

Policy-making for digital dev.: the role of the government

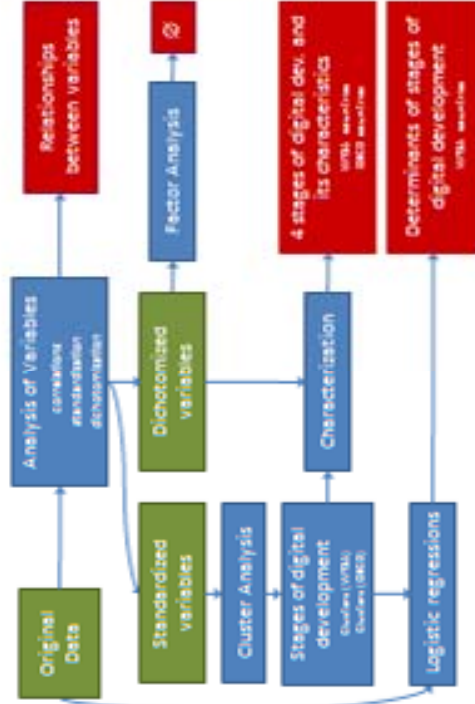
digital development stages
policy-making characterization
foster logit government role

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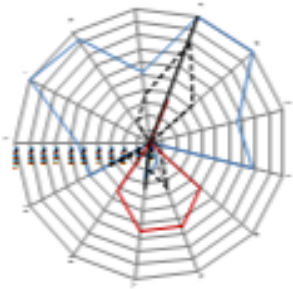
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Methodology



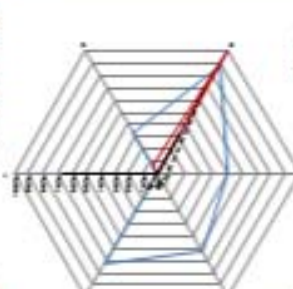
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Characterization of digital stages



Infrastructure

- 1) Number of fixed broadband subscriptions per 100 inhabitants (1)
- 2) Fixed broadband subscriptions per 100 inhabitants (2)
- 3) Mobile cellular subscriptions per 100 inhabitants (3)
- 4) Mobile cellular subscriptions per 100 inhabitants (4)
- 5) Fixed broadband subscriptions per 100 inhabitants (5)
- 6) Mobile cellular subscriptions per 100 inhabitants (6)
- 7) Fixed broadband subscriptions per 100 inhabitants (7)
- 8) Mobile cellular subscriptions per 100 inhabitants (8)
- 9) Fixed broadband subscriptions per 100 inhabitants (9)
- 10) Mobile cellular subscriptions per 100 inhabitants (10)
- 11) Fixed broadband subscriptions per 100 inhabitants (11)
- 12) Mobile cellular subscriptions per 100 inhabitants (12)

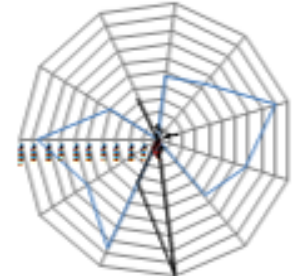


ICT Sector

- 1) Percentage of population using the Internet (1)
- 2) Percentage of population using mobile internet (2)
- 3) Percentage of population using mobile internet (3)
- 4) Percentage of population using mobile internet (4)
- 5) Percentage of population using mobile internet (5)
- 6) Percentage of population using mobile internet (6)
- 7) Percentage of population using mobile internet (7)
- 8) Percentage of population using mobile internet (8)
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- 11) Percentage of population using mobile internet (11)
- 12) Percentage of population using mobile internet (12)

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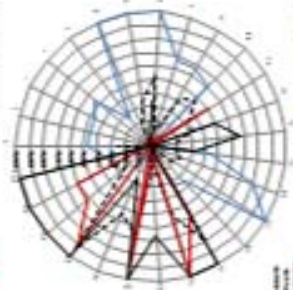
Characterization of digital stages



Usage

- 1) Percentage of population using mobile internet (1)
- 2) Percentage of population using mobile internet (2)
- 3) Percentage of population using mobile internet (3)
- 4) Percentage of population using mobile internet (4)
- 5) Percentage of population using mobile internet (5)
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Characterization of digital stages

