

Measuring digital development for policy-making: Models, stages, characteristics and causes

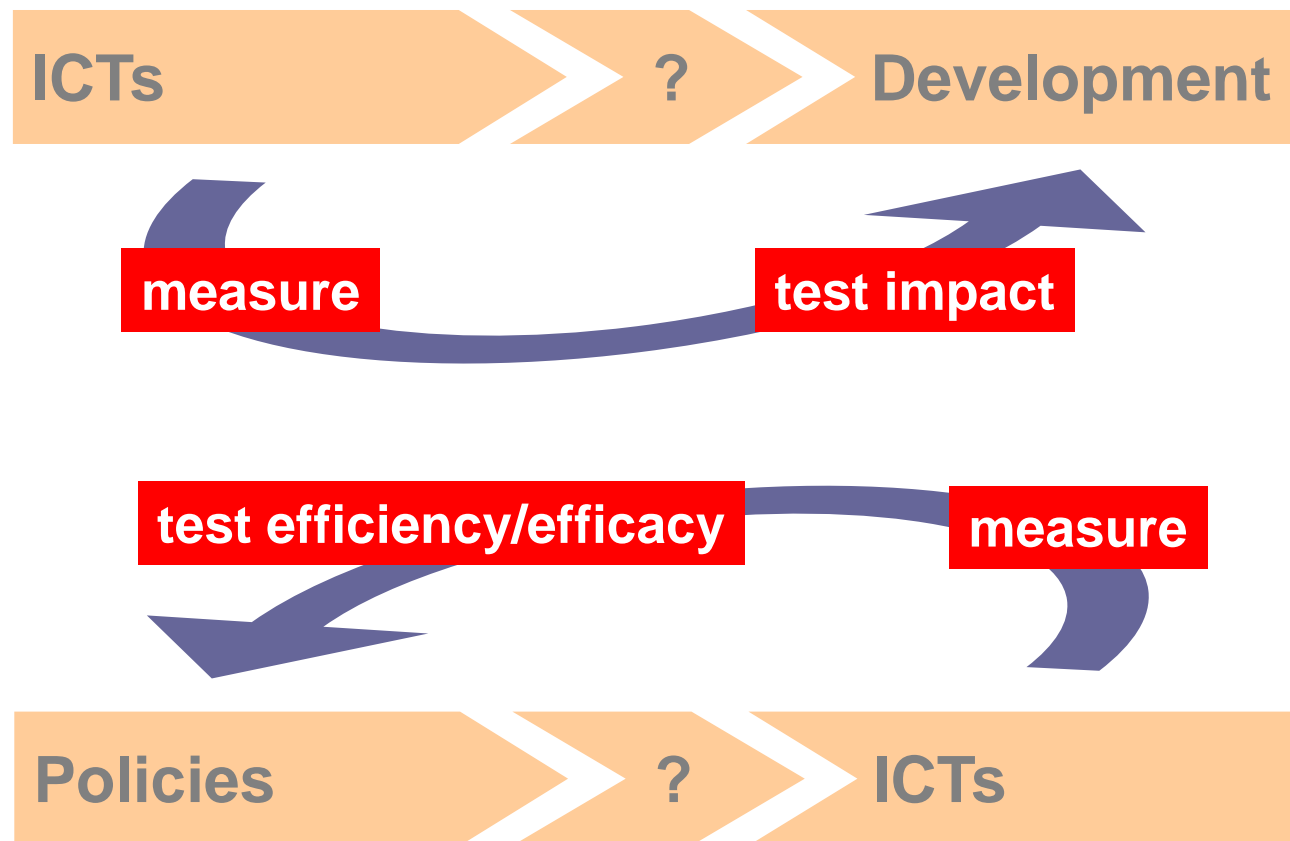
The role of the Government

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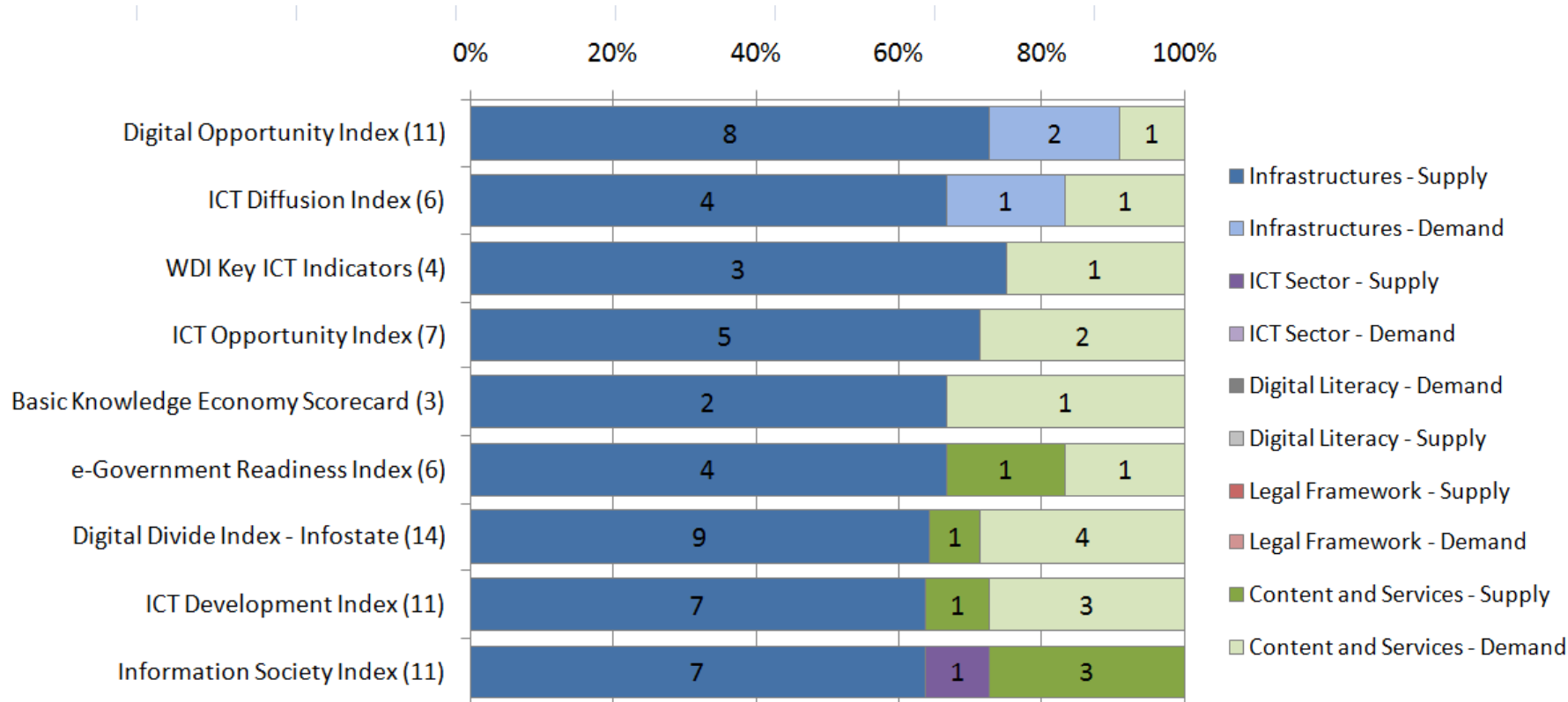
Direcció General de la Societat de la Informació
Barcelona, June 2nd, 2009

