M-Lab: The Mobile and Ubiquitous Computing Lab

The Challenge of Identifying Value-Creating Ubiquitous Computing Applications

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Introduction – Adoption of UbiComp

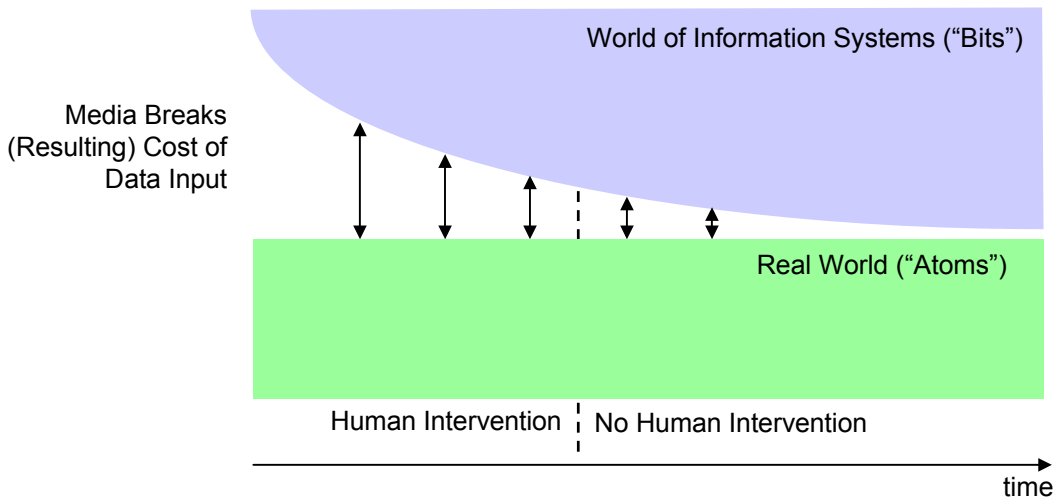
- Ubiquitous computing (UbiComp):
  - No widely accepted definition
  - Our understanding:
    UbiComp applications involve
    - large numbers
    - of non-traditional networked computing devices
    - which are often mobile
    - and/or equipped with sensors to collect data

- Status adoption:
  - Mainly pilots
  - Value creation uncertain

Introduction – Potentials of UbiComp

- **Our focus: Business applications**

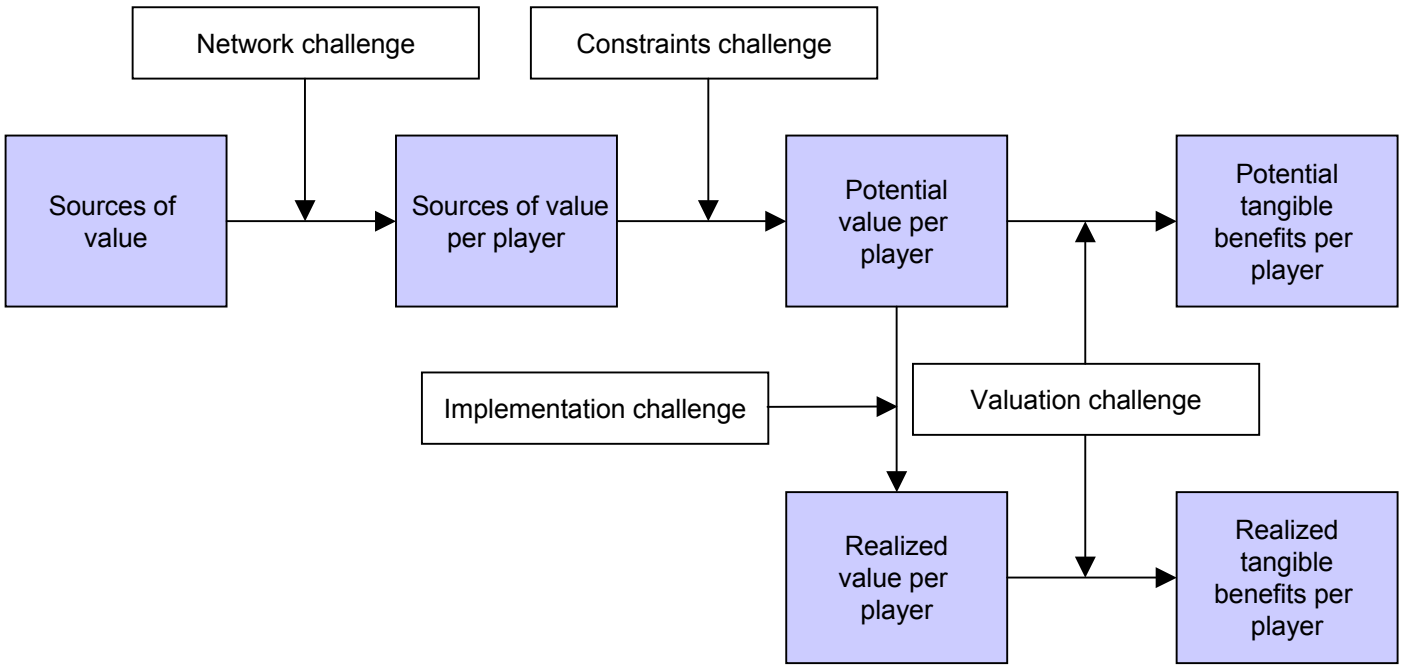
- **One of the main capabilities of UbiComp technologies in this context: Potential to reduce media breaks between the physical world and information systems**
  -> Opportunity for a more accurate, timely and detailed representation of the real world in information systems.



