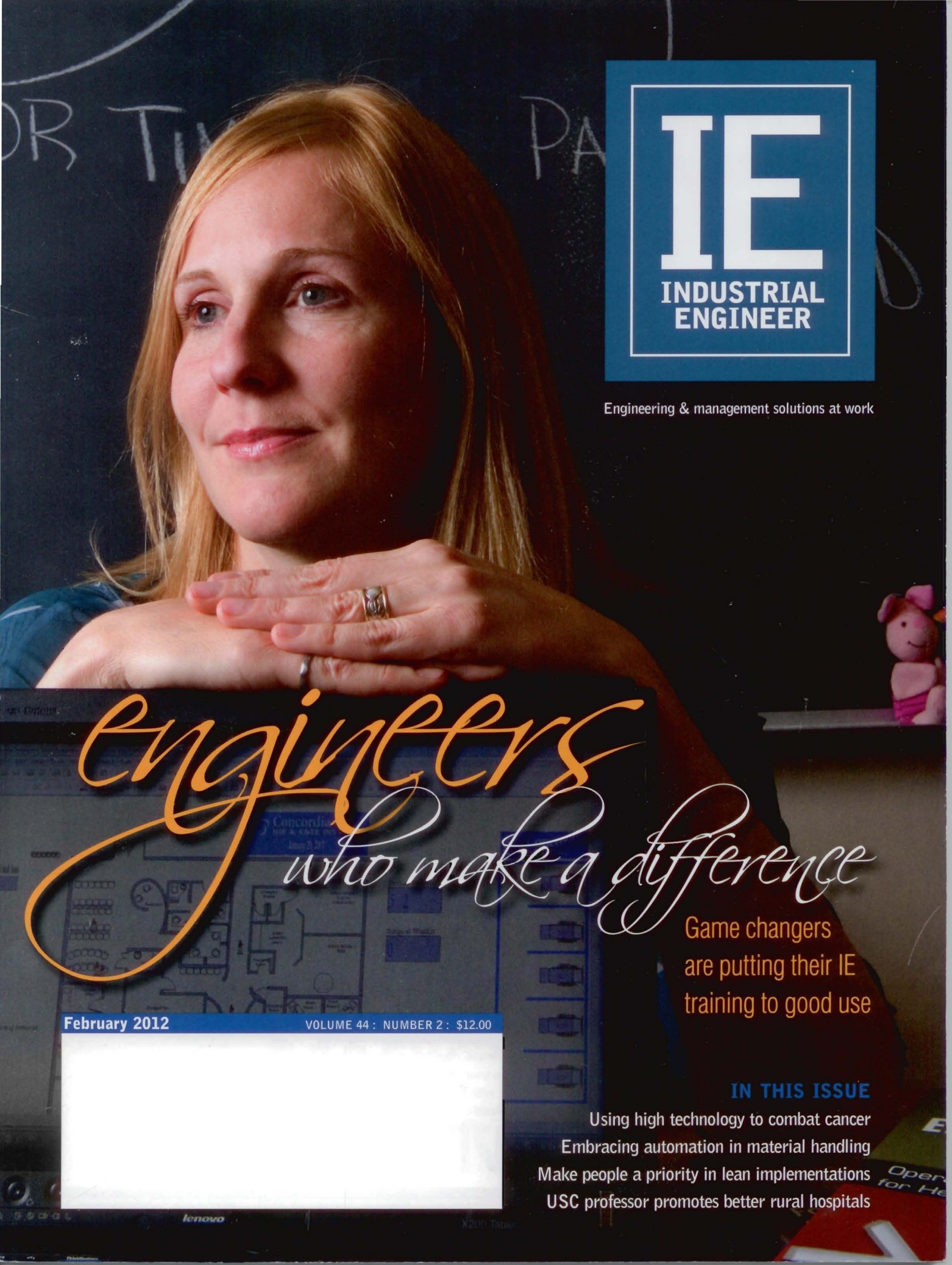

IE
INDUSTRIAL ENGINEER

Engineering & management solutions at work

engineers who make a difference

Game changers are putting their IE training to good use

February 2012 VOLUME 44 : NUMBER 2 : $12.00

IN THIS ISSUE

Research

EXECUTIVE SUMMARIES : EDITED BY SUSAN ALBIN

This month we highlight industrial engineers who focus on service. The first paper gives insight into managing a queue where the customers tend to arrive even before the server is there. The second paper takes on the task of mass customization for the service sector and finding an efficient way to combine services to offer the combination of functions that customers want. These articles will appear in the March issue of IIE Transactions *(Volume 44, No. 3).*

Refael Hassin and his colleague found that eliminating early arrivals has little effect on average waiting times.