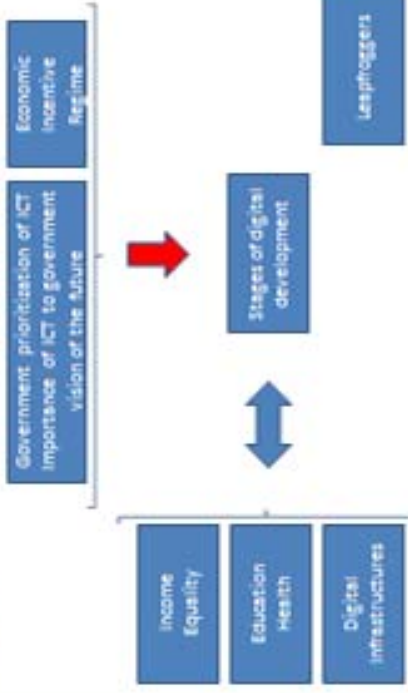


Analogous Indicators

- 1) Percentage of population using mobile internet (1)
- 2) Percentage of population using mobile internet (2)
- 3) Percentage of population using mobile internet (3)
- 4) Percentage of population using mobile internet (4)
- 5) Percentage of population using mobile internet (5)
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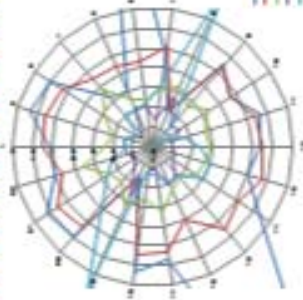
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Hypotheses



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Clusters and cluster centre values

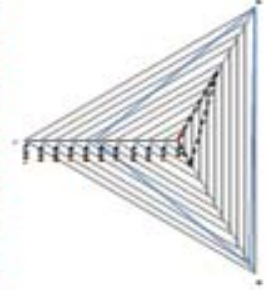


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- Digital Leader (cluster #1, n = 14): USA, Australia, Japan, France, Germany, Taiwan, Japan, Rep. of Korea, New Zealand, Norway, Singapore, Sweden, Switzerland, UK
- Digital Innovator (cluster #2, n = 17): Brazil, Bulgaria, Chile, Greece, Hungary, IDN, Jamaica, Mexico, Panama, Portugal, Romania, Saudi Arabia, Spain, Thailand, Turkey, Uruguay, United Arab Emirates
- Digital Laggard (cluster #3, n = 14): Argentina, Bolivia, Ecuador, Egypt, India, Indonesia, Pakistan, Peru, Philippines, Sri Lanka, Uganda, Cameroon, Vietnam, Zimbabwe
- Digital Transformer (cluster #4, n = 2): Jordan, South Africa, Senegal

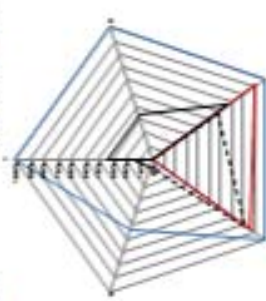
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Characterization of digital stages



Digital Literacy

- 1) Percentage of population using the Internet (1)
- 2) Percentage of population using mobile internet (2)
- 3) Percentage of population using mobile internet (3)
- 4) Percentage of population using mobile internet (4)
- 5) Percentage of population using mobile internet (5)
- 6) Percentage of population using mobile internet (6)
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- 10) Percentage of population using mobile internet (10)
- 11) Percentage of population using mobile internet (11)
- 12) Percentage of population using mobile internet (12)



Policy and Regulatory Framework

- 1) Percentage of population using mobile internet (1)
- 2) Percentage of population using mobile internet (2)
- 3) Percentage of population using mobile internet (3)
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Determinants of being a digital leader/laggard

logit(being a digital leader) = β1 + GEN05 + β2 + GEN06 + β3 + GEN07 + β4 + GEN08 + β5 + LEGAL_D_04 + ε

Variable	B	S.E.	Wald	DF	Sign.	Exp(B)
GEN05 (GEN05)	0.229	0.020	3.464	1	0.064	1.257
GEN06 (GEN06)	-1.055	0.176	3.425	1	0.065	0.344
GEN07 (GEN07)	-1.138	0.176	3.025	1	0.081	0.334
GEN08 (GEN08)	1.073	0.177	3.618	1	0.061	2.917
LEGAL_D_04 (LEGAL_D_04)	3.859	1.727	5.717	1	0.019	47.611

Constant = -1.176
N of Valid Cases = 139 (100%)

Model Summary

Model	Sum of Squares	df	Mean Square	F	Sign.
1	1.176	5	.235	1.330	.248

Model Coefficients

Model	Sum of Squares	df	Mean Square	F	Sign.
1	1.176	5	.235	1.330	.248

logit(being a digital laggard) = β0 + β1 + GEN05 + β2 + GEN06 + β3 + GEN07 + β4 + GEN08 + β5 + LEGAL_D_01 + ε

Variable	B	S.E.	Wald	DF	Sign.	Exp(B)
GEN05 (GEN05)	-0.229	0.020	3.464	1	0.064	0.797
GEN06 (GEN06)	1.055	0.176	3.425	1	0.065	2.869
GEN07 (GEN07)	1.138	0.176	3.025	1	0.081	3.217
GEN08 (GEN08)	-1.073	0.177	3.618	1	0.061	0.334
LEGAL_D_01 (LEGAL_D_01)	-4.354	2.239	3.656	1	0.059	0.129

Constant = 38.214
N of Valid Cases = 139 (100%)

