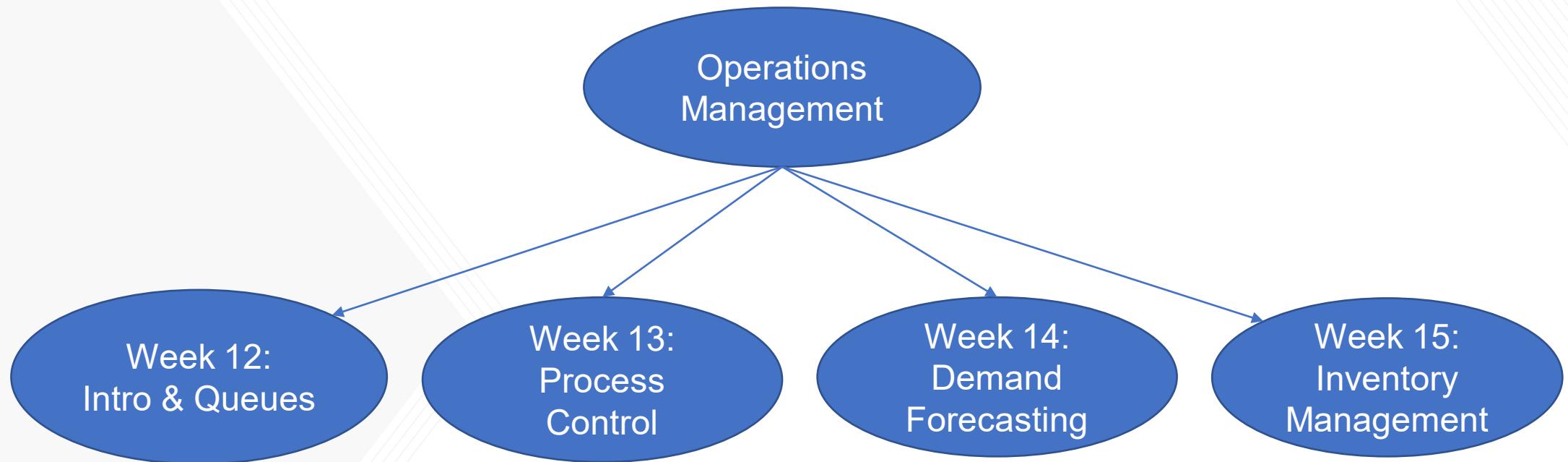




# Week 12

## Office Hours

# Ops. Unit Overview:



# What is Operations Management

Operations management is the management (design, operation, and improvement) of the processes that transform material, labor, energy, and information into goods and services



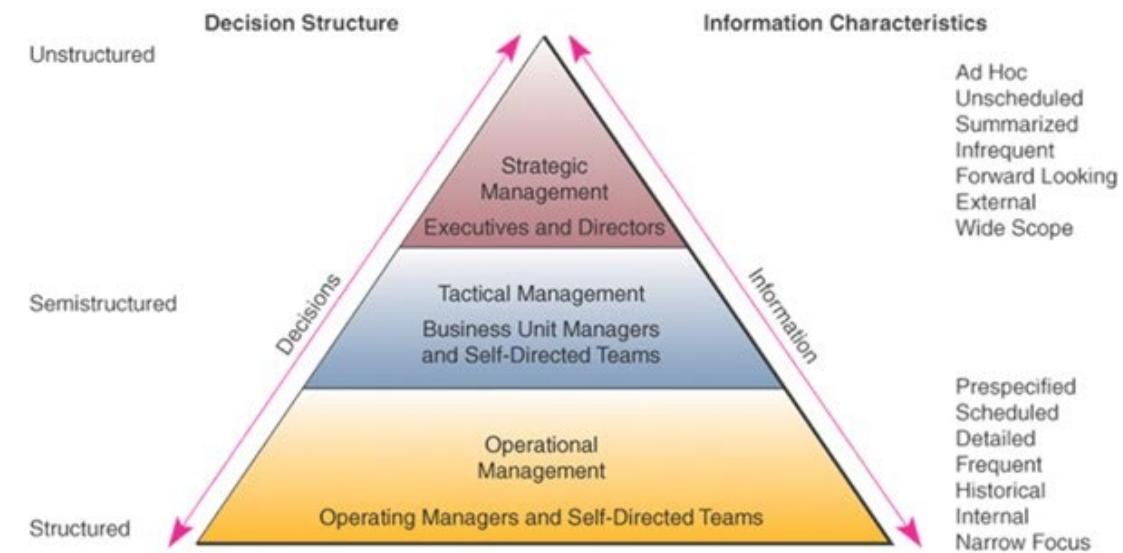
## Three Primary Objectives

- 1) Efficiency: operating at minimal cost given constraints
- 2) Effectiveness: actions coincide with overall objectives
- 3) Value: increase ratio of quality-to-price

# Operations Management Decisions

Three main types

- 1) Strategic: Long-term; upper management; Targets long term goals; significant risk and uncertainty; 5 years+; Hard to determine a set end date.
- 2) Tactical: Deciding specifically how resources will be utilized to achieve strategic goals; Middle management; 1-3 years as a timeframe.
- 3) Operational: Short term planning; Lower management; Typically centers on remaining operational; Timeline less than or equal to a year.



