboration strategy for the AWP pilot project: “In this pilot project, there is a clear plan on who will be engaged and active in the method. Some contributors, like equipment suppliers and purchasers, may need to understand certain aspects of the method, such as coding, but not the whole method. The core team and core functions are heavily engaged in the method, but it is too complex to expect everyone to understand it fully. Therefore, it is important to limit the scope of understanding to those who need it for their specific contributions."

Analysis of interview G: Interviewee G, General manager at Wartsila, currently leads the AWP core team at Wartsila and is responsible and owning of the AWP method for the Wartsila enterprise. He is supporting as AWP champion for pilot project.

he gave briefings on the AWP method (Chapter 2) in the Wartsila context and why the organization aiming for it. He generalized the AWP method and ideas for having it in projects. He exclaimed that bigger-size projects get failed during the construction phase of the project (Chapter 2.1). So, he understands the AWP method is a method developed to secure and improve the construction probability of big complex projects. He finds the AWP method as all about bringing the construction into the early planning and engineering phase of the project to ensure a productive construction during construction at the site (Figure 03).

Interviewee G, Realizes the importance of sequencing concerning the project's scheduled start date to start the construction. He said if we don't support what the construction needs then this will impact or negative impact on the project. He thinks this would improve by doing the package the engineering in several work area packages (Chapter 2.3). So, they can start the construction already on package one although still have several packages in the project than can be made available to meet construction demand and sequencing to start construction at the correct point of time to meet the objective.

Interviewee G said while now Wartsila implementing the AWP method within the organization however, he expects the other contributing and partnering organizations also to know this method he mentioned at the beginning of the process they involved Citec to get their viewpoint on it as they are engineering partner in our pilot project so we have formed a core team members and involved members from Citec and we get the training from an external expert company to know this method and process.

From the Wartsila organization perspective, interviewee G mentions the expectations that the organization is looking for, which is predictability in their business, especially in EPC projects where the site construction is involved, and they need to achieve the agreed schedule and quality and cost.

There is no change in the Citec gate model (Chapter 3.5) said Interviewee D because Wartsila and Citec have referenced the gate models in the background to build up the AWP method implementation. Also, he realizes the AWP method involves basic engineering and detailed engineering and the gates in between are already tied to the existing gate model.

Interviewee G thinks implementing the AWP method and changing the behavior of team members is just a short-term mindset and no big drastic change as such for change (Chapter 3.2). He said it is just driving the sequence order of work relating to the prioritization of things that are the most urgent from a construction point of view. This has led the engineers to start from the less convenient work, rather than prioritizing things that they feel are easier to do. He said the project manager needs to think construction driven and make sure about what the construction needs to have to efficiently execute the construction at the site.

Interviewee G described the roles and engagement of the engineering manager and champion (Chapter 3.3.3). He thinks the engineering manager will remain in the center of the projects and is managing the project similarly to before. However, in the AWP method, we have having/involved him already from the sales phase who will be engaging with the construction manager for planning in the initial stage. In the champion role, he mentions the champion he won't have an active role in the planning of the project itself. However, he is one that is coaching and advising on the AWP method. He was just enough involved to support the team in the implementation of the AWP method. However, there would project specific AWP champion who will help the team to implement and do all of the AWP essential steps and this would be any team member within the project team perhaps construction manager or one who has enough experience on this method.

Interviewee G realizes the AWP method is developed for a more complex and bigger project and is to be used in the case of Wartsila EPC projects and it may not be beneficial for smaller EEQ or small scope projects for instance service projects. He agrees the AWP is time taking process and would need a longer time schedule.

Interviewee G expressed his opinion on the collaboration (Chapter 3.3.4) strategy for the AWP method from Wartsila. The Wartsila has decided and planned the way forward for implementing the AWP method, he says the project organization in this pilot project has a clear plan for who will be engaged and who will be active on the method. They ensure those involved need to know the method and be skilled in it through training. However, those who are for example equipment suppliers don't need to understand the whole method because this is a complex method, and it is too complex for everyone to understand it. therefore, the core team and core functions are heavily engaged in AWP, but they are supporting and helping each other all the time.

