

Theoretical Quantum System Design

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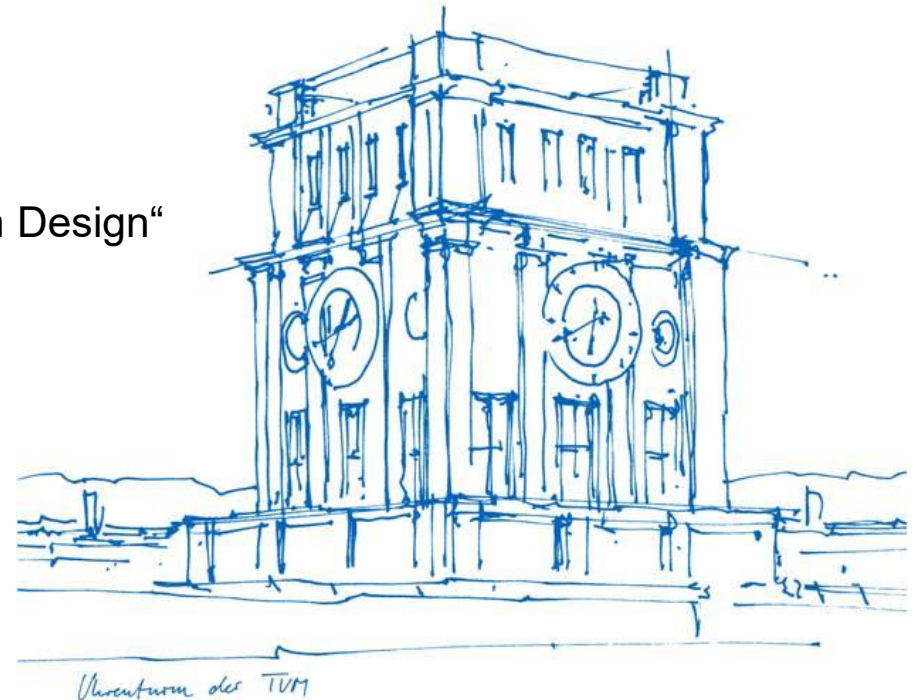
Research group „Theoretical Quantum System Design“

München, 19. Juli 2019

Emmy
Noether-
Programm



DFG Deutsche
Forschungsgemeinschaft



**Incremental
Innovation**

Moore's Law

**Quantum
Technology**

**Key
Components**

**Revolutionary
Design**

**Accurate
Planning**

**Communication
Networks**

**Information
Theory**

**Robust
Flexible**

**New Use
Cases**

Simulation

**Statistical
Analysis**

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Moore's Law

$$\lim_{t \rightarrow \infty} \frac{\textit{bits}}{\textit{photon}} = 1$$

$$\lim_{t \rightarrow \infty} \frac{\textit{bits}}{\textit{electron}} = 1$$

$$\lim_{t \rightarrow \infty} \frac{\textit{bits}}{\textit{atom}} = Z$$

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Quantum Technology

- Extremal information density
- Extremal data rates
- Entirely new adaptive long range correlations
- *Quantum* information as the successor to information
- Dramatic increase in computational power
- Perfect secrecy already at the physical layer