# Real world Strategic Decisions:

- Disney transitions to a more streaming centered approach to content distribution
- Audi halts development of new petrol internal combustion engines to focus on energy alternatives
- Apple cuts dependence on intel chips opting for in-house manufacturing



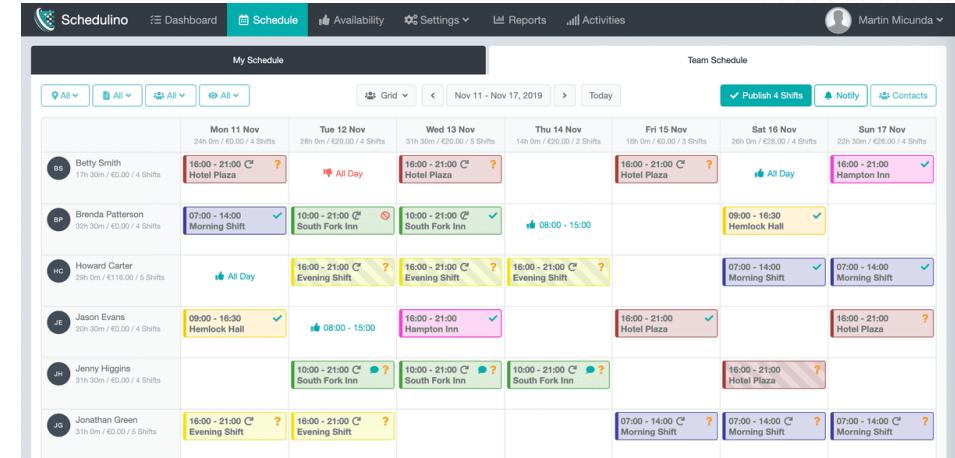
# Real world Tactical Decisions:

- [Microsoft](#) expands operations in Atlanta adds new hires
- Hartsfield Jackson alters queue design (Professor Sokol)
- As AMD has improved their chip quality they have raised prices almost inline with Intel which has for years been priced at a premium
- Adjusting inventory levels to meet short term demand
- Managing information flow across divisions



# Real world Operational Decisions:

- Placement of machinery on a manufacturing line
- Scheduling of workers throughout the day
- How should services be allocated best
- Manage critical operational priorities



# Successes of Operations Management

- Chick-fil-a drive thru's are some of the most efficient in the industry, and are constantly undergoing improvements.
- Restaurant & Grocery store quick transition to to-go, pickup, and online ordering
- JnJ and Colgate-Palmolive demonstrated strong performance over the past year considering the current economic conditions.



# Failures of Operations Management

- U.S. lumber prices. Raw timber remains abundant, but timber finishing services have lagged demand making finished timber products both scarce and significantly more expensive
- Samsung faces both a silicon shortage and production issues related to computer components just when the world is in demand of them the most.
- Tesla's over-automation debacle and tent manufacturing line



# Future of Operations Management

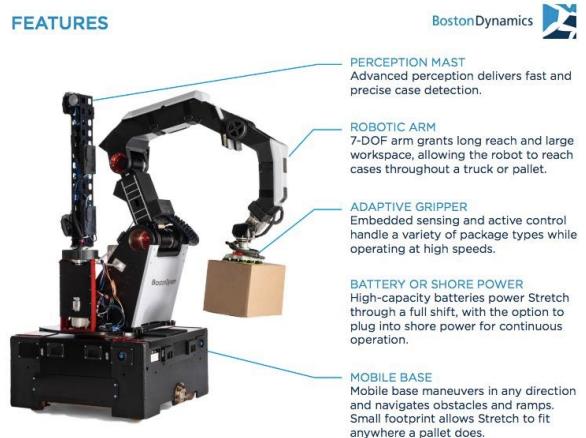
How far has each field grown since the professor original recording of the lecture?

## Robotics: Boston Dynamics

3D-Printing: Cost and print time has been reduced significantly over the past few years.