Model Summary

Model	Sum of Squares	df	Mean Square	F	Sign.
1	1.176	5	.235	1.330	.248

Model Coefficients

Model	Sum of Squares	df	Mean Square	F	Sign.
1	1.176	5	.235	1.330	.248

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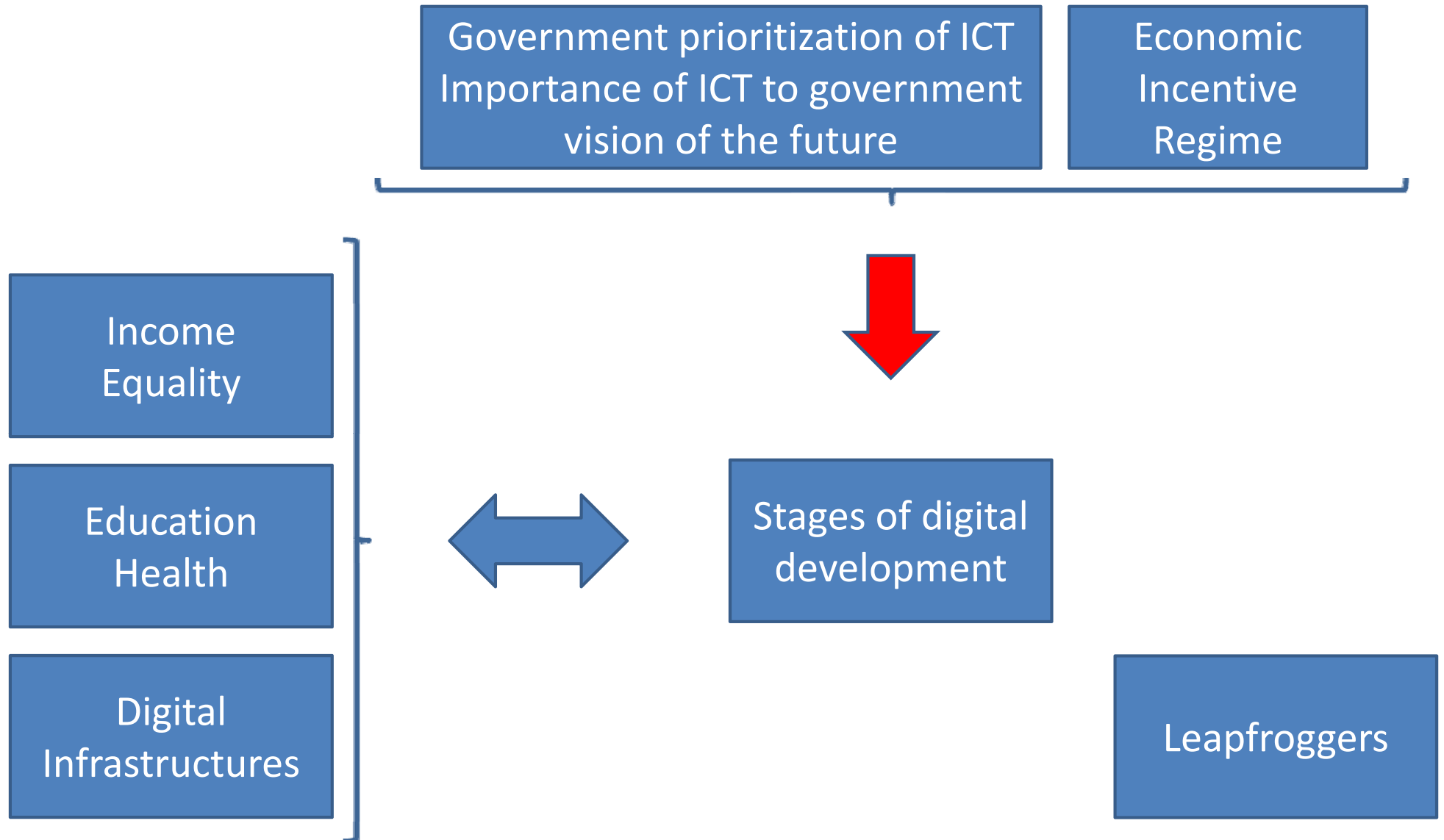
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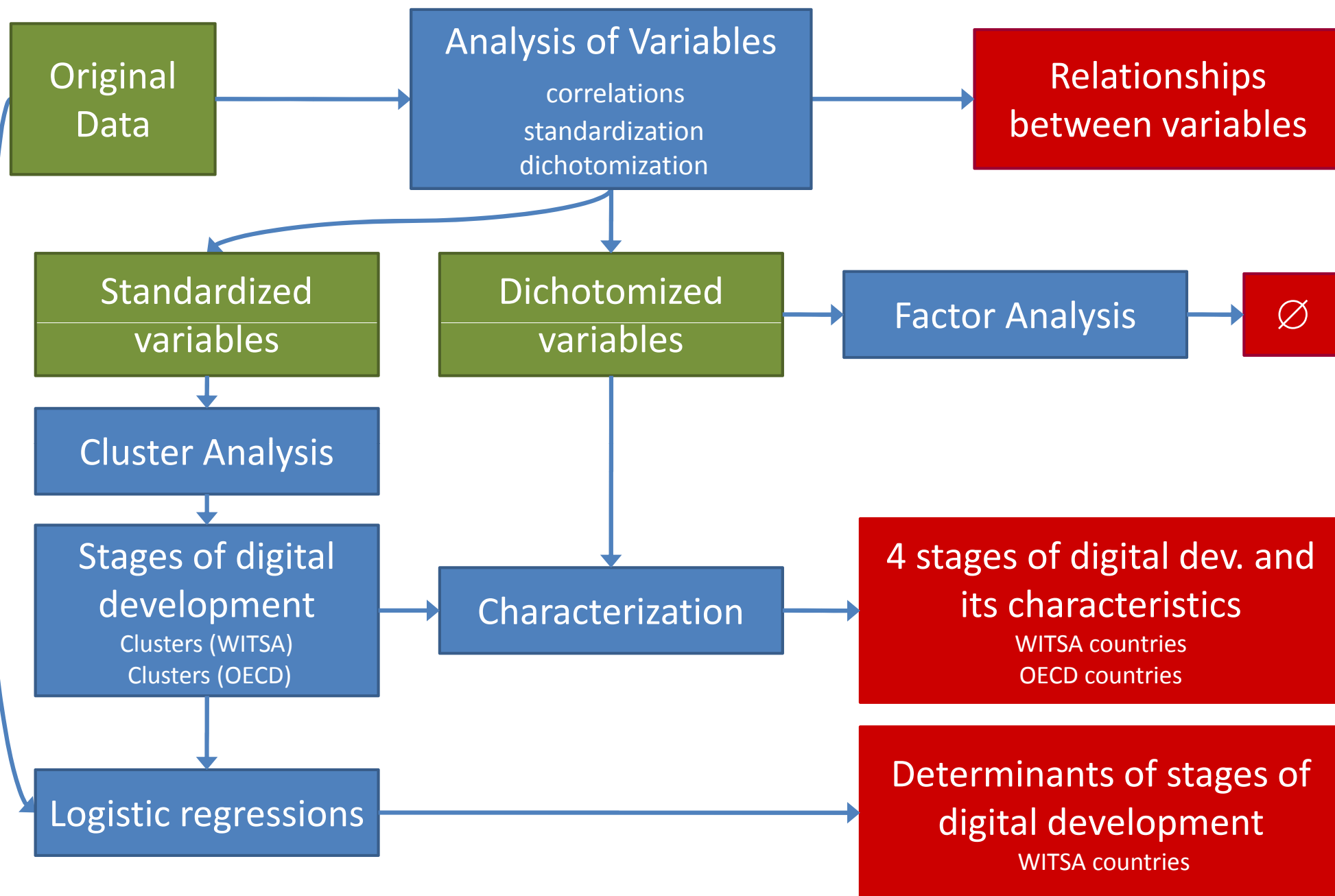
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Hypotheses

