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Assessing Colombian Government Websites

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Citizens and businesses rely on government websites to access important information and services. Unfortunately, many Colombian government websites fail to meet basic website standards for security, speed, mobile friendliness, and accessibility.

KEY TAKEAWAYS

- Only 38 percent of Colombian government websites passed the desktop page-load speed test, and less than 5 percent passed the mobile page-load speed test.
- One-third of Colombian government websites do not use HTTPS to encrypt website traffic, and only one website has correctly configured DNSSEC to secure its domain.
- Half of Colombian government websites do not follow the accessibility standards that enable people with disabilities to access their websites.
- To address these deficiencies, the Colombian government should create new security requirement, establish a mobile-first strategy, move all websites to the cloud, increasing accessibility testing, and launch a website modernization sprint.

INTRODUCTION

The coronavirus pandemic has highlighted the importance of citizens and businesses having secure and reliable access to online government services.[1] Unfortunately, many Colombian government websites fail to meet basic website standards. This report used publicly available tools to test the page-load speed for both desktop and mobile browsers, mobile-friendliness design, security, and accessibility of 42 Colombian government websites. All websites failed at least one test. Many of the sites are slow, difficult to use on mobile devices, inaccessible, and insecure. As such, they make it unnecessarily difficult to find government information online and expose users to security risks.

To assess whether Colombian government websites performed adequately, we compared their performance to the performance of 20 popular nongovernment Colombian websites, such as Wikipedia.org and eltiempo.com.[2] We established a benchmark score for each test—typically one standard deviation below the average score of popular nongovernment websites—and Colombian government sites had to meet or exceed a test's benchmark to pass.

Many Colombian government websites performed poorly on both page-load speed and mobile-friendliness tests. For example, only 38 percent of Colombian government websites passed the desktop page-load speed test, and less than five percent passed the mobile page-load speed test. Almost 60 percent of sites passed the mobile-friendliness test. Only two websites passed both the mobile page-load speed and mobile-friendliness tests. The latter statistic is particularly concerning because more than half of Colombia's population uses a mobile device to access the Internet. The two websites that passed both the mobile page-load speed test and the mobile-friendliness test are the Superintendency of Corporation's website (Superintendencia de Sociedades) and the Colombian Migration website (Migración; Ministerio de Relaciones Exteriores).

Many Colombian government websites also did not perform well on security. This report reviews two security features. The first is Hypertext Transfer Protocol Secure (HTTPS), a standard protocol to encrypt communications between web browsers and websites. The second is Domain Name System Security Extensions (DNSSEC), a set of protocols used to verify the IP address associated with a particular domain name is authentic. We used a tool that analyzes Secure Sockets Layer (SSL) and Transport Layer Security (TLS) certificates, which are used by most HTTPS connections, to test that the websites had enabled and adequately configured HTTPS.[3] We found that 67 percent of Colombian government websites passed the HTTPS test. This result means that users could not privately and securely browse one-third of the sites we tested. In addition, we used a tool to determine whether the domain of each state government website used DNSSEC. We found that less than three percent of Colombian government websites had correctly enabled DNSSEC for their domain name. The only site that passed was the Vice President's website (Vicepresidencia).

Lastly, 48 percent of Colombian government websites passed the accessibility test. Five sites received a perfect score on a 0-to-100-point scale, but five websites also received scores below 60. These latter websites are likely highly inaccessible, meaning they are difficult for people with disabilities to use, including the more than 250,000 Colombians who are blind.[4]

We used the Colombian government websites scores for each test to calculate an overall 0-to-100-point scale score for every site. The Colombian Migration website (Migración; Ministerio de Relaciones Exteriores) performed the best by a wide margin. It received a score of 79.5, which is roughly 15 points better than the next best website. Overall, the five best performing Colombian government websites we tested are:

- Colombia Migration, (Migración; Ministerio de Relaciones Exteriores)
- Vice-Presidency (Vicepresidencia)
- Office of the Comptroller General of Colombia (Contraloría)
- Ministry of National Defense (MinDefensa)
- Vigilance and Private Security Superintendency (Superintendencia de Vigilancia y Seguridad Privada)

The five lowest-performing sites are:

- Adaptation Fund (Fondo Adaptación)
- Ministry of Commerce, Industry and Tourism (MinComercio)
- Financial Superintendency of Colombia (Superintendencia Financiera de Colombia)
- Superintendency of Solidarity-based Economy (Superintendencia de Economía Solidaria)
- Ministry of the Interior (MinInterior)

All Colombian government websites can make improvements. The Colombian government should take the following actions to ensure its citizens have access to fast, mobile-friendly, secure, and accessible government websites:

- Creating security requirements
- Establishing a mobile-first strategy
- Moving all websites to the cloud
- Testing the accessibility of websites with local partners
- Launching a website modernization sprint
- Authorizing websites to operate for a set period

Table 1 presents the overall rankings of Colombian government websites using a 0-to-100-point scale.