Introduction

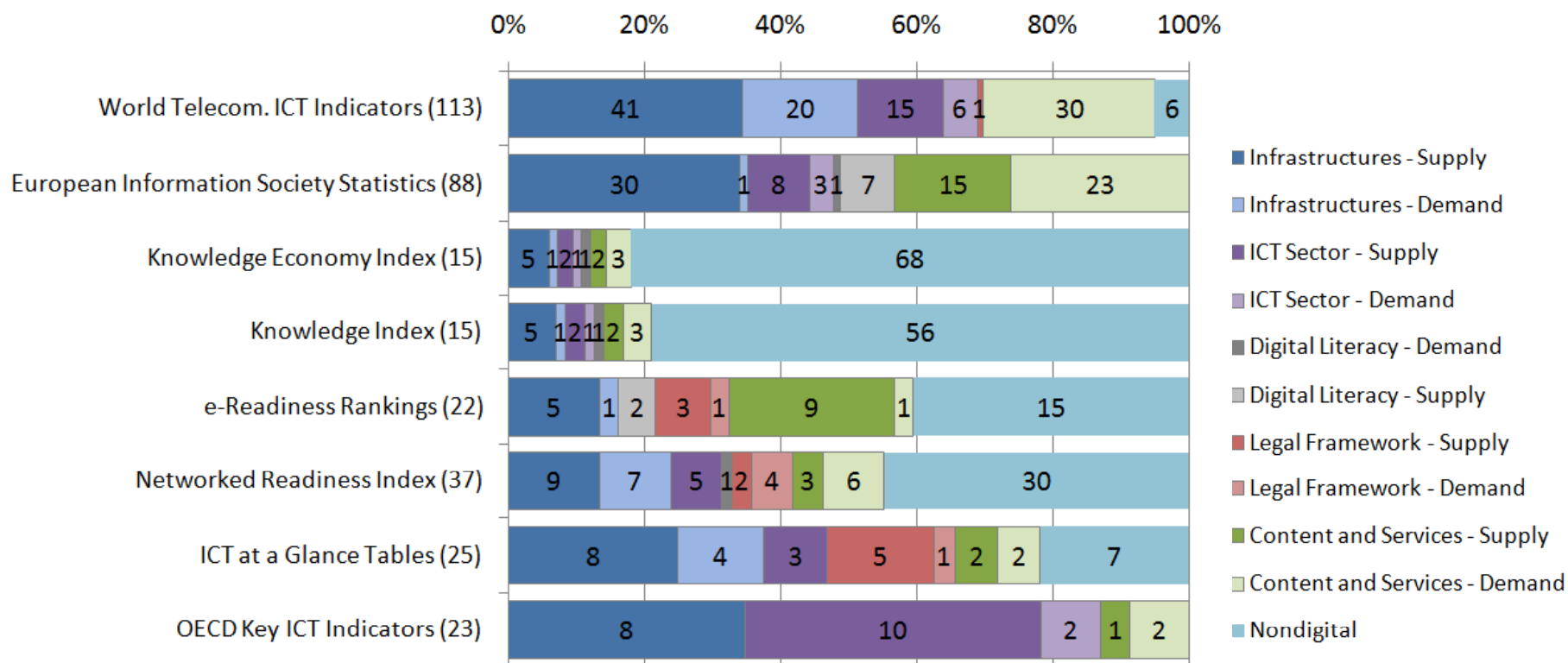
Fostering the information society?



