



## Conference Paper

# Development of an Integrated Monitoring Tool for Oil Field Activities

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## Abstract

One of the critical processes in managing oil field development is to effectively manage the Annual Work Program and Budget ('AWPB'), a program that contains a company's planned projects, costs, and oil recovery projections, and to execute this AWPB to meet company objectives and goals. Although creating an AWPB in an oil company is a challenge in and of itself, executing the plan with effective control represents a bigger challenge that is the key to achieving success in such a dynamic environment. To address this challenge with an effective tool, 'Tatweer Pulse' was developed as a strategic dashboard that brings the pulse of the field to the decision-makers' fingertips. Tatweer Pulse is a system that monitors the AWPB performance in terms of initiating and tracking field activities, communicating information between stakeholders for effective decision-making at any given point, promoting consistency across the organization, improving employee efficiency, and enabling executive management to implement real-time planning and change of strategy if needed. The author has successfully completed and tested the pilot phase of Tatweer Pulse, and is currently defining the scope and setting targets for the second phase.

**Keywords:** Tatweer Pulse, Annual Work Program and Budget (AWPB), Integrated Monitoring, Real Time Planning, Strategic Decision Making, Field Development Performance, Delay analysis

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## 1. Introduction

An essential and critical process in managing any upstream and midstream oil field development is to create an effective AWPB by integrating all activities from different disciplines to meet company objectives. Equally essential and critical is controlling all these activities during the execution stage, which is a complex process due to the dynamic nature of the oil field environment.

The Integrated Planning and Project Controls department ("IPPC") creates the AWPB and five-year plan activities, the selection of which is made based on defined criteria to

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facilitate future growth through maximizing cash flow, enhancing oil production, utilizing new technology, and improving business process efficiencies, all while continuing operations in a safe and prudent manner.

The AWPB represents the backbone of the business, and the most critical challenge that IPPC faces is successfully managing the AWPB, which includes monitoring and controlling a large number of unique, high value projects of various types, such as strategic, pilot, health safety and environment (“HSE”), production enhancement, and business improvement projects.

This paper addresses the challenges and how they are treated by integrating various processes involved in monitoring annual programs. This paper introduces a common platform from which stakeholders can manage, measure, and track all the planned activities.

In the absence of any commercial tools to address these challenges, the integration and monitoring tool called Tatweer Pulse was developed. This tool combines all company activities and projects into one centralized platform allowing for integrated monitoring and control, instantaneous access to the live status of field activities, greater communication between stakeholders, delay and impact analysis, and, most importantly, real time planning for alternative approaches for recovery plans.

Tatweer Pulse comprises many features, such as, but not limited to, the following:

- Monitoring the AWPB
- Individual projects’ oil and gas production profiles
- Performance of field activities
- Production growth enhancement schemes
- CAPEX and OPEX spending status
- Cost savings ideas tracker
- Well development program
- Alternative recovery plan (real time planning)
- Live field news and interaction

This paper elaborates on the tool’s capabilities of tracking performance, production, cost optimization, and efficiency within the value chain of the company.

## 2. Literature Review

In recent years, performance dashboards have gained popularity as a management tool in any organization or sector in the oil and gas industry and have been rapidly growing as a point of interest. Researchers agree that dashboards are defined as graphical user interfaces that identify and measure business performance to make managerial decisions to meet organizational objectives.

Kerzner notes that the main purpose of a dashboard is “to display all of the required information on a single screen, clearly and without distraction in a manner that can be assimilated quickly.” In addition, Kerzner emphasized that providing “the right information, to the right person at the right time...” is essential in managing any business. Moreover, Kerzner stated that “you can not correct or improve something that cannot be effectively identified and measured.” (Kerzner, 2013)

The main purpose of dashboards is to enable consistency, monitoring, planning, and communication. Dashboards are visual and interactive tools for management, arranged on one screen so the information can be measured, monitored, and controlled. (Yigit-basioglu and Velcu, 2012)

An executive dashboard gives greater visibility and insight into an overall business. This clear understanding of what exactly is happening in all aspects of a business will allow for better management. Hence, it gives stakeholders real value to know how healthy a project is in terms of production, cost, and cash flow. This, as well as knowing where they are today and where they would end up in the future, is not only important to executive managers, but to the project managers as well. Executive dashboards facilitate both integrated monitoring on a corporate level and precisely understanding the projects that are under performing, which therefore enables decision makers to change plans and focus on projects which are strategic and of a higher economic value. (Managementhelp.org, 2018)