Table 1: Overall Rankings of Colombian Government Websites

Rank	Website	Score	Rank	Website	Score
1	Migración; Ministerio de Relaciones Exteriores	79.5	22	MinCultura	51.8
2	Vicepresidencia	67.9	23	Superintendencia Nacional de Salud	51.6
3	Contraloría	64.2	24	Presidencia de la República de Colombia	51.4
4	MinDefensa	62.7	25	MinVivienda	51.2
5	Superintendencia de Vigilancia y Seguridad Privada	62.3	26	RTVC Sistema de Medios Públicos	50.8
6	Portal de Transparencia Económica	61.0	27	MinEnergía	50.3
7	MinCiencias	60.3	28	SuperSubsidio	49.4
8	ICETEX	59.9	29	De Cero a Siempre	49.0
9	MinTIC	59.6	30	MinTrabajo	48.9
10	Senado	59.4	31	Superintendencia de Industria y Comercio	48.6
10	Departamento Administrativo Nacional de Estadística	59.4	32	Oficina del Alto Comisionado para la Paz	48.5
12	MinTransporte	59.3	33	MinSalud	47.1
13	Colombia Ágil	59.2	34	MinJusticia	46.9
14	Superintendencia de Sociedades	58.8	35	MinEducación	46.6
15	Urna de Cristal	56.8	36	MinRelaciones	46.3
16	APC Colombia	56.6	37	Colombia Productiva	45.1
17	Datos Abiertos	55.7	38	MinInterior	42.1
18	MinHacienda	55.5	39	Superintendencia de Economía Solidaria	37.7
19	MinAmbiente	55.3	40	Superintendencia Financiera de Colombia	36.5
20	Policia	54.8	41	MinComercio (MinCIT)	35.1
21	MinAgricultura	51.9	42	Fondo Adaptación	34.5

METHODOLOGY

This report used six publicly available tests to assess the performance of 42 Colombian government websites. We tested the performance of Colombian government websites in April 2020. For any sites that a test could not assess in April, we retested by no later than June 2020. For each of the tests, we assessed the website's homepage.

The first tool the report uses is Google's PageSpeed Insights, which measured each website's page-load speed on both desktop and mobile browsers.[5] Second, we used a tool from RankWatch, an Internet marketing platform, to test the mobile-friendliness of websites. The tool checked sites for mobile-friendly best practices, such as that text is large enough to read on a mobile device, all the content fits on the screen, and that the website spaces links are far enough apart to make them easy to select.[6] Third, the report uses two tools to measures security: Qualys SSL Labs' SSL Server Test tool, which inspects the security of SSL certificates web servers use to encrypt communications, and Verisign Labs' DNSSEC Debugger tool, which assess whether a DNS server has implemented DNSSEC.[7] We refer to the SSL Server Test as the HTTPS test throughout this report. Finally, the report uses AChecker's Web Accessibility Checker to score websites on their level of accessibility based on WCAG 2.0.[8]

We scored each website on 0-to-100-point scale for each test. Two of the tools (PageSpeed Insights and RankWatch), provided 0-to-100 scores. Qualys SSL Labs' SSL Server Test tool creates four 0-to-100-point scores for a website's servers based on their certificate, protocol support, key exchange, and cipher strength. We also created a score to reflect if the website had any significant security vulnerabilities. We averaged these five scores to create a singular HTTPS test 0-to-100-point score for each website. For the DNSSEC test, websites earned a score of 100 if the tool found no errors and a zero if it found errors. Finally, we used a formula to create an accessibility score for the sites. The formula uses the number of known issues AChecker's Web Accessibility Checker found to create a 0-to-100-point score. The formula penalizes websites for having higher levels of known issues.[9]

To calculate an overall ranking, we converted each of the metrics (desktop page-load speed, mobile page-load speed, mobile-friendliness, accessibility, HTTPS, and DNSSEC) into z-scores, which indicate how many standard deviations a value is from the mean. Using z-scores allows for comparison across metrics with different distributions. We created a single score for page-load speed by averaging the z-scores of the desktop and mobile page-load speed metrics. We created a single score for security using the average of the HTTPS and DNSSEC z-scores. We created an overall score by averaging each of the categories (page-load speed, mobile-friendliness, accessibility, and security). Next, we converted the scores to a 100-point scale to make the overall scores more intuitive based on the minimum and maximum percentage of points earned by websites.[10]