Research Question

What are the challenges in identifying value-creating UbiComp applications?

Proposed framework: Challenges in identifying value-creating UbiComp applications



Our Contribution

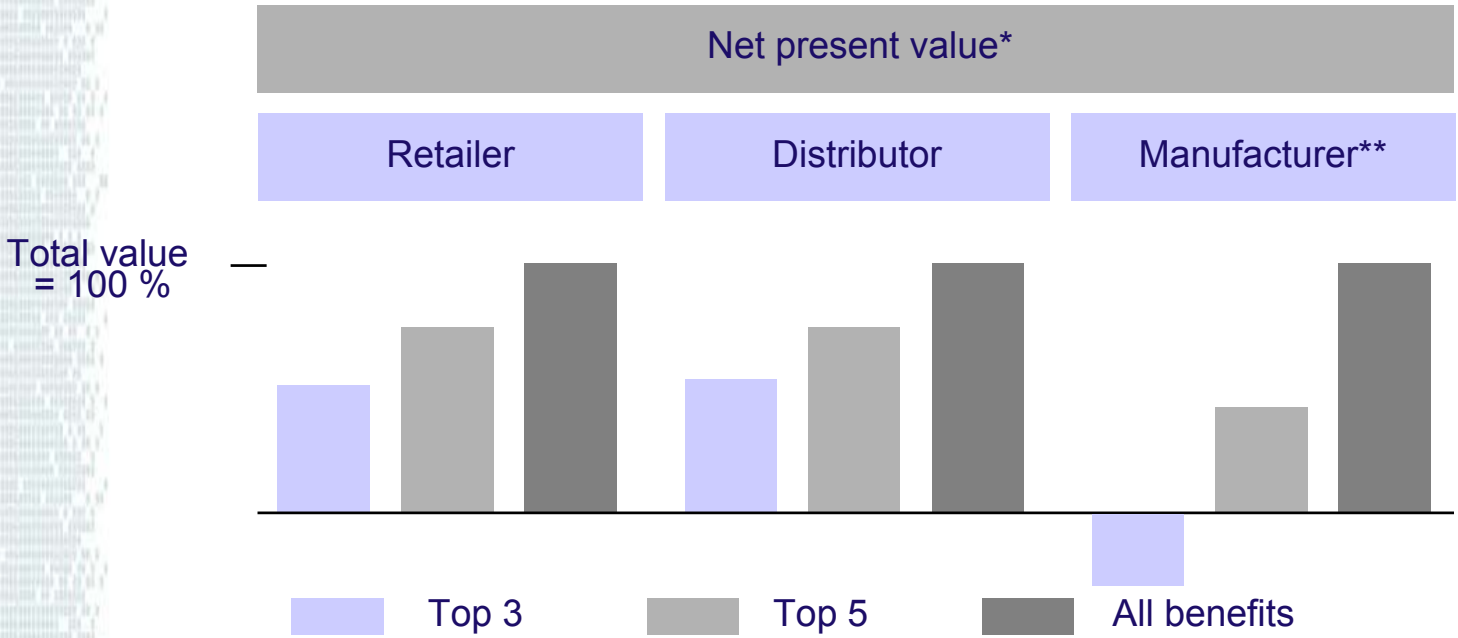
- **Proposed framework for identifying value-creating UbiComp applications**

  -> We consider what part of the value is visible to the parties involved. This is the basis on which decisions are made.