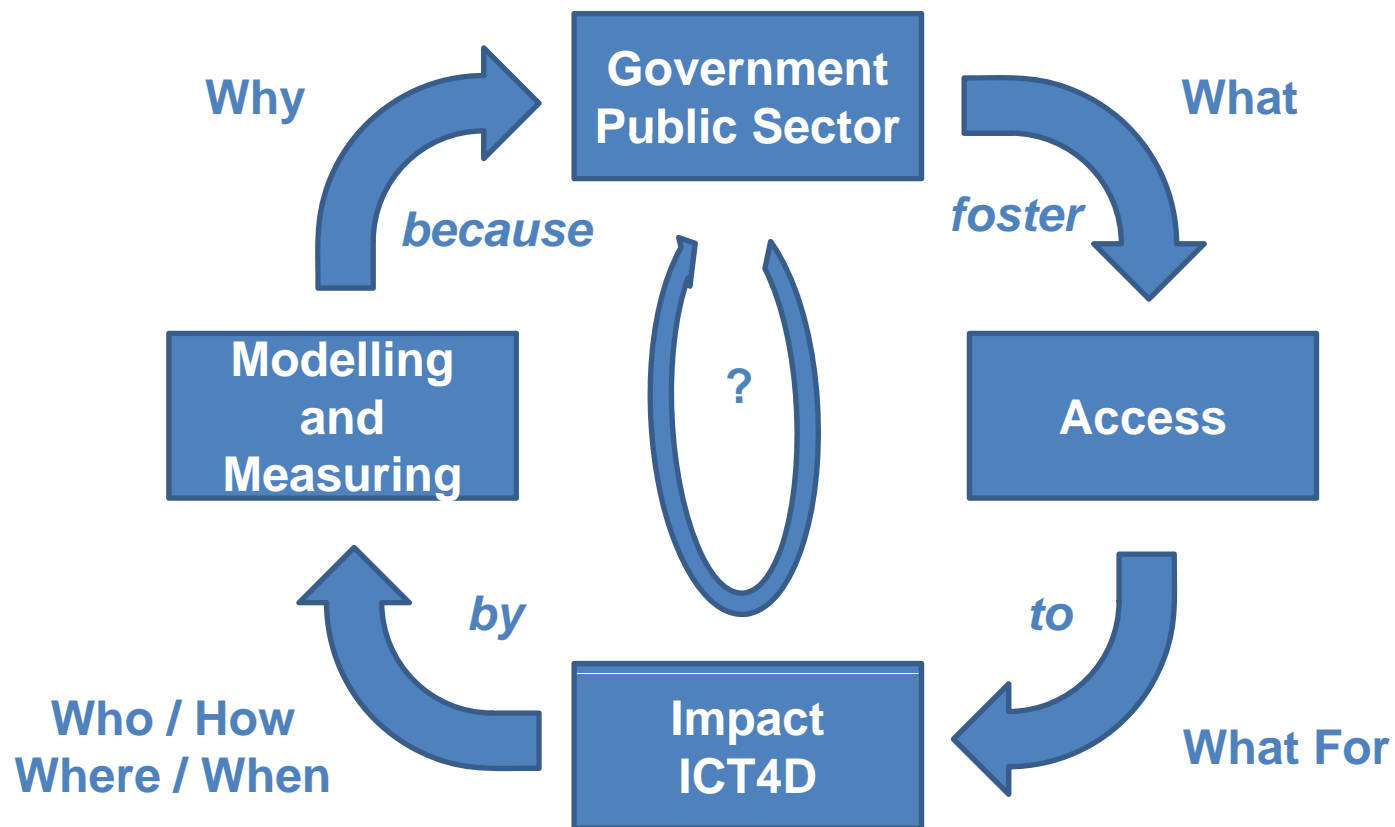
The Telecom Approach



The Broadcasting/e-Readiness approach



General approach of the research



Goals of this presentation

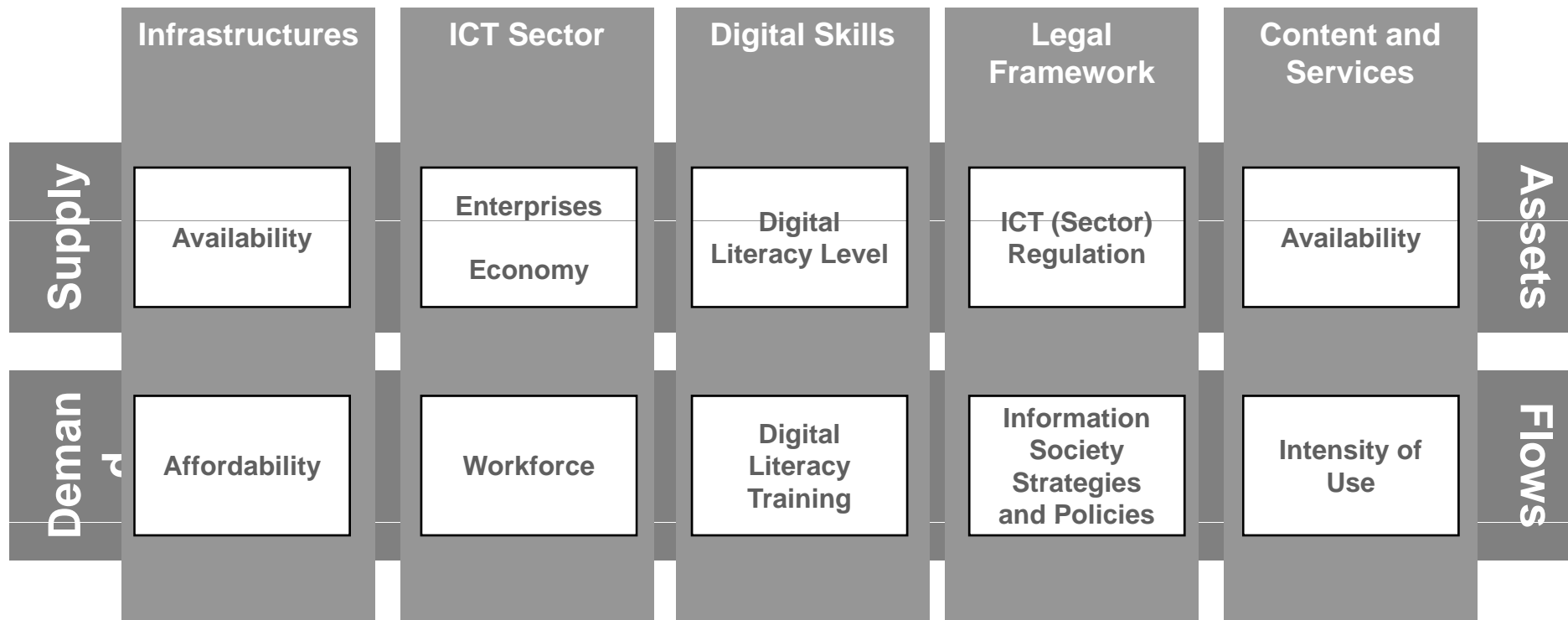
- **Present a 360° digital framework**
- **Identify stages of digital development (cluster analysis)**
- **Characterize digital development stages: indicators related with the government and the public sector at large (contingency tables)**
- **Find the determinants of digital development related with the government**
- **Advices for policy-making**

Methodology

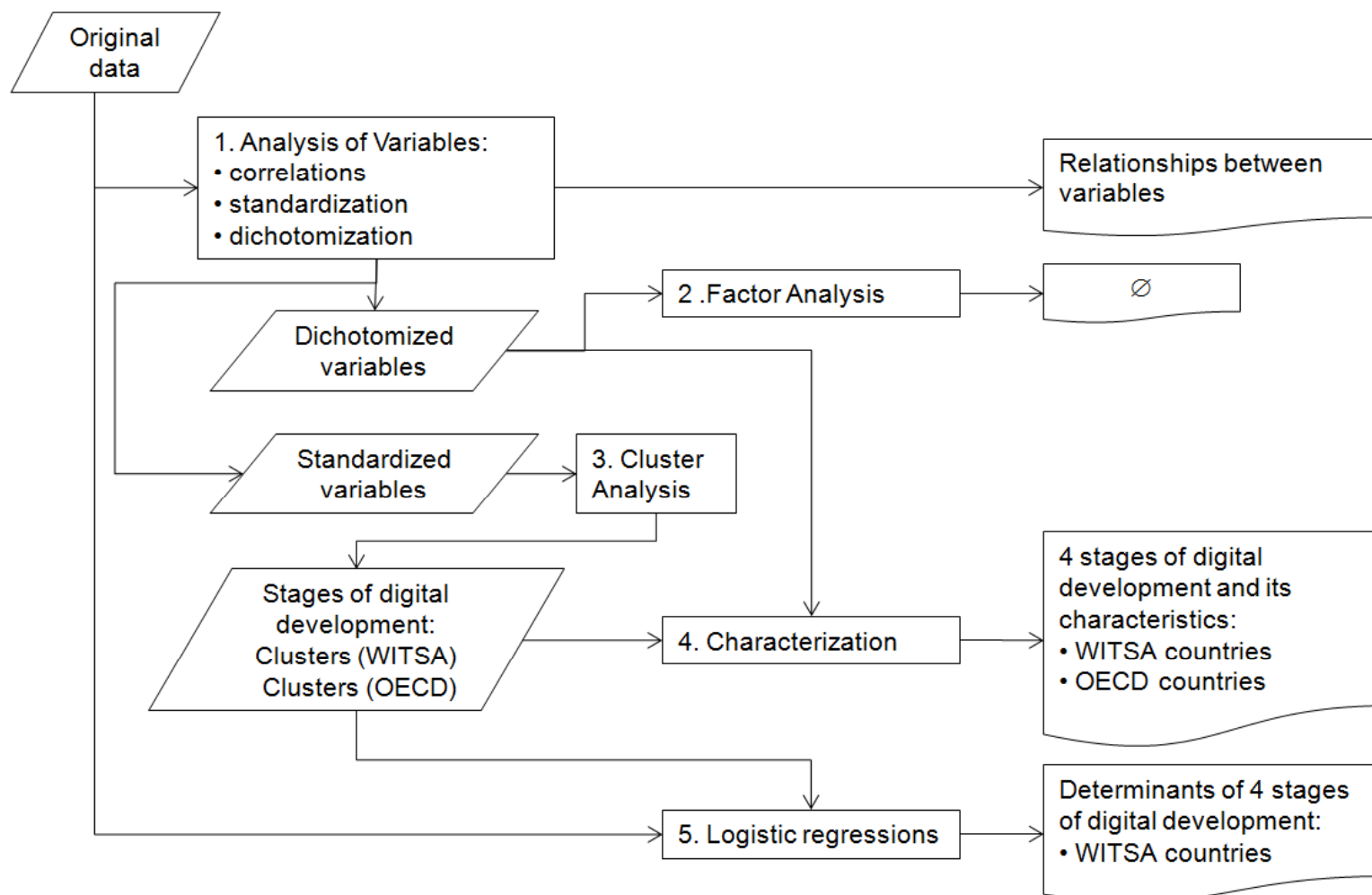
Qualitative analysis (summary)

- **55 models of the Information Society**
- **Iterative methodology**

360° Digital Framework



Quantitative analysis: methodology



Qualitative analysis: dataset

Initial dataset

- 14 databases
- 157 variables
- 257 countries
- 1 series with values of year 2007 (some exceptions)

