Decision support systems in geotechnical engineering: success or failure?

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Proposed Discussion Session: 5.2

According to a recent survey, the costs of failure in construction works in the Netherlands amount to 800 M€ per year. A substantial part of these costs is subsoil related. Inadequate site investigation, oversimplified design methods, inappropriate construction methods, overlooked failure mechanisms and poor communication between principal, consultant and contractor are among the main causes of failure.

In many cases, the knowledge to prevent failure has been developed somewhere in the geotechnical community, but is not used at the right place and the right time. Lessons learned at great costs in one project are not communicated to other practitioners in other projects. Thus, the efficiency of knowledge development remains low. At the same time, projects tend to become more complex. Conflicting interests of a variety of users need to be reconciled, necessitating integration of different disciplines. The integration of design, construction and operation further complicates the optimisation process, all against the background of tight deadlines.

Decision support systems have been developed as means to extend site-specific knowledge to more general application, connect knowledge from different disciplines and disclose specialist knowledge to non-expert users. The success or failure of decision support systems depends on an number of conditions, which will be investigated in this paper. Also, factors will be analysed obstructing the successful implementation of decision support systems. Two case histories illustrate how these conditions can be met and obstructions can be avoided.

The first case history describes the introduction and operation of a decision support system developed as part of the project Strategy for Sustainable Rehabilitation of Infrastructure on Soft Soils. This project is part of the program of Delft Cluster, an open network of six knowledge institutes. Besides the National Institute GeoDelft and consultants Arcadis and Municipal Works of Rotterdam, more than 25 municipalities, several utility companies and platforms like CROW (the national information and technology platform for infrastructure, traffic, transport and public space) participate in the project. Instruments developed in the project support strategic and operational decision making for construction and maintenance of municipal roads and underground infrastructure in soft soil areas. Success factors include a sharp focus on the end user's needs, the participation of key players in the field, establishing Communities of Practice in order to keep the participants involved, availability through use of tailor made computer applications, and accessibility for non-expert users. The main obstruction to overcome was to combine the different fields of expertise (geo-engineering, road construction, environmental impacts etc) into one decision support system.

The second case history describes the introduction of the decision support system MRoad, initiated by the Ministry of Transport (MoT) and GeoDelft. MRoad supports decision making for the construction and widening of highways on soft soil, considering maintenance, traffic hindrance, land claim and effect on nearby structures and underground infrastructure. Success factors for MRoad include a tight integration with the MoT workflow, MoT preferred construction methods and MoT end user contract specifications, acceptance by involvement of consultants and contractors in the further development, profitability by reduction of design costs and accessibility for non-expert users. The main obstruction to overcome was organising the regional units of MoT to adopt a corporate approach towards design and contracting, closing the plan-do-check-act circle.

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