

Microsoft



The Economic Impact of Interoperability

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The Economic Impact of Interoperability

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Technology and Economic Growth

The latest WITSA¹ Digital Planet study (2006), “The Global Information Economy.” provides an analysis of the global dimensions of information technology in the economy and includes detailed information on the size, growth, and access to information technology in the global marketplace, regional markets in 75 individual countries.

Throughout the years, the WITSA study results are clear. Spending on Information and Communications Technology (ICT) is a critically important element of the global economy. The ICT industry is among the most significant driver of the global economy, accounting for US\$1.8 trillion in spending in 1997, approximately 6 percent of the global GDP. This is greater than the GDP of France and almost twice the size of the GDP of the state of California. In addition, the study findings suggest that *national GDP grows when ICT spending increases* and that even in the face of worsening economic conditions, the effect on ICT spending is muted.

Additional evidence about the positive influence of ICT on economic growth due to productivity gains is described on the A. Bernasek article², where she notes that the investments on digital technologies are paying off, as demonstrated by the big productivity gains starting in 2001.

The strong influence of the deployment of ICTs on the GDP has also been recently corroborated by an investigation made by L. Waverman³ of the London Business School, who says, in a typical developing country, a rise of 10 mobile phones per 100 people boosts the rate of growth of GDP by 0.6 percentage points a year.

All of these studies are clear indicators of the strong economic impact on GDP brought by the use of ICT technologies. Therefore the importance of ICTs cannot be neglected by governments, once it leverages the economy and has the potential to positively impact GDP.

For Governments the deployment of e-government systems is a key component of the ICT technology investments. The availability of e-government systems is one of the pillars for a modern and efficient government. Although it seems to be no questions about the impact of ICT technologies has on economic growth, being e-Gov one of them, we will demonstrate why interoperable e-government systems can ultimately leverage economic growth and have significant positive impact on the GDP.

¹ <http://www.witsa.org/>

² Anna Bernasek, “The Productivity Miracle Is For Real”, *Fortune*, March 18, 2002

³ Waverman et al. (2005) “The impact of telecoms on economic growth in developing countries”

Governments and Interoperability

The wide availability of Internet access has changed the way governments provide services to their constituents. Citizens who become more knowledgeable every day about IT resources and capabilities are increasingly exerting political pressure to make governments accelerate the offering of online services. These e-services provide not only a better quality in the services being offered to the citizens, but also improve the overall efficiency and efficacy of the government as a whole and make the procedures of public services agencies more transparent.

If we analyze the evolution of the data-processing systems in any government, it is usual to find out that the first priority was to develop solutions that addressed government workflows, agency by agency and normally related to internal situations. Political decisions for deployment priorities were made based on the return on taxes and on a desire to demonstrate the improvement of highly visible public services such as security, health, or justice.

These solutions were developed on a vertical and stand-alone basis, each one addressing the problem of the individual agency trying to improve its services. Therefore, the tax agency had its system, the police agency had its own independent system, the justice sector had another one and so on. Although this *vertical* approach was ideal for solving government agencies' process issues, its main flaw was that it didn't take into consideration the full vision and needs of the citizens. Citizens do not only have vertical needs; they have mostly *horizontal* (that is, across the board) needs. For instance, a citizen who needs to get a passport will probably need to interact with many agencies, such as police (I am not a wanted criminal), justice (I don't have any court orders pending), tax (I do not owe taxes) and banking (Paying fees for the passport).

Even if all of the vertical systems are already deployed and working efficiently, the citizen still needs to do transactional interactions with independent and nonintegrated systems. We will see later how this duality on the needs for e-services (government versus citizens) affects the economy.