Real time strategic planning is “suited especially for people who believe that organizations are often changing much too rapidly for long-term, detailed planning to remain relevant. These experts might assert that planning for an organization should be done continuously, or in ‘real time.’” (Managementhelp.org, 2018)

In the art of project management, widely available Enterprise Resource Planning (“ERP”) solutions are inadequate to manage the risk oriented dynamic nature of the oil and gas industry. The available tools developed by service companies are specific to a particular need and fall short of integrated monitoring’s requirements. Furthermore,

the biggest challenge is customizing ERP solutions to apply in a real time environment of strategic planning and monitoring. (Managementhelp.org, 2018)

Great ideas and approaches result from arranging concepts in a unique way and this is strategic planning. (Cobb, 2018)

### 3. Framework and Research Methodology

Our literature review and interviews with the stakeholders in order to understand their expectations and requirements resulted in findings that emphasized the necessity of an executive management dashboard. A thorough review was carried out on existing available dashboards with various ERP vendors in the market, which compared the pros and cons of each tool and how it would fit into our organizational needs, but no commercially available tool was best suited to our requirements in terms of real-time planning approaches for different scenarios in the dynamic nature of our business.

One of the main challenges in finding a system that fits our requirements was related to integrating all field activities from different disciplines into one single platform. We were looking for a tool that is user friendly, integrating all projects into one screen. Despite the number of various ERP systems available in the market, their features were either too limited for our requirements or were far too specific to satisfy our needs.

A qualitative research approach was used as a methodology. Questionnaire surveys and interviews with limited sampling size to stakeholders were conducted, from which a road map and clear vision of the way forward were established.

The decision was made to create, in-house at Tatweer, a customized dashboard, Tatweer Pulse, utilizing existing IT skills and oil and gas expertise. After the conceptual stage, the project was started by identifying the users and their requirements, followed by building a framework of the required informative and user friendly screens.

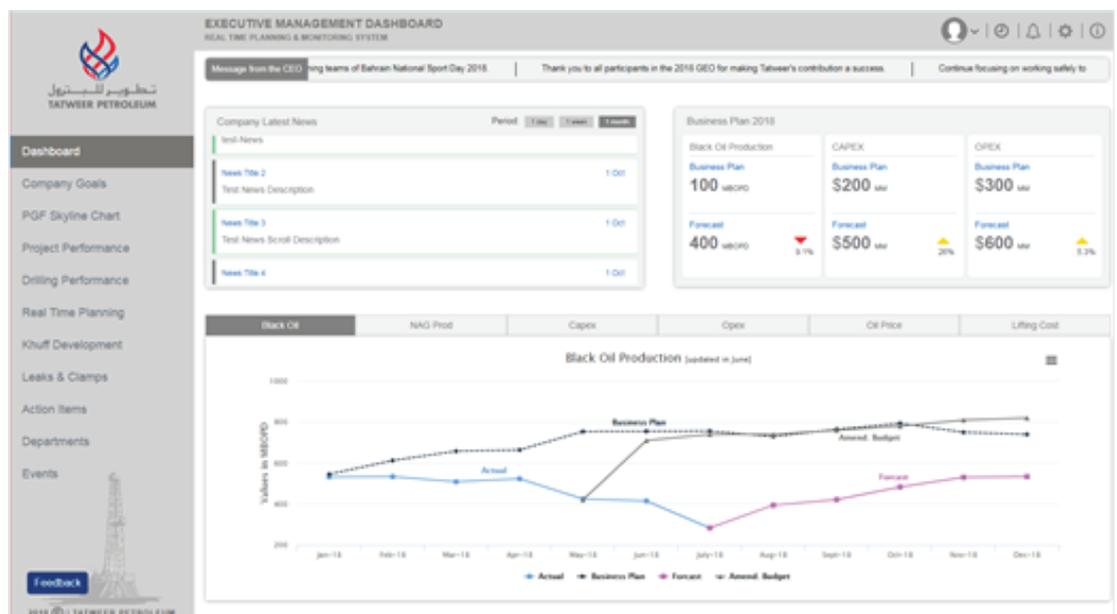
We have selected four main screens for Tatweer Pulse briefly presented in this paper:

1. Main Dashboard
2. Project Performance
3. Drilling Performance
4. Real Time Planning

**Figure 1** shows the Tatweer Pulse main Dashboard page. This page displays the company’s key performance indicators, those being up-to-date oil production, capital investment, and operational expenses, all of which are automatically measured against the AWPB targets. This information provides a concise, high-level overview of the company’s business health.