4.4 Summary of the Interviews

The interviews are conducted with a research goal to see the awareness of what conditions lead to adopting the AWP method in Citec and what process upgrades are to be made, and what challenges to address. The open literature source references (chapter 7), Concord Project technologies inc. and the author (Hamdi, O., 2013) (CII/COAA, 2013) support the analysis.

From Citec's perspective, Interviewees A and B have clear fundamentals of the AWP method; (Chapters 2.1 2.2). Interviewee A describes the benefits of using the AWP method in projects. Interviewee A says the method makes it easier to control and monitor cost and performance at the site and can provide the correct information at the right time for site use. As it is construction-driven (Hamdi, O., 2013), better planning in the project will help to reduce the rework and change orders. Interviewee A notices that the work packages improve productivity and safety at the site, which leads to total construction cost reduction. This supports constructability benefits (Hamadani, 2022). The AWP method facilitates working in a smaller area with small work areas, which is much better for control and monitoring purposes. Interviewee B mentioned that the AWP method is essential for bigger EPC projects to ensure better schedule and budget control (Halala, 2019).

Interviewee B said the Normal project process, as an engineering provider, would not have the site information and condition shared with them, and this could lead to miscommunication and end up in the wrong design; however, the AWP method (Figure 01) avoids this by involving the parties already in the planning stage with the collaboration contractor or procurement people will have then better information from the engineering side to do planning.

Interviewees C, D, E and F have undergone basic training on the AWP method since the start of the pilot project. Interviewees C and F mentioned it is a construction-driven process for them because the construction team or construction manager sets the engineering requirement, they need to perform at the construction site; it supports research (Hamdi, O., 2013), giving better predictability for better planning at the construction site. Interviewee D mentioned adopting the AWP method; for instance, the delivery process is changed completely. It will be delivered according to the construction work area package (Chapters 2.5, 2.6). Interviewee D strongly agrees that it will help procurement and construction more than engineering.

Interviewee E said the AWP method is required for more complex projects because in big complex projects getting all inputs needed is not happening at the same time, and inputs may be received in different intervals; the AWP method can prioritize the areas, and they can plan the engineering based on its critical and urgency with input constraints (Chapter 2.6, 2.7). Interviewee E also sees the benefits of using the AWP method; this will improve the overall performance of construction at the site and help to reduce the rework and change orders Interviewee E and G finds the AWP method with a path of construction improves better planning and performance at the construction site and reduces cost it supports to research by (Hamadani, 2022).

Interviewee F said working in all the work areas at once won't work efficiently (Chapter 2.1) and would need to breakdown of the work into smaller and more manageable sizes, and this adds the benefit of better control of the project, quality

and better performance, and planning and resourcing will be made much better way at the site. Additionally, interviewee F says a good thing with AWP is that teams can start with other areas with all available inputs if any site area is delaying installation work due to an unknown reason (Chapter 2.8).

Interviewee G gave briefings on the AWP method in the Wartsila context. Interviewee G generalized the AWP method and ideas for having it in projects (Chapter 2.2). Interviewee G exclaimed that bigger-size projects fail during the project's construction phase (Chapter 2.1). Interviewee G mentioned the AWP method as all about bringing the construction into the project's early planning in the engineering phase (Figure 02). Interviewee G traced the importance of sequencing with the project's construction start date. Interviewee G said if we don't support what the construction needs, then this impact or negative impact on the project.

Interviewees A, B, C, D, E & F have the same opinion and are happy with the training on the AWP method. Further, Interviewees A and C recommend that the training would be needed for key contractors, sub-vendors & designers for change (Chapter 3.2). Interviewee G explains that those involved need to know the AWP method and be skilled through training. However, he thinks, for example, equipment suppliers don't need to understand the whole method because this is a complicated method, and the core team and core functions are engaged in AWP and helping and supporting project functions.

