

Ants' behavior leads to new method for optimizing product development time, costs

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Trying to find just the right balance of time spent in meetings and time performing tasks is a tough problem for managers, but a Wayne State University researcher believes the behavior of ants may provide a useful lesson on how to do it.

Using [computer simulations](#) derived from the characteristics of ants seeking food, Kai Yang, Ph.D., professor of industrial and systems engineering in the College of Engineering, has developed a [mathematical model](#)-based methodology to estimate the optimal amount of time spent to develop a product, as well as the cost, in overlapped product development. It is the latest in a series of projects he has worked on for Siemens North America.

"Non-discrete [Ant Colony](#) Optimisation (NdACO) to Optimise the Development Cycle Time and Cost in Overlapped Product Development," published recently in the *International Journal of Production Research*, utilizes the concept of concurrent engineering (CE), a systematic approach to product development based on parallel execution of tasks. The approach integrates several functions to reduce the development time and cost of a product while maintaining its quality. Co-authors include Satish Tyagi, Wayne State research assistant, and Anoop Verma, Ph.D., of the University of Iowa.

In CE, cross-functional teams communicate through several meetings, some before the beginning of project, categorized as precommunication, and some during execution of the project, called communication policy.

Because significant cost is incurred through those meetings, Yang said, it is necessary to investigate the cost-time trade-offs involved in the concurrent product development process to enhance [work performance](#). Otherwise, applying the process can result in a larger number of iterations, or rework, adding to both time and cost.

"Currently, there is a lack of communication flow within organizations due to their large size, time differences, etc.," Yang said. "Therefore, the amount of precommunication and communication policy and the extent of overlapping stages should be meticulously determined to achieve the desired goals."

As [product development](#) moves forward, lack of communication from upstream decision-makers to downstream workers can leave the latter to operate without the latest available information to complete their task efficiently, he said.

Researchers studying ants' food-foraging behavior have noticed that changes in the pheromone trails left behind by the insects communicate the best ways for those that come after them to proceed. That led to the development of ant colony optimization (ACO) models, which Yang and his team are using.

Researchers believe their simulation model could reduce product definition time by as much as 50 percent, and lead to best practices that improve critical thinking and remove communication barriers. Such practices can be applied to large-sector manufacturing, health care and service companies, Yang said.

Provided by Wayne State University

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