## Autonomous Vehicles: Tesla , Toyota , & Waymo

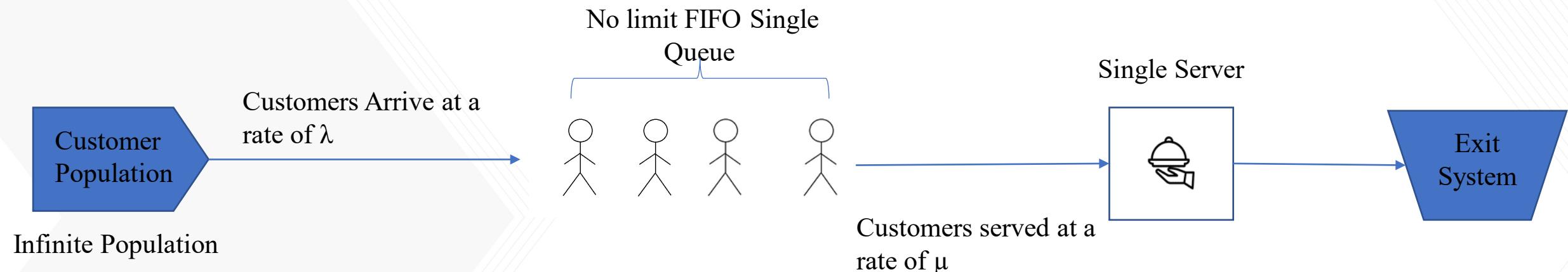
Each of these still has a ways to go...



# Overview Key Takeaways:

- Operations management is crucial to business success in the long term and short term.
- Wide ranging field covering both specific and general business opportunities. Not simply just how goods are made
- Methods can provide large gains in value, efficiency, and effectiveness
- Over optimization or over reliance on models can prove risky
- Still many exciting areas of innovation, but many are still in infancy

# M/M/1 Model

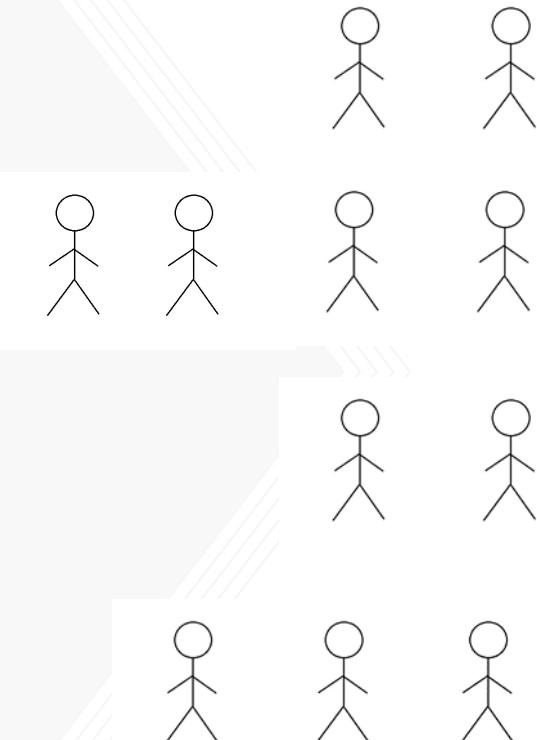


# Extending Models

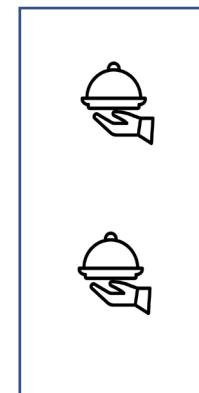
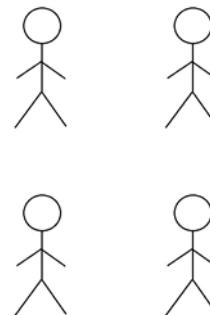
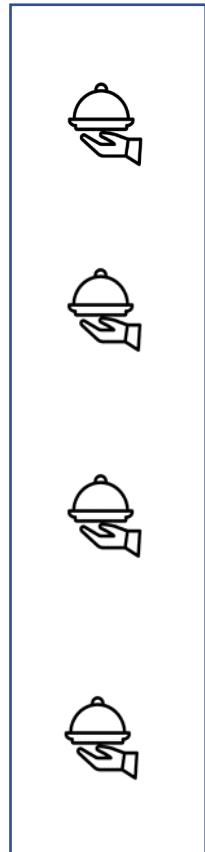
## Population Type

- Finite
- Infinite

Varying Queue Max Length



Number of Servers  
(Channels)

