D I S S E R T A T I O N D E F E N S E

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"INNOVATIVE MODELS IN SERVICE OPERATIONS"

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Many factors, including regulatory changes and the ubiquity of information technology, have spurred the growth of innovative ways of delivering services. As a result, the operations management community has been presented with new challenges. This dissertation seeks to model and provide insights for three such problems in the healthcare and retail industries.

Multiple listing – when patients awaiting organ transplants register in more than one region – has garnered attention since former Apple CEO Steve Jobs' successful liver transplant (in Tennessee). Supermarkets with multiple checkout lines exhibit a similar "multi-listing" phenomenon when a customer and a companion each join a line, but abandon the "slower" line as soon as either of them reaches the cashier. In the first chapter we model such situations using a two-server queueing system with two classes of customers, one of which is redundant (joins both lines) while the other joins a single line. We investigate the fairness of multiple listing, i.e., whether redundant customers' benefit is at the expense of *singly listed* customers. We show that singly listed patients actually benefit under redundancy of the other class compared to the case in which redundancy is prohibited, and the 'wealthier' class using their resources to travel, if necessary, joins the shortest queue, i.e., redundancy is *fair*, if the queues are symmetric in their arrival rates. But, if the queues are asymmetric, redundancy can be unfair; we find situations when singly listed patients are provably worse off under redundancy than when the other class joins the shortest queue.

The omnichannel strategy – wherein a firm jointly leverages its physical stores and digital assets to provide a seamless experience to customers – is quickly becoming the new norm among retailers. In the second chapter we study how an omnichannel firm makes return policy and pricing decisions when faced with heterogeneous customers who purchase, and possibly return misfit items, using either of its two (online or in-store) channels. We incorporate two significant aspects that have largely been ignored in prior work – identical prices across channels and cross-channel returns. In addition to being consistent with practice, the identical price assumption highlights an important constraint experienced by a firm due to its omnichannel nature. By modeling cross-channel returns, we are able to provide one explanation for the generous refunds often observed in practice. Specifically, we show that when customers return online, the refund chosen by an omnichannel firm is more generous than suggested by prior work that considers only single channel firms.

Recently, the Centers for Medicare and Medicaid Services published quality scores for hospices along various dimensions (e.g., pain assessment, treatment preferences): The goal is to provide more transparency for patients and encourage providers to improve the quality of their services. In the third chapter we study a hospice manager's problem of controlling quality of care in light of

these changes, with the aim of investigating whether such programs are likely to actually improve quality. We use a discrete-time Markov decision model that captures the impact of quality on the patient census – the number of patients cared for by a hospice: Quality affects both the rate at which patients join the hospice (reputation effects) and the rate at which they depart (quality of care effects). We find that the current approach may incentivize reporting and result in improved quality for hospices that choose to report; but, those that strategically choose not to report may reduce their quality level due to the penalty imposed for not reporting.