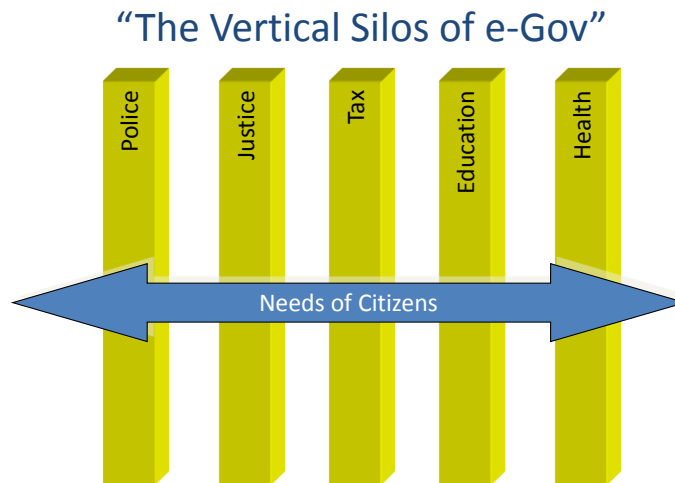


Figure 1 - Citizens and e-gov

The deployment and availability of on-line services by governments follows a clear pattern. Both the UN and Gartner, propose a five steps maturity model to understand and rank how countries behave on e-government services deployment. The UN utilizes this model to publish its e-Government Readiness Index. Both models are represented in the following illustrations

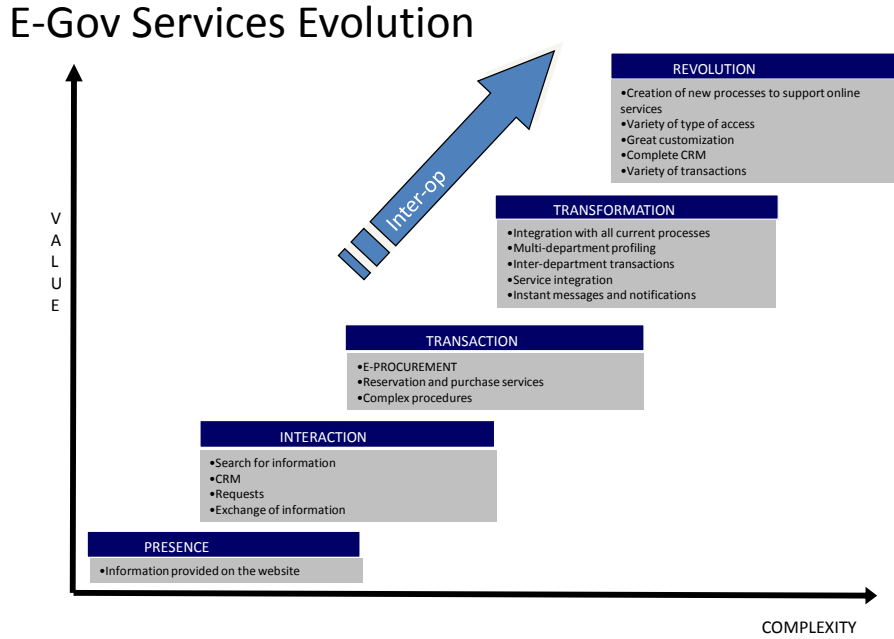


Figure 2 - Gartner Maturity Model

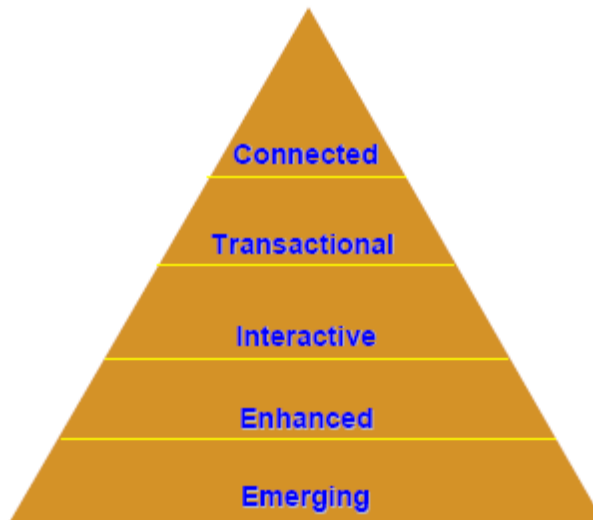


Figure 3 - UN Web index model

The Web **presence/emerging** phase is the simplest one. It's usually deployed in governments through the development of simple Web sites containing basic information to citizens and businesses. The deployment of this phase is done independently by each agency with no common goals.