Moore's Law

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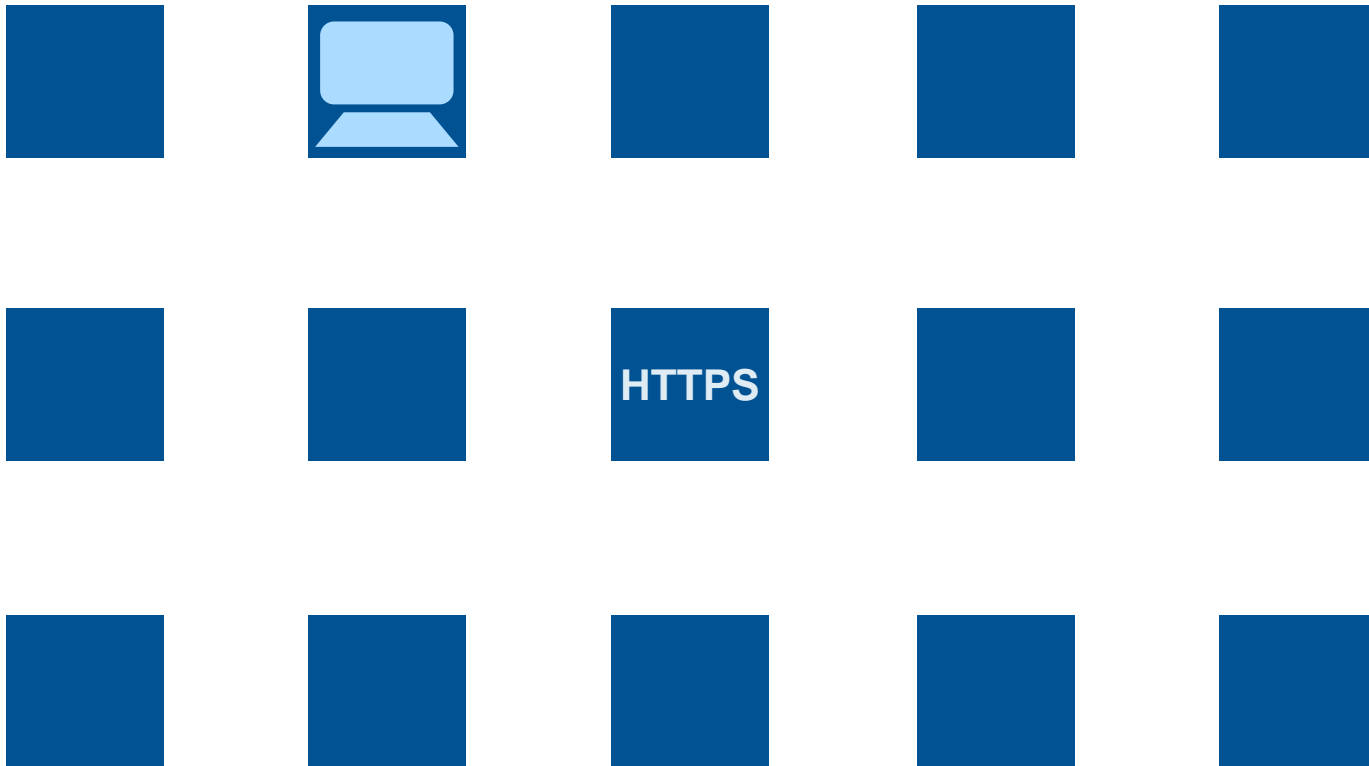
Robust
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Accurate
Planning