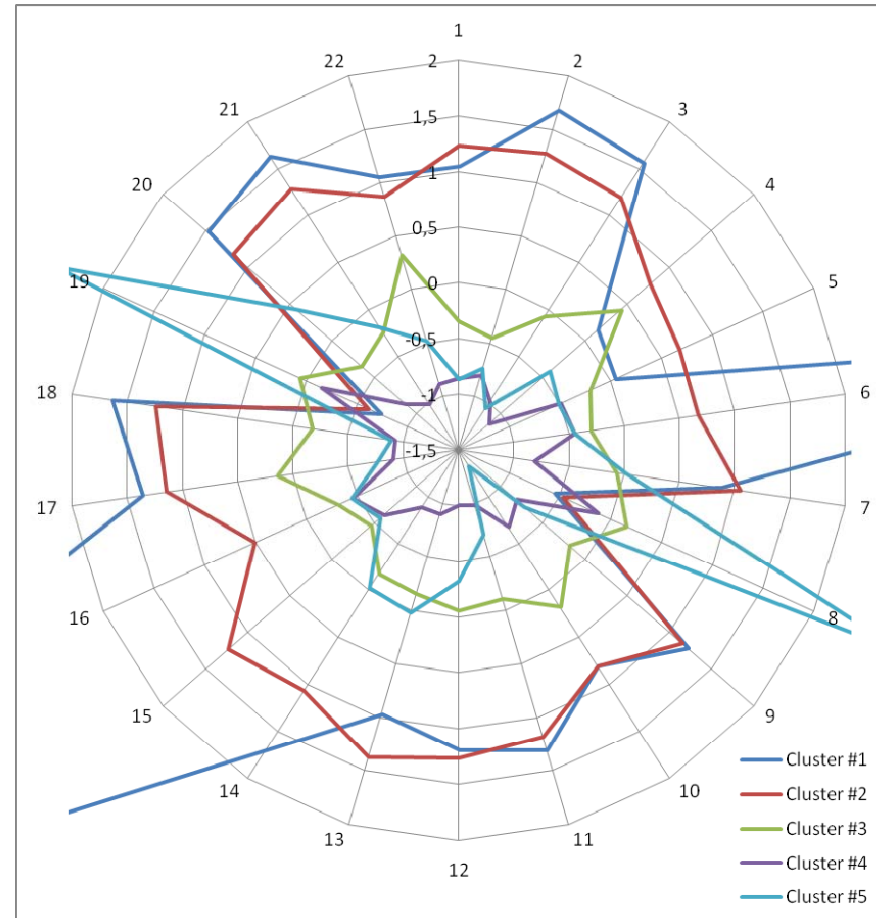
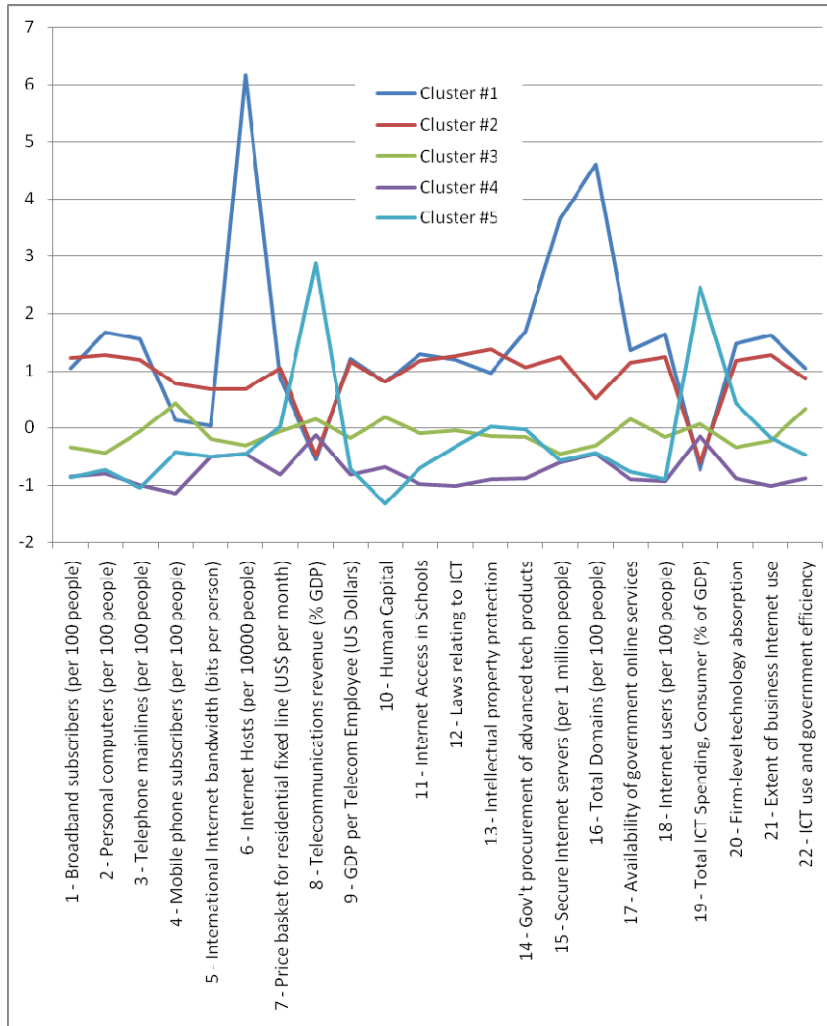
Final dataset

- 14 databases
- 49 countries (WITSA dataset) / 28 countries (OECD dataset)
- cluster analysis: 22 variables (WITSA) / 17 variables (OECD)
- characterization: 65 variables (WITSA) / 53 variables (OECD)

Results

Stages of digital development

Stages of digital development (WITSA)