The next phase, **interaction/enhanced**, is the natural evolution of the Web site: the public can not only look for information, but also can communicate with the authorities, exchanging information and filling out request forms. Requests and forms are then integrated into mainline applications to be duly processed, either manually or electronically.

The third phase, **transaction/interactive**, begins to provide more relevant services and interaction. Users can make their requests online and have the system taking care of everything. This is the phase where the first need for interoperability becomes visible, although it is not necessarily where implementation begins. Many government agencies develop and deploy independently their own solutions. However, a great number of these solutions will need to interoperate with other existing systems and even legacy systems — thus, the need to build a common interoperability gateway represents a major step forward in solving this integration need and is achieved in the next phase.

The **standardization/transactional** phase integrate the various applications among the different agencies. Interoperability becomes more relevant; transactions among citizens and government become simpler and there is an overall increase in productivity and data quality.

The last stage, **transformation/connected**, allows a great variety of transactions to be integrated; new services can be offered at lower cost and the benefits provided by this integrated services increases the overall value of the e-government system network.

Interoperability and Network Value

This integration for the e-government network has an economic behavior quite similar to a valued network structure in which the global value of the integrated network can be measured or correlated to the number of possible interconnections in the network.

According to V. Allee⁴, *“the value and capability of a network expands with the numbers of connections.... When a certain level of connectivity is reached in a complex system, the capabilities that are being unleashed may be far greater than the sum of the parts”*.

This can be mathematically demonstrated. The value of an interoperable system can be measured as a function of the number of connected transactions.

This function can be represented as:

⁴ Verna Allee, *The Future of Knowledge, Increasing prosperity through Value Networks*, 2003 Elsevier Science, p78

$$Value = \sum_{i=1}^m \lambda^i \left(t! \frac{1}{(t-n)! n!} \right)$$

Where:

t is the total number of transactions to interoperate

n is the number of transactions that need to be combined to complete a process

m is the number of sub-systems

λ is the correlation factor

Then, as we increase the number of combinations, we increase the efficiency of the system and increase its value.

The following illustration for N=2 shows how significant the increase is on the network value as we increase the number of transactions that interconnect or interoperate. Mathematically speaking, this is a factorial progression.

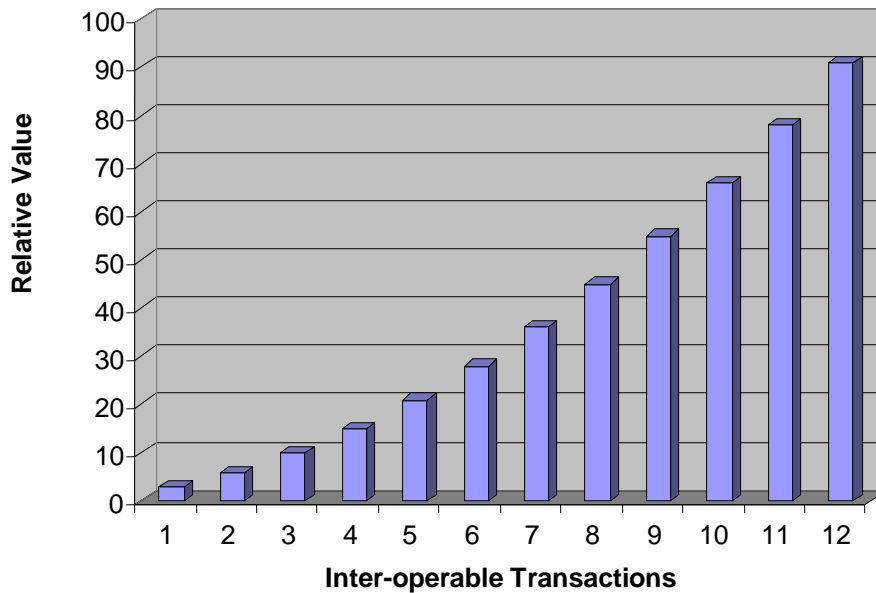


Figure 4 - Network Value

The Impact of Interoperability on the GDP

This explains why deploying a fully interoperable system produce a huge impact. As we increasing the number of connections in a network the consequence is the increased overall network value, much higher than the sum of the parts. Once a government decides to adopt interoperability as its key IT strategy, this mathematical phenomenon will, over time, bring a huge increase in productivity.