This information is broken down graphically at the bottom of the main page. This section charts information from the beginning of the fiscal year to date against targets (and amendments to these targets) as well as charting up-to-date forecasts until the end of the fiscal year. In addition to oil production, capital investment, and operational expenses, this section also breaks down non-associated gas production, oil price fluctuations, and lifting costs.

Additionally, the Dashboard page also displays messages from the Chief Executive Officer and the most pertinent company news.



**Figure 1:** Main Dashboard Page.

**Figure 2** shows the Project Performance page. This page lists all capital investment projects that make up the AWPB. The baseline schedule is displayed against each project, as well as the project’s progress in terms of production gain and capital expenditure, both of which are measured against the AWPB targets. The displayed projects can be filtered by department or budget line for quick access.

Detailed analyses comparing between targets and achievements/forecasts for each project are available in three different modes. Each mode shows both the monthly

breakdown of the targets and achievements/forecasts. The three modes are as follows:

- Production Mode: Displays the target production per month versus the achievements to date and forecasts until the end of the fiscal year.
- Capex Mode: Displays the target capital expenditure per month versus the achievements to date and forecasts until the end of the fiscal year.
- Time Variance Mode: Displays the number of days a project is ahead of schedule or delayed.

This was considered one of the top requirements by the executive management, which was a single platform for monitoring and tracking projects within the organization through user friendly interface.

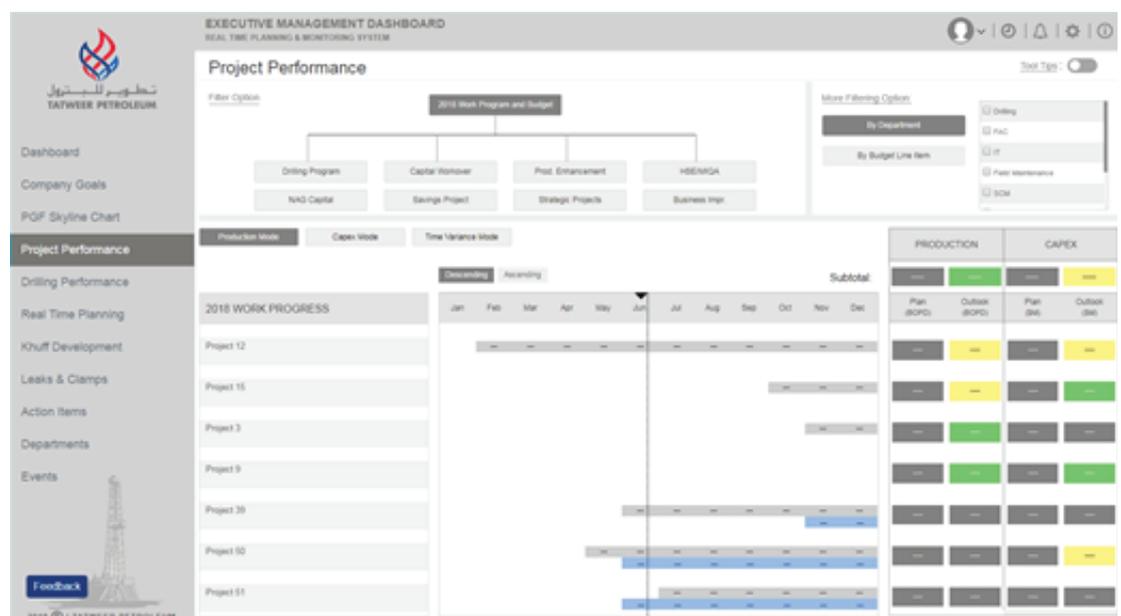


Figure 2: Project Performance Page.

Figure 3 shows the Drilling Performance page which analyzes company performance related to drilled wells. At a high level, the Drilling Program Summary section compares achievements to date against targets in terms of number of drilled wells, oil gain, and capital expenditure.