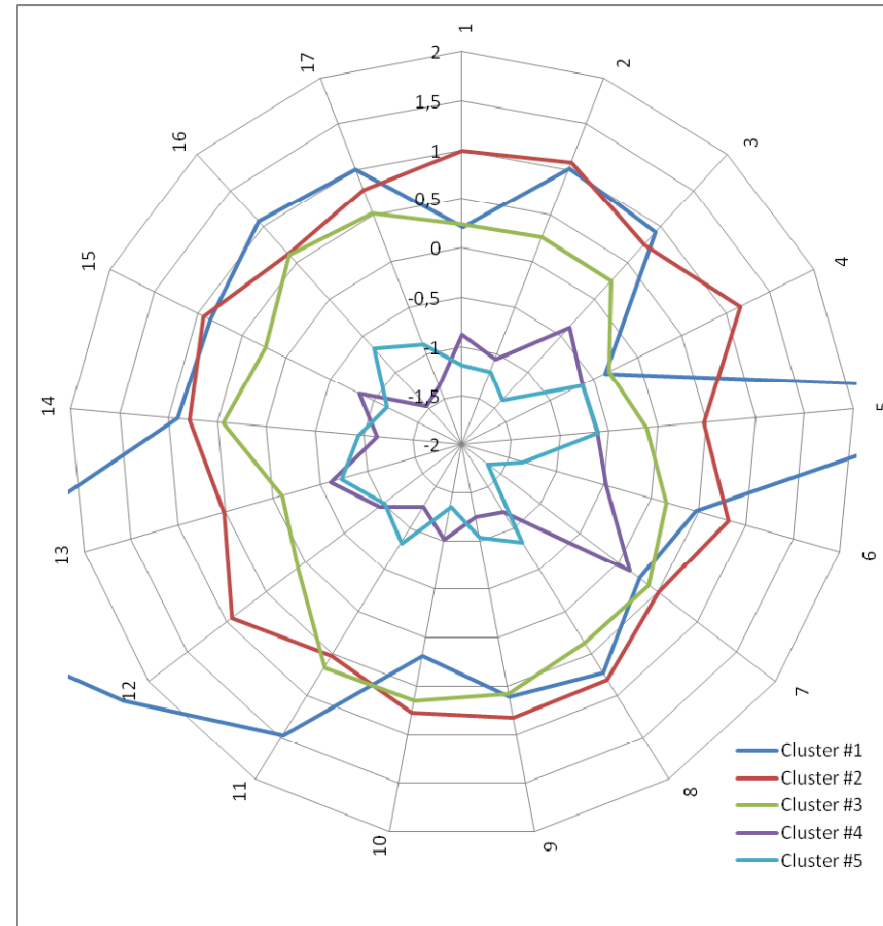
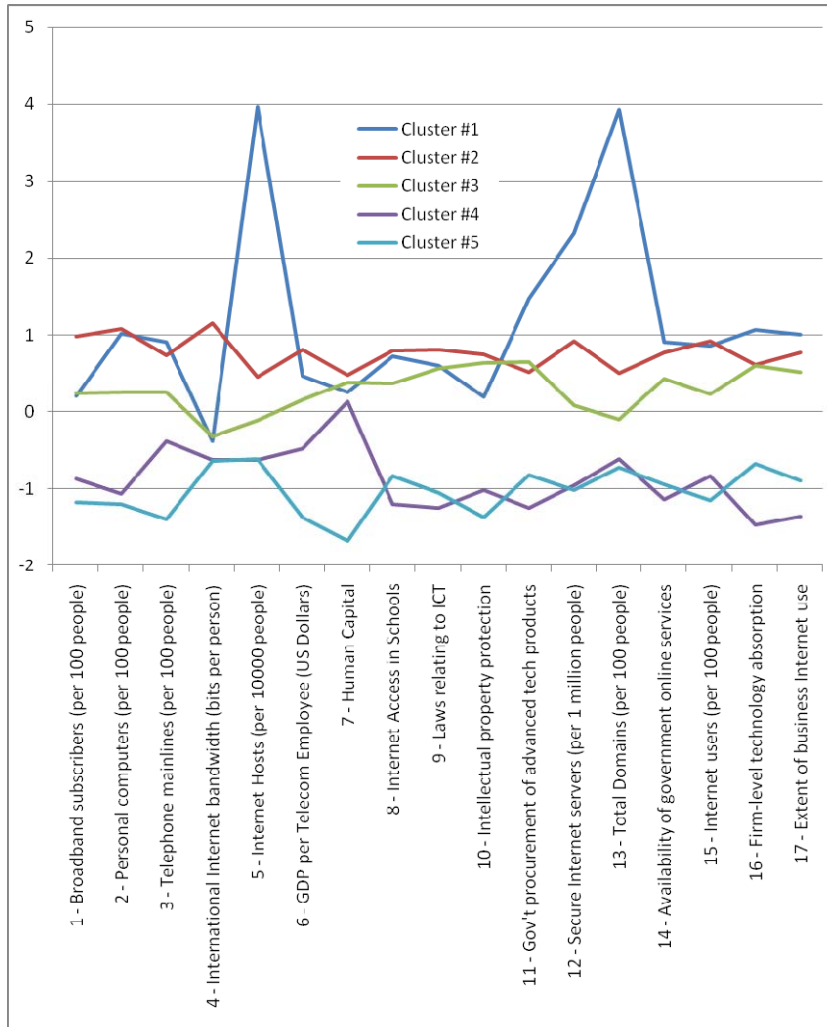


Cluster centre values for WITSA countries

Stages of digital development (WITSA)

- **Digital leaders:** United States, Australia, Austria, Finland, France, Germany, Ireland, Japan, Rep. of Korea, New Zealand, Norway, Singapore, Sweden, Switzerland, United Kingdom
- **Digital strivers:** Brazil, Bulgaria, Chile, Greece, Hungary, Italy, Jamaica, Mexico, Panama, Portugal, Romania, Saudi Arabia, Spain, Thailand, Tunisia, Uruguay, United Arab Emirates
- **Digital laggards:** Argentina, Bolivia, Ecuador, Egypt, India, Indonesia, Pakistan, Peru, Philippines, Sri Lanka, Algeria, Cameroon, Vietnam, Zimbabwe
- **Digital leapfroggers:** Jordan, South Africa, Senegal

Stages of digital development (OECD)



Cluster centre values for WITSA countries

Stages of digital development (OECD)

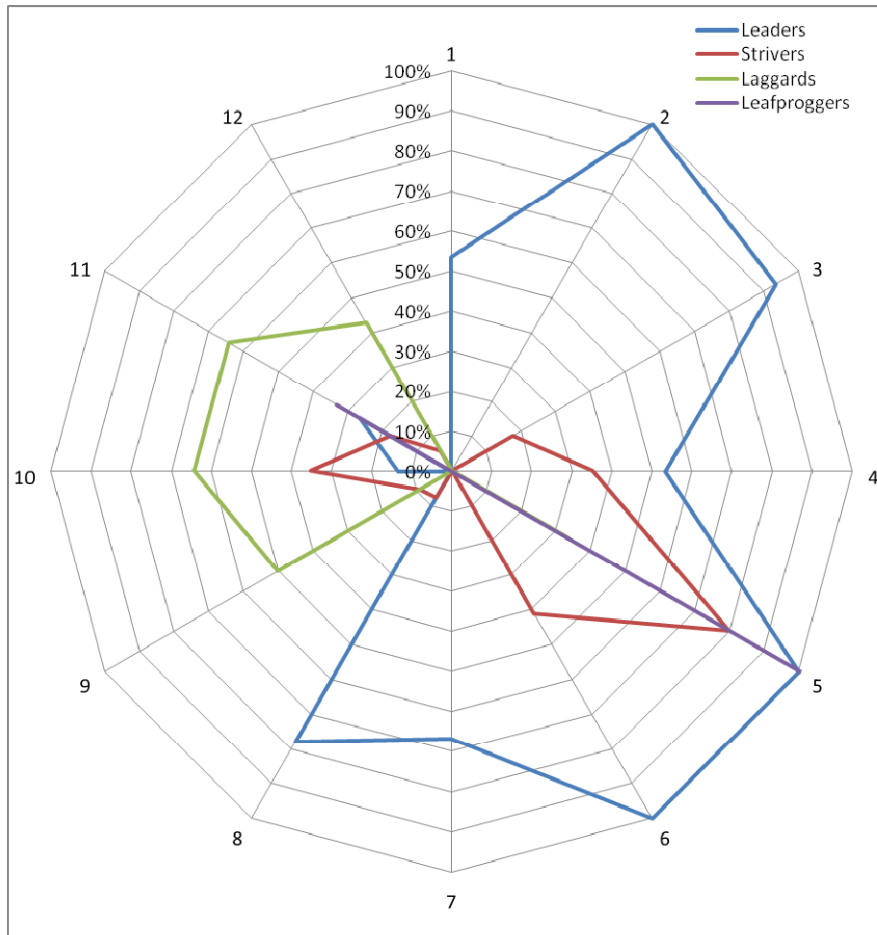
- **Primary digital leaders:** United States, Australia, Canada, Denmark, Netherlands, Norway, Sweden, Switzerland, United Kingdom
- **Secondary digital leaders:** Austria, Finland, France, Germany, Ireland, Japan, Rep. of Korea, New Zealand
- **Primary digital strivers:** Greece, Hungary, Italy, Poland, Spain
- **Secondary digital strivers:** Czech Republic, Mexico, Portugal, Slovak Republic, Turkey