We used an additional tool from Sitemorse, a company that has several tests to assess the performance of websites, to assess the percentage of a website's pages that had at least one violation of a WCAG 2.1 (Level A) success criteria. We did not include the results from this test in our overall score because both government and private-sector websites performed poorly on the metric, making it difficult to establish a reasonable benchmark. Nonetheless, the results indicate that nearly every Colombian government webpage violates WCAG 2.1 (Level A) success criteria in at least one way.

There are several limitations to our findings. First, we did not test all Colombian government websites. Instead, we used Alexa.com to identify the most popular government websites, including websites for the Superintendency of Health, the National Police of Colombia, and the Presidency of the Republic.[11] We then identified government websites linked to by these top Colombian government sites to create a list of 42 websites to analyze. Second, we tested only the homepage of each site. Different pages on the same website can perform differently. Third, we generally only performed each test once, so temporary problems that existed during our testing penalized a website's score. Fourth, we used automated tools to provide an assessment of sites, but manual reviews can provide more complete information. For example, a full analysis of a website's accessibility requires a manual review.[12] Finally, we did not test for many factors that are also important for government websites, such as clear navigation, ease of use, and quality of information, nor did we check for a variety of backend security vulnerabilities, such as whether websites were running the latest security patches, using two-factor authentication, or had protections in place to remain resilient during spikes in traffic or denial-of-service attacks.[13]

To help validate our findings and put them in context, we also conducted video interviews during July and August of 2020 with individuals from a number of government agencies including the Superintendency of Corporation (SuperSociedades), the Ministry of Transport (MinTransporte), the Ministry of Science, Technology, and Innovation (MinCiencias), and the Ministry of Information Technologies and Communications (MinTic).

PAGE-LOAD SPEED

Slow government websites hurt citizen engagement. Slow websites create a poor user experience, and users spend less time on these sites.[14] In addition, search engines like Google rank slow sites lower in search results making them harder to find.[15] Therefore, government agencies should optimize their page-load speeds.

To test the page-load speed of Colombian government websites, we used Google's PageSpeed Insights. The tool uses five metrics of page-load speed to provide a 0-100 score.[16] For example, the tool tests how fast the first piece of content on a webpage loads, which confirms to a user that the page is loading.[17] The tool also suggests ways websites can improve their performance, such as by properly sizing images.

To provide a baseline for comparison, we tested 20 of the most popular non-government websites Colombian Internet users visit.[18] We found that these non-government websites had average desktop and mobile page-load speed scores of 74 and 52, respectively. We set the cutoff to pass the desktop page-load speed and mobile speed test at 50, which is the lowest score a website could earn for Google to consider it to have moderate speed.[19]

We found that 60 percent of Colombian government websites failed both speed tests. Indeed, only 38 percent of Colombian government websites passed the desktop page-load speed test, and less than five percent of sites passed the mobile test. A more in-depth analysis reveals the severity of these poor scores. For example, only three websites received desktop page-load speed scores higher than the average rating of popular non-government websites (74). Moreover, only one site, the website of the Ministry of Foreign Affairs (Migración; Ministerio de Relaciones Exteriores), passed both page-load speed tests. Even worse, more than half of the sites had mobile page-load speed scores below 17.

Colombian government websites had average desktop and mobile page-load speed scores of 40 and 15 respectively. Table 2 shows the distribution of desktop and mobile page-load speed scores for Colombian government websites. The table demonstrates that few sites performed well on mobile page-load speed.

Table 2: Frequency of Desktop and Mobile Page-Load Speed Scores by Range

Score Range	Count of Desktop Scores	Count of Mobile Scores
0-25	13	36
26-50	14	4
51-75	12	1
76-100	3	1

There are several ways for Colombian government websites to improve their page-load speed by using best practices. First, they can optimize their use of JavaScript, a programming language for websites, or Cascading Style Sheets (CSS), a markup language used to format webpages.[20] Website designers can optimize their use of either by placing scripts necessary to render page content above the fold within the HTML webpage, instead of as a linked script, which causes browsers to make extra network requests.[21] Second, Colombian government entities can compress images and remove unused plugins and unnecessary characters and comments from their code.[22] Third, the Colombian government can increase the cache lifetime of certain assets, which can speed up a page's load time for repeat visits.[23]

Tables 3 and 4 list the desktop and mobile page-load speed scores for each website.