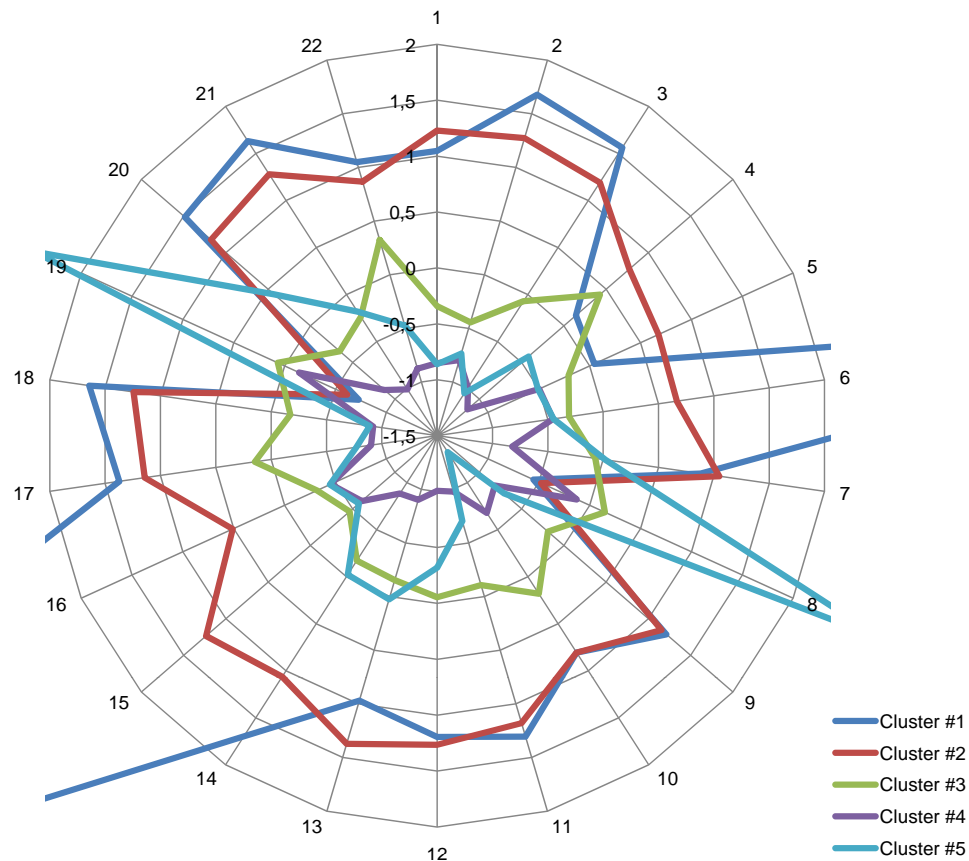


Methodology



Clusters and cluster centre values

Non-hierarchical K-means cluster analysis.
Significance of F in ANOVA for *all* variables: $p < 0.001$
Graphic plots centre values.

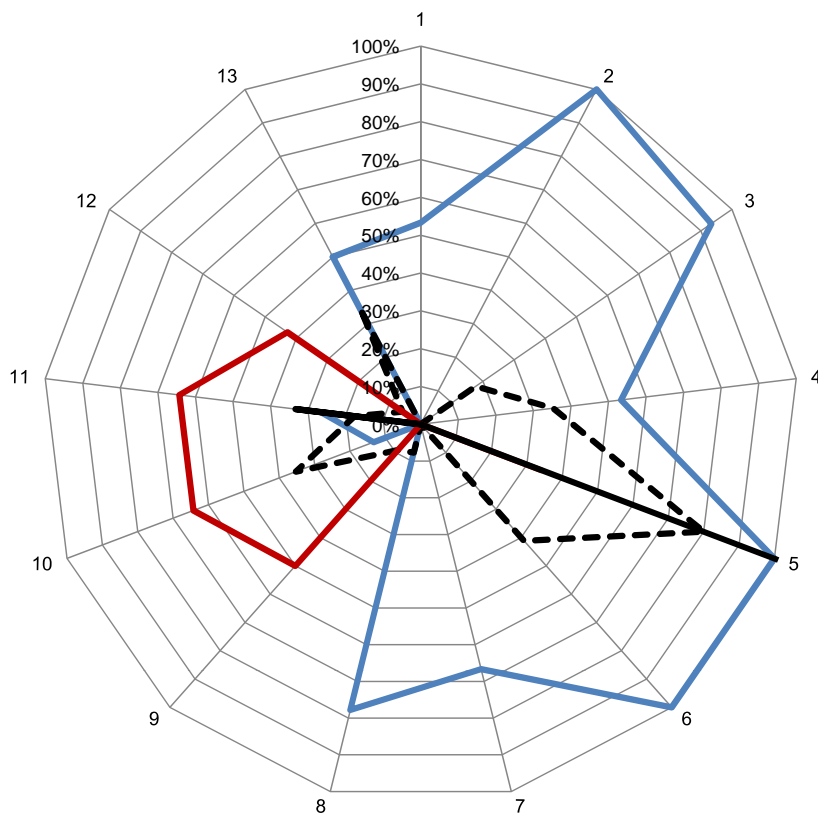


- 1 - Broadband subscribers (per 100 people)
- 2 - Personal computers (per 100 people)
- 3 - Telephone mainlines (per 100 people)
- 4 - Mobile phone subscribers (per 100 people)
- 5 - International Internet bandwidth (bits per person)
- 6 - Internet Hosts (per 10000 people)
- 7 - Price basket for residential fixed line (US\$ per month)
- 8 - Telecommunications revenue (% GDP)
- 9 - GDP per Telecom Employee (US Dollars)
- 10 - Human Capital
- 11 - Internet Access in Schools
- 12 - Laws relating to ICT
- 13 - Intellectual property protection
- 14 - Gov't procurement of advanced tech products
- 15 - Secure Internet servers (per 1 million people)
- 16 - Total Domains (per 100 people)
- 17 - Availability of government online services
- 18 - Internet users (per 100 people)
- 19 - Total ICT Spending, Consumer (% of GDP)
- 20 - Firm-level technology absorption
- 21 - Extent of business Internet use
- 22 - ICT use and government efficiency