To better understand the impact, let’s measure the burden over the GDP when a citizen needs to wait in a line for a government service.

The following table identifies how much one working hour contributes to the GDP

Country	GDP (millions of USD)	Population	GDP / cap	GDP / Working Hour
World	48,244,879	6,671,226,000	7,232	3.62
Australia	768,178	20,850,000	36,843	18.42
Belgium	392,001	10,457,000	37,487	18.74
Brazil	1,067,962	186,500,000	5,726	2.86
Canada	1,251,463	32,990,000	37,935	18.97
China	2,668,071	1,319,000,000	2,023	1.01
France	2,230,721	64,102,140	34,799	17.40
Germany	2,906,681	82,310,000	35,314	17.66
India	906,268	1,169,016,000	775	0.39
Italy	1,844,749	58,883,958	31,329	15.66
Japan	4,340,133	127,720,000	33,982	16.99
Mexico	839,182	103,263,388	8,127	4.06
Netherlands	657,590	16,390,000	40,121	20.06
Russia	986,940	142,499,000	6,926	3.46
South Korea	888,024	48,224,000	18,415	9.21
Spain	1,223,988	44,708,964	27,377	13.69
Sweden	384,927	9,150,000	42,069	21.03
Switzerland	379,758	7,484,000	50,743	25.37
Turkey	402,710	74,877,000	5,378	2.69
United Kingdom	2,345,015	60,209,500	38,948	19.47
United States	13,201,819	301,950,000	43,722	21.86

Sources:

GDP: World Bank 2006
 Population: UN Estimates (UN Web Site)

Assumption:

2000 Working hours/year

At the same token, if one hour is wasted in lines, just waiting for a government service, the citizen is then not contributing to the GDP. Therefore, we can say that one hour is lost from the GDP contribution.

The following table shows a sensitivity analysis on the GDP when we vary the number of activities a citizen has to carry out annually (pay taxes, fill out forms, obtain permits and others) due to laws or government requirements, as well as the number of minutes needed to fully execute with each one of the required activity. The time to execute these activities cannot be considered productive time toward GDP increase.

Normalized Impact on GDP

Minutes to execute	Number of activities per year										
	10	15	20	25	30	35	40	45	50	55	60
5	0.04%	0.06%	0.08%	0.10%	0.13%	0.15%	0.17%	0.19%	0.21%	0.23%	0.25%
10	0.08%	0.13%	0.17%	0.21%	0.25%	0.29%	0.33%	0.38%	0.42%	0.46%	0.50%
15	0.13%	0.19%	0.25%	0.31%	0.38%	0.44%	0.50%	0.56%	0.63%	0.69%	0.75%
20	0.17%	0.25%	0.33%	0.42%	0.50%	0.58%	0.67%	0.75%	0.83%	0.92%	1.00%
25	0.21%	0.31%	0.42%	0.52%	0.63%	0.73%	0.83%	0.94%	1.04%	1.15%	1.25%
30	0.25%	0.38%	0.50%	0.63%	0.75%	0.88%	1.00%	1.13%	1.25%	1.38%	1.50%
35	0.29%	0.44%	0.58%	0.73%	0.88%	1.02%	1.17%	1.31%	1.46%	1.60%	1.75%
40	0.33%	0.50%	0.67%	0.83%	1.00%	1.17%	1.33%	1.50%	1.67%	1.83%	2.00%
45	0.38%	0.56%	0.75%	0.94%	1.13%	1.31%	1.50%	1.69%	1.88%	2.06%	2.25%
50	0.42%	0.63%	0.83%	1.04%	1.25%	1.46%	1.67%	1.88%	2.08%	2.29%	2.50%
55	0.46%	0.69%	0.92%	1.15%	1.38%	1.60%	1.83%	2.06%	2.29%	2.52%	2.75%
60	0.50%	0.75%	1.00%	1.25%	1.50%	1.75%	2.00%	2.25%	2.50%	2.75%	3.00%

To complete this analysis, let's apply these percentage ranges to the GDP of a few countries.

