

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 (≥ 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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- ▶ Graduate Research Seminar
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- ▶ Elective Theoretical + Empirical (Data-Based)
- ▶ **Compulsory within Industrial-Engineering:**
attended by ≥ 100 students (I.E. and others) annually.

Main Messages

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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 .

Staffing: How Many? When? What? Who?

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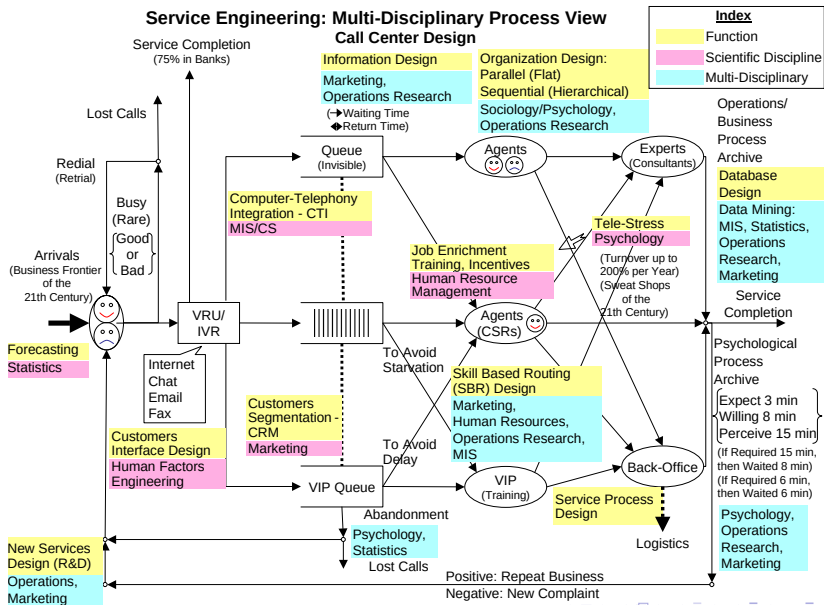
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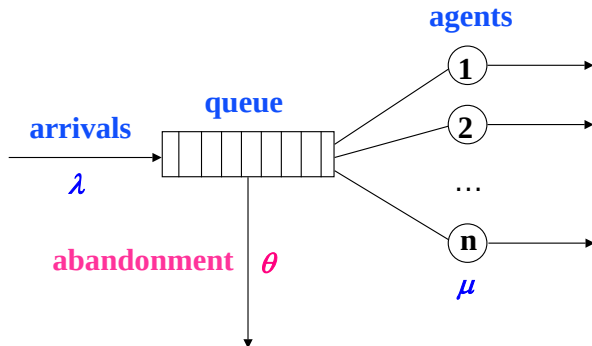
Consider, for example, **Palm/Erlang-A**: a simple (but not too simple) **Mathematical Model** of the complex reality of call centers.

Complex Reality: Call-Center Network

Service Engineering: Multi-Disciplinary Process View Call Center Design



Simple Model: Palm/Erlang-A

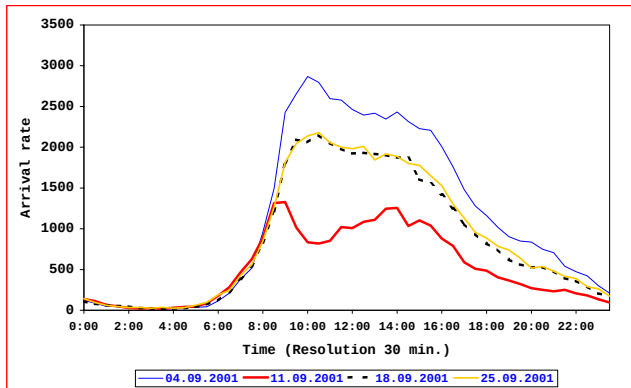


Erlang-A Parameters (Math. Assumptions):

- ▶ λ – **Arrival** rate (Poisson)
- ▶ μ – **Service** rate (Exponential)
- ▶ θ – **Impatience** rate (Exponential)
- ▶ n – Number of **Service-Agents**.