- **Digital leaders (clusters #1 & #2; n = 1+14):** USA, Australia, Austria, Finland, France, Germany, Ireland, Japan, Rep. of Korea, New Zealand, Norway, Singapore, Sweden, Switzerland, UK
- **Digital strivers (cluster #3; n = 17):** Brazil, Bulgaria, Chile, Greece, Hungary, Italy, Jamaica, Mexico, Panama, Portugal, Romania, Saudi Arabia, Spain, Thailand, Tunisia, Uruguay, United Arab Emirates
- **Digital laggards (cluster #4; n = 14):** Argentina, Bolivia, Ecuador, Egypt, India, Indonesia, Pakistan, Peru, Philippines, Sri Lanka, Algeria, Cameroon, Vietnam, Zimbabwe
- **Digital leapfroggers (cluster #5; n = 3):** Jordan, South Africa, Senegal

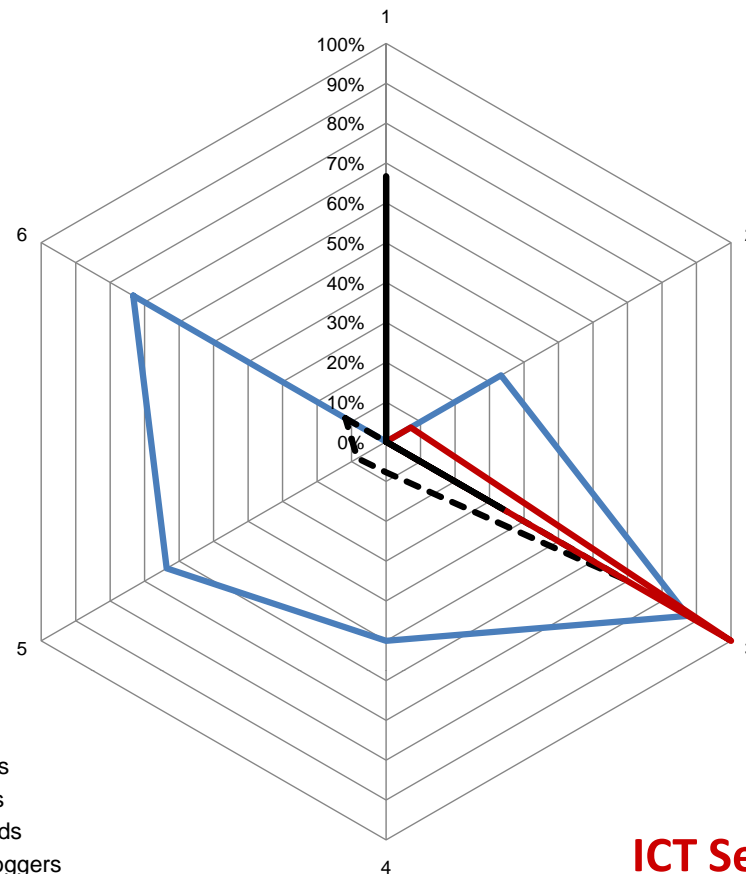
Characterization of digital stages

% of countries that scored "high" on indicator per cluster
 (*): $p < 0.01$ (**): $p < 0.05$ (***): $p < 0.1$



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) (***)

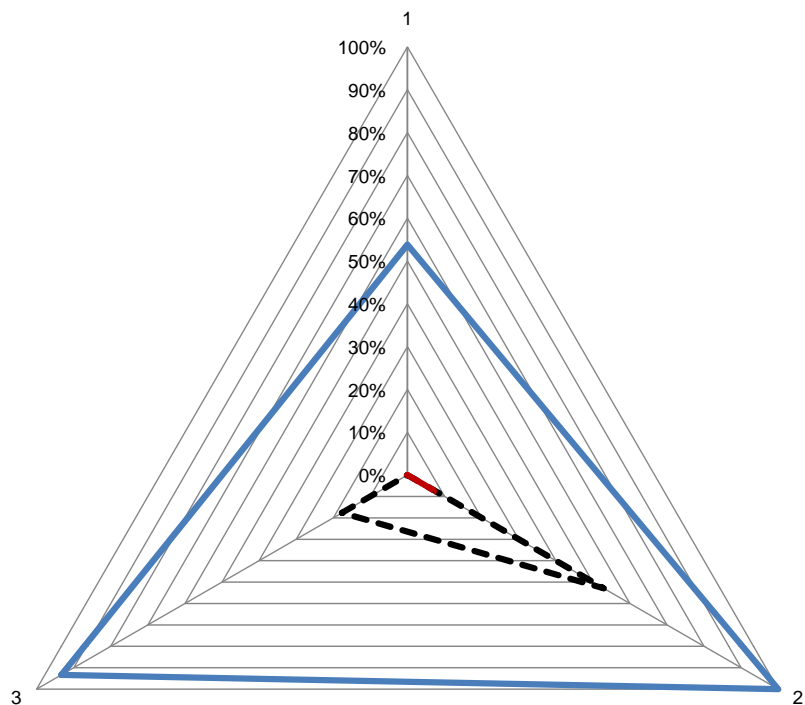


ICT Sector

- 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) (*)