Results

Characteristics of digital development

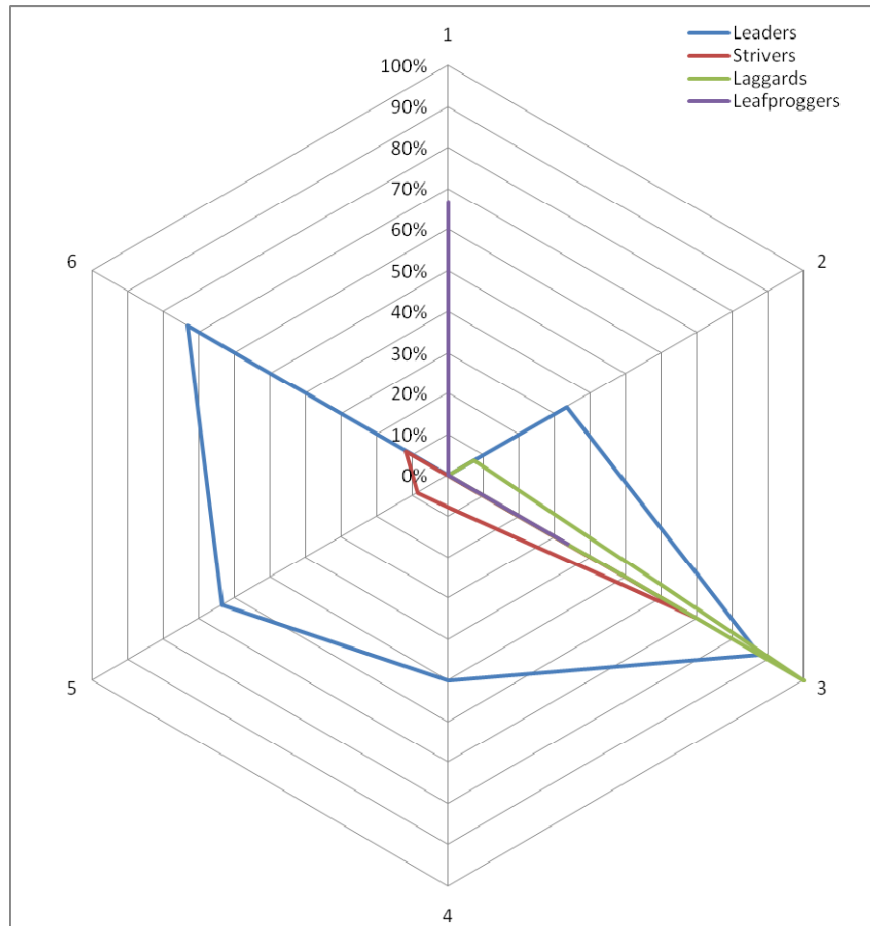
(WITSA dataset)

Infrastructures



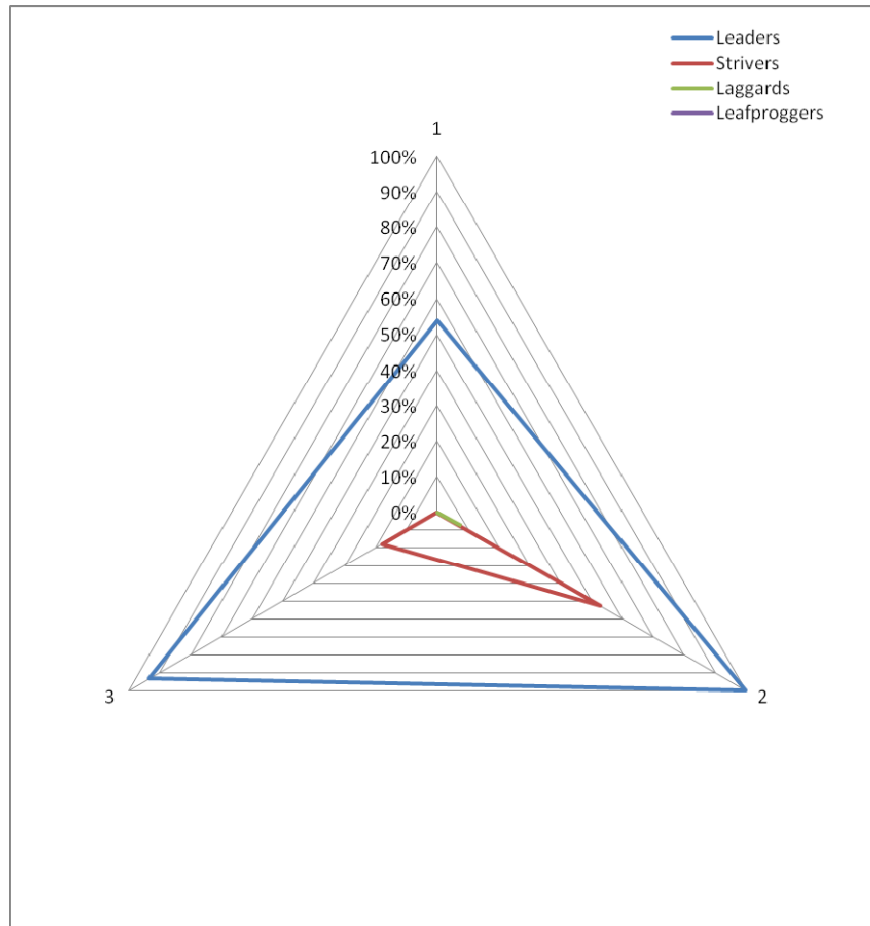
- 1 - Broadband subscribers (per 100 people)
- 2 - Personal computers (per 100 people)
- 3 - Telephone mainlines (per 100 people)
- 4 - Mobile phone subscribers (per 100 people)
- 5 - Population covered by mobile telephony (%)
- 6 - International Internet bandwidth (bits per person)
- 7 - Internet Hosts (per 10000 people)
- 8 - Internet subscribers (per 100 inhabitants)
- 9 - Residential monthly telephone subscription (US\$)
- 10 - Price basket for Internet (US\$ per month)
- 11 - Price basket for mobile (US\$ per month)
- 12 - Price basket for residential fixed line (US\$ per month)
- 13 - Telephone average cost of call to US (US\$ per three minutes)

ICT Sector



- 1 - Telecommunications revenue (% GDP)
- 2 - High-technology exports (% of manufactured exports)
- 3 - Telephone subscribers per employee
- 4 - Telephone employees (per 100 people)
- 5 - Total full-time telecommunications staff (per 100 people)
- 6 - GDP per Telecom Employee (US Dollars)

Digital Literacy

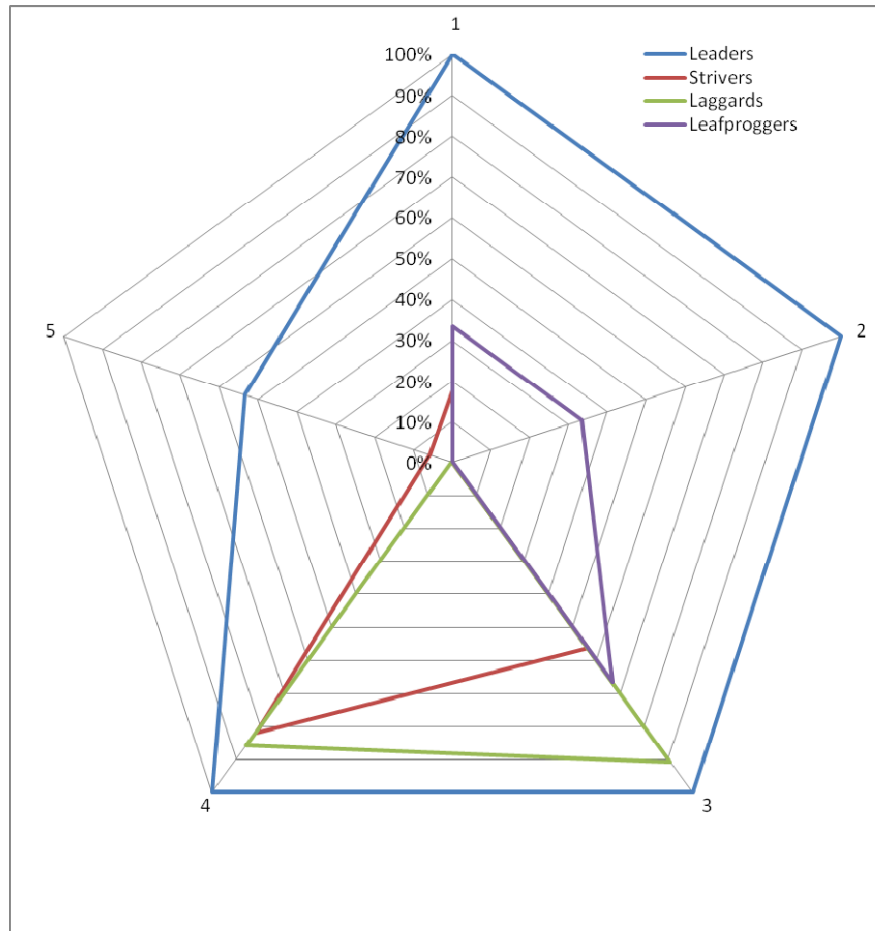


1 - Enrolment in science. Tertiary. (per 100 people)

