

# Service Engineering: Data-Based Research and Teaching in support of Service Management

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<http://ie.technion.ac.il/serveng>

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## Background Material (Downloadable)

Technion's "**Service-Engineering**" Course ( $\geq 1993$ ):  
<http://ie.technion.ac.il/serveng>

### Evolution:

- ▶ Graduate Research Seminar
- ▶ Elective Theoretical course: joint graduate-undergraduate
- ▶ Elective Theoretical + Empirical (Data-Based)

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- ▶ Elective Theoretical + Empirical (Data-Based)
- ▶ **Compulsory within Industrial-Engineering:**  
**attended by  $\geq 100$  students (I.E. and others) annually.**

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Technion + Wharton **research** project, available for (academic)  
adoption. (eg. 2.5 years, 220M/40M telephone calls, 800 agents)

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4. Yields **scientifically-based design principles and tools (software)**, that support the balance of service **quality**, process **efficiency** and business **profitability**, from the often-conflicting views of **customers, service-providers, managers and society:**

**Service Engineering** .

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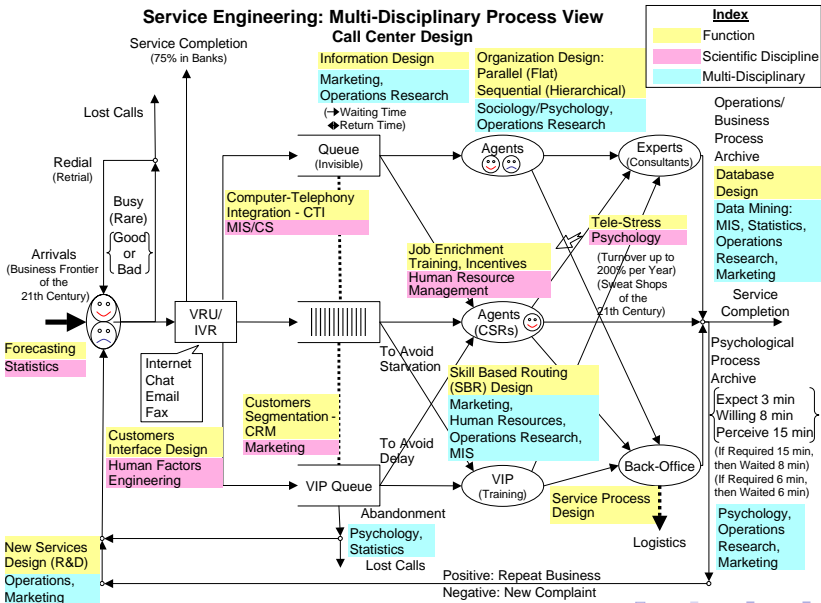
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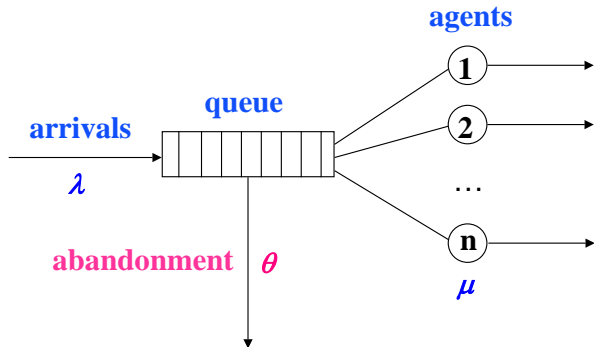
Consider, for example, **Palm/Erlang-A**: a simple (but not too simple) **Mathematical Model** of the complex reality of call centers.

# Complex Reality: Call-Center Network

## Service Engineering: Multi-Disciplinary Process View Call Center Design



## Simple Model: Palm/Erlang-A

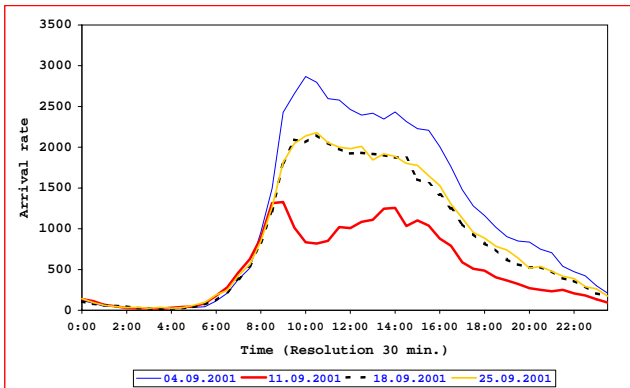


### Erlang-A Parameters (Math. Assumptions):

- ▶  $\lambda$  – **Arrival** rate (Poisson)
- ▶  $\mu$  – **Service** rate (Exponential)
- ▶  $\theta$  – **Impatience** rate (Exponential)
- ▶  $n$  – Number of **Service-Agents**.

