New success criteria system takes guess work out of large-scale construction projects

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Medium and large-scale construction projects will have a better chance of success if they are able to adhere to a set of success criteria, new research from Edith Cowan University (ECU) found.

ECU Lecturer Dr. Neda Kiani Mavi has developed a system that could

help builders take the guess work out of the feasibility of construction projects. The machine learning-based decision support system is able to forecast the success of mid- and large-scale construction projects based on their identified critical success factors and criteria.

The research has been published in the *International Journal of Construction Management* and *Engineering, Construction and Architectural Management*.

"There is a need to clearly define and determine success factors and success criteria for construction projects to make project success measurement possible," said Dr. Mavi.

In her research, Dr. Mavi has identified 19 success criteria, which have been grouped into five clusters: project efficiency, business success, impacts on end-users, impacts on stakeholders, and impacts on the project team.

"Our findings reveal that project efficiency holds the highest importance, followed by impacts on the project team and stakeholders. Within project efficiency, effective risk management is ranked as the most crucial criterion. This enables organizations to manage and monitor risks effectively by employing strategies such as resource reallocation.

"Research revealed that large construction projects exceeding $200 million often surpassed their budgets by over 30%, with 77% of them lagging behind schedule by more than 40%, partly due to ineffective risk management practices. However, efficient and effective operations management can enable construction companies to achieve margins ranging from 20% to 30%."

The construction industry plays a pivotal role in the development of economies worldwide. In Australia, this sector contributes approximately

20% to the nation's gross domestic product, which totals more than $2.85 trillion.

The Australian Construction Industry Forum (ACIF) recently forecast that the building and construction industry would grow by 5% in 2023–24, raising the value of work currently under way to $298 billion. However, as the ACIF points out, the industry has been grappling with a difficult economic environment, which included rising inflation, high interest rates and industrial relation changes.

"Despite its vital role in the economy, the construction industry faces numerous challenges that significantly impact its success. The inherent complexity and uncertainty of construction projects make them difficult to manage, even for experienced project managers," said Dr. Mavi.

"The Australian construction sector is particularly affected by issues such as stagnant productivity growth and increasing pressures related to risk management. Over the past three decades, Australia's productivity in this sector has been persistently poor, resulting in an estimated $47 billion in lost opportunities."

The 2023 KPMG Global Construction Survey showed that an overwhelming 87% of project managers continue to struggle with project performance, often dealing with schedule delays and cost overruns. Additionally, only 50% of project owners are successfully meeting completion deadlines, mainly due to effective risk management strategies.

Dr. Mavi's decision support system analyses the interrelationships among critical success factors and critical success criteria of construction projects, to forecast project success.

She noted that the early introduction of the application would allow for

early intervention in a project, which could mitigate potential delays, cost overruns or other issues.

"When contractors, sponsors, owners, and project managers understand whether a project is more or less successful than previous similar projects, they then can address the weaknesses and improve the strengths to enhance the success of their own project in terms of project efficiency, addressing things like schedule, budget, scope, quality, and project effectiveness, addressing issues of business success, and stakeholder satisfaction," Dr. Mavi added.

"Successful projects lead to satisfied clients, enhanced reputations for companies, and increased profitability. On the other hand, project failures can result in financial losses, legal issues, and damage to a company's reputation. Given this, understanding and achieving project success is crucial for project sponsors who aim to control both current and future projects. So, forecasting project success is not just beneficial but essential for the industry."

More information: Neda Kiani Mavi et al, Forecasting project success in the construction industry using adaptive neuro-fuzzy inference system, *International Journal of Construction Management* (2023). DOI: 10.1080/15623599.2023.2266676

Neda Kiani Mavi et al, An MCDM analysis of critical success criteria for medium and large construction projects in Australia and New Zealand, *Engineering, Construction and Architectural Management* (2024). DOI: 10.1108/ECAM-08-2023-0838

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