

TECHNOLOGY

A Shot in the Arm for Services: Scaling Health Care Services with Innovation and Digital Transformation

by Vish Krishnan, Ashley Gambhir, and William Ford



Image Credit | Steven Cornfield

Key lessons for countries and organizations from the pandemic years.

✔ **INSIGHT** | FRONTIER 01 Feb 2022

As countries and organizations rebound, they must find ways to grow gracefully and bring to bear the lessons learned from the pandemic. **Customers used to the convenience of digital interactions have come to expect swift and seamless experiences.** Our research and field work shows that it is possible to scale human-intensive services with innovative design and digital transformation, achieving the elusive combination of efficiency and resiliency in customer service encounters.

Based on lessons learned from scaling vaccine-delivery at the University of California (UC), we propose that conventional scaling challenges associated with human-intensive services can be overcome with design and process innovation solutions that could be a “shot in the arm” for organizations. We discuss the service challenges and show how we addressed them through a detailed case study involving Covid vaccine administration in San Diego. In 2021, vaccines were in high demand across the country overwhelming vaccination sites, leading to long wait times and patient dissatisfaction. UC San Diego Health, a community health system in San Diego, successfully delivered the vaccine to over 25% of San Diego County in just 3 months. With rapid improvement cycles deployed during the first three weeks of operation, the site was able to serve over 6,000 patients in 12 hours days (Longhurst et al. 2021), and opened a second vaccination superstation a month later, which combined process and technological innovations for a vastly improved patient experience with much lower wait times and staff requirements. The lessons learned from this initiative can certainly be applied to a broad variety of service industries who seek to achieve quality customer services with high efficiency and resiliency, creating both social and economic value.

The Services Challenge

Service organizations face a host of challenges including increasing complexity and rising costs (referred to as the cost curse by the economist Bill Baumol). A number of unique features of service settings amplify the operational challenges in settings such as health care delivery (Bates et al 2013). Unlike in manufacturing, the customer/client is often directly involved in the delivery process, which makes aligning capacity with demand challenging. In addition, there is significant real-time interaction with customers during the delivery, which can increase variability and complexity. Electronic commerce has also

raised customer expectations for speed and seamlessness of the service encounter. Service organizations face the need for highly capable professionals, who can be in short supply. Scaling customer-facing services is one of the frontier challenges for executives in many industries from restaurants to health-care delivery.

To cope with the scaling challenges, leaders of service organizations have looked for promising ideas that have benefited other industries. Many have been intrigued by the multi-stage “pin-factory” manufacturing approach that is associated with significant productivity improvements due to the specialization/division of labor. However, we find that healthcare and other complex people-intensive services can become less resilient to supply and cause uncertainties with worse customer service due to the fragmentation caused by “pin-factory” approaches. We propose an alternative approach that combines process innovation with digital transformation for scaling services.

The Pin Factory Model And Its Challenges for Complex Human-Intensive Services

Adam Smith’s classic work in Economics popularized the pin-factory model of production which drove productivity improvements due to division of labor. His **book** argued that subdivision of the pin manufacturing process into elementary steps (drawing, straightening, cutting, grinding) can raise productivity by several orders of magnitude. Manufacturing companies in many industries benefited from the division of labor in such a multi-stage production approach, which drove productivity and prosperity improvements in countries and companies. Simplification of the individual steps and the resulting economies from specialization and faster learning made multi-stage production processes popular and widespread. Many service industries and organizations have attempted to borrow the multi-stage approach to achieve similar productivity/performance improvements. However, the unique aspects of human-intensive services combined with increasing adoption of information technology make multi-stage processes suboptimal.

Our experience and data collected from the rollout of San Diego vaccine superstations shows the pitfalls of the pin factory approach, and the need to be deliberate about designing service delivery, especially the number of service stages and number of service providers per stage. The multi-stage pin factory model achieved its famed efficiency by decomposing the aggregate effort into elementary tasks done in sequence, simplifying tasks and accelerating productivity improvements. However, the serviced customer is bounced over from one stage to the other. The increasing role of information technology also entails each stage accessing the electronic customer/patient records and updating them, which can frustrate customers as well as increase the labor content of the service that may offset the specialization benefits from the multi-stage process. In our first vaccination site, we noted that the multi-stage pin factory approach resulted in five stages of service delivery, introduced new transitions across stages for customers, and repeated access to the electronic medical record that increased the organizational work-load, compromising service rate and the customer experienced organizational responsiveness. In addition, when customer/patient needs are more diverse and heterogeneous, the multi-stage pin-factory processes experience greater variability and moving bottlenecks that can cause additional customer frustration and lower resiliency of the system. Reducing the number of stages all the way to one can minimize the number of customer transitions, but increases the demand for skilled labor and the cost of customer service.