Table 3: Raw Desktop Page-Load Speed Scores and Rank

Rank	Website	Score	Rank	Website	Score
1	Migración; Ministerio de Relaciones Exteriores	91	21	Urna de Cristal	37
2	De Cero a Siempre	88	23	Departamento Administrativo Nacional de Estadística (DANE)	36
3	MinVivienda	77	24	ICETEX	33
4	Colombia Ágil	73	25	MinCultura	31
5	Superintendencia de Vigilancia y Seguridad Privada	72	26	Presidencia de la República de Colombia	28
6	Portal de Transparencia Económica	68	26	MinTIC	28
7	APC Colombia	66	28	Superintendencia Nacional de Salud	27
8	Fondo Adaptación	63	29	MinDefensa	26
9	MinTransporte	61	30	MinRelaciones	23
10	Contraloría	58	30	MinAgricultura	23
10	MinEnergía	57	30	Superintendencia de Industria y Comercio	23
12	Vicepresidencia	55	33	Policia	21
13	Senado	53	34	MinComercio (MinCIT)	20
14	MinCiencias	53	35	MinEducación	18
15	Minjusticia	52	36	Superintendencia de Economía Solidaria	17
16	MinAmbiente	50	37	Datos Abiertos	15
17	Oficina del Alto Comisionado para la Paz	49	38	RTVC Sistema de Medios Públicos	14
18	MinSalud	40	39	MinInterior	11
18	MinHacienda	40	40	Superintendencia Financiera de Colombia	8
18	Superintendencia de Sociedades[24]	40	41	MinTrabajo	6
21	Colombia Productiva	38	41	SuperSubsidio	6

Table 4: Raw Mobile Page-Load Speed Scores and Rank

Rank	Website	Score	Rank	Website	Score
1	Migración; Ministerio de Relaciones Exteriores	96	21	MinAgricultura	11
2	Superintendencia de Sociedades	75	23	Oficina del Alto Comisionado para la Paz	9
3	Fondo Adaptación	41	23	MinSalud	9
4	De Cero a Siempre	36	25	Senado	7
5	APC Colombia	32	25	Urna de Cristal	7
6	Colombia Ágil	27	27	Presidencia de la República de Colombia	6
7	MinVivienda	24	27	Superintendencia de Economía Solidaria	6
7	Portal de Transparencia Económica	24	29	ICETEX	5
9	Superintendencia de Vigilancia y Seguridad Privada	20	29	MinEducación	5
9	MinCiencias	20	31	Policia	3
9	MinDefensa	20	32	Departamento Administrativo Nacional de Estadística (DANE)	2
12	MinTransporte	19	32	Superintendencia Nacional de Salud	2
12	MinHacienda	19	34	MinTIC	1
14	MinAmbiente	18	34	MinRelaciones	1
15	Contraloría	17	34	Superintendencia de Industria y Comercio	1
16	MinComercio (MinCIT)	15	34	RTVC Sistema de Medios Públicos	1
17	Colombia Productiva	14	34	MinInterior	1
18	MinEnergía	12	34	Superintendencia Financiera de Colombia	1
18	Minjusticia	12	40	Datos Abiertos	0
18	MinCultura	12	40	MinTrabajo	0
21	Vicepresidencia	11	40	SuperSubsidio	0

MOBILE FRIENDLINESS

Providing citizens a positive mobile experience is important for several reasons. For example, more than half of Colombia's population accesses the Internet using a mobile device.[25] In addition, search engines, such as Google, display websites that are mobile-friendly higher in their search results.[26] Most importantly, it is difficult for individuals to navigate poorly-designed mobile websites.

We tested the mobile-friendliness of Colombian government websites using the Mobile Friendly Checker tool from RankWatch, an Internet marketing platform. The tool provided scores on a 0-100 scale. It checked websites for mobile-friendly best practices, such as that text is large enough to read, all the content fits on the screen, and that a website spaces links far enough apart to make them easy to click on the smaller screen of a mobile device.[27] We also tested twenty of the most popular nongovernment websites in Colombia, which averaged a score of 97. As such, we set the benchmark for Colombian government websites to pass the test as a 90 or above, which is roughly two standard deviations below the mean of the average score for nongovernment sites.[28] Websites that score between 90 or above typically provide users positive experiences on mobile devices.[29]

We found that 60 percent of Colombian government websites passed the mobile-friendliness test (scoring a 90 or above). The median score was a passing 94, and five sites (Agile Colombia, Colombia Ágil; General Comptroller of the Republic, Contraloría; Open Data, Datos Abiertos; Ministry of National Defense, MinDefensa; and Migration, Migración) received a perfect score. Nonetheless, more than 15 percent of the websites scored below 80, illustrating that many sites can make improvements. These websites typically had content that was too wide for a mobile device and links that were too close together.

