Mismanaging the quality-speed tradeoff in congested environments

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We study the effect of workload on judgment and decision-making in "people-operated" systems that are prone to congestion because of variability in demand arrivals and processing times. When human behavior determines how precisely work is carried out, varying workload is usually managed through discretionary changes in work speed (Staats and Gino 2012), work sequence (Ibanez et al. 2017), or work content (Batt and Terwiesch 2016).

Our research contributes to a growing body of theoretical and empirical literature on the conditions under which decision makers should (e.g., Hopp et al. 2007, Alizamir et al. 2013), and do (e.g., KC and Terwiesch 2012, Kuntz et al. 2015, Berry Jaeker and Tucker 2017) reduce work content when workload increases. Specifically, we study the behavioral mechanisms behind workload-dependent adjustments of work content, and assess whether decision-making is adequately sensitive to workload.

To that end, we present the results from a set of controlled laboratory experiments designed to test the predictions of a formal sequential testing model that captures the quality-speed tradeoff in a setting where the gathering of additional information (i.e., diagnostic testing) is likely to improve diagnostic judgments. As a key feature of our setting, the cost of additional information is related to the time it takes to gather the information, and the possible increase in congestion during this time. As a result, the time spent on a given task also determines the information search cost for subsequent tasks. This notion of endogenized time pressure across different tasks
characterizes many real service and manufacturing systems, and is in stark contrast to the related settings considered in the extant literature on information search and stopping problems in non-congested environments, in which decision tasks are typically independent from each other. Importantly, it implies that decision makers should decide with less information when congestion is high, and sometimes abort the gathering of additional information, i.e. make a diagnosis while waiting for a pending test result, when congestion intensifies.

We find that decision makers are overly sensitive to diagnostic signals: they tend to stop a diagnostic process immediately after the first test result, and sometimes without gathering any information, even at low congestion levels, for which additional testing is inexpensive. On the other hand, decision makers are insufficiently sensitive to congestion, with an aversion to aborting a diagnostic process when congestion intensifies.

Contrary to what is suggested by reasonable normative accounts, we find evidence that stopping behavior is path-dependent. Decision makers tend to stop when they reach a system state (defined as a combination of system congestion and diagnostic information gathered) after receiving the results of a diagnostic test, but tend to continue when they reach the same state after observing an increase in system congestion. As a result of these behavioral patterns, the majority of decision makers manage the system with both lower-than-optimal diagnostic accuracy and higher-than-optimal congestion cost.

References