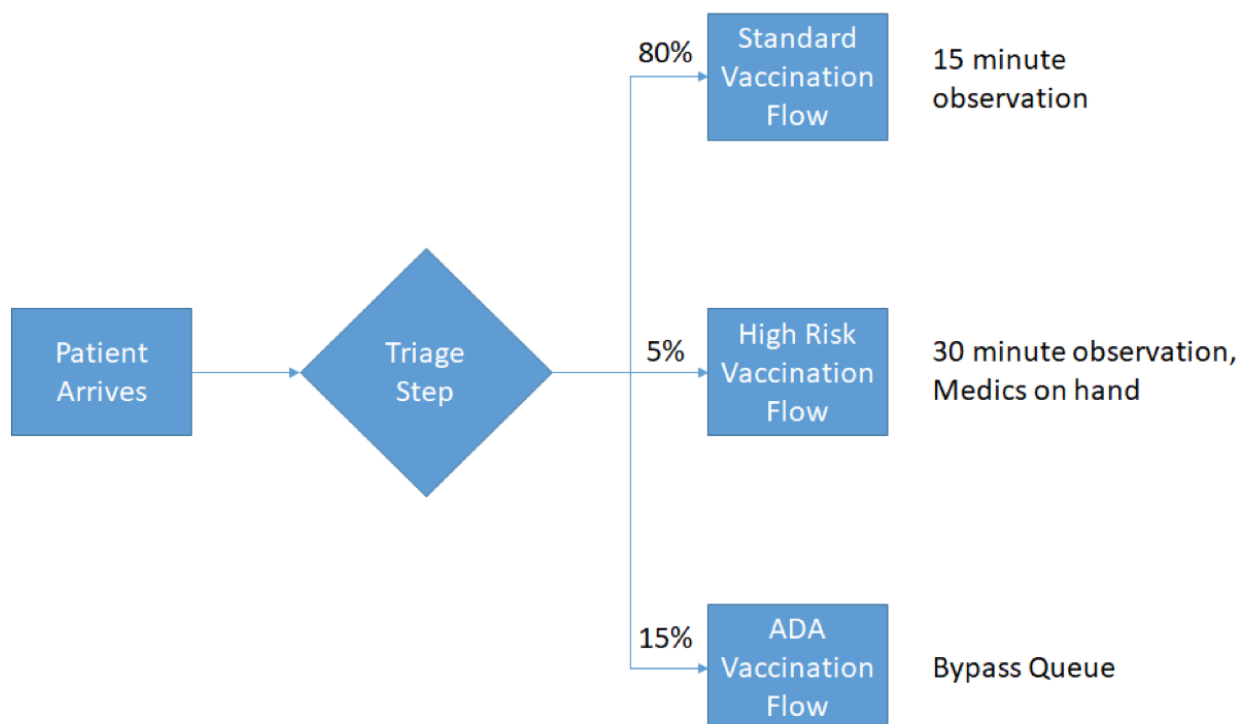


Figure 1: Hybrid Vaccination Process with Combined Registration and Vaccination

We converged on a hybrid two-stage design (Figure 1): vaccination and electronic registration combined at one stage with a single access to the electronic medical record following a triage step that simply directed patients to the right area. Such an approach eliminated repeated processing of patients resulting in a 50% reduction in the labor content (from 6 staff for every 100 patients in the multi-stage setup to 3 staff for every 100 patients in the hybrid approach). In addition, the hybrid approach shrank the patient's total visit time in half, and significantly improved the customer/patient experience due to the lack of repeated transitions and information processing. Most importantly, the hybrid approach improved not only the system efficiency but also its resiliency by allowing the site manager to flexibly adjust the number of vaccination tables staffed based on demand.

