RESEARCH
Inside IISE Journals

This month we highlight two articles in *IISE Transactions*. The first article looks into the trade-off of performance evaluation and employee satisfaction. The authors found that using the relative rating versus the absolute rating has different impacts. One rating may be better suited in working environments where the rating pool size is small or the job is routine while the other rating is more appropriate in the opposite working environments. The authors applied their idea to officers rating exercise in the U.S. Army and found the data supports their hypothesis. The second article asked the question of whether the parking industry would embrace data sharing and, more specifically, how to incentivize data owners to share their private parking data. The authors developed a game-theoretical model to quantify the value of data sharing among garages in a parking network. The authors furthermore conducted a case study using the SFpark data for validating their quantification of the value of data sharing. These articles will appear in the February 2022 issue of *IISE Transactions* (Volume 54, No. 2).

A tale of relative versus absolute rating accounting for the dual goals of performance, employee satisfaction

As the U.S. Army implements a "People First" strategy, it is evaluating how it promotes talent through the ranks to positions of higher responsibility. One of the items under consideration is the performance rating system used by centralized committees to select individuals for promotion. Currently, all senior officers and noncommissioned officers in the U.S. Army are rated according to a relative (competitive) rating system, where the top 49% and 24%, respectively, of a rank-specific rating pool can receive a high rating.

To increase fairness and transparency to workers, many other organizations have begun to shy away from the use of such competitive schemes in favor of absolute (noncompetitive) rating systems, where workers are awarded high ratings by performing at or above a standard threshold. Which of these rating systems leads to higher workforce performance?

In their work, "The Implications of Rating Systems on Workforce Performance," Morvarid Rahmani and Christopher Green from the Georgia Institute of Technology use normative decision models to compare the performance of relative and absolute rating systems from both the firm and employees' perspective. They find that an absolute rating system can generate a higher performance from workers than a relative rating system when the rating pool size is small or the job is routine (workers' cost of effort relative to their efficiency rate is low), and the reverse holds true otherwise.

When considering the workers' perspective, they find that higher ability workers prefer an absolute system due to its predictable nature, while lower ability workers prefer a relative system as it provides them an opportunity to outperform other workers. Moreover, when instituting a relative system, they find that firms can benefit from setting higher rewards and offering fewer high ratings to sufficiently motivate workers to perform higher. With an absolute system, firms can use lower rewards and can thus be more inclusive by offering a larger number of high ratings to incentivize low-ability workers to perform higher.

Morvarid Rahmani

Christopher Green

A case study of the U.S. Army officers rating exercise in both operationally deploying units and training/garrison units supports the above-stated insights.

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Will the parking industry embrace data sharing?

Parking is always a headache in the metropolitan areas. With parking infrastructures upgraded to be capable of making parking data comprehensive and readily available, there is a good chance to provide customer-oriented parking services.

Yuguang Wu

Qiao-Chu He

Xin Wang

The wide adaptation of smart meters and mobile parking apps make it possible to shift parking demand across time and space. Garage owners and municipalities can now increase or decrease parking rates over time to modulate parking behavior.

Many recent projects, such as SFpark, have even allowed time-varying parking management strategies. More importantly, a huge amount of data with a broad spectrum of customer behaviors are collected, although not necessarily shared. With this data-sharing, researchers for the first time could, quantify customer parking behaviors, which further leads to better social warfare and a reduction in traffic congestion. With the parking data stringently protected, those benefits will be hard to materialize. A natural question is how to incentivize the data owners to share the private parking data.

In the paper, "Competitive Spatial Pricing for Urban Parking Systems: Network Structures and Asymmetric Information." doctoral student Yuguang Wu from the University of Wisconsin-Madison, professor Qiao-Chu He from Southern University of Science and Technology, China, and professor Xin Wang from the University of Wisconsin-Madison establish a game-theoretical model to quantify the value of data sharing among garages in parking networks.

The authors demonstrate that data-sharing produces win-win outcomes for garages, in most cases. Specifically, they show that the garages are always better off in a circular-networked city, whereas they could be worse off in the suburbs of a star-networked city. Data-sharing improves the overall revenue for garages and reduces congestion.

On the flip side, the authors point out that customers could be further exploited due to the power shift more toward garage owners as a result of using the pricing algorithms and shared parking data.

The authors validate the value quantification of data sharing through a case study using the SFpark data. Garages with higher price-demand elasticity and lower demand variance tend to enjoy a higher benefit due to data-sharing. These insights support the joint design of parking rates structure and information systems. A message for policymakers is that they should carefully evaluate their transportation data-sharing policy since the economic impacts on customers typically conflict with those on service providers.

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This month we highlight an article from *IISE Transactions on Healthcare Systems Engineering*, (Volume 11, No. 4). In the paper, authors from the University of Wisconsin-Madison and Geisinger Medical Center discuss use of health information technology to better coordinate patient care among healthcare providers. The authors recommended a central health IT system accessible by healthcare professionals across care settings on various platforms to allow providers to communicate and share patient information from a single tool.

Health information technology can be a game changer for cross-communication among healthcare professionals

Nearly half of the U.S. population suffers from at least one chronic illness. Chronically ill patients may go to the emergency department (ED) because their symptoms worsen, and they are not sure of what options they have for treatment. They may be admitted to the hospital from the ED or directly. After hospitalization they may be discharged home or to a nursing facility.

As these patients transition through different care settings, a variety of healthcare professionals, including physicians, nurses and social workers, become involved in managing their care. Communication between these healthcare professionals during care transitions is key to maintaining effective coordination during care transitions.

In the article "Understanding Care Transition Notifications for Chronically Ill Patients," doctoral student Sarah Kianfar, Ann Schoofs Hunt, Peter Hoonaker, professor Pascale Carayon and doctoral student Abigail Wooldridge from the University of Wisconsin-Madison collaborated with Jim Walker, M.D., Doreen Salek and Janet Tomcavage from Geisinger Medical Center to better understand communication during transitions of care for chronic patients. Using interviews with healthcare professionals involved in care coordination at Geisinger Medical Center, the authors carefully studied how healthcare professionals notified each other of transition of their patients. They found out that the process was mostly

Sarah Kianfar

manual and involved multiple tools, which made it time-consuming and error prone.

Health information technology (health IT), if designed appropriately, has the potential to make the communication around care transition notifications among healthcare professionals more efficient, and thus help improve patient care. The authors recommended a central health IT system accessible by healthcare professionals across care settings with both synchronous (e.g., audio call, text messaging) and asynchronous (email, voicemail) capabilities, along with a status indicator (e.g., available, offline) to allow healthcare professionals communicate and share patient information from a single tool.

Additionally, the authors suggested using Health IT to generate automated care transition notification alerts and free the healthcare professionals from having to notify one another about patient transitions.

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IISE Transactions on Healthcare Systems Engineering (*link.iise.org/iisetransactions_healthcare*) is a quarterly, refereed journal that publishes papers about the application of industrial engineering tools and techniques to healthcare systems.

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