CROSS-PROJECT SIMULATION OF CONSTRUCTION PRODUCTIVITY FOR CAISSON FABRICATION

J. P. Pantouvakis*[1], A. Panas[2]

1) National Technical University of Athens & School of Engineering, Greece & Nazarbayev University, Astana, Kazakhstan; *ioannis.pantouvakis@nu.edu.kz; 2) National Technical University of Athens, Athens, Greece

Introduction. The aims are to (a) predict crew productivity improvement due to the repetitive nature of caisson fabrication as the result of on the job learning and (b) validate the previously specially built simulation platform *CaissonSim'* in different projects. More specifically, two such marine projects one in Greece and one in Cyprus have been studied.

Materials and Methods. The methodology followed has been based on the comparative evaluation of key productivity parameters, including analysis of the workflow sequence, construction method and number and type of deployed equipment. Data was collected from on-site activities using time-lapse video and from analyses of historical productivity records. Data consistency was ensured through statistical data normalization and screening. The *CaissonSim* system was then fed with the data for retrospective evaluation of learning rates and for comparative analysis of expected vs actual caissons completion times. In a similar way the use of the *CaissonSim* system may yield future productivity.

Results and discussion. It has been proven that the *CaissonSim* system produces valid results in both projects. Workflow sequence modifications may affect productivity by approximately 20%. Learning rates differ as they are project dependent though the effect of learning becomes more dominant as projects evolve in time. The submersible floating dock's capacity of constructing two caissons simultaneously (Figure 1) or only one caisson each time is a key determinant of construction productivity.

Conclusions and future research. The sliding rate is the target productivity metric which determines the efficiency of the construction process. Thus, project-level decision making should be based on the sliding rate, which "behaves" in a similar manner for different construction settings and operational conditions (e.g. construction method, floating equipment). *CaissonSim* provides consistency and accuracy in the productivity analysis across different projects.

References.

1. Panas, A. and Pantouvakis, J.P. (2014). Simulation-based and statistical analysis of the learning effect in floating caisson construction operations. ASCE Journal of Construction Engineering and Management, DOI: 10.1061/(ASCE)CO.1943-7862.0000782.
2. Pantouvakis, J.P. and Panas, A. (2013). Computer simulation and analysis framework for floating caisson construction operations. Automation in Construction, 36: 196-207.