UMSL Innovations
University of Missouri–St. Louis

Tool to Optimize Complex Industrial Projects

A resource optimization system for use in managing large-scale projects such as construction, pharmaceutical production, etc., to save time and money.

With complex industrial projects in any industry, optimization of resources is absolutely critical. Key resources need to be allocated effectively and efficiently as resource allocation decisions have a huge impact on project cost, duration/finish times and Return on Revenue (ROR). However, current project management solutions are lacking as they don't provide dynamic, real-time optimization support, without which any small change in resources (e.g., a certain task takes longer than expected, available human capital for a task changes, supplies are delayed, machinery breaks down, etc.) can have a ripple effect throughout the overall project delaying finish times and increasing costs. Also, the number of possible combinations of activity options in a project explodes with the project size.

THE SOLUTION. This novel, patented industrial project management software tool uses mixed-integer programming (MIP), is dynamic and adaptable, and works in real-time. It is designed to effectively optimize industrial projects that have a high number of combinations of activities and disturbances that can alter the project's costs and duration if not factored into the decision-making process as they happen. Unlike other tools on the market, this technology offers all critical functionality in one place: task scheduling, cash-flow prediction, payment scheduling, dynamic/adaptive functionality, and real-time feedback.

DEVELOPMENT STAGE. A preliminary prototype has been developed with web-based architecture using ASP technology (eliminates the need for user to purchase optimization solver), successful integration of GUI, database and optimization models, and controlled user portal and privilege. Testing with real-world construction company data has been completed. Moving forward, additional design and development of the user interface and workflow automation for users with different roles in a project are needed to enhance user experience. Additional development also should include incorporating both cloud-based architecture to support mobile access and seamless data exchange with project management applications (e.g., MS Project), along with rigorous testing and de-bugging of the tool.

POTENTIAL MARKET USES. This technology can be used across a variety of industries including construction, military, oil & gas, logistics, supply chain, professional services, manufacturing, and more. This information sheet focuses on the construction industry.

MARKET. The construction software market was estimated at $1.3 billion in 2018 and is expected to reach between $1.62 billion and $2.71 billion by 2024 growing at a CAGR of between 7.9% and 8.8% (2019-24). Of smaller construction firms: 1/3 currently use construction software, 1/3 used generic tools such as email/spreadsheets, and 28% cite improved workflow efficiency as their top need/priority.

IP PROTECTION. U.S. Patent No 11,334,824 (issued 05/17/2022); software copyrights.

BUSINESS OPPORTUNITY. The University of Missouri–St. Louis seeks a commercial partner to help further develop this technology and bring it to market.

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