The bottom section provides a detailed breakdown on each well drilled during the fiscal year and a graphical representation of its performance compared to its target. The information provided includes the reservoir type for each well and the well number.

The information can be filtered by reservoir type for quick access, and the performance graphs can similarly be filtered by reservoir, individual wells, or the entire drilling program during the fiscal year.

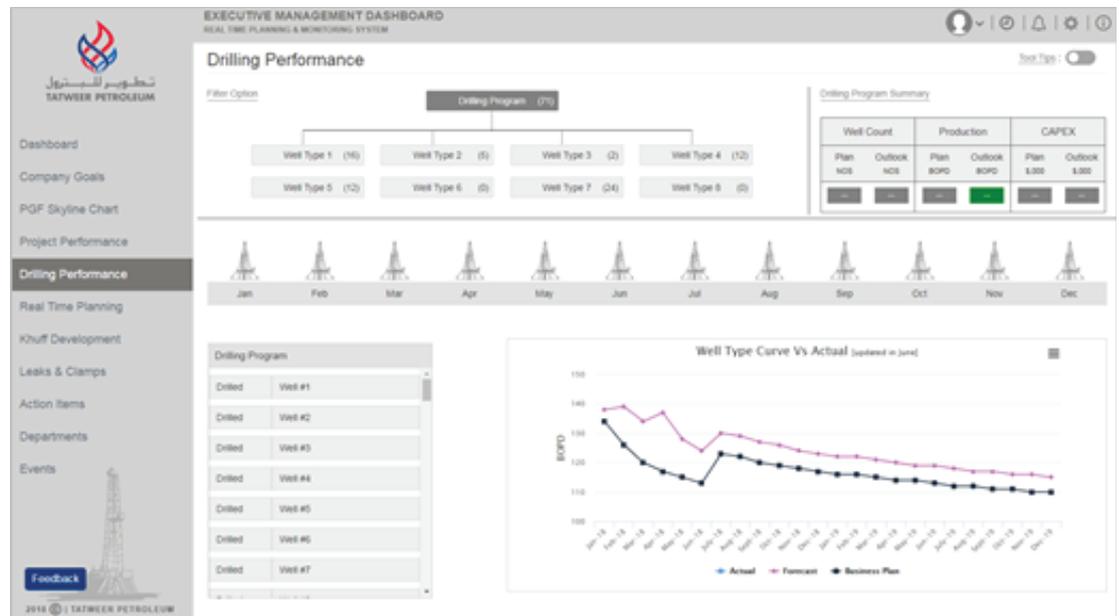


Figure 3: Drilling Performance Page.

Figure 4 shows the Real Time Planning page, which is a powerful real time strategic planning and course correction tool.

Included under this page are up-to-date alternative projects that are not currently underway and ongoing, or planned projects that have the potential to be deferred or cancelled.

This tool allows for real time, instantaneous deferral or cancellation of projects and the introduction of new projects to the fiscal year, and the resulting impact on oil production, capital expenditure, operational expenses, and cash flow over a two-year period. The impact outputs are displayed both in figures and graphically.

#### 4. Findings of the Research

Currently, the available products in the oil and gas industry for real time planning are not direct competitors, but rather indirect competitors that provide readymade, prefabricated, circumscribed tools that do not conciliate the user’s real requirements. Based on the preliminary research, the oil and gas requirements for real time decision making is complex and critical without the in-depth analysis of the status of the field at any given point.