Interviewee A, B, E and F notice and confirms that doing engineering and producing deliverable documents would remain the same. It's to be submitted in work area-wise deliverables instead of a whole. Otherwise, everything is the same. Interviewee C describes the AWP method from a mechanical and piping perspective, focusing on one area rather than working the whole site simultaneously. Interviewee C sees the benefits of this. Also, it will help to report the progress cost and, importantly, resourcing in a better way, and it makes it possible because each area will be worked out separately. Interviewee D mentioned that the change that impacted them is the budgeting of the project and reporting and cost follow-up for

the engineering process; mapping needs to be updated to work for area-wise reporting. Also, the document management system must be updated to match the construction work packaging (Chapter 2.6) needs. All the Interviewees agree that there is no change in the Citec gate model, and the way of doing engineering (Chapter 3.5) will remain unchanged. Interviewees A, B, C, D, E and F explained that their current roles and job remain the same, and there is no drastic change. However, they see the change from engineering concerns to delivering documents as per construction work areas (Chapter 2.3). Interviewee D said from electrical, the AWP method is a challenge for them because delivery can't split the material list in the work area; wise also, the cables can't be cut area-wise when it jumps from one area to any other area, and there would have limitation in electrical for this method.

Interviewees A, B, C, D, E, and F are concerned about the project progress reporting point at Citec. The reporting will be as per work area-wise reporting instead of on one single project task.

Interviewee B and G both describes the AWP Champion be the person who is only interfering and promoting the process to get this AWP methodology to go through at the enterprise level and deciding the critical and measure decisions from an organizational perspective to adopt the AWP method (Chapter 3.2). Interviewees B and G said the project manager role is in the center at the project level as before. However, Interviewees B and G mention that the project-specific AWP champion would be anyone with enough experience with the AWP method (Chapter 3.2).

Interviewee G explained the AWP method is developed for complex and bigger projects and used for EPC projects; it may not be used for EEQ and small-scope projects because the AWP is time-consuming and requires a longer schedule (CII 2011). Interviewee B points out that the EEQ projects will not bring this method any added value because of the limited scope and no scope for construction. However, all other interviewees have similar opinions on using the AWP method in projects; they also see the benefits and expectations of using the AWP method

from Citec and Customer perspectives few of them they mentioned are better planning and monitoring, better collaboration between stakeholders in the initial planning phase, increase in overall performance at the construction site, Improves data information at the site, predictability these supports to construction industry institute (CII 2011) and other studies made on AWP.

Conclusion: All of the Interviewees know the AWP method's significance; however, Interviewees A, B and G are more deep expertise in the AWP method and can express in a broader way of the AWP method on the organizational level. Were as other interviewees that are C, D, E, and F, were keen on their discipline of engineering and limited to a project-specific range on AWP method. The interviewee's discussions and comments are relevant to the AWP method and support the literature review.

5 DISCUSSION AND CONCLUSIONS

5.1 Theoretical Implication

RQ1. What are the conditions leading to implementing AWP?

The AWP method has been developed to address challenges in cost and schedule overruns in the industrial construction projects as mentioned in the Literature review in (Chapters 1 and 2). The following are some of the conditions that lead to the implementation of AWP, also discussed, and observed in the literature. One or more of these conditions mentioned below are observed in interviewees, and these conditions support the theory (Chapter 4).

1. Large and complex construction projects: AWP is most effective for large and complex projects where many activities, different shareholders and constraints need to be coordinated. (CII 2011)
2. Multiple Stakeholders and Contractors: When various stakeholders and contractors are involved in a project, there is a greater need for coordination and collaboration to ensure that work is executed efficiently and effectively.
3. Tight schedules and predictability: AWP method helps to ensure that projects are completed on time by providing a structured approach to planning and execution.
4. Limited access and space constraints: Projects with restricted access and space constraints can benefit from the AWP method as it helps optimize resource use and reduce waste.
5. Safety requirements: The AWP method help to improve safety on construction sites by identifying potential hazards and risks early in the planning process. (CII 2011)
6. Cost constraints: The AWP method help to reduce costs by improving productivity and reducing waste at the site.

RQ2. What process upgrades or changes need to be made at Citec in order to adapt AWP?

The literature review (Chapter 2) mentions the terms and processes that involves with the AWP method, as Introduced, and illustrated in Figure 1. However, as previously stated in the thesis, Citec's perspective is limited to the Engineering phase because they are not involved in the entire project cycle of the AWP method (Chapter 1.1). However, the interviewee's search found that the current Citec process, the Citec gate model (Chapter 3.5), is aligned with the AWP method. The only difference is that the project will be packaged as per the construction work area, as discussed in the chapter (Chapter 2.3).

