

## **Enhancing Competitiveness: A Study on Income Level Groups and Networked Readiness Index**

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### **Abstract**

*The promise information and communication technology (ICT) offers to this era of rapid change is too good to be underemphasized. For a particular economy, this translates to the propensity, measured by the networked readiness index (NRI), to survive in an environment where competition dictates the pace. The NRI index aims to describe how conducive a national environment is to exploiting ICT resources for development. According to Wallsten (2005), richer countries have better access to ICT than poorer countries making the people of the former exploit ICT more for economic development. As such, this study aims to empirically determine the effect of income level groups to a country's NRI. The Global Information Technology Report 2009-2010 (GITR or "the report") published by INSEAD and World Economic Forum (WEF) served as the main reference for NRI in this study. The Report grouped the participating countries into four income level groups based on the classification by the World Bank. These are: (1) high income (HI); (2) upper-middle income (UM); (3) lower-middle (LM) income; and (4) low income (LO). The Report presented comprehensive assessments of ICT readiness covering 133 economies from the developing and developed world. Of these countries, four have incomplete economic profiles. This resulted in having only 129 useful countries-observations for this study. Comparing and contrasting the networked readiness indexes of 129 countries based on income level groups with LO as the base, results showed that income level group has a significant effect on NRI ( $\beta = .997, .353, .191, p < .05$ ). In fact, the networked readiness indexes of the four income level groups significantly differ among each other. Several implications, conclusions, and recommendations related to income level groups and NRI were drawn out of these findings.*

**Keywords:** competition, national development, income level, information and communication technology, networked readiness index

### **Introduction**

It was in 2007 when the world witnessed the worst recession in 70 years. It began with the collapse of the United States (US) subprime house mortgage market which then spread to the entire financial sector not only in other developed countries but also in a number of developing countries. There have been varying responses from each country toward this crisis as other countries try to cope and recover much faster than the others. China and India have peaked at a healthy GDP growth of 8.5% and 5.4%, respectively, in 2009 (Dutta & Mia, 2010). Early in 2010, Japan, Germany, and France have shown encouraging signs of recovery (Anbumozhi & Bauer, 2010).

The gradual recovery from global recession can be attributed to many factors. One of the factors being pointed out is information and communication technology, in which, its increasing importance in the world today has pervaded all aspects of life (McGill, 2003). As such, ICT is seen as a potent enabler of renewed and sustainable growth manifested in being a key element of infrastructure for efficient industries and a critical productivity enhancer which is crucial for sustaining recovery and laying the foundations for economies that are competitive in the long run (Dutta, Mia, Geiger & Herrera, 2010).

The Global Information Technology Report 2009-2010 (GITR or "the Report") published by INSEAD and World Economic Forum (WEF) presented a very comprehensive report on the state of ICT around the world. The highlight on this issue was on the instrumental role of ICT in improving competitiveness. The Report put its emphasis on the NRI of more than 130 countries and how this index can be used as leverage to becoming sustainable amidst global crisis and competition. The Report ranked the participating countries in terms of NRI and presented findings with respect to the interplay between competitiveness and NRI.

One glaring realization from this report was that the higher the country's NRI, the more conducive the country is toward exploiting its ICT for national development and sustainability, thereby fuelling a country's propensity to recover from an economic downturn.

If such this is the case, it is just proper to explore on the variables that might affect a country's NRI. Once these variables are identified, a particular country can be initiative and creative enough to invest on projects geared toward improving NRI.

For this study, the variable considered is income level grouping being the initial determinant of a country's propensity to be competitive.

### **Research problem and objectives**

This study aims to explore and investigate the effect of income level group on NRI. This seeks to provide an answer to the question: *to what extent does income level group affect NRI?*

Moreover, this study specifically aims:

1. To find out the strength and significance of correlation between income level group and NRI;
2. To determine whether or not income level group has significant effect on NRI using empirical evidence from countries covered in the GITR;
3. To develop plausible recommendations that will benefit policy makers, government leaders, and fellow scholars.