Government websites that perform poorly on mobile-friendliness tests make it difficult for citizens to access essential services and information. For example, the Colombia Ministry of Finance and Public Credit (Ministerio de Hacienda y Crédito Público) provides information on how the government will support access to credit for businesses due to COVID-19 on its website. But the website's homepage (minhacienda.gov.co) has text that goes beyond the screen. Indeed, the link to and a brief description of the COVID-19 credit policy on the ministry's website's homepage did not fit on the page when we visited the site on a mobile device. As of June 4, 2020, the website had not fixed this issue and it was still cutting off descriptions and links on the news section of the homepage.[30] The Colombian government can improve the mobile-friendliness of its websites in several ways, including by ensuring all content fits on the screen. In addition, buttons on mobile websites should meet minimum size requirements, and font sizes should scale across devices.[31]

Table 5: Average, Median Mobile-Friendliness Scores and Passing Percentages

Benchmark Score	Average Score	Median Score	Percentage Passed
90	90	94	60

Figure 1 compares the websites' scores across mobile-friendliness and page-load speed. Significantly more websites (60 percent) passed the mobile-friendliness test than the mobile page-load speed test (5 percent). The site with the best combined mobile page-load speed and mobile-friendliness score was the Ministry of Foreign Affairs' migration website (Migración; Ministerio de Relaciones Exteriores). It received a perfect score on the mobile-friendliness test and scored 96 out of 100 on the mobile page-load speed test. Its combined score was nearly 13 percent higher than the score of the next best website (Superintendency of Corporations, Superintendencia de Sociedades) and more than 50 percent higher than the third highest performing website (Agile Colombia, Colombia Ágil). The Superintendency of Solidarity-based Economy (Superintendencia de Economía Solidaria) website performed the worst over the two metrics. The website received a score of 6 out of 100 on the mobile page-load speed test and a 67 out of 100 on the mobile-friendliness test. The website had text too small to read on mobile devices, links that were too close together, and content that was wider than the mobile screen. Only two sites passed both the mobile page-load speed and mobile-friendliness tests. Consequently, nearly every Colombian government website likely needs to make improvements to provide adequate service to mobile devices.

