Data Analytics and Immersive Learning Technology in the Oil & Gas Industry

A rapidly growing concern in the construction world, is the acute need to ease the transition and bridge the gap between the highly experienced senior team members approaching retirement and the novel generation of professionals beginning to assume key planning and management roles. In fact, according to a Business & Industry Connection publication, "the ongoing generational transition of the workforce that is occurring in the oil, gas and petrochemical industries has leaders scrambling to fill positions being vacated by retirees".

This situation has shaped the emerging need to compensate for the newer generation's lack of empirical knowledge, utilize the industry's mass amounts of available data and to realign the educational and training focus towards Immersive Learning Technology and Artificial Intelligence (A.I).

The Challenge

It appears that the large number of senior professionals in the industry who are getting closer to a well-deserved retirement, will be taking with them a vast and in-depth understanding of the construction world that was the result of many grueling years in a career path from craftsmen to lead planners and managers. This extensive exposure to the work in the field has given them the invaluable ability to comprehend the microenvironment of every project, something that is absolutely essential during the planning and bidding of a project as well as during its execution. The use of estimating software with preset parameters or the use of standard publications has some benefit for the less experienced, but overreliance on those tools may cause inconsistencies, inaccuracies and costly omissions during the biding and planning process.

On the other side of the spectrum, a significant portion of novel construction professionals attracted to the Oil & Gas world tend to be highly educated and technologically inclined, but severely lacking the hands-on experience of their senior counterparts. They increasingly come from diverse backgrounds such as IT, aerospace, military, government or even general management and finance. These individuals tend to have an imperfect understanding of the microcosm of the construction world but are usually able to learn processes and specialized software very quickly while utilizing their analytical skills and learning capabilities to adapt to new conceptual applications in technical fields previously unknown to them.

To mitigate their lack of field and craft experience, the first suggestion that comes to mind is to have these individuals spend more time where the actual work is being performed. However, extensive additional field exposure will likely reach the point of diminishing returns with this demographic rather quickly, as back in the office galloping IT developments, combined with ever-increasing analysis and reporting requirements by Clients, demand vast amounts of time and effort while continuous training is necessary simply to keep up and remain relevant. Additionally, these individuals who have been exposed to technology early in their lives, learn in a much different way than past generations. For example, they usually demonstrate the ability to absorb information that is the product of Immersive Learning Technology such as 3D modeling and Augmented/Virtual Reality, much better and faster than by participating in a physical walk in the field.

A Possible Path Forward

Fortunately, the industry has resources that can, at least partially, assist in this predicament: mass amounts of data generated, plenty of tech-competent personnel adept in data analysis and a highly adaptive academic and training infrastructure.

Indeed, there is a truly staggering amount of data that is collected (even though not always evaluated and stored in a cognizant manner) for every project estimated and executed. Detailed QA/QC documents from past projects, bid packages, detailed workhour estimates, AWP plans, Earned Value logs and "as-built" Project Schedules are among the information clusters generated that can provide a valuable analytical prop. Based on such information, we can reasonably infer among others, activity durations, the Path of Construction, project finish dates, cost, safety procedures, staffing requirements and desired plan granularity.

These data sources allow us to create Decision-Making Models that can simulate the cumulative past experience of senior professionals by gathering information from a very large number of completed projects. These models may very easily be delimited by project type, the geographical location and the chronological placement of the project which can ensure relevancy to the outcome of the analysis. In other words, we can take into consideration, among other things, the type of work performed, the local weather patterns, the local labor market and the technology, tools and methods available during the timeline in which these projects were completed. Finally, within such data samples, statistical outliers such as OSHA recordable incidents, hurricanes, fires and large-scale evacuations that can obscure the data can easily be identified and isolated to further refine our decisions.

Of course, when using such a large amount of data to estimate, plan and manage change, pedestrian weighted average calculations are far from sufficient. A thorough examination of the validity of the decision-making model must be performed and the degree of uncertainty in the decisions to be made determined and measured. Regression Models have to be used in order to understand the impact that certain attributes have on variables that will in turn be driving decisions. Essentially, it is important to know if the variables examined have a positive and strong association with the measurable parameters of the decisions and if they have any significant correlation with each other (multicollinearity).

It is not a coincidence then that important educational institutions in Oil & Gas hotbed areas are increasingly offering Data Analytics coursework as part of their Project Management curriculum or as stand-alone diplomas and certifications. Estimating and planning are no longer stand-alone academic subjects – they are now taught and driven on the shoulders of data science. Furthermore, collecting, analyzing and utilizing mass amounts of already available data in the decision-making process is becoming a fundamental element of modern Project Controls departments in the field. At the same time, on-site training is seeing dramatic changes with virtual project walk-throughs and task simulations that make onboarding and overall employee development more efficient by saving time and increasing safety for inexperienced new hires.

Finally, as A.I. starts to take over key aspects of data entry and planning, decisions will eventually almost exclusively be based on computer-friendly statistical modeling via past project data sets rather than circumstantial personal experience of individuals. This emergence of A.I. in the industry will require properly educated and trained people to assist in the Machine Learning process and to provide the necessary reality-check between statistically inferred decisions and the countless complications commonly encountered during the execution of a project in the field.

Perhaps after the challenge of using technology and data to bridge the gap between senior, field-experienced planners and managers and the novel generation of Oil & Gas professionals, the next big test for our industry will be the ability to manage the symbiotic relationship between A.I. based data analysis and the largely unpredictable human element that practically guarantees the inevitable deviation from construction plans.

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