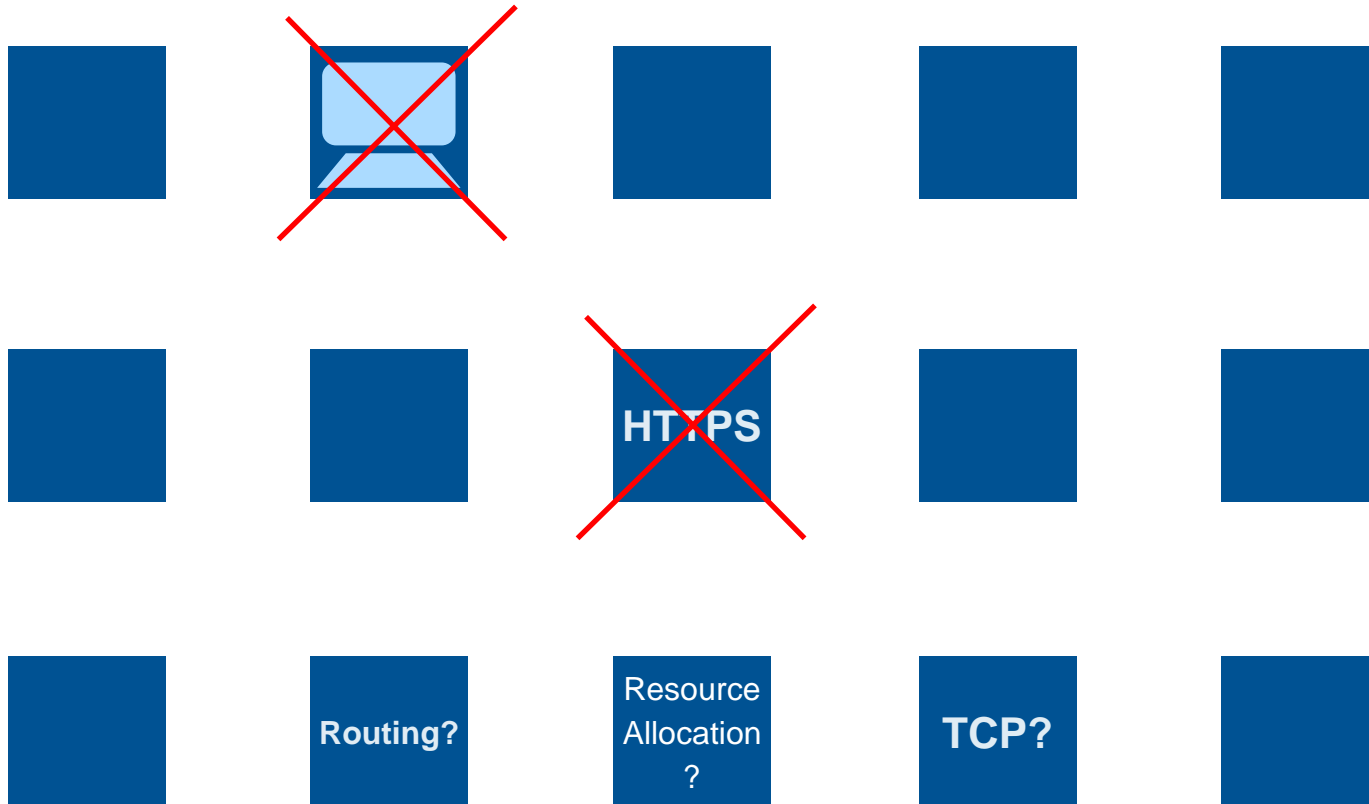
Key
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Revolutionary Design