### **Research significance and limitations**

As a matter of significance in the local arena, one of the short-term plans of the Philippine government is to create a new executive office that caters specifically to ICT issues. As such, this study offers a valuable input with regard to developing workable frameworks and proactive plans that will serve as a guide for future projects. In the international arena, this study has the potential to provide a global benchmarking initiative for countries to improve their NRI with due regard to all levels of governmental units and national agencies. For the limitations, this study focuses only income level group of countries covered in the GITR as classified by the World Bank and the NRI scores as indicated in the same Report dated 2009-2010.

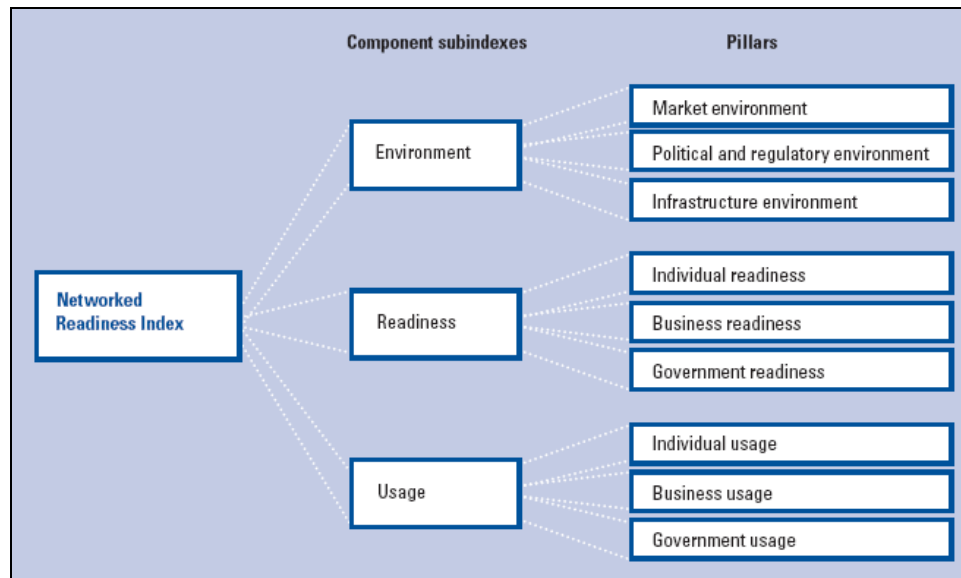
### **Literature review and hypotheses development**

The determination of NRI by INSEAD and WEF is based on a methodological framework that identifies the enabling factors for countries to fully benefit from ICT advances while highlighting the joint responsibility of all social actors, such as individuals, businesses, and governments (Greenhill, 2010). This framework is based on three main principles: (1) environment is a crucial enabler of networked readiness; (2) a multi-stakeholder effort is key; and (3) ICT readiness facilitates ICT usage (Dutta, Mia, Geiger & Herrera, 2010). The Report in itself is a compilation of insightful literature in forms of researches, essays, and case studies about networked readiness. The report is a series launched in 2001 and published annually. It offers a snapshot of the state of networked readiness in the world.

Based on the Report, the top 10 of NRI ranking for 2009-2010 is dominated by four Nordic countries with Sweden in the frontline, a position enjoyed by the current third placer Denmark in the past three years. Two countries from Asia, Singapore and Hong Kong, ranked second and eight, respectively are in the top 10 with US and Canada on the fifth and seventh places, respectively. Winding up the top 10 are: Switzerland, fourth; Finland, sixth; Netherlands, ninth; and Norway, tenth.

### **Networked readiness index**

The networked readiness index has three dimensions, as depicted in *Figure 1*. These dimensions are environment, readiness, and usage. The environment component is broken down into market, regulatory, and infrastructure while the readiness and usage components are broken down into individual, business, and government. The final NRI score is just an average of the three dimensions (Dutta, Mia, Geiger & Herrera, 2010).