Country	GDP (millions of USD)	Population	GDP / cap	GDP / Working Hour	0.30%	0.70%	1.20%	3.00%	Avg
World	48,244,879	6,671,226,000	7,232	3.62	144,735	337,714	578,939	1,447,346	627,183
Australia	768,178	20,850,000	36,843	18.42	2,305	5,377	9,218	23,045	9,986
Belgium	392,001	10,457,000	37,487	18.74	1,176	2,744	4,704	11,760	5,096
Brazil	1,067,962	186,500,000	5,726	2.86	3,204	7,476	12,816	32,039	13,884
Canada	1,251,463	32,990,000	37,935	18.97	3,754	8,760	15,018	37,544	16,269
China	2,668,071	1,319,000,000	2,023	1.01	8,004	18,676	32,017	80,042	34,685
France	2,230,721	64,102,140	34,799	17.40	6,692	15,615	26,769	66,922	28,999
Germany	2,906,681	82,310,000	35,314	17.66	8,720	20,347	34,880	87,200	37,787
India	906,268	1,169,016,000	775	0.39	2,719	6,344	10,875	27,188	11,781
Italy	1,844,749	58,883,958	31,329	15.66	5,534	12,913	22,137	55,342	23,982
Japan	4,340,133	127,720,000	33,982	16.99	13,020	30,381	52,082	130,204	56,422
Mexico	839,182	103,263,388	8,127	4.06	2,518	5,874	10,070	25,175	10,909
Netherlands	657,590	16,390,000	40,121	20.06	1,973	4,603	7,891	19,728	8,549
Russia	986,940	142,499,000	6,926	3.46	2,961	6,909	11,843	29,608	12,830
South Korea	888,024	48,224,000	18,415	9.21	2,664	6,216	10,656	26,641	11,544
Spain	1,223,988	44,708,964	27,377	13.69	3,672	8,568	14,688	36,720	15,912
Sweden	384,927	9,150,000	42,069	21.03	1,155	2,694	4,619	11,548	5,004
Switzerland	379,758	7,484,000	50,743	25.37	1,139	2,658	4,557	11,393	4,937
Turkey	402,710	74,877,000	5,378	2.69	1,208	2,819	4,833	12,081	5,235
United Kingdom	2,345,015	60,209,500	38,948	19.47	7,035	16,415	28,140	70,350	30,485
United States	13,201,819	301,950,000	43,722	21.86	39,605	92,413	158,422	396,055	171,624

(A table with additional countries is included at the end of this document)

The table above shows a few economic scenarios and their burden on GDP (Gross Domestic Product) caused by the lack of interoperable systems.

Conclusions

There is no question about e-government systems leading to more-efficient governments. However, e-government initiatives work primarily on diminishing the *time* to process each transaction (the vertical vision), whereas interoperability solutions work primarily on diminishing the *number* of processes or activities (the horizontal vision) by combining many of them in the same “activity or transactional effort”.

Therefore, deploying e-government systems *and* at the same time making them interoperable will produce higher gains of scale at the same or even less cost. This can be simultaneously achieved by the use of technologies like WEB services and Service Oriented Architecture (SOA)⁵.

On top of that, the network combinatorial effect that was previously demonstrated increases the net value of the government's information system which translates into a positive-leverage impact on GDP growth

In addition to the impact on GDP, there are other benefits from having interoperable e-government systems. Better data quality, more relevant information and increased agility to expedite required bureaucratic processes, as well as an improvement in the government's perceived image by its citizens. On the article "*Measuring the returns from investments on e-government*"⁶ we address the issue of valuing these non tangible returns that are obtained when deploying e-government systems, such as transparency, quality, efficiency and equal opportunity to compete for government business.