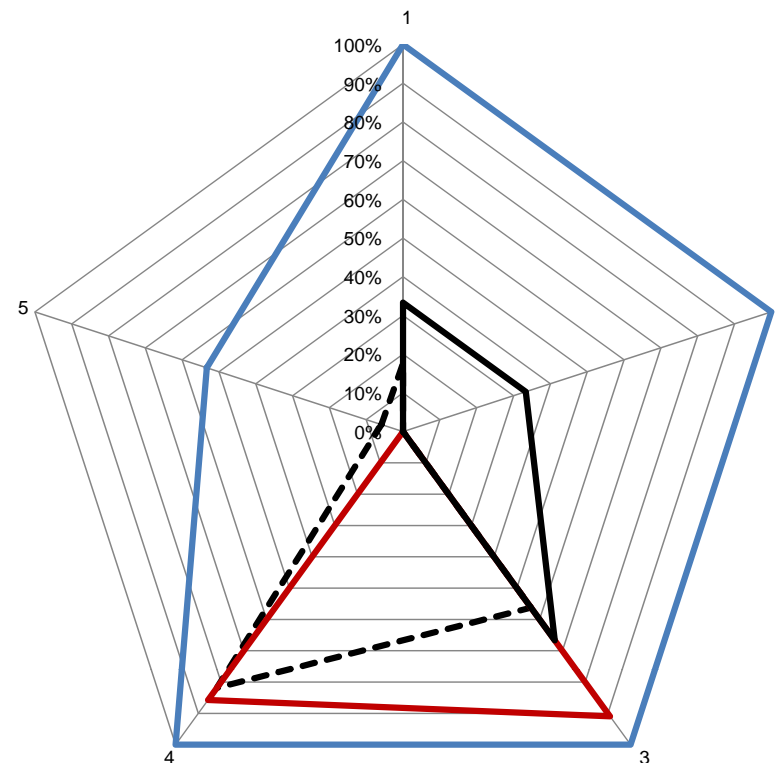
Characterization of digital stages

% of countries that scored "high" on indicator per cluster
 (*): p<0.01 (**): p<0.05 (***): p<0.1



Digital Literacy

- 1 - Enrolment in science. Tertiary. (per 100 people) (*)
- 2 - Human Capital (*)
- 3 - Internet Access in Schools (*)



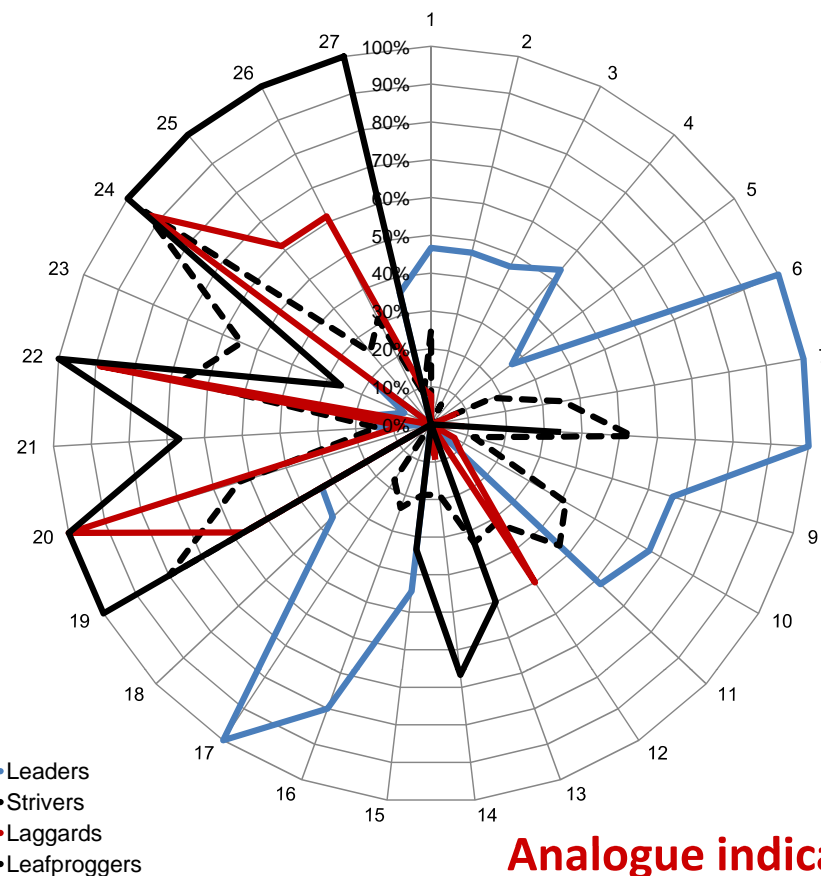
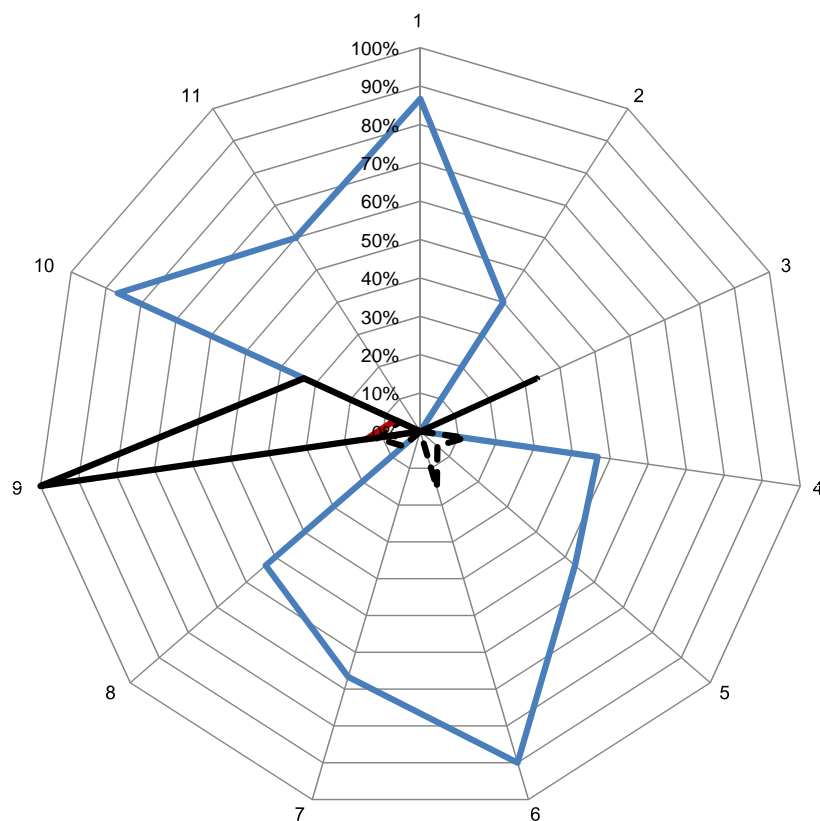
Policy and Regulatory framework