Figure 1: Mobile-Friendliness and Mobile Page-Load Speed Scores

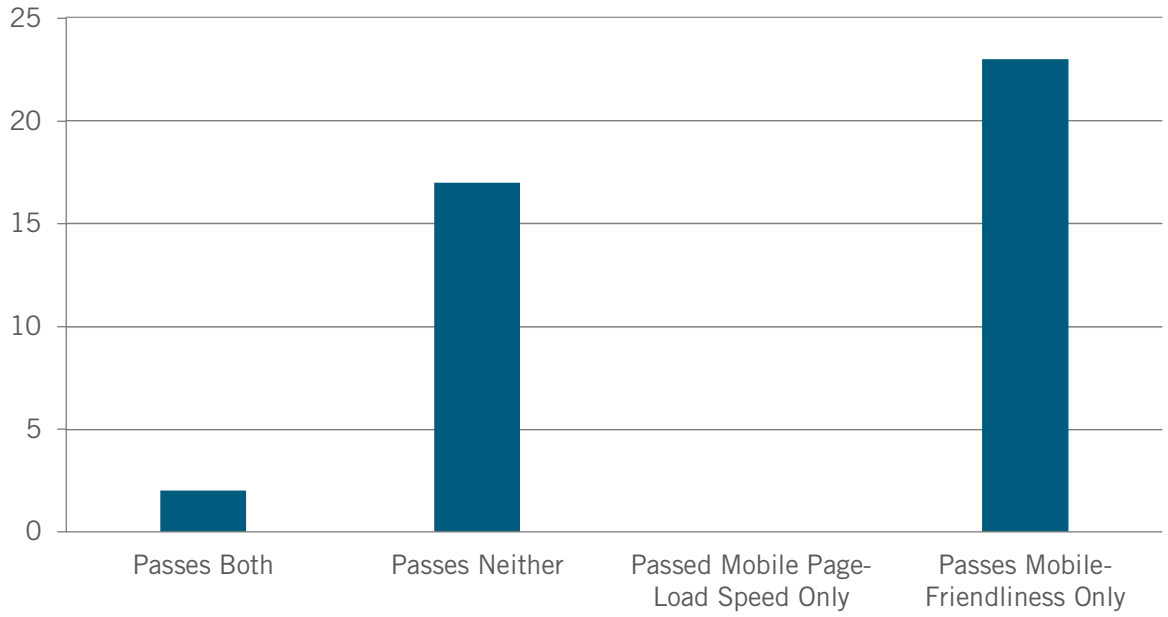

Table 6 ranks Colombian government websites by their mobile-friendliness scores.

Table 6: Raw Mobile-Friendliness Scores and Rank

Rank	Website	Score	Rank	Website	Score
1	Migración; Ministerio de Relaciones Exteriores	100	22	Vicepresidencia	93
1	Colombia Ágil	100	23	MinCiencias	92
1	MinDefensa[32]	100	24	MinCultura	92
1	Contraloría	100	25	MinInterior	90
1	Datos Abiertos	100	26	MinEnergía	89
6	Superintendencia de Sociedades	99	26	MinTrabajo	89
6	MinVivienda	99	28	Policia	88
6	Portal de Transparencia Económica	99	28	RTVC Sistema de Medios Públicos	88
6	Colombia Productiva	99	30	MinSalud	87
6	Oficina del Alto Comisionado para la Paz	99	31	Superintendencia de Vigilancia y Seguridad Privada	86
6	Superintendencia Nacional de Salud	99	32	MinTransporte	85
6	MinTIC	99	33	MinAmbiente	83
6	Superintendencia de Industria y Comercio	99	34	MinJusticia	81
14	Urna de Cristal	98	35	MinHacienda[33]	80
14	ICETEX	98	36	APC Colombia	79
16	SuperSubsidio	97	37	MinEducación	77
17	Superintendencia Financiera de Colombia	96	38	MinRelaciones	76
18	MinAgricultura	95	39	Superintendencia de Economía Solidaria	67
18	Presidencia de la República de Colombia	95	40	MinComercio (MinCIT)	64
20	Senado	94	41	De Cero a Siempre	62
20	Departamento Administrativo Nacional de Estadística (DANE)	94	42	Fondo Adaptación	57

SECURITY

Secure websites protect the confidentiality of user information and prevent attackers from redirecting visitors to malicious websites. This report tests if Colombian government websites have implemented basic security protocols: Hypertext Transfer Protocol Secure (HTTPS) and Domain Name System Security Extensions (DNSSEC). HTTPS is a combination of the HTTP protocol and Transport Layer Security (TLS), and it facilitates the encryption of communications between web browsers and websites, ensuring user data is not read or changed by third parties.[34] Several web browsers warn users when they visit websites that do not enable HTTPS.[35] Google also uses a sites' HTTPS implementation status as a ranking signal for its search engine.[36] DNSSEC uses cryptographic signatures to validate the authenticity of a website. As such, the protocol ensures Internet users arrive at their intended destination.[37]

To test if Colombian government websites had properly implemented HTTPS, we used Qualys SSL Labs' SSL Server Test (HTTPS test).[38] The tool checks a website's Secure Sockets Layer (SSL) certificate or TLS certificate, scoring web servers on their certificate, protocol support, key strength, and cipher strength.[39] We also created a score to represent if the website had any significant security vulnerabilities.[40] We averaged these five scores to create a 0-to-100-point score for each website. The benchmark for Colombian government websites to pass the test was a score of 80, which is roughly one standard deviation below the average score of popular nongovernment websites.[41] In addition, we used Verisign's DNSSEC Debugger tool to assess sites' implementation of DNSSEC. The tool tests whether each zone in the "chain of trust" includes the necessary records and is signed with DNSSEC. The tool provides grades for each step in the "chain of trust," with a "good," "warning," or "error" label.[42] We gave websites with only "good" or "warning" labels a score of 100 and scored sites with "error" warnings a 0.