**Figure 1.** The networked readiness index  
Source: Dutta, Mia, Geiger & Herrera, 2010.

### Income level

The Report grouped the participating countries into four income level groups based on the classification by the World Bank (based on GNI, US\$, per capita). These are: (1) high income (HI) (above US\$11,905); (2) upper-middle income (UM) (between US\$3,856 and 11,905); (3) lower-middle income (LM) (between US\$976 and 3,855); and (4) low income (LO) (under US\$976).

Based on the Report, HI countries dominated the ranking with 40 of them in the top 50. Most of the UM and LM countries are scattered in the middle with LO countries occupying most of the bottom 20.

According to Wallsten (2005), people in richer countries have better access to ICT and use ICT more intensively than do people in poorer countries. Moreover, in the same study by Jorgenson and Vu (2005), they found out that contributions of IT investment are more evident in industrialized economies and developing Asia. The rush in IT investment was particularly evident in the US where ICT is coming to dominate the contribution of capital input. Alongside, developing Asia was responsible for the 60% of world economic growth before 1995 and 40% afterward, with China alone responsible for half of this amount (Jorgenson & Vu, 2005).

$H_{01}$ : There is no significant correlation between income level group and NRI.

$H_{02}$ : Income level group has no significant effect on NRI.

### Competitiveness

Snowdon and Stonehouse (2006) couldn't be more precise in their article about competitiveness in a globalized world. They documented their interview with Michael Porter regarding his research and ideas relating to economic foundations of global competitiveness. To Porter, governments should act as a catalyst, helping companies to improve their competitive position. In addition, with respect to global competitiveness reports, aside from the Report, Porter asserted that reports should be used in conjunction with the different indexes. In such a case, the Report should be used in a manner that different indexes must be taken individually and generally. Moreover, if such indexes tell much about a country's competitiveness, it is but worth the pursuit to study the variables that might drive competitiveness, thus, the main motivation for this study. In summary, previous findings of researchers, consistent and conflicting, with respect to the interplay between NRI and income level group have created an interesting gap that needs to be bridged.

### Research framework

#### NRI framework

This study has its underpinnings rooted on the current NRI framework which aims to measure:

(1) the degree to which a national environment is conducive to ICT development and diffusion, by taking into account a number of features of the broad business environment, some regulatory aspects, and the soft and hard infrastructures for ICT; (2) the extent to which the three main national stakeholders in a society (individuals, the business sector, and the government) are inclined and prepared to use ICT in their daily activities and operation; and (3) the actual use of ICT by the above three stakeholders (Dutta & Mia, 2010). paragraphs of the same section.

### Val IT framework

This study is also anchored in Val IT framework of the IT Governance Institute (ITGI) of the Information Systems Audit and Control Association (ISACA). This framework is a comprehensive and pragmatic organizing framework that enables the creation of business value from IT-enabled investments by integrating a set of proven governance principles, processes, and practices and supporting guidelines to help stakeholders optimize the realization of value from IT investments (ITGI, 2008).

### Value-added theory

This theory is based on the assumption that certain conditions are needed for the development of a social movement. Smelser (1962) argued that six things are necessary and sufficient for collective behavior to emerge, and that social movement evolves through the following stages: (1) structural conduciveness; (2) structural strain; (3) generalized belief; (4) precipitating factors; (5) mobilization for action; and (6) operation (failure) of social control.

### Modernization theory

This theory is used to explain the process of modernization within societies. The theory looks at the internal factors of a country while assuming that, with assistance, “traditional” countries can be brought to development in the same manner more developed countries have. According to Durkheim (1964), modernization theory attempts to identify the social variables which contribute to social progress and development of societies, and seeks to explain the process of social evolution. This theory not only stresses the process of change but also the responses to that change. It also looks at internal dynamics while referring to social and cultural structures and the adaptation of new technologies.

### Diffusion of innovations theory

This theory is concerned with the spread of innovation, ideas, and technology through a culture or cultures. According to this theory, there are many qualities in different people that cause them to accept or not to accept an innovation. Likewise, there are also many qualities of innovations that can cause people to readily accept them or to resist them. There are five stages to the process of adopting an innovation: (1) knowledge, in which the an individual becomes aware of an innovation but has no information about it; (2) persuasion, in which the individual becomes actively interested in seeking knowledge about the innovation; (3) decision, in which the individual weighs the advantages and disadvantages of the innovation and decides whether or not to adopt it; (4) implementation, in which the individual actually does adopt and use the innovation; and (5) confirmation, in which the individual makes a final decision about whether or not to continue using it based on his own personal experience with it.