  Failure to see value in applications can hinder adoption.

  Based on framework, relevant challenges in a project can be identified and addressed early.

Illustration – Network Challenge

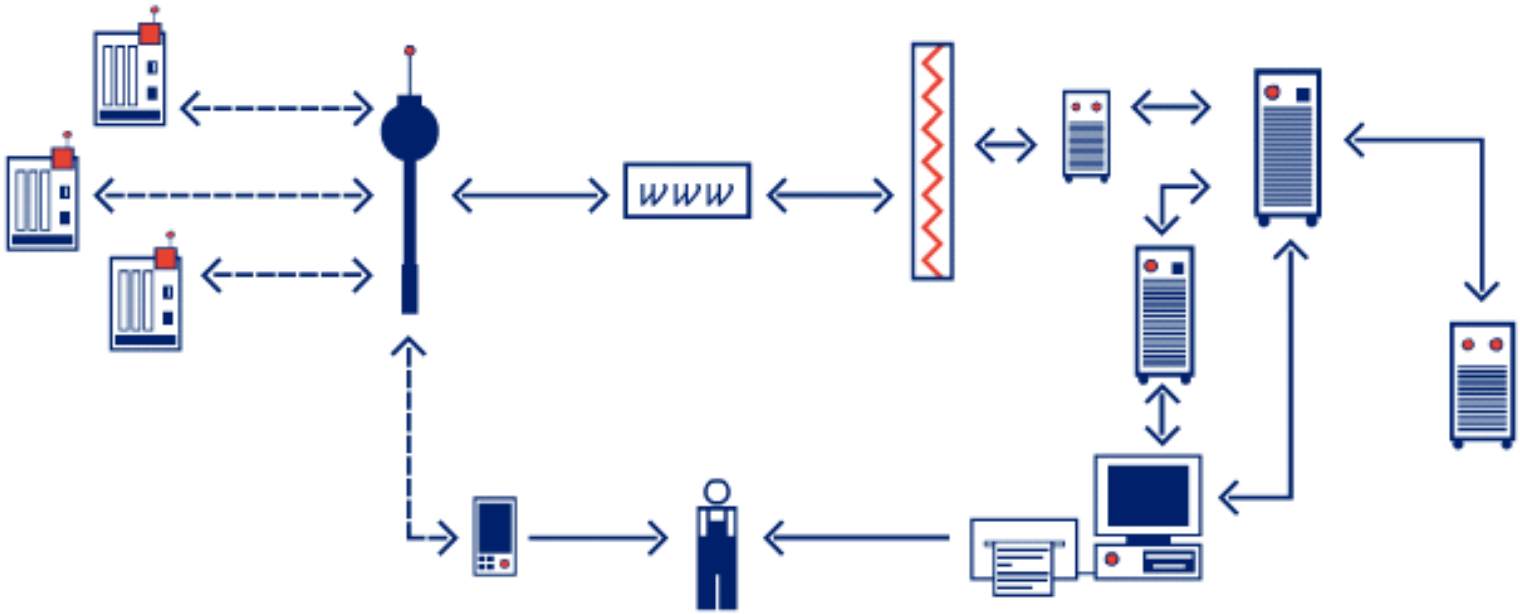


* Results of Auto-ID Calculator. Exemplary for case level tracking, based on default values
Results can vary considerably depending on the specific supply chain