Colombian government websites had a mixed performance. Indeed, only one site (Vice-Presidency, Vicepresidencia) passed both security tests. In addition, two-thirds of Colombian government websites passed the HTTPS test, and less than three percent of Colombian government websites enabled DNSSEC. These scores differ drastically from those of U.S. federal government websites, which ITIF tested in 2017. Roughly 90 percent of U.S. government websites had enabled DNSSEC, and 84 percent received SSL scores of 80 or higher.[43] U.S. federal government websites' better performance is likely in part due to HTTPS and DNSSEC being requirements for federal sites.[44]

Table 7: Frequency of HTTPS and DNSSEC Scores

Score Range	Count of HTTPS Score	Count of DNSSEC Score
0-50	3	41
51-60	0	0
61-70	0	0
71-80	15	0
81-90	16	0
91-100	8	1

Besides not fully enabling DNSSEC, many of the websites had the same errors. First, more than half of the sites did not use HTTP Strict Transport Security (HSTS). This web server setting ensures web browsers never switch to an unencrypted channel when handling data.[45] Second, several websites (Colombia Productiva, Ministerio del Interior, and Minsalud) were vulnerable to POODLE attacks. These attacks force a site to use an outdated SSL protocol that has vulnerabilities.[46] Third, websites frequently suffered from weak implementations of Diffie-Hellman, a cryptographic algorithm that allows Internet protocols to negotiate a secure connection.[47] Weak Diffie-Hellman make it easier for bad actors to crack the cryptographic keys that servers and web browsers share. Fourth, websites commonly supported TLS 1.0 and 1.1, which are older versions of TLS and have known vulnerabilities.[48]

Tables 8 and 9 list the HTTPS and DNSSEC scores for each website.

Table 8: HTTPS Scores and Rank

Rank	Website	Score	Rank	Website	Score
1	Datos Abiertos	100	12	SuperSubsidio	84
2	MinCultura	96	12	MinCiencias	84
3	MinDefensa	94	12	Contraloría	84
3	MinTIC	94	25	Presidencia de la República de Colombia	80
3	Urna de Cristal	94	25	Vicepresidencia	80
3	RTVC Sistema de Medios Públicos	94	25	MinHacienda	80
3	Policia	94	25	Superintendencia de Industria y Comercio	80
3	ICETEX	94	29	Colombia Productiva	78
9	MinTransporte	90	30	MinTrabajo	72
9	Migración; Ministerio de Relaciones Exteriores	90	30	MinComercio (MinCIT)	72
11	Superintendencia de Vigilancia y Seguridad Privada	86	30	MinVivienda	72
12	MinJusticia	84	30	Portal de Transparencia Económica	72
12	MinRelaciones	84	30	Fondo Adaptación	72
12	MinEnergía	84	30	Oficina del Alto Comisionado para la Paz	72
12	MinEducación	84	30	De Cero a Siempre	72
12	MinAgricultura	84	30	Senado	72
12	MinAmbiente	84	30	Superintendencia de Economía Solidaria	72
12	APC Colombia	84	30	Colombia Ágil	72
12	Departamento Administrativo Nacional de Estadística (DANE)	84	40	MinInterior	48
12	Superintendencia de Sociedades	84	40	MinSalud	48
12	Superintendencia Nacional de Salud	84	40	Superintendencia Financiera de Colombia	48

Table 9: Raw DNSSEC Scores and Rank

Rank	Website	Score	Rank	Website	Score
1	Vicepresidencia	100	2	Fondo Adaptación	0
2	MinRelaciones	0	2	Oficina del Alto Comisionado para la paz	0
2	Presidencia de la República de Colombia	0	2	De Cero a Siempre	0
2	Minjusticia	0	2	Colombia Productiva	0
2	MinDefensa	0	2	Departamento Administrativo Nacional de Estadística DANE	0
2	MinTrabajo	0	2	Datos Abiertos	0
2	MinInterior	0	2	Senado	0
2	MinHacienda	0	2	Superintendencia de Industria y Comercio	0
2	MinSalud	0	2	Superintendencia de Sociedades	0
2	MinEnergía	0	2	Superintendencia Financiera de Colombia	0
2	MinComercio (MinCIT)	0	2	Superintendencia de Economía Solidaria	0
2	MinTIC	0	2	Superintendencia Nacional de Salud	0
2	MinEducación	0	2	Superintendencia de Vigilancia y Seguridad Privada	0
2	MinCultura	0	2	SuperSubsidio	0
2	MinAgricultura	0	2	MinCiencias	0
2	MinAmbiente	0	2	RTVC Sistema de Medios Públicos	0
2	MinTransporte	0	2	Migración; Ministerio de Relaciones Exteriores	0
2	MinVivienda	0	2	Policia	0
2	Urna de Cristal	0	2	Colombia Ágil	0
2	APC Colombia	0	2	Contraloría	0
2	Portal de Transparencia Económica	0	2	ICETEX	0

