Motivated by kitting and assembly processes, we consider a Markovian finite capacity queueing system with multiple coupled queues and customer impatience. Coupling means that departures from the different queues are synchronised and that service is interrupted if any of the queues is empty. Even under Markovian assumptions, the state-space grows exponentially with the number of queues involved. To cope with this inherent state-space explosion problem, we investigate performance by means of two numerical approximation techniques based on series expansions, as well as by deriving the fluid limit. We further show that the numerical complexity of the numerical methods reduces drastically if the arrival intensities in all queues are equal, which is the most common regime as coupling implies equal departure rates from all queues. By means of numerical examples, we show that the approximation methods complement each other, each one being accurate in a particular subset of the parameter space. Finally, we compare the numerical analysis method at hand with a decomposition approach, where a single queue is analysed in isolation, the availability of customers in the other queues being approximated by a two-state Markov model.