Finally, we can summarize the main conclusions as follows:

- E-government initiatives provide a substantial savings on public sector spending, returning benefits to citizens and private enterprises;
- Spending on ICT leverages economic growth;
- Interoperability leverages the benefits of e-government. Using the right architectural model to deploy e-government through WEB services doesn't cost more and the benefits of interoperability are an immediate by-product, with a direct, positive impact on the GDP.

Finally, from a Microsoft perspective, we want to mention the Gartner study⁷ that positions Microsoft as a leading provider of WEB services platforms.

⁵ Jerry Fishenden, Oliver Bell and Alan Grose. "*Government Interoperability – Enabling the Delivery of E-Services*," a Microsoft white paper

⁶ Lorenzo Madrid, "*Measuring the returns from investments on e-government*", a Microsoft white paper

⁷ Magic Quadrant for Web Services Platforms, 2005," D. Smith, C. Abrams, D. Sholler, D. Plummer, M. Cantara. July 12, 2005, Gartner

Annex – World Wide GDP Table & Interoperability Impact

Country	GDP	0.30%	0.70%	1.20%	3.00%	5.00%
	(millions of US\$)					
Gross world product	48,244,879	144,735	337,714	578,939	1,447,346	2,412,244
United States	13,201,819	39,605	92,413	158,422	396,055	660,091
Japan	4,340,133	13,020	30,381	52,082	130,204	217,007
Germany	2,906,681	8,720	20,347	34,880	87,200	145,334
China	2,668,071	8,004	18,676	32,017	80,042	133,404
United Kingdom	2,345,015	7,035	16,415	28,140	70,350	117,251
France	2,230,721	6,692	15,615	26,769	66,922	111,536
Italy	1,844,749	5,534	12,913	22,137	55,342	92,237
Canada	1,251,463	3,754	8,760	15,018	37,544	62,573
Spain	1,223,988	3,672	8,568	14,688	36,720	61,199
Brazil	1,067,962	3,204	7,476	12,816	32,039	53,398
Russian Federation	986,940	2,961	6,909	11,843	29,608	49,347
India	906,268	2,719	6,344	10,875	27,188	45,313
South Korea	888,024	2,664	6,216	10,656	26,641	44,401
Mexico	839,182	2,518	5,874	10,070	25,175	41,959
Australia	768,178	2,305	5,377	9,218	23,045	38,409
Netherlands	657,590	1,973	4,603	7,891	19,728	32,880
Turkey	402,710	1,208	2,819	4,833	12,081	20,136
Belgium	392,001	1,176	2,744	4,704	11,760	19,600
Sweden	384,927	1,155	2,694	4,619	11,548	19,246
Switzerland	379,758	1,139	2,658	4,557	11,393	18,988
Indonesia	364,459	1,093	2,551	4,374	10,934	18,223
Poland	338,733	1,016	2,371	4,065	10,162	16,937
Austria	322,444	967	2,257	3,869	9,673	16,122
Norway	310,960	933	2,177	3,732	9,329	15,548
Saudi Arabia	309,778	929	2,168	3,717	9,293	15,489
Denmark	275,237	826	1,927	3,303	8,257	13,762
South Africa	254,992	765	1,785	3,060	7,650	12,750
Greece	244,951	735	1,715	2,939	7,349	12,248
Iran	222,889	669	1,560	2,675	6,687	11,144
Ireland	222,650	668	1,559	2,672	6,680	11,133
Argentina	214,058	642	1,498	2,569	6,422	10,703
Finland	209,445	628	1,466	2,513	6,283	10,472
Thailand	206,247	619	1,444	2,475	6,187	10,312
Portugal	192,572	578	1,348	2,311	5,777	9,629
Hong Kong, China	189,798	569	1,329	2,278	5,694	9,490
Venezuela	181,862	546	1,273	2,182	5,456	9,093
Malaysia	148,940	447	1,043	1,787	4,468	7,447
Chile	145,841	438	1,021	1,750	4,375	7,292
Czech Republic	141,801	425	993	1,702	4,254	7,090
Colombia	135,836	408	951	1,630	4,075	6,792
Singapore	132,158	396	925	1,586	3,965	6,608

