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# Impact of Advanced Work Packaging on the Oil and Gas Sector: A Review

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***Abstract*— Advanced Work Packaging (AWP), a term coined by the Construction Industry Institute (CII), incorporates a structured approach to project planning and execution. Its origin lies in tackling issues like budget and timeline excesses within the realm of industrial construction. Evaluations of AWP through real-world instances reveal a spectrum of advantages spanning productivity, expenses, safety, and scheduling. Nevertheless, a notable hurdle in grabbing AWP is the absence of a clearly defined framework for measuring its costs and merits, which leaves a void in substantiating the indicated gains. This study focuses on the AWP phenomena, the barriers to implementing AWP, and the improvement of the Oil and Gas sector through AWP. The integration between construction and engineering, lower workforce turnover, and better accountability results in the improvement of the Oil and Gas sector. The cost overrun and time delay can be reduced using this integrated approach.***

***Keywords—Advanced Work Packaging (AWP), Construction Industry Institute (CII), Impact, Oil and Gas.***

## I. INTRODUCTION

One of the important and primary objectives of the industrial sector is to complete the project on time within the limits of the provided budget by the client [1]. To achieve these primary objectives the control of the project and its planning play a very vital role in executing the project in the best possible way [1]. The schedule of the project, cost analysis, resource leverage, methods for the execution, and the activities sequence are the elements that help to achieve the extent of the work. For the decision, the control system takes the feedback on the progress of work in the sector and compares it with the planned progress according to schedule to decide that if lacking behind how to accelerate the activities without making the quality of work at stack [1].

The projects in the Oil and Gas sector are forecasted to increase in their complex work nature and as well as size in the next decade, as project failure continues to occur day by day so a lot of work is needed in the project management to cope with this issue. The recurrence of the failure of the project is alarming when it comes to mega projects i.e. the projects cost beyond the range of 1 billion USD [2]. In the Oil and Gas sector four out of five large projects undergo the phenomena of failure according to Independent Project Analysis means that the failure ratio is 80% [3]. It was further analyzed by IPA that when it comes to the other sectors like petrochemicals and power the failure rate is 50% means that the Oil and Gas sector is suffering more and that problem needs to be addressed on an immediate basis. The poor execution of the industrial project sector is highlighted when 70 % of the project exceeds 10% of the original estimated project cost as a reference to the research by the Construction Industry Institute [4]. The lack of planning results in the cost overrun [5] which will perform the wrong cost estimate and not able to cope with the industrial sector complexity [6].

Many methods have been used by different researchers for the control system and planning of the project, i.e. package works [7, 8], lean construction methods [9, 10], and building information modeling [11, 12]. The improvement in the techniques is necessary due to the hike in the complexity of the projects which in turn causes the lack of forecasting in different industrial sectors. A few of the developed methods depend on pre-collaboration between the stakeholders, engineering, and planning to cope with the potential risks [1].

This study includes the improvement of the Oil and Gas sector through AWP having the overall review to analyze the barriers in it, the whole phenomena of the AWP briefly, and to suggest the way the mega projects in the oil and gas sector can be improved in the way of cost overrun issue, delayed project completion. Management of labor in addition to the material is a complex task and AWP is used as a constraint management method and way [13]. For production control and planning constraint management is one of the important and critical strategies [14]. AWP use has recently shown an increased number of users globally and it has interconnection with multiple stages of design and construction at the bottom level constraints [15-17]. AWP was previously defined as a framework to divide the mega work in small spots into manageable ways to enhance productivity [18]. There is a movement seen in the industrial sector in terms of productivity, productivity can be gained

with the help of scheduling, material availability, and human resources [19]. With the increase in the complexity of the project, the aligning of physical data with digital data will enhance productivity [20]. This study evaluates the AWP in the oil and gas sector with a comparison of implementations, this work is not done before, showing the novelty in work. This paper uses a native review approach for literature searches and analysis. Includes comparison of projects with and without AWP.

