Master Thesis Proposal

Capacity Planning of Fitness Studio using Simulation

With every New Year and related resolutions, the good intentions of people towards their fitness spike. This attracts a huge traffic to the fitness studios and an increase in membership purchases. According to Gold's Gym, an American chain of international co-ed fitness centers; the customer traffic spikes 40% between December and January. Immediately after few weeks of the peak demand period, a strong decline in the motivation to exercise leads to lower member-traffic at the fitness studios. In fact, the gym industry thrives on the above customer behavior.

In other businesses like retail or restaurant, emptiness in terms of customer traffic, implies disaster or bankruptcy. On the contrary, the fitness studio business is one of the few businesses which benefits economically, when its customers don't set foot in the door on a frequent basis. In support of the above argument, the statistics related to the member-traffic at a leading fitness studio, revealed by The Washington Post[1], are alarming. According to the article, the gym had signed up 6000 members, with the capacity to hold only 300 people. Additionally, 50 percent of the members didn't ever go the gym.

Looking at the gym industry, the concept of capacity of a fitness studio is pretty vague. Every machine used for cardio training (e.g. treadmill, cross-trainer) to weight training (e.g. horizontal seated leg press, chest press) acts as a server, in queuing theory terminology. Even a spin racing or yoga class serves multiple members at once. Furthermore, people visiting a gym might choose randomly to exercise on a treadmill or attend a spin racing class. This behavior adds another layer of complexity in capacity estimation of the fitness studio in terms of the number of members that the studio can hold at a given point in time.

As part of a regular fitness studio membership, every member can use the resources of the facility every day. But, due to busy lifestyles, decline in motivation etc., different members' facility-usage patterns can be grouped into various categories: daily, twice a week, once a week, twice a month and so on. The challenge for the service provider is to find a good balance between the number of memberships at the fitness center and reasonable utilization levels of the facility's servers, considering the members' usage behavior.

The objectives of the thesis are to:

- Review literature that is concerned with the analysis of queuing network underlying gyms or similar membership-based systems;
- Develop reasonable performance measures in terms of utilization levels and wait times for the gym setting;
- Suggest how reasonable levels for the performance measures can be derived, e.g. through market research;
- Develop a conceptual model for simulating the relationships b/n size of the calling population (number of members) and the performance measures;
- Specify the input data requirements for the simulation model, e.g. arrival time distributions to gym and servers, service time distributions, etc.
- Based on the simulation analysis, suggest capacity planning improvements with regard to suitable performance measures.
- Analyze the characteristics of the fitness studio revenue model.
- Comment theoretically on how the "membership capacity" of a fitness studio, i.e. the maximum number of membership that should be granted are estimated in practice.

Requirements:

- OPM 781
- Profound knowledge in Operations Research and process design
- Excellent analytical skills and an ability to transform real-world business examples into simulation software

Recommended basic literature:

[1]Ana Swanson (2016) What your new gym doesn't want you to know. *The Washington Post* (January 5):B2. https://www.washingtonpost.com/news/wonk/wp/2016/01/05/what-your-new-gym-doesnt-want-you-to-know/?utm_term=.a38bd4ac740e

Borshchev, A. (2013). The big book of simulation modeling: multimethod modeling with AnyLogic 6 (p. 614). Chicago: AnyLogic North America.

Russo, D., F. Passacantando, L. Geppert, and L. Manca (2012): Business Process Modeling and Efficiency Improvement through an Agent-Based Approach. *AnyLogic Conference* 2012.

Ilya Grigoryev (2014): AnyLogic 7 in Three Days: A Quick Course in Simulation Modeling.

Administrative information for writing a master thesis at the Chair of Service Operations Management can be found here:

http://serviceoperations.bwl.uni-mannheim.de/en/lehre1/master_m_sc/master_thesis