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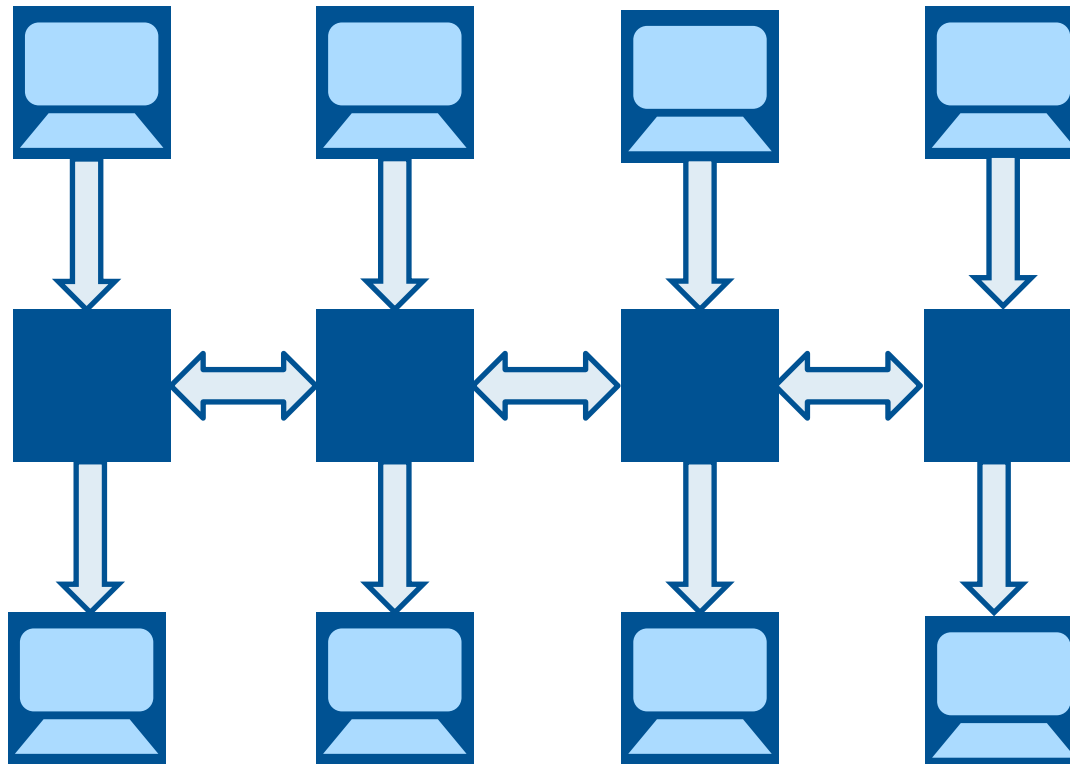
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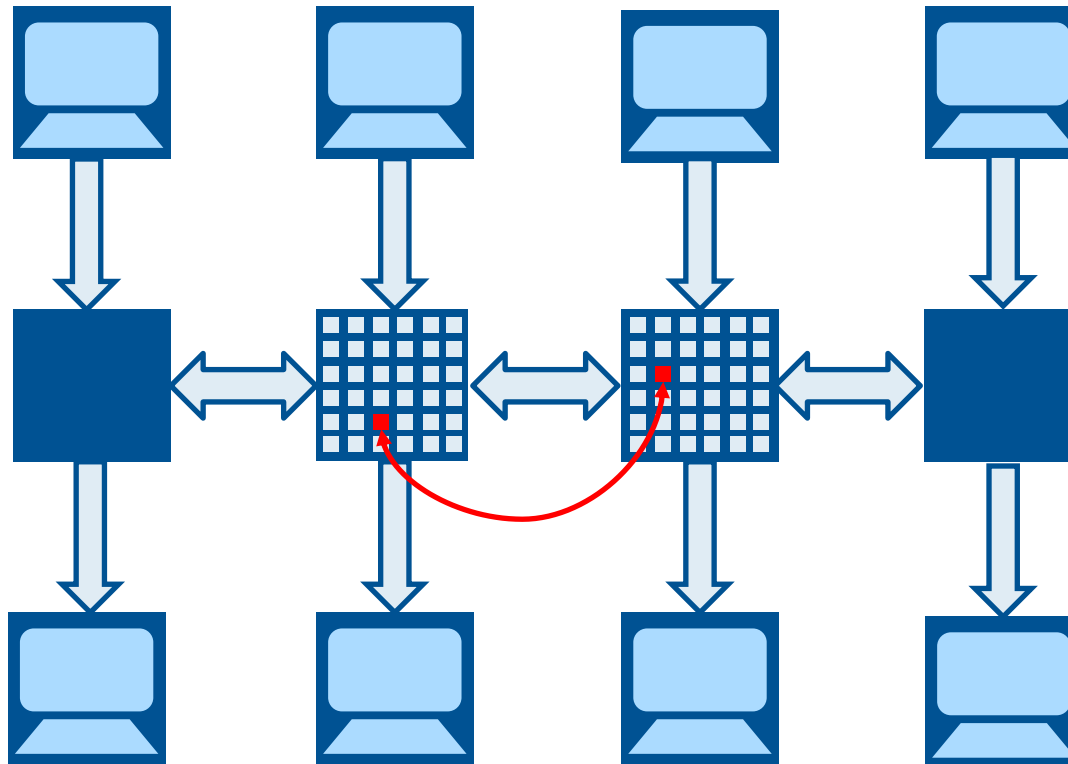
Simulation