### Research methodology

This study is both exploratory and empirical research. It employs causal and explanatory research design to investigate the effect of income level group on networked readiness index. The researcher used secondary data obtained from the 2009-2010 Report. *Table 1* shows the summary of variables.

**Table 1. Summary of dependent and independent variables**

<b>Dependent Variable</b>	<b>Explanatory Variable</b>
▪ Networked Readiness Index (metric)	▪ Income level group (non-metric) <ol style="list-style-type: none"> <li>1. High income</li> <li>2. Upper-middle income</li> <li>3. Lower-middle income</li> <li>4. Low income (base)</li> </ol>

One hundred thirty-three countries participated in the Report. Of these countries, four have at least one economic variable not available. This has resulted in a 129 useful countries-observations. Income level groups and NRI of these 129 countries were summarized and subjected to statistical analyses.

This study used Pearson Correlation and OLS regression approach to determine the correlation of income level groups and NRI and to determine the effect of the former on NRI, respectively. In addition, this study also tested the dependent variable for any violation to normality assumption related to linear regression. The statistical software used was SPSS 17. *Table 2* summarizes the tests that were conducted and the guidelines that were employed on how to interpret the findings.

**Table 2. Summary of tests and interpretation guidelines**

Test		Interpretation
▪ Normality	▪ Kolmogorov-Smirnov (KS)	▪ Normal if p-value > 0.05
▪ Correlation	▪ Pearson Correlation	▪ Significant if p-value < 0.05

As an initial procedure, the dependent variable was tested for normality using KS. This is appropriate since the number of observations under study is 129, which is greater than 100 observations. To ensure normality, the dependent variable was transformed accordingly (Osborne, 2002). *Table 3* summarizes the results of tests for normality after data transformation was performed.

**Table 3. Results of test for normality**

Variable	Short Names	KS	p-value	Remarks
Networked readiness index	LNNRI	0.075	0.074	normal at .05

For the purpose of testing the hypotheses, this study used an empirical model for OLS regression analysis with respect to income level groups and NRI as shown in *Equation 1*. The LO group was used as the base for analysis purposes.

**Equation 1.** Empirical model for OLS regression

$$LNNRI = B_{01} + B_6HI + B_7UM + B_8LM$$

Where: LNNRI = log networked readiness index  
 HI = high income level  
 UM = upper-middle income level  
 LM = lower-middle income level

**Results, discussion, and conclusion**

The correlation matrix of dependent variable and explanatory variable, found in *Table 4*, showed that income level groups and NRI have positive correlation as indicated by the Pearson rho of .787. This means that for every unit of movement from a lower income level group to a higher income level group, there is a corresponding log unit increase in NRI. Moreover, such correlation is statistically significant (p<.05). In this regard,  $H_{01}$  could be rejected.

**Table 4. Correlation matrix**

		Income Group Level
LNNRI	Pearson Correlation	.787**
	Sig. (2-tailed)	.000
	N	129

*Table 5* shows the results of OLS regression analysis. Based on the empirical model, income level group has a significant effect on NRI ( $\beta=.997, .353, .191, p<.05$ ), thus rejecting  $H_{02}$ . Moreover, using LO as the base income group level, the NRIs of countries belonging to different income groups differ significantly ( $p<.05$ ).

**Table 5. Results of OLS regression analysis**

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients Beta		
1	(Constant)	1.133	.023		48.216	.000
	HI	.415	.029	.997	14.267	.000
	UM	.164	.031	.353	5.237	.000
	LM	.091	.032	.191	2.864	.005
a. Dependent Variable: LNNRI						
R-square						.674
No. of observations						129
F-value						86.148
Sig.						.000

This finding validates one of the observations highlighted in the Report. Countries with high income tend to have higher NRI thereby dominating 40 slots in the top 50, with most countries with upper-middle and lower-middle incomes scattered in the middle, and low-income countries occupying most of the bottom 20. This supports the statistical finding that NRIs of countries belonging to different income level groups also significantly differ.