Yana Kleiner helped show that setting certain times for admitting customers helped reduce waiting times.

Is early-bird queuing a good idea?

We often see people waiting in line for a long time before the server they are waiting for has arrived. Just think of rock 'n' roll fans wishing to buy a concert ticket, trucks waiting at the port's gate, travelers wishing to get a visa from a local embassy and so on. The waiting times of early arrivals are clearly a waste from a societal point of view, with their engines idling and the people's unproductive use of time. One approach to alleviate the queuing costs is to eliminate early arrivals, for example, by randomly allocating queue positions to all customers present at opening time. So is it a good idea to discourage early-bird queuing?

This question motivated the paper "Equilibrium and Optimal Arrival Patterns to a Server with Opening and Closing Times" by Refael Hassin, a professor in the Department of Statistics and Operations Research at Tel Aviv University, and Yana Kleiner, Hassin's former master's degree student and a senior software engineer at Intel Haifa.

One of their surprising findings is that eliminating early arrivals has almost no effect, in most cases, on the average waiting time. Consider a doctor's clinic that accepts patients between 9 a.m. and noon according to a first-come, first-served order. As expected, patients arrive before the doctor, often before the waiting room opens. Each patient thinks that arriving before 9 a.m. is a good choice; after all, the early bird may not have to wait at all. On the other hand, if many or all patients show up before 9 a.m., then it is possible that arriving before 9 is a bad choice, likely to result in a long waiting time.

Kleiner and Hassin show that a helpful alternative to eliminating early arrivals is to admit customers only at a small number of instants, say at 9, 10:30 and 11:30 in their clinic example. They compute the socially optimal arrival pattern and demonstrate that the average waiting time can be reduced considerably with this policy.

CONTACT: Refael Hassin; hassin@post.tau.ac.il; Department of Statistics and Operations Research, Tel Aviv University, Tel Aviv, Israel

Customizing services – the next big market push

Many companies compete globally by producing products that are customized for each individual consumer. The concept of mass customization, where each unit produced has functionalities to suit the individual customer's needs, is well-known in manufacturing. The research here investigates how to extend mass customization to the service industries. Further, the challenge is to create customized services in dynamic global markets.

Soundar Kumara (from left), Seung Ki Moon and Timothy Simpson, along with their colleague Jun Shu (not pictured), used product family design principles and game theory for mass customization in the service industry.

In "A Module-Based Service Model for Mass Customization: Service Family Design," Seung Ki Moon, an assistant professor at Nanyang Technological University and a Ph.D. graduate of Pennsylvania State University, along with Penn State assistant professor Jun Shu, professor Timothy Simpson and Pearce Chair Professor Soundar Kumara, address the challenge.

The research uses product family design principles, familiar in product design, to develop their method for designing customized families of services. Further, they use game theory to model situations involving dynamic market environments.

A case study involving a family of banking services is provided to demonstrate the efficacy of the proposed method. The authors create modules of functions and determine which modules are shared in common to provide the most benefit. They also create a novel visual representation by fusing object-oriented principles with service family design.

Product family design is a cost-effective way to achieve mass customization for services by allowing highly differentiated products to be developed from a common platform while targeting individual products to distinct market segments.

CONTACT: Seung Ki Moon; skmoon@ntu.edu.sg; 65-6790-5599; Division of Systems and Engineering Management, School of Mechanical and Aerospace Engineering, Nanyang Technological University, 50 Nanyang Ave., Singapore 639798

Susan Albin is a professor at Rutgers University in the department of industrial and systems engineering. She is editor-in-chief of IIE Transactions *and a fellow of IIE.*

About IIE Transactions

IIE Transactions is IIE's flagship research journal and is published monthly. It aims to foster exchange among researchers and practitioners in the industrial engineering community by publishing papers that are grounded in science and mathematics and motivated by engineering applications.

To subscribe, call (800) 494-0460 or (770) 449-0460.