**OM 302 F21**

**Quiz 4**

**Notes as of 11/15/21**

**Waiting Lines**

The operating characteristics of the system does not include the arrival rate or the rate at which units leave the system. The two parts to a queuing system are: the queue and the service. The important variables that are considered when optimizing the operating characteristics of the system are: population source (finite or infinite), patterns of arrival, queue discipline, service rate, and number of servers. The most common queue discipline is First-In/First-Out.

Managers have to balance the costs of capacity and service costs with the costs incurred by waiting customers. There is an optimal point at which the overall cost of waiting and serving will be minimized.

The notation M/M/1 describes a single channel model with Poisson arrivals and exponential service times. The notation M/M/2 refers to a multiple-server system with two servers working independently inside the system.

For managers in service industries, it is very important to be concerned with the queuing theory. Service based industries sell experience, which has to be designed-in, not tested-out. If managers do not pay attention to this principle, their firms will experience a possible loss of goodwill and show lower customer satisfaction.

Customers who refuse to join a queue are balking and those who leave a queue are “reneging”. It is important to recognize that the psychology of waiting is as important as the mathematics of waiting. Disney’s Parks are very good in applying this understanding (i.e., Fast Pass system).

Mr. Erlang is best known for modeling operating characteristic of the telephone system in Copenhagen, Denmark.

**Simulations**

Large scale simulations require significant computing power as well as a high level of mathematical competence. They are an excellent training tool that permits an analyst to experiment with system’s behavior. Smaller simulations can run on desktop computers.

All major business decisions are based on facts and data derived from simulated models. It would be irresponsible to make such decisions based only on intuition.

Simulations compresses time so that managers can quickly discern the long-term effects of their proposed actions. When properly used, they can produce more comprehensive answers to a complex problem that is difficult or impossible to solve problem than a mathematical/analytical model.

The following steps are a part of the simulation process: define the problem, identify decision variables, construct a mathematical model, and find the optimal solution

Simulations do not produce an optimum solution. Instead, they are good estimation tools. In other words, simulations models are designed to compute the probability of a particular optimal outcome within the range of possible outcomes.

One reason for using a simulation rather than an analytical model in solving inventory problems is that the simulations can handle probabilistic demand and inventory replenishment lead times. Simulations are not descriptive, they are probabilistic.

In addition, simulations can be based on physical or mathematical models that reflect the variables of the real-world environment. It is important to use an unbiased methodology that includes random number generators and the Monte Carlo framework.

**Human Resource Management**

Even highly skilled workers can be replaced by technology. For example, accountants can be replaced by programs based on artificial intelligence. One's flexibility, adaptability, and willingness to learn is the key to future employment. In this everchanging environment, the objective of a human resource strategy is to ensure that qualified staff is effectively and efficiently utilized.

For example, the “Hard Rock Café” hires the best qualified, not the best available. Then it, trains, empowers, and retains its employees. The “Hard Rock Café” has a unique culture and would not be a good fit for someone who likes discipline, order, and structure.

The “Ritz Carlton” hospitality organization is another example where employee empowerment is the key managerial philosophy.

The Michigan University HR model should not be used in managing service-based organizations. It assumes that humans are just like a piece of production machinery that is to be used, depreciated, and replaced at the end of their useful lives.

The Harvard University School of Thought is more aligned with the needs of the service economy where humans are an extension of the brand. Therefore, it would be a good business policy to treat employees well.