Arrivals to Service: Poisson-Relatives

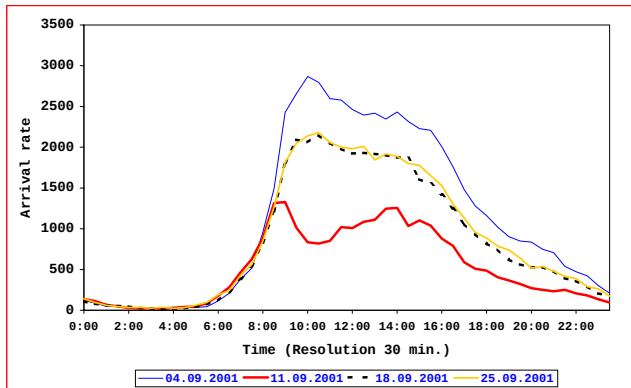
Arrival Rates on Tuesdays in a September – U.S. Bank



- **Tuesday**, September 4th: **Heavy**, following Labor Day
- **Tuesdays**, September 18 & 25: **Normal**

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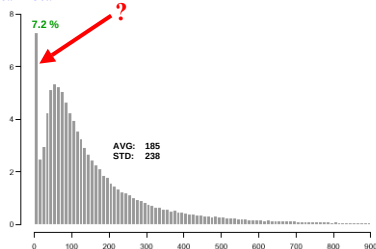
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- ▶ **Tuesday, September 11th, 2001.**

Service Durations: The LogNormal Law

Service Durations in a Typical (?) Call Center

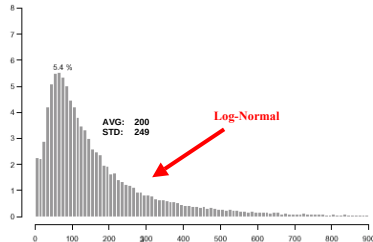
January-October

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November-December

Nov - Dec:



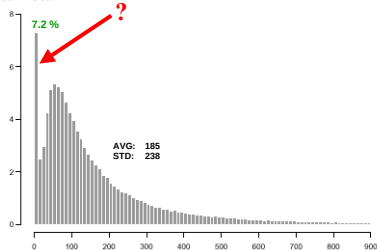
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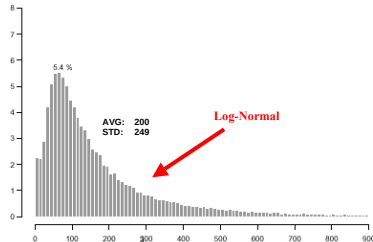
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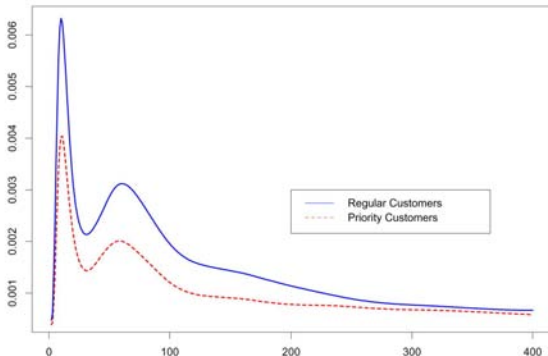
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- ▶ **Lognormal** service times prevalent in call centers
- ▶ **7.2% Short-Services:** Agents' "Abandon" (improve bonus, rest)
- ▶ **Distributions**, not only **Averages**, must be measured.

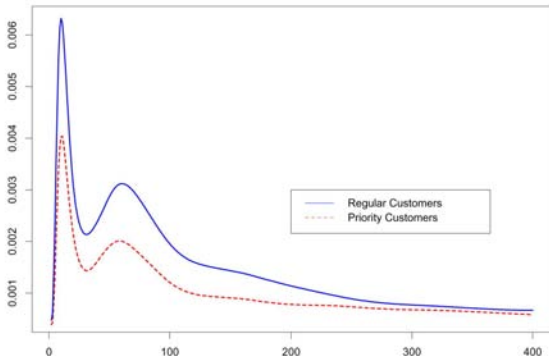
(Im)Patience While Waiting: Palm's Law of Irritation

Hazard Rates of (Im)Patience – Israeli Bank:
Regular over **VIP** Customers



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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).

Erlang-A: Simple, Useful, Robust, Insightful, Optimal

- ▶ **Simple:** 4CallCenters calculator (download in our Website)

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Yet the model often fits very well, so much so that the model is

- ▶ **Useful:** Replaces Erlang-C as the WFM standard
- ▶ **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>