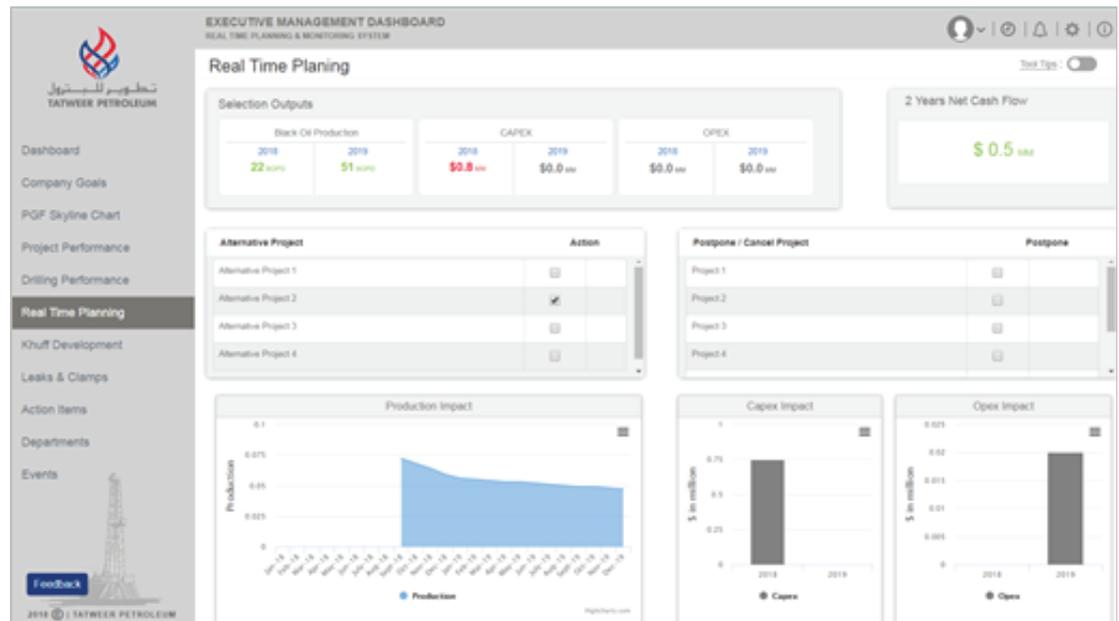


Figure 4: Real Time Planning Page.

Moreover, customizing an existing ERP system would be costly in terms of development as well as maintenance over a long-term period.

Tatweer Pulse brings various field-related information to executive management to monitor the performance of field activities, where they can track the AWPB against actual results and seek improvements, understand the challenges, and make critical decisions appropriate to the situation. This system has been designed in such a way to include a user-friendly interface, effective communication between stakeholders. Considering the business perspective, this innovation will result in changing the decision-making approach from reactive to proactive.

Tatweer Pulse is an in-house product, an outcome of combined internal resources having technical, project management, and IT specialization working with a small budget. Moreover, the advantage of future progression on Tatweer Pulse is not only cost-effective, but also adding value practically in terms of work efficiency.

It is also worth highlighting the indirect economic beneficial outcome of the implementation of Tatweer Pulse. Firstly, by minimizing and mitigating the risks associated to the business on time, potential future expenses are avoided. Secondly, the introduction of real time communication brings time saving across the business in terms of eliminating the number of meetings between executive management and their subordinates. Economic benefits will continue to grow with creating in-house job opportunities for progression of the product and to maintain it long-term.

Tatweer Pulse is expected to fill the vacuum of real time planning in the oil and gas industry. We have high expectations that the introduction of “standardization in monitoring philosophy” of Tatweer will eventually penetrate into the rest of the industry. The introduction of real time vertical communication between executive management and proponents/engineers will be a key aspect of effective real time planning at any given point of the AWPB cycle.

Furthermore, the concept of real time planning with the luxury of alternative approaches by selecting the various scenarios during the AWPB cycle is an effective introduction in the planning process.

Bringing the root cause of any issue to key decision makers on time and obtaining the solution to re-align targets is a crucial function in the industry, especially when considering the dynamic nature of the oil field and the high rate of risks. This will equally be vital for developers operating as joint ventures.

Enabling the control options of the product shall be another much needed feature in the joint venture nature of business which will protect confidentiality among stakeholders up to the required level while monitoring the performance of different entities across the business.

The following areas are planned for the second phase of the Tatweer Pulse project:

- Automating all interrelated data across the field with Tatweer Pulse.
- Bringing live the extended Real Time Planning by enhancing the alternative options at any given point during the AWPB cycle.
- Fully integrating with all reports across the business.

## 5. Conclusions

The executive management dashboard is a visual representation that gives executives a quick and easy way to view the company’s performance in real-time by ensuring that ongoing projects are aligned with company goals and enable proactive strategic decisions to be made as and when needed. In addition, the tool will provide the platform for effective communication with multiple options between essential hierarchies within the organization. Centralizing all the information in one platform that does not require accessing multiple systems or reports will save considerable time and effort.

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