- 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 (*)

- Leaders
- - - Strivers
- Laggards
- Leafprogrgers

Characterization of digital stages

% of countries that scored "high" on indicator per cluster
 (*): p<0.01 (**): p<0.05 (***): p<0.1



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 (*)

- 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 pop. with access) (*)
- 9 - Health Public Expenditure (% of govt. expenditure) (*)
- 10 - Health Public Expendit. (% of total Health expend.) (*)
- 11 - School enrollment, primary (% net) (***)
- 12 - School enrollment, primary (% gross) (**)
- 13 - Education Public Expendit. (% of govt. expend.) (***)
- 14 - Gross National Expenditure (% of GDP) (**)

Analogue indicators

- 15 - General Govt. final consumption expend. (% of GDP) (***)
- 16 - Economic Incentive Regime (*)
- 17 - Innovation (*)
- 18 - Population in urban agglom. > 1 M(% of total pop.) (*)
- 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) (**)

Determinants of being a digital leader/laggard

$$\text{logit}(\text{being a digital leader}) = \beta_1 \cdot \text{GEN30} + \beta_2 \cdot \text{GEN05} + \beta_3 \cdot \text{GEN07} + \beta_4 \cdot \text{GEN08} + \beta_5 \cdot \text{LEGAL_D_04} + \epsilon$$

Binary logistic reg. w. digital leaders (1 is a digital leader, 0 is not a digital leader) as the dep. variable (N = 46).

	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

Correctly predicted cases 95.7% 96.8% (leaders)
 -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)

$$\text{logit}(\text{being a digital laggard}) = \beta_0 + \beta_1 \cdot \text{GEN06} + \beta_2 \cdot \text{GEN14} + \beta_3 \cdot \text{INF_S_06} + \beta_4 \cdot \text{LEGAL_D_01} + \epsilon$$

Binary logistic reg. w. digital laggards (1 is a digital laggard, 0 is not a digital laggard) as the dep. variable (N = 47).

	B	S.E.	Wald	df	Sig.	Exp(B)
Constant	38.214	16.958	5.078	1	.024	$3.945 \cdot 10^{16}$
Inequality-10 (GEN06)	-.235	.138	2.909	1	.088	.790
Health Public Expend. (% of total Health exp.) (GEN14)	-.176	.081	4.665	1	.031	.839
Pop. covered by mobile telephony (%) (INF_S_06)	-.100	.050	3.936	1	.047	.905
Importance of ICT to govt vision of future (LEGAL_D_01)	-4.304	2.239	3.696	1	.055	.014
Constant	38.214	16.958	5.078	1	.024	$3.945 \cdot 10^{16}$

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)