# Arrivals to Service: Poisson-Relatives

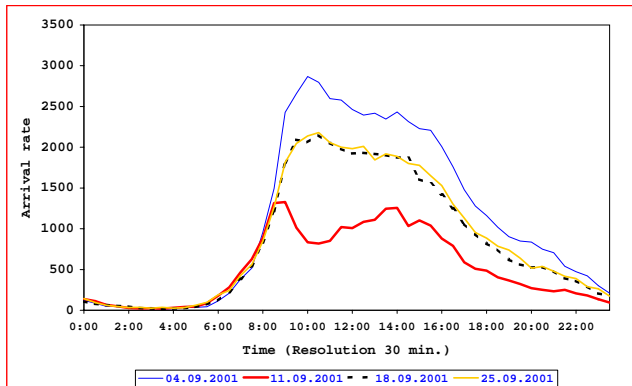
## Arrival Rates on Tuesdays in a September – U.S. Bank



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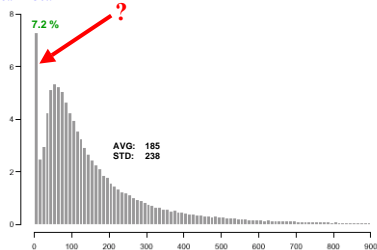
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- ▶ **Tuesday, September 11th, 2001.**

# Service Durations: The LogNormal Law

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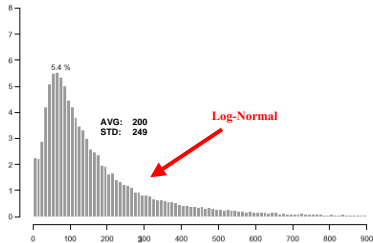
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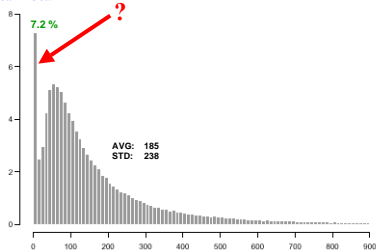
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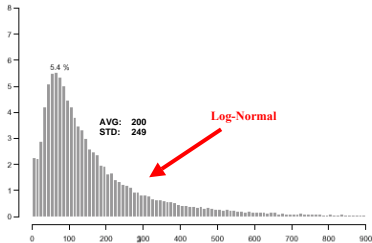
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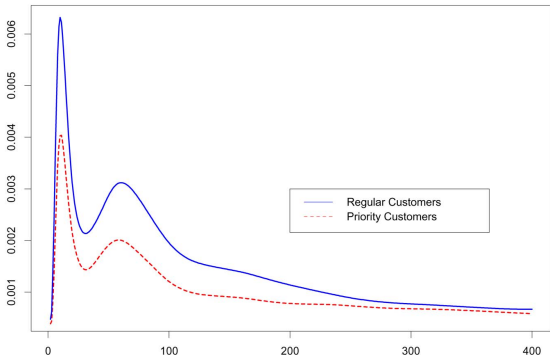
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- ▶ **Lognormal** service times prevalent in call centers
- ▶ **7.2% Short-Services:** Agents' "Abandon" (improve bonus, rest)
- ▶ **Distributions**, not only **Averages**, must be measured.

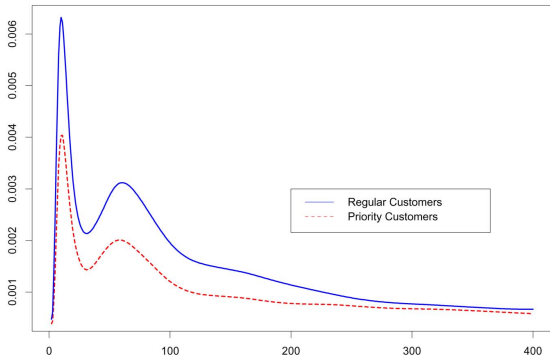
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- ▶ **Peaks** of abandonment at times of **Announcements**
- ▶ **VIP** are more **Patient** (Needy) than the Others
- ▶ **Call-by-Call Data (DataMOCCA)** required (Un-Censoring).

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- ▶ **Robust:** QED asymptotics (moderate-to-large systems)
- ▶ **Insightful:** Square-Root Staffing rules; E.O.S.
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**Still** has its **Limitations**, theoretical & practical, all of which simulates

⇒ **Current Research**

## Back to Main Messages: Summary of Erlang-A

1. **Simple useful** model, requiring and stimulating **deep** analysis.
2. Supported by **Data-Based** research & teaching.  
(**DataMOCCA**, available for (academic) adoption.)
3. Takes one back to the **basic-research** paradigm:  
Measure, Model, Experiment, Validate, Refine, etc.
4. Generates scientifically-based **design principles, tools (software) and teaching material**, downloadable at the Service-Engineering Course website <http://ie.technion.ac.il/serveng>