Figure 2: Efficiency-Resiliency Balancing in Service Delivery

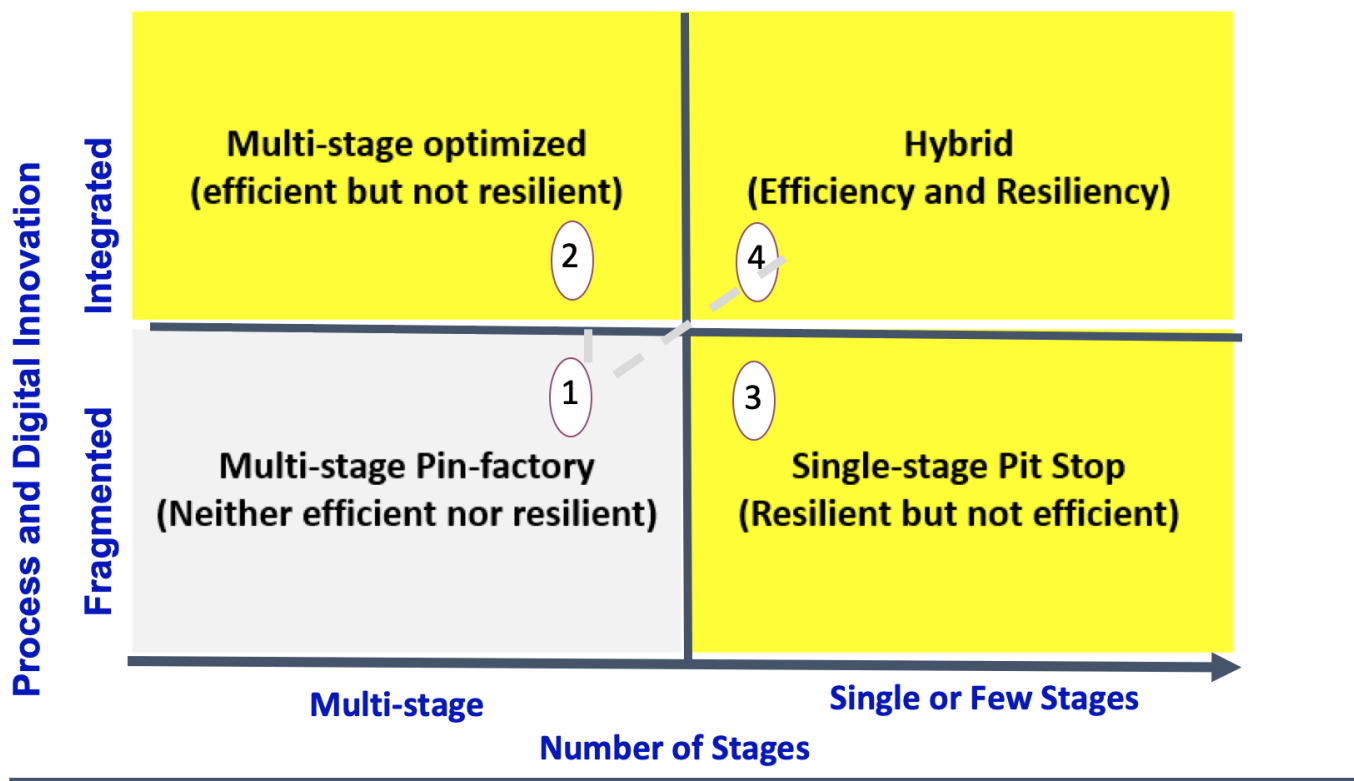


Figure 2: Efficiency-Resiliency Balancing in Service Delivery

One Size Does Not Fit All: Resiliency for the Rebounding Economy

Achieving both efficiency and resiliency requires integration with digital technologies and tailoring the process to the nature of customer demand. The rollout of the COVID vaccination sites is a good illustration of the importance of not sacrificing the service quality and resiliency in the name of efficiency. Customers/patients are far more heterogenous than raw materials in a pin factory. At the vaccine clinic, some patients have physical conditions that need to be accommodated, ranging from removing a jacket to expose their arm to needing a wheelchair for mobility. They also have emotional needs that require consideration, ranging from questions about side effects to needle and vaccine phobias. These needs differ across patients and challenge the process design.

Serviced-led Innovation

Service delivery processes have not innovated to the same degree product design and development organizations have in pushing the frontier. At UC San Diego Health, we have begun to invest in service innovation. Starting with the classical Plan-Do-Study-Act (PDSA) for process innovation to more extensive service re-design, we achieved a 25% improvement in productivity and 50% lead time reduction in several settings as experienced in the vaccination super-sites. This bodes well for future scaling of services, including healthcare, by aligning the system design to the customer context.

We recommend leaders challenge their organizations to consciously integrate digital capabilities and transform their delivery systems and processes for customer experience. Our vaccine delivery innovation shows how innovative design and digitization help reduce the complexity and variability of service delivery systems, significantly boosting customer responsiveness and service productivity.



Vish Krishnan [Follow](#)

Vish Krishnan (PhD from MIT) holds the Jacobs Family Chair in Engineering and Management at the University of California, San Diego. He helps catalyze innovative practices and new ventures, has co-authored influential research articles, and has been named the Most Valuable Professor by students four times.



Ashley Gambhir [Follow](#)

Ashley Gambhir (MBA) is the Senior Director for Healthcare Transformation at UC San Diego Health. She drives operational and cultural transformation to make UCSD Health the very best place to give and receive care.



William Ford [Follow](#)

William Ford (MBA) is the Director of Innovation and Transformation for UC San Diego Health. He chairs the organizational efficiency committee and leads a team of project managers focused on a variety of strategic and operational improvement initiatives throughout the health system.