The Economic Impact of Interoperability

Country	GDP	0.30%	0.70%	1.20%	3.00%	5.00%
		(millions of US\$)				
United Arab Emirates	129,702	389	908	1,556	3,891	6,485
Pakistan	128,830	386	902	1,546	3,865	6,442
Israel	123,434	370	864	1,481	3,703	6,172
Romania	121,609	365	851	1,459	3,648	6,080
Philippines	116,931	351	819	1,403	3,508	5,847
Algeria	114,727	344	803	1,377	3,442	5,736
Nigeria	114,686	344	803	1,376	3,441	5,734
Hungary	112,899	339	790	1,355	3,387	5,645
Egypt	107,484	322	752	1,290	3,225	5,374
Ukraine	106,111	318	743	1,273	3,183	5,306
New Zealand	103,873	312	727	1,246	3,116	5,194
Peru	93,269	280	653	1,119	2,798	4,663
Kuwait	80,781	242	565	969	2,423	4,039
Kazakhstan	77,237	232	541	927	2,317	3,862
Bangladesh	61,961	186	434	744	1,859	3,098
Vietnam	60,884	183	426	731	1,827	3,044
Morocco	57,307	172	401	688	1,719	2,865
Slovak Republic	55,049	165	385	661	1,651	2,752
Libya	50,320	151	352	604	1,510	2,516
Angola	44,033	132	308	528	1,321	2,202
Croatia	42,653	128	299	512	1,280	2,133
Qatar	42,463	127	297	510	1,274	2,123
Luxembourg	41,382	124	290	497	1,241	2,069
Ecuador	40,800	122	286	490	1,224	2,040
Sudan	37,565	113	263	451	1,127	1,878
Slovenia	37,303	112	261	448	1,119	1,865
Belarus	36,945	111	259	443	1,108	1,847
Guatemala	35,290	106	247	423	1,059	1,765
Syrian Arab Republic	34,902	105	244	419	1,047	1,745
Serbia	31,808	95	223	382	954	1,590
Bulgaria	31,483	94	220	378	944	1,574
Dominican Republic	30,581	92	214	367	917	1,529
Tunisia	30,298	91	212	364	909	1,515
Lithuania	29,791	89	209	357	894	1,490
Sri Lanka	26,967	81	189	324	809	1,348
Oman	24,284	73	170	291	729	1,214
Lebanon	22,722	68	159	273	682	1,136
Costa Rica	22,145	66	155	266	664	1,107
Kenya	21,186	64	148	254	636	1,059
Azerbaijan	20,122	60	141	241	604	1,006
Latvia	20,116	60	141	241	603	1,006
Trinidad and Tobago	19,911	60	139	239	597	996
Cameroon	18,323	55	128	220	550	916
El Salvador	18,306	55	128	220	549	915