2 - Human Capital

3 - Internet Access in Schools

Policy and regulatory framework



1 - Laws relating to ICT

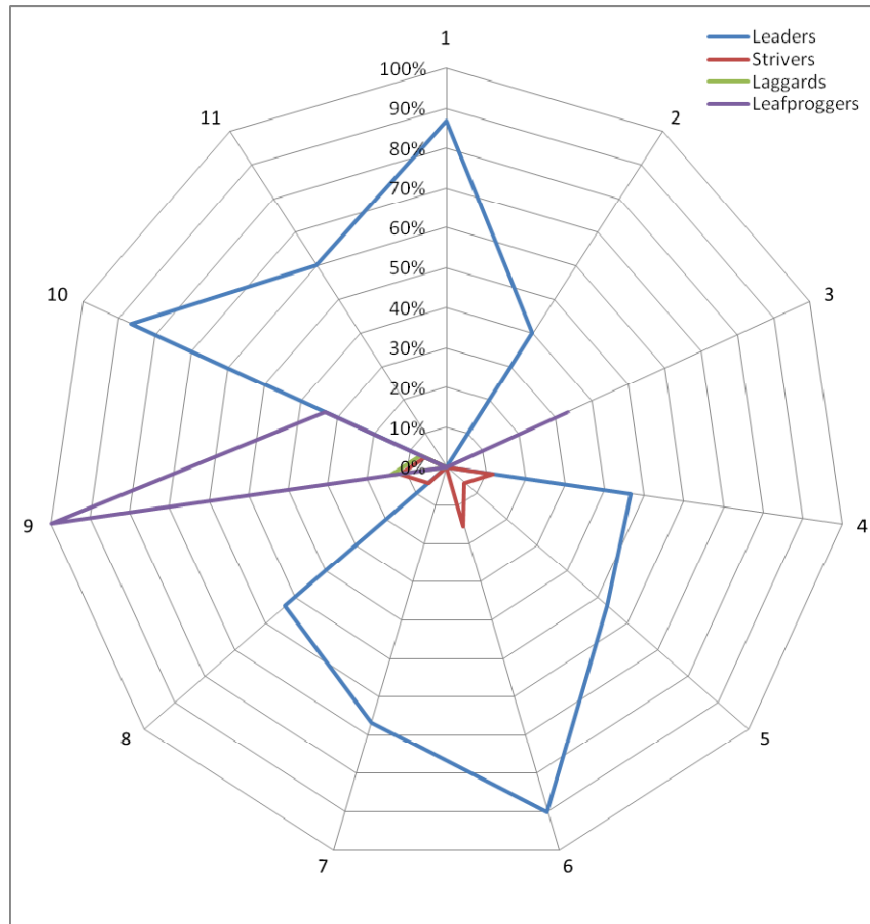
2 - Intellectual property protection

3 - Level of competition – DSL

4 - Level of competition – Cable modem

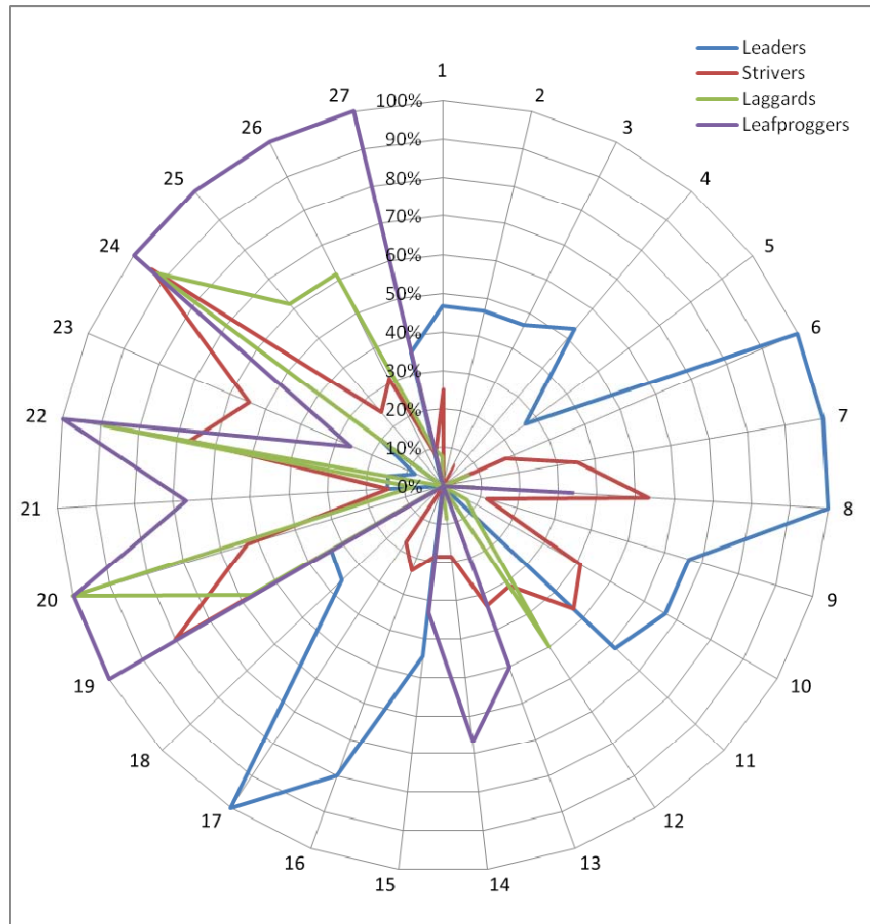
5 - Gov't procurement of advanced tech products

Usage



- 1 - Secure Internet servers (per 1 million people)
- 2 - Total Domains (per 100 people)
- 3 - Total ICT Spending, Retail Trade (% of GDP)
- 4 - Web Measure
- 5 - Availability of government online services
- 6 - International outgoing telephone traffic (minutes) (per 100 people)
- 7 - Internet users (per 100 people)
- 8 - E-Participation
- 9 - Total ICT Spending, Consumer (% of GDP)
- 10 - Firm-level technology absorption
- 11 - Extent of business Internet use

Analogue indicators



- 1 - GDP
- 2 - GDP Capita
- 3 - GDP per capita, PPP (current international \$)
- 4 - GNI per capita, Atlas method (current US\$)
- 5 - GNI per capita, PPP (current international \$)
- 6 - HDI
- 7 - Life expectancy at birth, total (years)
- 8 - Improved water source (% of population with access)
- 9 - Health Public Expenditure (% of govt. expenditure)
- 10 - Health Public Expenditure (% of total Health expenditure)
- 11 - School enrollment, primary (% net)
- 12 - School enrollment, primary (% gross)
- 13 - Education Public Expenditure (% of govt. expenditure)
- 14 - Gross National Expenditure (% of GDP)
- 15 - General Govt. final consumption expenditure (% of GDP)
- 16 - Economic Incentive Regime
- 17 - Innovation
- 18 - Population in urban agglomerations > 1 million (% of total population)
- 19 - Inequality-10
- 20 - Mortality rate, infant (per 1,000 live births)
- 21 - Population growth (annual %)
- 22 - Interest payments (% of GDP)
- 23 - Present value of debt (% of GNI)
- 24 - GDP deflator (base year varies by country)
- 25 - Inflation, consumer prices (annual %)
- 26 - Inflation, GDP deflator (annual %)
- 27 - Tax revenue (% of GDP)

Results

Derterminants of digital development

(WITSA dataset)

Determinants: digital leaders

Binary logistic regression with digital leaders (1 is a digital leader, 0 is not a digital leader) as the dependent variable.