Statistical
Analysis

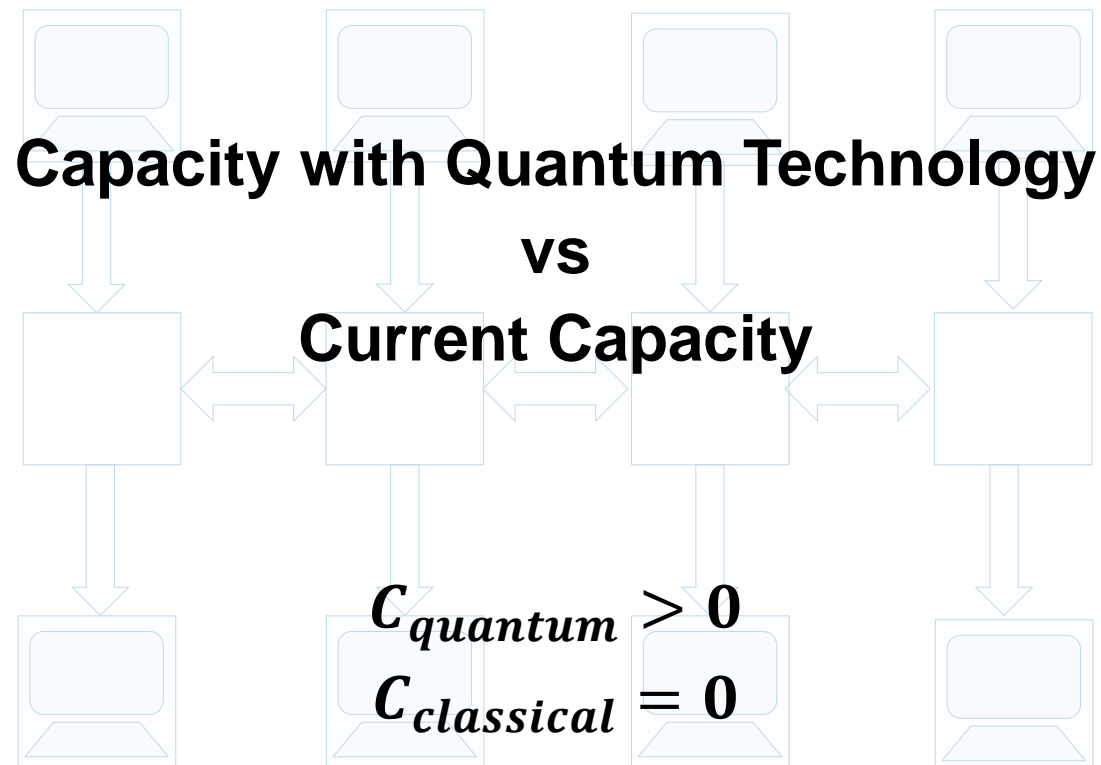
Information Theory

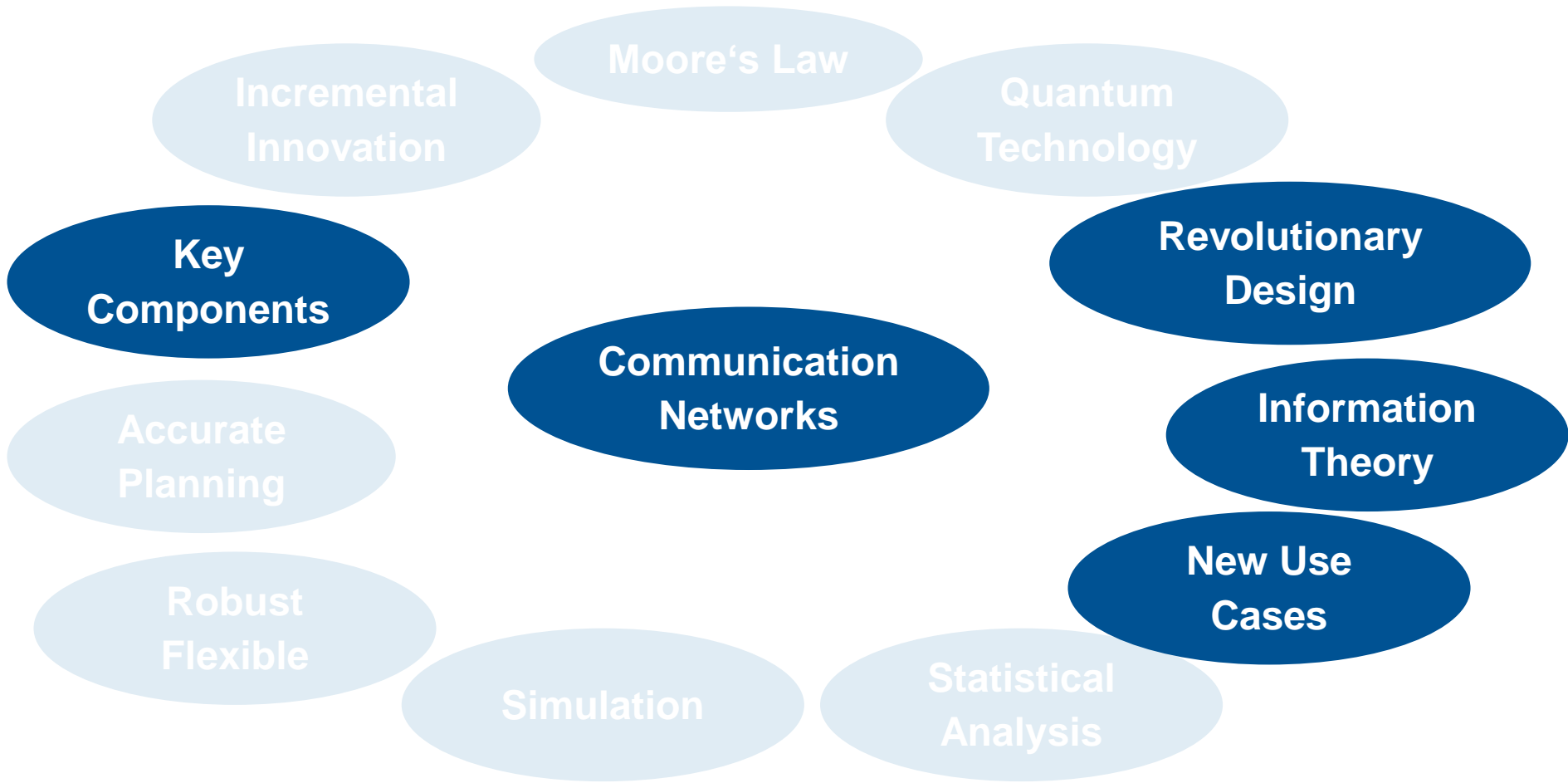


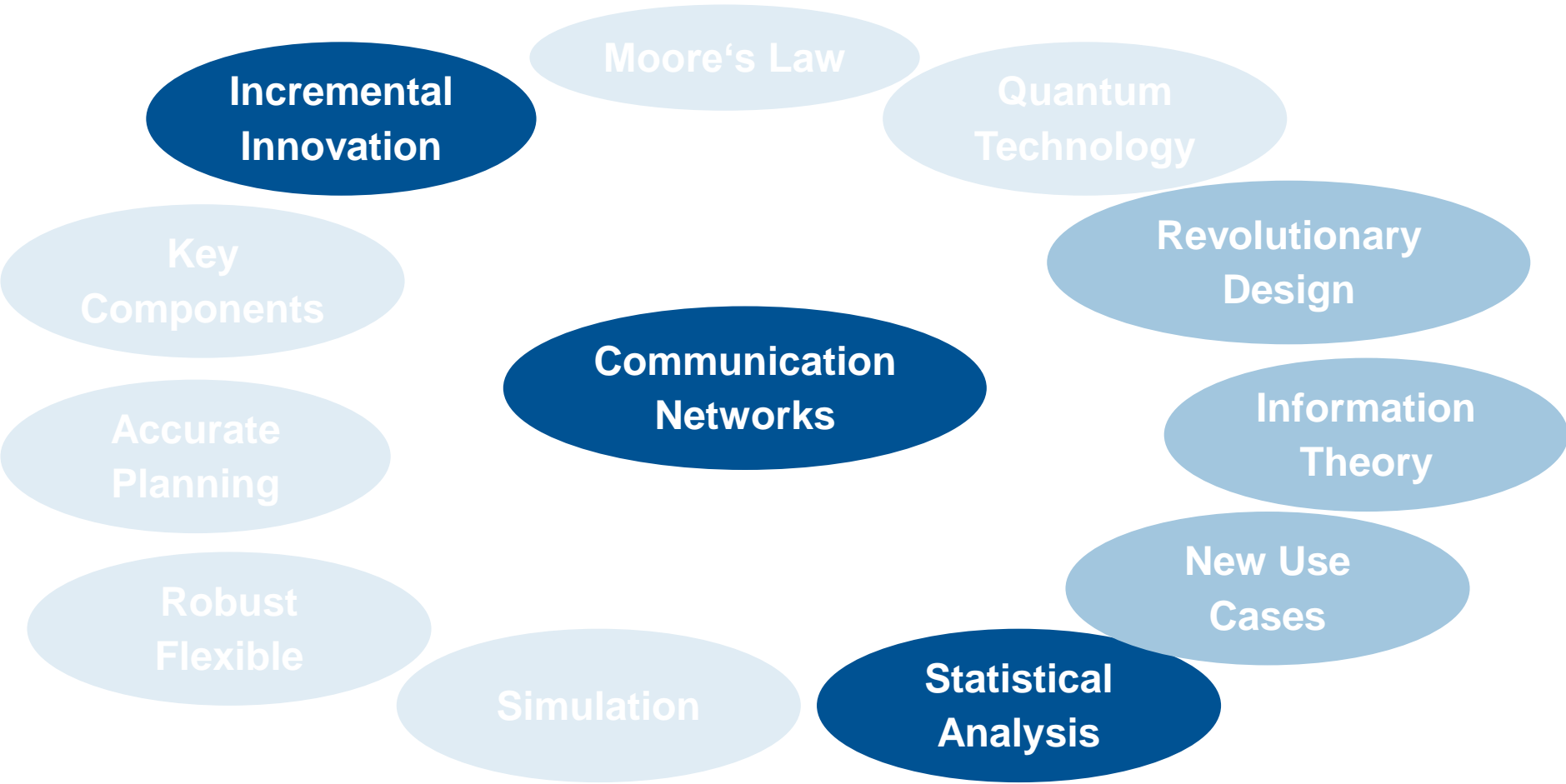