The Economic Impact of Interoperability

Country	GDP	0.30%	0.70%	1.20%	3.00%	5.00%
(millions of US\$)						
Côte d'Ivoire	17,484	52	122	210	525	874
Uzbekistan	17,178	52	120	206	515	859
Panama	17,097	51	120	205	513	855
Estonia	16,410	49	115	197	492	821
Iceland	15,854	48	111	190	476	793
Cyprus	15,418	46	108	185	463	771
Macao, China	14,285	43	100	171	429	714
Jordan	14,176	43	99	170	425	709
Ethiopia	13,315	40	93	160	399	666
Bahrain	12,914	39	90	155	387	646
Ghana	12,906	39	90	155	387	645
Tanzania	12,784	38	89	153	384	639
Bosnia and Herzegovina	11,296	34	79	136	339	565
Bolivia	11,163	33	78	134	335	558
Zambia	10,907	33	76	131	327	545
Jamaica	10,533	32	74	126	316	527
Turkmenistan	10,496	31	73	126	315	525
Botswana	10,328	31	72	124	310	516
Gabon	9,546	29	67	115	286	477
Uganda	9,322	28	65	112	280	466
Honduras	9,235	28	65	111	277	462
Albania	9,136	27	64	110	274	457
Paraguay	9,110	27	64	109	273	456
Senegal	8,936	27	63	107	268	447
Equatorial Guinea	8,563	26	60	103	257	428
Congo	8,543	26	60	103	256	427
Afghanistan	8,399	25	59	101	252	420
Nepal	8,052	24	56	97	242	403
Mozambique	7,608	23	53	91	228	380
Georgia	7,550	23	53	91	227	378
Republic of Congo	7,385	22	52	89	222	369
Cambodia	7,193	22	50	86	216	360
Chad	6,541	20	46	78	196	327
Mauritius	6,448	19	45	77	193	322
Armenia	6,406	19	45	77	192	320
Brunei Darussalam	6,400	19	45	77	192	320
Namibia	6,372	19	45	76	191	319
Republic of Macedonia	6,217	19	44	75	187	311
Burkina Faso	6,205	19	43	74	186	310
Mali	5,929	18	42	71	178	296
Papua New Guinea	5,654	17	40	68	170	283
Malta	5,570	17	39	67	167	279
Madagascar	5,499	16	38	66	165	275
Nicaragua	5,369	16	38	64	161	268

The Economic Impact of Interoperability

Country	GDP	0.30%	0.70%	1.20%	3.00%	5.00%
(millions of US\$)						
Zimbabwe	5,010	15	35	60	150	251
Haiti	4,961	15	35	60	149	248
Benin	4,775	14	33	57	143	239
West Bank and Gaza	4,059	12	28	49	122	203
Niger	3,544	11	25	43	106	177
Laos	3,404	10	24	41	102	170
Guinea	3,317	10	23	40	100	166
Moldova	3,266	10	23	39	98	163
Barbados	3,091	9	22	37	93	155
Fiji	2,822	8	20	34	85	141
Tajikistan	2,811	8	20	34	84	141
Kyrgyz Republic	2,695	8	19	32	81	135
Mongolia	2,689	8	19	32	81	134
Mauritania	2,663	8	19	32	80	133
Swaziland	2,648	8	19	32	79	132
Rwanda	2,494	7	17	30	75	125
Montenegro	2,347	7	16	28	70	117
Malawi	2,232	7	16	27	67	112
Togo	2,206	7	15	26	66	110
Suriname	1,597	5	11	19	48	80
Central African Republic	1,486	4	10	18	45	74
Lesotho	1,476	4	10	18	44	74
Sierra Leone	1,443	4	10	17	43	72
Belize	1,217	4	9	15	37	61
Cape Verde	1,144	3	8	14	34	57
Eritrea	1,085	3	8	13	33	54
Antigua and Barbuda	962	3	7	12	29	48
Bhutan	927	3	6	11	28	46
Maldives	915	3	6	11	27	46
St. Lucia	906	3	6	11	27	45
Guyana	896	3	6	11	27	45
Burundi	807	2	6	10	24	40
Djibouti	757	2	5	9	23	38
Seychelles	750	2	5	9	23	38
Liberia	631	2	4	8	19	32
Grenada	519	2	4	6	16	26
The Gambia	511	2	4	6	15	26
St. Kitts and Nevis	487	1	3	6	15	24
St. Vincent and the Grenadines	466	1	3	6	14	23
Samoa	422	1	3	5	13	21
Comoros	403	1	3	5	12	20
Vanuatu	388	1	3	5	12	19
East Timor	356	1	2	4	11	18
Solomon Islands	335	1	2	4	10	17

The Economic Impact of Interoperability

Country	GDP	0.30%	0.70%	1.20%	3.00%	5.00%
		(millions of US\$)				
Guinea-Bissau	304	1	2	4	9	15
Dominica	300	1	2	4	9	15
Micronesia	245	1	2	3	7	12
Tonga	223	1	2	3	7	11
Palau	157	0	1	2	5	8
Marshall Islands	155	0	1	2	5	8
São Tomé and Príncipe	123	0	1	1	4	6
Kiribati	71	0	0	1	2	4