This then solidifies the claim of Wallsten (2005) that richer countries have better access to ICT and thus have higher potential to utilize it for development and to become more competitive. The high correlation between income level group and NRI validates as well the observations of Jorgenson and Vu (2005) with regard to the contribution of ICT investments in higher-income economies to be more evident as manifested in more jobs being created and more production being carried out. The same is also being felt in highly developing countries in Asia where business process outsourcing is one of the key economic generators.

Furthermore, as can be seen in the Report, there are still a number of economies that display higher levels of NRI than their income level would suggest. This can be supported by the r-square. Though the r-square is relatively high at .674, there is still this chance that the response of NRI to income level group is not in accordance with what is expected (positive relationship) but the level of comfort is still high at more than 65 percent of the time that the behavior of NRI with respect to income level group is that which is expected.

Moving on the discussion of competitiveness, the results of this study is consistent with the ideas relating to economic foundations of global competitiveness as highlighted by Snowdon and Stonehouse (2006) and supported by Porter. As such, the use of NRI to gauge a country's competitiveness with respect to ICT is not a baseless undertaking and the quest to look for variables that can positively NRI is a noble initiative the fact that a country's NRI speaks largely of its propensity to utilize ICT for economic development.

But as a word of caution, the results of this study do not intend to stereotype and to impose an unnecessary label that a country has to be in a higher income-level group first to be competitive; if such is the case, then absolutely there can no country whose NRI is higher than its income level group. This was explicitly negated by the Report. More importantly, as an insight, the knowledge that income level group does significantly affect NRI can be used as a potent starting point to come up with value-adding projects that can improve NRI and thus increasing a country's potential to be more competitive.

### Recommendations

The contribution of this study rests mainly on how national governments can make use of the results and findings of this study to improve their NRI. This study therefore recommends that for governments to enhance their conduciveness toward exploiting ICT for national development and sustainability, they should focus on developing relevant fiscal and monetary policies that are rooted on how well its current income level group can handle and cope with. These may range from overall ICT strategic plans down to operational policies that may pertain to regulations on ICT infrastructure and to programs that aim to increase the awareness of the benefits of electronic commerce while equally investing on controls that mitigate risks posed by privacy, confidentiality, security, and transaction integrity threats.

Moreover, it is also recommended that future researches be geared toward investigating the bi-directionality between NRI as independent variable and income level group as dependent variable.

In addition, it is also recommended that additional independent variables, preferably economic variables, be included in the model. Likewise, the behaviors of the new variables and the existing variables must be investigated for additional insights, including any violations in the assumptions of the multiple linear regression approach. In the same manner, the new model may also be strengthened using panel data approach as to consider the element of time, among others.

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## Appendix - Raw Data (taken from the Report)

	COUNTRY	NRI	INCOME GROUP
1	Albania	3.27	LM
2	Argentina	3.38	UM
3	Australia	5.06	HI
4	Austria	4.94	HI
5	Azerbaijan	3.75	LM
6	Bahrain	4.58	HI
7	Bangladesh	3.01	LO
8	Barbados	4.36	HI
9	Belgium	4.86	HI
10	Benin	3.06	LO
11	Bolivia	2.68	LM
12	Bosnia and Herzegovina	3.07	UM
13	Botswana	3.47	UM
14	Brazil	3.80	UM
15	Brunei Darussalam	3.77	HI
16	Bulgaria	3.66	UM
17	Burkina Faso	3.10	LO
18	Burundi	2.80	LO
19	Cambodia	3.03	LO
20	Cameroon	2.86	LM