** Assuming sharing of RFID tag cost over supply chain

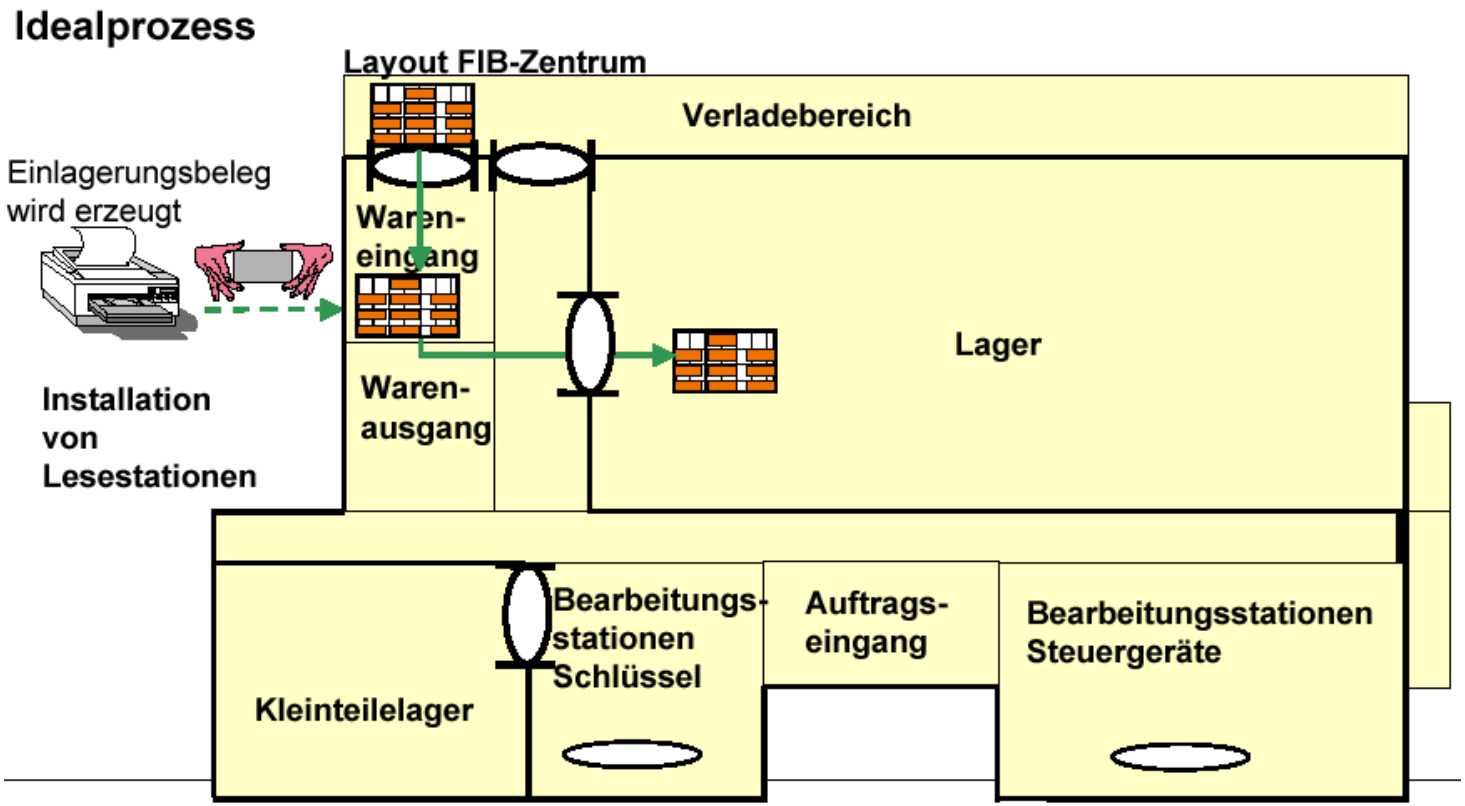
- **Example:**
  - **Will the manufacturer initially be willing to invest in the technology?**

Illustration – Constraints Challenge



- **Example:**
  - **How can a company increase product availability based on real-time data when current processes and cost structure do not allow for dynamic routing?**

