An Economic Perspective of Public Key Infrastructures
SUMMARY

PREAMBLE
- PKI penetration rate?
- PKI maturity?

COSTS
- Items that should be considered when estimating the cost of a PKI?

REVENUES
- Processes that generate revenue streams based on PKI?

METRICS & INDICATORS
- Value metrics to assess the economic impact of PKI?
- Significant KPIs?

RISKS & UNCERTAINTY
- Uncertainty characterizing the performance of a PKI?

OPEN ISSUES
- Extend the evaluation methodology to future usages of PKI?
PKI Penetration Rate

**SWEDEN ~ 88%**
- ✓ Influence of the electronic ID.
- ✓ Development of e-services.

**ARABIC COUNTRIES ~ 3%**
- ✗ Lack of online content.
- ✗ Late implementation.
- ✓ Efforts directed towards e-government.

Source: Inhouse benchmarking.
### Content development

**Strong correlation with PKI**

**Investments not necessarily balanced with exports**

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**Source:** Infrastructure Economy Report, 2012 (UNCTAD).

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<table>
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<tr>
<th>Metrics &amp; Indicators</th>
<th>Risks &amp; Uncertainty</th>
<th>Open Issues</th>
<th>Discussion</th>
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**Preamble**

**Costs**

**Revenues**

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**Diagram Description**

The diagram illustrates the relationship between computer software and services spending as a percentage of GDP and the share of economy. It categorizes countries into four types:

- **A. Low share of economy**
  - High export intensity
- **B. Low share of economy**
  - Low export intensity
- **C. High share of economy**
  - Low export intensity
- **D. High share of economy**
  - High export intensity

The countries are plotted on a graph with the x-axis representing computer software and services spending as a percentage of GDP, and the y-axis representing the ratio of computer software and information exports to computer software and services spending.

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**Country Examples**

- **Sri Lanka (1.1)**
- **Uruguay (17.7)**
- **Costa Rica (11.7)**
- **Romania (1.1)**
- **Jamaica (1.8)**
- **India (4.4)**
- **Philippines (2.1)**
- **Argentina**
- **Morocco**
- **Ukraine**
- **Malaysia**
- **China**
- **South Africa (2.2)**

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**Country Name Examples**

- **Morocco**
- **Ukraine**
- **Malaysia**
- **China**
- **South Africa (2.2)**

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**Country Statistics**

- **GDP Percentage**
  - High share: Sri Lanka (1.1), Uruguay (17.7), Costa Rica (11.7), Romania (1.1), Jamaica (1.8), India (4.4), Philippines (2.1)
  - Low share: Argentina, Morocco, Ukraine, Malaysia, China, South Africa (2.2)

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**Notes**

- Infrastructure Economy Report, 2012 (UNCTAD)
- Data is sourced from various international reports and databases.
E-government

6 Arab countries in top 50

Tunisia ranked 1st in Africa

Good potential
Return-of-experience analysis is required
PKI in the Arab World – 15 years later

15 years later

TUNISIA
2000

MOROCCO
2007

EGYPT
2004

OMAN
2008

SAUDI ARABIA
2008

Many ongoing projects

?
Return-on-Investment (RoI)

MATURITY

Enough data to conduct accurate analyses.

UNBALANCED RoI

Benefits are often lower than expectations

Need for RoI assessment mechanisms
COSTS

HARDWARE

SOFTWARE

MANPOWER

HUMAN RESOURCES

PREAMBLE  COSTS  REVENUES  METRICS & INDICATORS  RISKS & UNCERTAINTY  OPEN ISSUES  DISCUSSION
BENEFITS

- DIRECT INCOME
- EFFICIENCY IMPROVEMENT
- DELAY REDUCTION
- SECURITY IMPROVEMENT

PREAMBLE

COSTS

REVENUES

METRICS & INDICATORS

RISKS & UNCERTAINTY

OPEN ISSUES

DISCUSSION
CONTEXT-AWARENESS

COSTS & BENEFITS DEPEND ON THE CONTEXT WHERE THE PKI IS IMPLEMENTED
KPIs - Costs

How to measure the costs?

Hardware
- Servers
- HSMS
- Smartcards

Software
- CA
- CRL, OCSP
- Client signature

Manpower
- Interfaces between CA modules
- In-house development

Metrics & Indicators
KPIs - Benefits

How to measure the benefits?

- **Number of new customers**
  - Customer registration rate
  - Churn rate?

- **Delay reduction**
  - Average process delay
  - Time-to-market

- **Threat reduction**
  - Number of attack attempts
  - False positive rate
Example - 1

2010-2013

Number of new customers
Example - 2

2010 - 2013

Website hacking

Number of hacked websites

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<th>Year</th>
<th>2010</th>
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<th>2012</th>
<th>2013</th>
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Interpolation based on regional statistics

Métrics & Indicators

Costs

Revenues

Risks & Uncertainty

Open Issues

Discussion
# 2012

## Net benefit per certificate

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OPEN ISSUES

WILL PKI ADAPT TO NEW NETWORKING/COMPUTING PARADIGMS?

CLOUD COMPUTING
- New investment models
- New governance models
- Risk sharing

BIG DATA
- Complexity of cryptographic routines
- Multiple processing needs (e.g., search, aggregation)
- Dramatic increase in size

IoT
- No IP addresses
- Limited CPU, memory, and storage resources
- Dynamic space-time behavior

SOCIAL NETWORKS
- New types of communities
- New types of threats
THANKS FOR YOUR ATTENTION