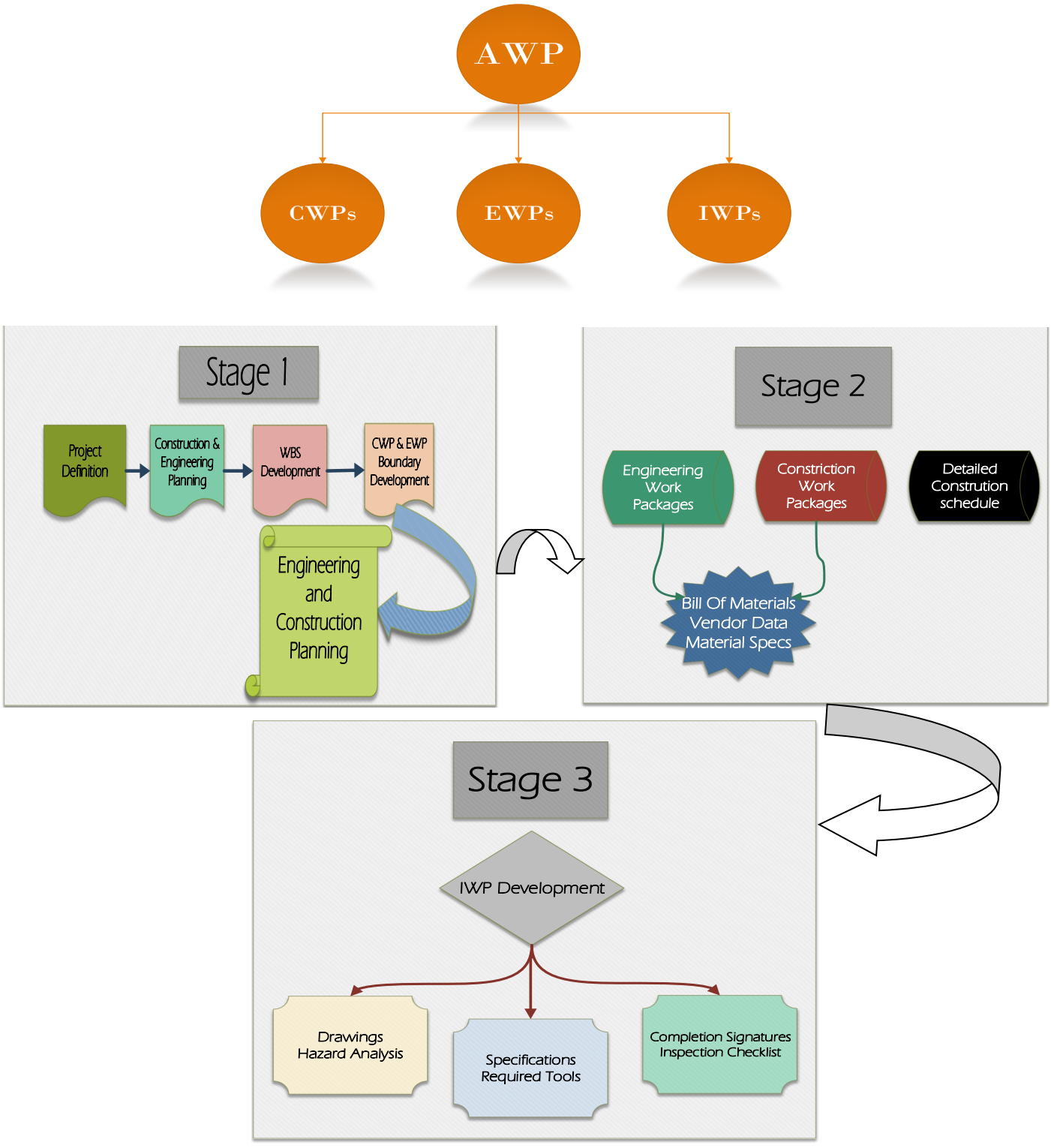


*Figure 1: Schematic of Advance Work Packaging*

## II. AWP Phenomena

The first stage of the AWP phenomena is the preliminary planning and design stage. The critical planning elements are being identified to gain the possible sequence by the project management team [8]. The deliverables of the work packaging help to obtain the sequence of the project. The manageable and logical work in the construction is defined when the project is cut down to the Construction Work Packages. CWPs are linked with the Engineering Work Packages or engineering deliverables. Engineering and procurement are used to support the construction as EWPs are part of CWPs. The system recognizes the EWPs in the projects.

The detailed specifications of EWPs are mentioned in the second stage, this stage includes a detailed construction schedule [8]. This stage clears the work that is started in the first stage i.e. preliminary planning and design. The level 3 plan is being prepared with the minute details including the engineering, procurement, and construction.

Stage 3 includes the in-depth planning of the work to be executed in the industry or commodity known to be the installation work packages [8]. IWPs ensure the safety of the specific system through detailed documentation. The AWP planner is responsible for the detailed documentation and its responsibility is to solve the constraints emerging during the operations. The documentation of IWPs must be issued three weeks before the commencement of work in the field and in addition, it needs the approval and permission of the frontline manager who will become responsible in the future for the execution of the operational work [8].

## III. Improvement through AWP

In a research study, they usually refer to the case studies and questionnaires that with AWP the cost overrun is decreased and the work completed before the time but the question is how all these things happen and what is the background process running behind these improvements [8].

The combination of engineering and construction will help to improve the project and these are the elements of AWP [8]. Since the initial planning, the involvement of construction representatives has been a factor in the consistency of the whole project. The collaboration between construction and engineering as well as the other disciplines i.e. plumbing and electrical play a key role in delivering the project in the best possible way. The relation between the two different departments will help to minimize the contains in the mega project and it is due to the integrated approach of engineering and construction.

