Poster Session

Network-based Product Ramp-up in a Demand Shock: Evidence from Ventilator Challenge UK

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Currently, there is a grave uncertainty in ramp-up capabilities of modern supply networks. For many SME organizations the opportunities to increase capacity (i.e. capacity sharing) is constrained by the complexity of new collaborations (Kazantsev et al., 2018). Recent COVID-19 outbreak has provided an example how excellence in collaboration design and Industry 4.0 technologies allowed UK to cover the national need for ventilators in June 2020. The goal of Ventilator Challenge UK was to produce the lifesaving product and the goal of this paper is to capture the main lessons learned of ad-hoc supply chain operation dynamics and make it available for other supply networks facing ramp-ups.

We state the research question of our study as follows: How could we simulate the ramp-up dynamics of Ventilator UK Challenge (2020) and predict its further development? Stock and flow diagrams have been developed to model the system (Akkermans and Van Wassenhove, 2018). As recommended by Sterman (2000, p. 158), we undertook an in-depth interview to validate the units consistency, get feedback on causal dynamics and get values for parameters. Whilst doing this work we were following the available project description in blogs, social networks, and industrial journals and on the official website of the project , so we were able to capture the full dynamics from the start until finish. The local production facilities ordinarily have combined capacity for 110 ventilators per week, which has been raised in the project up to 1,500 units a week within four weeks, against an industry norm of over 12 months. By mid-June they had made around 7 000 ventilators delivered, 29 June - 10 000 units. 4 July - end of the project - One completed ventilator every 88 seconds, 13 437 ventilators in total 12 weeks' time.

The dynamic model consists of balancing and counteracting loops that interact and allow to increase or decrease production dynamics. We started the model with capturing the gap between the initial number of ventilators (5 900) available in the UK NHS by March 2020 and the forecasted number- (20 000), which was calculated by the UK Government. This gap (14 100 units) has triggered formation of an ad-hoc supply network to ramp-up production of ventilators locally. We calculated the time slack (negative in the beginning) which was driving project motivation (possibility to work in double shifts), and supply chain bottleneck elimination (production efficiency against takt time), which reduced the overall time of production. In the heart of the model we placed the induction process of new employees, which was done remotely using 3D lenses that complied with social distancing practices. The rapid raise of experienced people who assembled the ventilator, reinforcing loops for raising motivation after each produced ventilator (not included into the model) was the driving force for meeting the required target in 12 weeks.