	B	S.E.	Wald	df	Sig.	Exp(B)
Life expectancy at birth, total (GEN30)	-.399	.208	3.664	1	.056	.671
Inequality-20 (GEN05)	-1.066	.578	3.403	1	.065	.344
Urban Population (%) (GEN07)	.138	.079	3.030	1	.082	1.148
Economic Incentive Regime (GEN08)	1.671	.877	3.628	1	.057	5.317
Government prioritization of ICT (LEGAL_D_04)	2.869	1.737	2.727	1	.099	17.611

N	46		
Correctly predicted cases	95.7%	96.8% (leaders)	93.3% (rest)
-2 Log likelihood	15.970		
Cox & Snell R-square	.646		
Nagelkerke R-square	.862		
Chi-Square (sig)	47.799	(.000)	
Hosmer and Lemeshow Test Chi-Square (sig)	1.546	(.981)	

Determinants: digital laggards

Binary logistic regression with digital leaders (1 is a digital laggard, 0 is not a digital laggard) as the dependent variable.

	B	S.E.	Wald	df	Sig.	Exp(B)
Constant	38.214	16.958	5.078	1	.024	3.945·10 ¹⁶
Inequality-10 (GEN06)	-.235	.138	2.909	1	.088	.790
Health Public Expenditure (% of total Health expenditure) (GEN14)	-.176	.081	4.665	1	.031	.839
Population covered by mobile telephony (%) (INF_S_06)	-.100	.050	3.936	1	.047	.905
Importance of ICT to government vision of the future (LEGAL_D_01)	-4.304	2.239	3.696	1	.055	.014

	N	47	
Correctly predicted cases	94.6%	96.4% (laggards)	88.9 % (rest)
-2 Log likelihood	11.391		
Cox & Snell R-square	.551		
Nagelkerke R-square	.823		
Chi-Square (sig)	29.663	(.000)	
Hosmer and Lemeshow Test Chi-Square (sig)	3.684	(.815)	

Conclusions

**The role of the Government
and advice for Policy-Making**

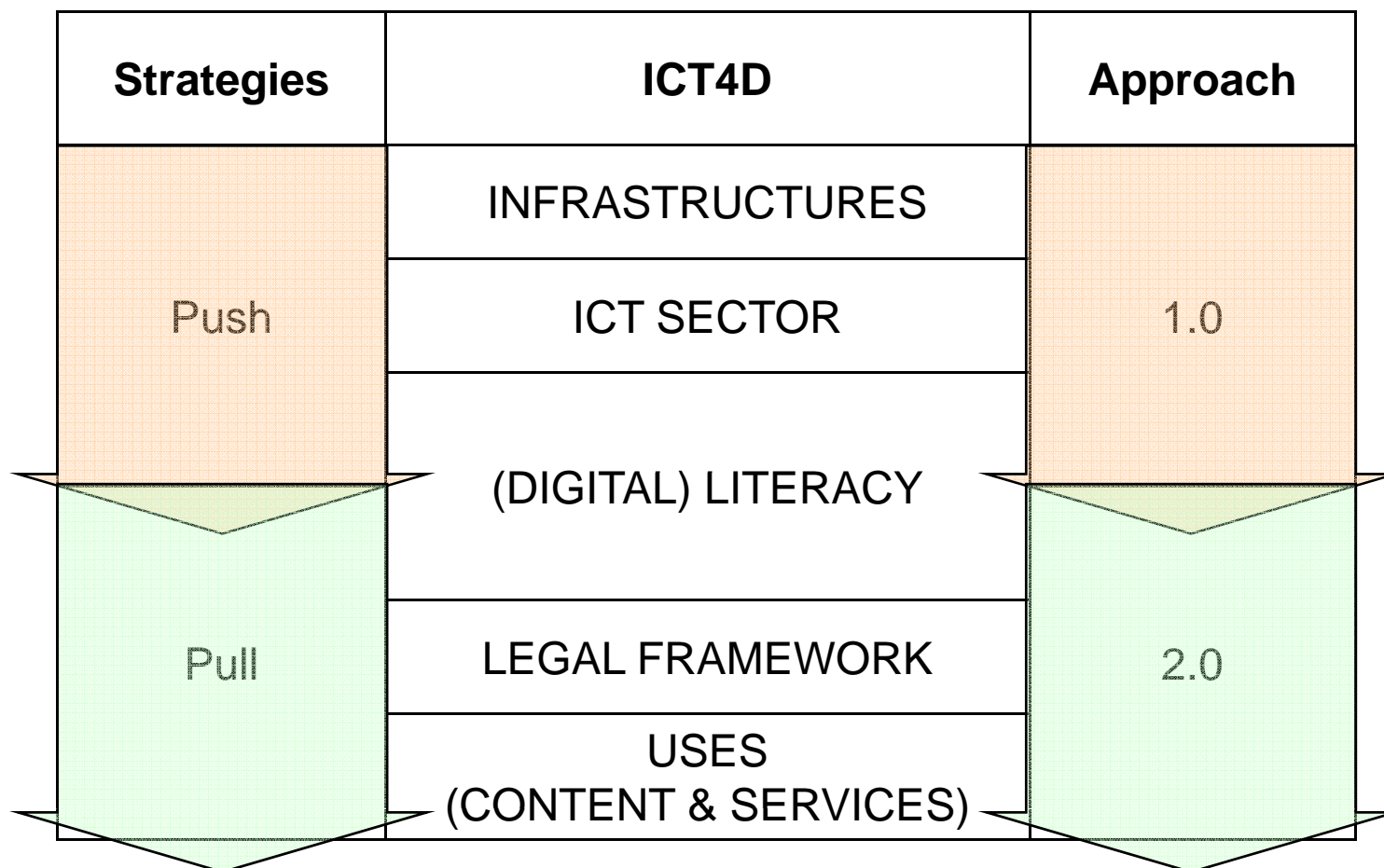
Policy-making and digital development

- Income, Health, Human Capital
- Economic **incentive regime & innovation**
- **Infrastructures + Real Economy** approach
- Strong Information Society **regulatory framework**
- **Direct intervention** (expenditure) does not make a difference — Keynesian or liberal is ok.
- **Demand** triggers digital development
- G2B, G2G, B2C, e-Commerce, e-Administration, e-Government, e-Health, e-Justice **pull** digital development

A comment on leapfrogging

- Some evidence that leapfrogging is possible
 - Based on
 - Human capital
 - ICT regulatory and policy framework
 - Strong, international-bound ICT Sector
 - Dubious impact on domestic economy beyond most direct one
- ICT Sector a locomotive for (nation-wide) development?

Summing up: what policies?



Barcelona, June 2nd, 2009. Direcció General de la Societat de la Informació

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<http://ictlogy.net/presentations/20090602_ismael_pena-lopez_-_measuring_digital_development_role_of_government.pdf>

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