Contractors need complete documentation for the execution of the IWPs and the project needs complete accurate estimates from the contractor in terms of IWPs and the exact documents are provided to the contractor for the smooth running of the whole process [8]. Accountability is the key element to making improvements through AWP. The project manager is involved in the development of the same IWPs by the contractors and they have the authority to edit or make some changes before the execution in the field to start the project constraint-free.

The important key element in the mega projects is workforce retention. The workforce engagement is high due to the training activities in the AWP, the constructive and safety factors attract the laborers and work faces and lastly, their early involvement made them feel that they are part of the whole network. By using AWP the lower workforce turnover results in a productive environment [8].

## IV. CONSTRAINTS IN AWP

One of the most important constraints that comes during the implementation of advanced work packaging is the buy-in of stakeholders. There are several reasons for the constraints and barriers to stakeholder buy-in. One of the major reasons is that every stakeholder has a different opinion and point of view due to which the stakeholder has a different point of view on the objective of the project and project scope. The other fact is that a transfer is needed for the execution of the project means that AWP needs new technologies and tactics that need to be immediately adopted by the stakeholder but the stakeholder may not be ready to adopt these things in a very short time. Side by side to these factors the unclear and confused communication about AWP and its advantages can lead to the challenge of stakeholders buy-in.

In AWP a large number of stakeholders are present including construction managers, procurement managers, designers, engineers, and subcontractors, These diverse nature of people have a specific set of their own goals, objectives, and requirements. The aligning of all these stakeholders is a difficult and complex task which becomes the reason for conflicts, communication misunderstandings, and wrong decision making. This barrier in the way of implementation of AWP can lead to an increase in the project time, and cost overrun and the quality of work may be compromised. Due to the large number of project stakeholders, everyone in the team may be on the same page about the project's scope and project description, which in turn leads to misunderstandings in the project and the quality of the project will be compromised.