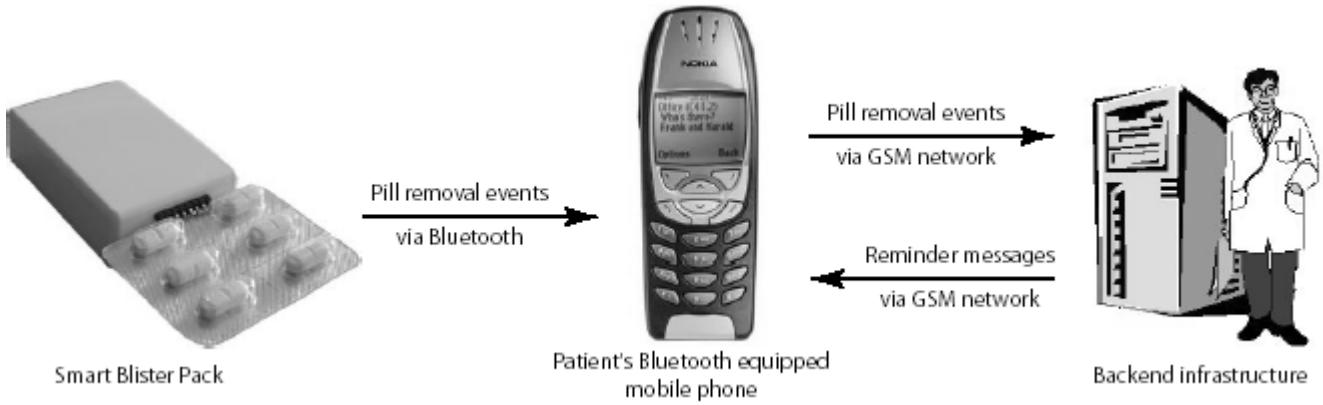
Illustration – Implementation Challenge



- **Example:**
  - **How much value gets lost if a promising application is not realized due to lack of available human resources to conduct the project?**

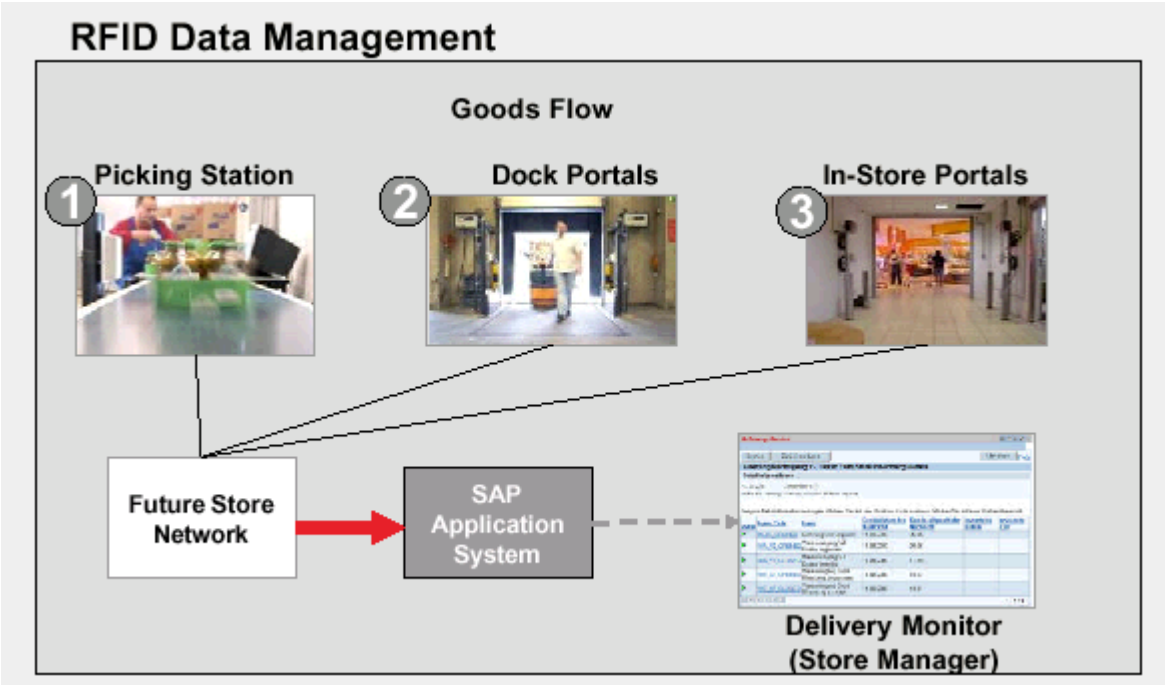
Illustration – Valuation Challenge ex-ante

- Sensors integrated into blister pack to detect pill removals
- Bluetooth module to communicate with mobile phone
- Mobile phone as user interface and home gateway



- **Example:**
  - **Will such a monitoring solution increase compliance?**
  - **What value would hereby be created, e.g. by reducing the churn rate?**

Illustration – Valuation Challenge ex-post



- **Example:**
  - **By how much can UbiComp technologies really increase labor efficiency and product availability once rolled-out completely?**