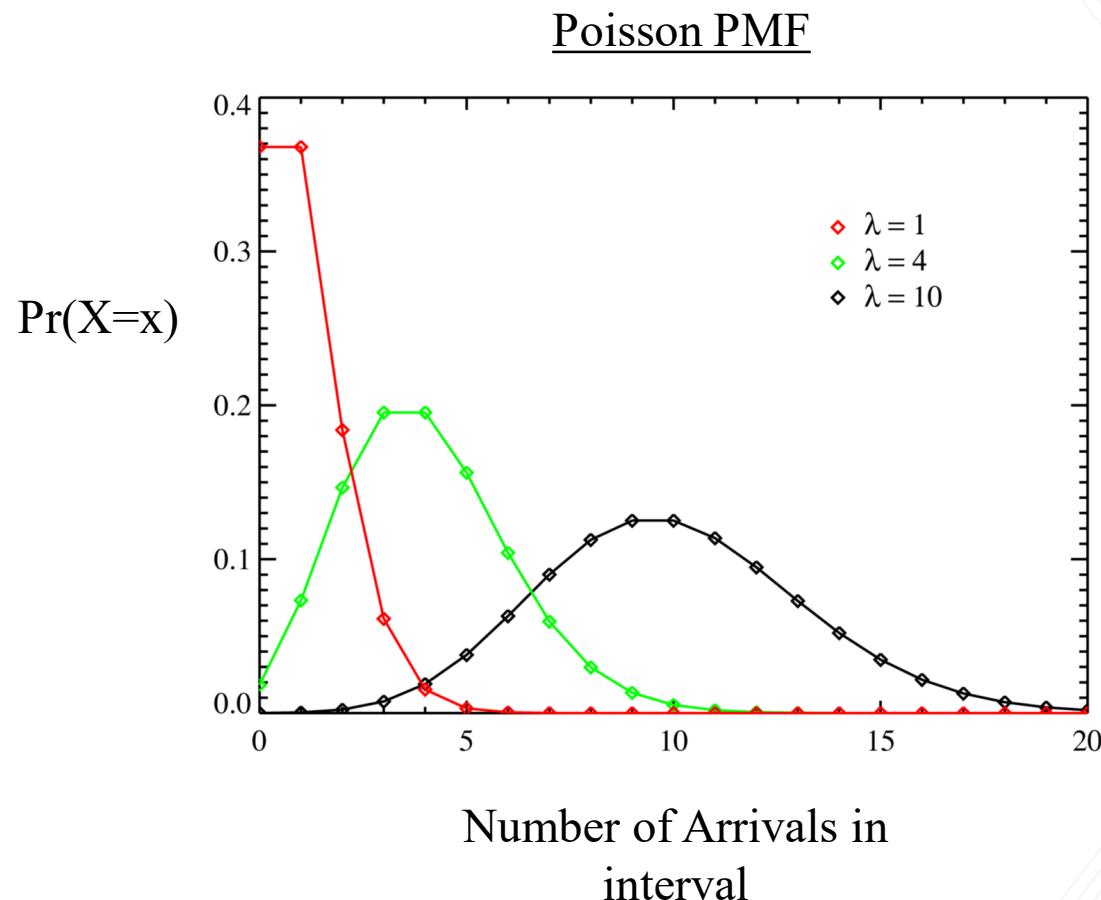


Number of Phases = 2

Exit System?  
- Customer returns  
- Exit queues

# Poisson Distributions

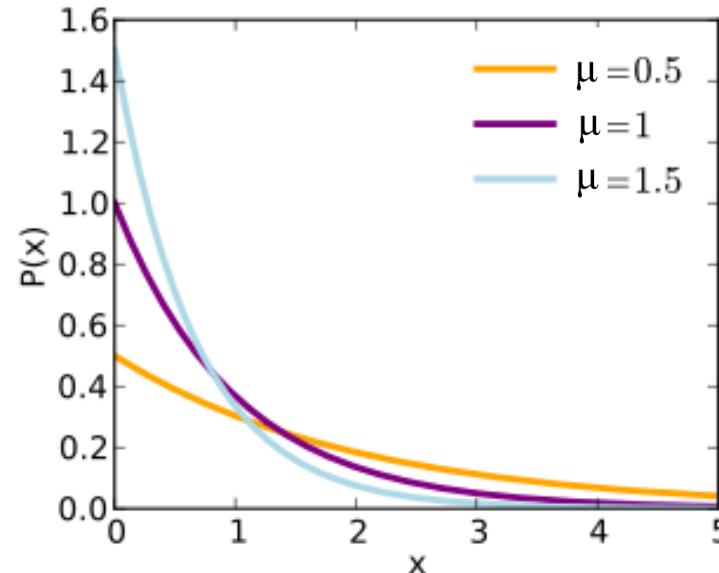
- Discrete Distribution  $[0, \infty)$
- Only parameter is lambda or the average arrival rate
- Think in terms of intervals of a given time
- Provides a model for how many customers might arrive in a given hour
- Given an average arrival rate of 10 customers per hour what is the probability in a given hour 10 customers actually arrive?
- $\sim .13 \sim 13\%$
- [Zed's Stats](#)



# Exponential Distributions

- Continuous Distribution
- Only parameter is service rate mu
- Measure time between events
- Provides a model for the amount of time between services
- Can be thought as the inverse of the Poisson
- Zed stats

Exponential PDF



Poisson

Number of cars passing a tollgate in one hour

Exponential

Number of hours between car arrivals

# M/M/1 Model