The lesser knowledge of resource leveraging, project scope, schedule, risk analysis, and procurement is a barrier to the implementation of AWP. The project coordinators and managers must know the project scope and description and lack of this kind of knowledge can lead to wrong and incompetent decision-making due to which the allocation of work goes to the wrong team and stakeholder which in turn puts the whole project at a stake. The lack of alignment of the stakeholders at the same time is a sign of poor management, it is the responsibility and main thing in AWP to align engineers, designers, and contractors side by side, any delay in the aligning of all these stakeholders leads to the disaster in the project in terms of cost, time and risk.

Engineering, procurement, and construction are different disciplines with their own set of phenomena and methodologies, styles, and ways of communication, the different sets of cultures become the challenge in the way of implantation of AWP at some point [21]. The engineering sector deals with the design, and technicality of the project, and they do everything with accuracy while the construction team is somehow flexible due to which there may be a misunderstanding between the engineering and construction teams during the implementation of AWP. The procurement sector focuses on the costs and the material details, due to all these different cultures there may be misunderstandings during the implementation process which becomes a bigger

challenge in the implementation of AWP and turn affects the project poorly.

## V. DISCUSSION

AWP's objective is to minimize poor planning by counterbalance it with early planning [22]. The actual condition of the AWP is that it can be used and beneficial for all kinds of projects, though its use in mega projects is more necessary it can be used both on large and small-scale projects [23]. It has been assumed by some of the industrial sectors that AWP needs additional staff but it is not the case when a project is started it has all of the players that are necessary and are present, the project has a manager, procurement officer, contractors, and sub-contractors, all of them are also in AWP, so no additional staff is required rather than their proper and correct responsibilities to correct team is necessary for AWP [23]. Mostly capital projects result in cost overrun, It has been noted that 9 out of 10 projects lead to cost overrun but AWP is the solution to this problem and it heals the minor problems which in turn not be the cause of major problems in the project and project will be on the safe side, if AWP is applying firstly by an institution than some more cost is apply as it's the first time and you have to train the whole team and bear some expenses initially, initially, it looks like a hectic and costly task but in terms of long term it is much way better and the institution will be on the right track.

Constraint management is seeking attention globally as the complexity of the project increases [24]. Constraint management includes the monitoring and consultancy of, a constraint-free system[25]. Many researchers have used techniques for the removal of constraints like the Program Evaluation Review Technique (PERT), critical path method (CPM), last planner system(LPS), and workforce planning(WFP) [26-32]. Besides these, the AWP is one of the latest members of the family and the whole discussion in this article moves around AWP which is the reason to analyze the impact of AWP on the oil and gas sector.

TABLE I. COMPARISON OF PROJECTS WITH AND WITHOUT AWP

| S.No | Comparison of Projects with and without AWP | | |
|---|---|---|---|
| | ***Description*** | ***With AWP*** | ***Without AWP*** |
| 1. | Scope of Work with documents list | ☑ | ☒ |
| 2. | Vendor Data | ☑ | ☒ |
| 3. | Schedule follow up | ☑ | ☒ |
| 4. | Environmental Requirements | ☑ | ☒ |
| 5. | Special Resources Requirements | ☑ | ☒ |
| 6. | Hazard Analysis | ☑ | ☒ |
| 7. | Divided and more specified work | ☑ | ☒ |

## VI. CONCLUSION

AWP is the new member in the race of the techniques used for smooth, timely running and avoiding cost overrun in every kind of project That's why its knowledge among the new and old industrialists is necessary who want to make their project productive and in addition, they have to know about it and must experience in their firms. The project can be improved in the oil and gas sector by the involvement of AWP, in addition to that the barriers need to be addressed for smooth running. Cost overrun, time management issues, disputes and lack of coordination, and greater workforce turnover can be reduced by using AWP. The integration between construction and engineering with side-by-side coordination with the other departments plays a key role in the mega projects of the oil and gas sector. The industrial sector has to work on AWP and understand the methodology so that they can adopt it to reduce productivity issues.

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