Conclusions

- The challenges identified are not unique for UbiComp applications
- Framework can help to identify critical issues early that can make it difficult to come up with sound business cases for UbiComp applications
- However, three of them are from our point of view of specific relevance for UbiComp applications:
  - The network challenge

    (due to number of players, new business models being discussed)
  - The constraints challenge

    (due to compatibility issues with existing processes and need for new functionality in information systems in order to to deal with additional data)
  - The ex-post valuation challenge

    (due to limited experience with "life" applications that would allow to measure realization of benefits after implementation)

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Backup

Research Method – Background

- **Project: M-Lab (www.m-lab.ch), together with ETH Zürich (Prof. Friedemann Mattern)**

ETH Eidgenössische Technische Hochschule Zürich Swiss Federal Institute of Technology Zurich

University of St.Gallen

- **Objective:**

  "The M-Lab concentrates on identifying and creating effective business applications for smart things in the area of B2B – from the idea to the demonstrator."

  -> Generate learnings from projects and other activities

- **Current partner companies (M-Lab II):**

Infineon technologies, MIGROS, SAP, SAP SI, SIG, swisscom mobile, Swiss Re

- **Auto-ID Center since April 2003**

AUTO-ID CENTER

Research Method – Details

- Action research
- Challenges encountered in several projects
- Proposed framework based on literature review and experience from projects
- Examples given to provide evidence for the relevance of the challenges

Related Work I

- **Taxonomies for classifying information technology applications:**
  - **Farbey, B., Land, F.F., Targett, D. (1995)**

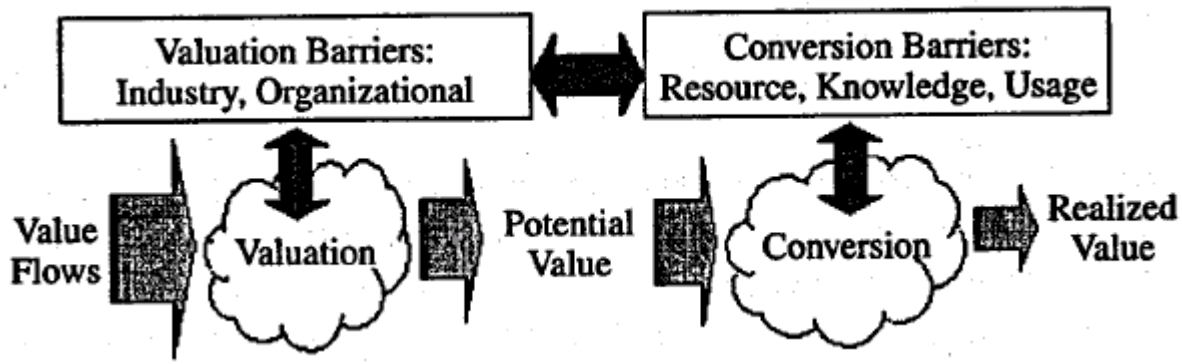
Rang no.	Description
8	Business transformation
7	Strategic systems
..	...
2	Automation
1	Mandatory changes

Moving up the ladder:
- **Increased complexity of evaluation**
- **Increased degree of risk and uncertainty**

  - **Venkatraman, N. (1994)**

Related Work II

- **Limits-to-value framework:**
  - **Chircu, A.M., Kauffman, R.J. (2000)**



Focus: Barriers that prevent the sources of value from being fully realized

Our Contribution – Details

- **Limitations of limits-to-value framework:**
  Barriers that prevent the sources of value from being fully realized, independent of their visibility

- **Incorporate ideas from taxonomies of information systems into the framework regarding evaluation complexity, risk, and uncertainty**

- **Contribution: Proposed framework for UbiComp applications**

  -> We consider what is visible to the parties involved.
  This is the basis on which decisions are made.

  Failure to see value in applications can hinder adoption.

  Based on framework, relevant challenges in a project can be identified and addressed early.

Managerial Implications

- Two generic approaches towards UbiComp based on perception of challenges?
  - Incremental improvements and quick wins:
    - Realize applications that involve only a few players
    - Focus on applications which are compatible with existing systems and processes
    - Select applications with tangible benefits that are easily observable after implementation
  - Radical innovation:
    - Scan, elaborate and prioritize a large number of potential applications
    - Engage in industry initiatives, collaborate with other companies, develop internal resources, and seek close contact with academic institutions
    - Conduct extensive pilots