Furthermore, on the organizational level, as mentioned in Chapter 3.3.7 it was discovered during the interviews that the AWP is an complex process to understand and would require trainings for those who are involved in process. This was found to be important for many interviewees.

RQ3. What challenges must be addressed in order to develop an AWP adaption plan or model?

The AWP method has processes that are defined and discussed in literature review; theoretically, the method demands certain systematic ways to be followed by using the templates for each of the process phase as defined in AWP framework Figure 2. in Chapter 2.2. The study research shows, from the Citec perspective, that they have to create a new template to support AWP and use this method while preparing the Engineering work packages as defined by their own template or in cooperation with as customer requirements. The study finds, in the pilot project for Citec, that they do have very minimal changes, and they see there are no big changes for them. (Ribeiro)

5.2 Practical Implication

The research study concludes that, from Citec's perspective, the AWP method has no impact on their daily work and doing engineering work or preparing packages from each discipline, with an exception for electrical; One of the interviewees explained the practical challenges and difficulties that is not possible to cut and separate the cables as per construction work areas. However, to overcome it, a separate concise, logical plan must be made for electrical in cooperation with the rest of the stakeholders.

The study finds there is no change in project team person roles; however, there will be more work to perform due to the different engineering work packages to be prepared as per construction work areas. Also, minor changes in PDMS application; design hierarchy to be made to suit the AWP method at Citec.

The study found that there has been a change in performance measurement and reporting at Citec; the AWP requires a structured approach to performance measurement and timely submissions. It involves tracking key performance indicators (KPIs) and reporting on schedule progress. However, at Citec, current reporting has a significant impact and must be developed to report in fulfillment with construction work area packaging.

However, the AWP is new to the organization, the findings of the study support and recommend training be given to team members to enhance awareness of the method.

The study finds that AWP is so new to the organization that it is recommended to arrange training that gives more awareness of the method and its benefits to Citec and offer values to the customer.

The objective of the thesis was also to identify current documents at Citec and templates that are Citec organization is using for their customer delivery projects and to study, analyse the findings of the existing templates, and to make the

change recommendations required to adopt the AWP method at Citec. However, due to companies' confidentiality policy, the results of the template documents are presented separately and are not included in the thesis.

The study itself and literature content will be used in full and support as a guidance to understand the AWP method in brief; Since there have not been many studies made on this topic, this case study would be very much limited and a small process part of the whole AWP method. That is until the Engineering work packaging.

5.3 Limitation and Further Research

This thesis aims to understand the conditions leading to adopting the AWP method in the Citec organisation, what process changes needed to be made and what challenges must be addressed to adopt the AWP method.

During the literature review it was noticed that there are very few but excellent sources of information available on this method, but for the research, this was a limitation to explore this topic in a more detailed and confliction way.

The case study took place in the Citec organisation where the current practices and other interview findings were analysed. The interviewees were project managers, CDE's from each discipline and AWP champions. Interviews were made to obtain the perspective from each discipline. So, the observation was limited.

Another limiting factor is that the case study was done in a limited context in a single organization, therefore, the results and conclusions are limited to the Citec perspective. The context of the study topic is limited up to the preparation of engineering work packing.

Yet another limitation of the study is that the case study was done during the project initial stage and this limited the expectations of the interviewee thoughts. Thus, more research can be done to explore this method and strategy in border context that would bring benefits and fulfil the company's goals.

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7 APPENDIX

List of Interview questions

Why do organization need an AWP?

What are the conditions leading to implementing AWP?

How did organization prepare for change?

hat results are expected for adapting / implementing AWP?

Do you see any Drastic change in current Way of Working & Citec gate model if AWP in use?

Do you see project team members current roles would need changes in AWP?

AWP method; roles of AWP Champion and role of PM in projects.

Do you see any limitation to use AWP as a standard project method in the future all projects?

Project stake holder Collaboration is important element in AWP, how organization will perceive this to achieve to its heights level?