	<b>COUNTRY</b>	<b>NRI</b>	<b>INCOME GROUP</b>
21	Canada	5.36	HI
22	Chad	2.57	LO
23	Chile	4.13	UM
24	China	4.31	LM
25	Colombia	3.80	UM
26	Costa Rica	3.95	UM
27	Cote D'Ivoire	3.16	LM
28	Croatia	3.91	HI
29	Cyprus	4.48	HI
30	Czech Republic	4.35	HI
31	Denmark	5.54	HI
32	Dominican Republic	3.64	UM
33	Ecuador	3.04	LM
34	Egypt	3.67	LM
35	El Salvador	3.55	LM
36	Estonia	4.81	HI
37	Ethiopia	2.98	LO
38	Finland	5.44	HI
39	France	4.99	HI
40	Gambia, The	3.61	LO
41	Georgia	3.38	LM
42	Germany	5.16	HI
43	Ghana	3.25	LO
44	Greece	3.82	HI
45	Guatemala	3.53	LM
46	Honduras	3.13	LM
47	Hong Kong SAR	5.33	HI
48	Hungary	3.98	HI
49	Iceland	5.20	HI
50	India	4.09	LM
51	Indonesia	3.72	LM
52	Ireland	4.82	HI
53	Israel	4.58	HI
54	Italy	3.97	HI
55	Jamaica	3.73	UM
56	Japan	4.89	HI
57	Jordan	4.09	LM
58	Kazakhstan	3.68	UM
59	Kenya	3.40	LO
60	Korea, Republic	5.14	HI
61	Kuwait	3.62	HI
62	Kyrgyz Republic	2.97	LO
63	Latvia	3.90	UM
64	Lesotho	3.12	LM
65	Libya	3.16	UM
66	Lithuania	4.12	UM
67	Luxembourg	5.02	HI
68	Macedonia, FYR	3.64	UM
69	Madagascar	3.00	LO
70	Malawi	3.01	LO
71	Malaysia	4.65	UM
72	Mali	3.27	LO
73	Malta	4.75	HI
74	Mauritania	3.19	LO
75	Mauritius	3.89	UM
76	Mexico	3.61	UM



	<b>COUNTRY</b>	<b>NRI</b>	<b>INCOME GROUP</b>
77	Mongolia	3.36	LM
78	Montenegro	4.10	UM
79	Morocco	3.43	LM
80	Mozambique	3.03	LO
81	Namibia	3.40	UM
82	Nepal	2.95	LO
83	Netherlands	5.32	HI
84	New Zealand	4.94	HI
85	Nicaragua	2.95	LM
86	Nigeria	3.25	LM
87	Norway	5.22	HI
88	Oman	3.91	HI
89	Pakistan	3.44	LM
90	Panama	3.81	UM
91	Paraguay	2.88	LM
92	Peru	3.38	UM
93	Philippines	3.51	LM
94	Poland	3.74	UM
95	Portugal	4.41	HI
96	Qatar	4.53	HI
97	Romania	3.80	UM
98	Russian Federation	3.58	UM
99	Saudia Arabia	4.30	HI
100	Senegal	3.63	LO
101	Serbia	3.51	UM
102	Singapore	5.64	HI
103	Slovak Republic	3.86	HI
104	Slovenia	4.51	HI
105	South Africa	3.78	UM
106	Spain	4.37	HI
107	Sri Lanka	3.65	LM
108	Suriname	2.92	UM
109	Sweden	5.65	HI
110	Switzerland	5.48	HI
111	Syria	3.13	LM
112	Taiwan, China	5.20	HI
113	Tajikistan	3.09	LO
114	Tanzania	3.01	LO
115	Thailand	3.97	LM
116	Timor-Leste	2.69	LM
117	Trinidad and Tobago	3.60	HI
118	Tunisia	4.22	LM
119	Turkey	3.68	UM
120	Uganda	3.03	LO
121	Ukraine	3.53	LM
122	United Arab Emirates	4.85	HI
123	United Kingdom	5.17	HI
124	United States	5.46	HI
125	Uruguay	3.81	UM
126	Venezuela	3.06	UM
127	Vietnam	3.87	LO
128	Zambia	3.26	LO
129	Zimbabwe	2.67	LO