Information Theory: Multi-Party Communication



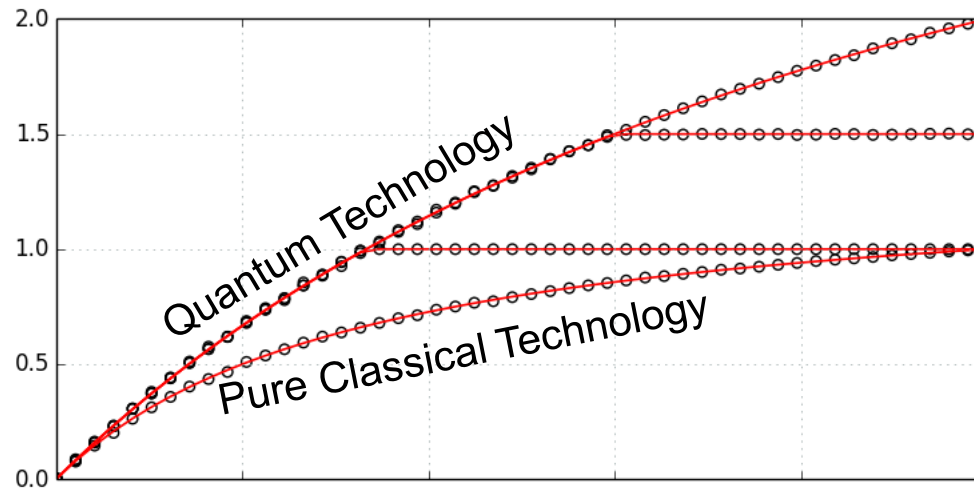
Information Theory: Extremal Gain Scenarios







Simulation and Statistical Analysis



Throughput
Delay
Error rates

Incremental
Innovation

Moore's Law

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**Build Better Networks
With Quantum Technology**

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