ACCESSIBILITY

Web accessibility guidelines make web browsing easier for individuals with disabilities. These guidelines include providing text descriptions for audio, video, and images, using high-contrast colors, and avoiding the use of flashing animations that can cause seizures.[49] Inaccessible government websites can make it difficult or impossible for some individuals to access basic public services. For example, adhering to accessibility standards is important to ensure government websites are accessible to everyone, including the more than 250,000 Colombians who are blind.[50] Moreover, Colombia's "Disability Law,"(Ley de Discapacidad) directs the national government to adopt measures to guarantee people with disabilities access to information.[51] Another statute, "Law 1680" (Ley 1680), has a goal of guaranteeing visually impaired individuals access to information.[52] Finally, Colombia's online government manual, which helps the government implement its online strategy, states that webpages should be accessible to individuals with disabilities and that operators should implement accessibility tests with users.[53]

We tested the accessibility of Colombian government websites using two tools. The first tool was AChecker's Web Accessibility Checker. It analyzes URLs to identify accessibility issues based on WCAG 2.0 (Level AA), a World Wide Web Consortium (W3C) standard. The tool examines sites for known problems, likely problems, and potential problems.[54] We only penalize websites if the tool detects known issues, and then assign a score on a scale of 0 to 100.[55] Websites pass the test with a score of 85 or higher, which is roughly the average of popular non-government websites Colombians visit. Websites that score an 85 or higher have 10 or fewer known problems.[56]

The second tool we used was from Sitemorse, a company that has several tests to assess the performance of websites. Sitemorse assessed the percentage of a website's pages that had at least one violation of a WCAG 2.1 (Level A) success criteria.[57] WCAG 2.1, the latest version of WCAG standards, includes all success criteria from WCAG 2.0 and 17 additional criteria to address mobile accessibility, people with low vision, and people with cognitive and learning disabilities.[58] Level A success criteria include elements that are essential for a webpage to be accessible, such as that non-text content includes a text alternative.[59] We converted websites' passing percentages to a 0-100 score. We did not set a benchmark or use Sitemorse's data as part of Colombian government websites' overall scores because both government websites and most private-sector websites performed poorly on this metric.

Colombian government websites did not perform well on accessibility. Under half (48 percent) of the sites passed the benchmark of scoring an 85 or higher. In comparison, 63 percent of U.S. federal government websites met or exceeded the benchmark in 2017.[60] Furthermore, Sitemorse's tool revealed that, on average, more than 99 percent of a Colombian government website pages had at least one accessibility violation at WCAG 2.1 (Level A).

Table 10: Frequency of Accessibility Scores by Range

Score Range	Count of AChecker Scores	Count of Sitemorse Scores[61]
0-25	0	38
26-50	2	0
51-75	13	0
76-100	27	0

Websites can improve their accessibility in several ways. For example, websites should not use color alone to convey information. Websites should also present information clearly in variously sized viewports. In addition, websites should ensure that interactive elements, such as links, are easy to identify. Websites can achieve this by changing the appearance of an object when the mouse hovers over it.[62] The Web Content Accessibility Guidelines (WCAG) 2.1 offer an exhaustive list of best practices for accessibility.[63] Table 11 presents websites' accessibility scores and rank.

Table 11: Raw Achecker Accessibility Scores and Rank

Rank	Website	Score	Rank	Website	Score
1	Migración; Ministerio de Relaciones Exteriores	100	22	MinInterior	79
1	Senado	100	23	Datos Abiertos	78
1	Departamento Administrativo Nacional de Estadística	100	23	Urna de Cristal	78
1	Superintendencia de Vigilancia y Seguridad Privada	100	25	Colombia Ágil	77
1	MinHacienda	100	26	Presidencia de la República de Colombia	76
6	Contraloría	95	26	Superintendencia de Economía Solidaria	76
7	MinDefensa	93	28	MinAgricultura	75
7	MinCiencias	93	29	SuperSubsidio	74
7	MinTransporte	93	29	Vicepresidencia	74
10	MinTIC	91	31	Superintendencia Nacional de Salud	71
10	Policia	91	32	MinCultura	68
12	ICETEX	90	33	MinJusticia	67
12	MinTrabajo	90	33	MinComercio (MinCIT)	67
12	MinAmbiente	90	35	MinEnergía	66
15	APC Colombia	89	36	Superintendencia de Industria y Comercio	65
16	Portal de Transparencia Económica	87	37	Superintendencia de Sociedades	62
16	MinSalud	87	38	Oficina del Alto Comisionado para la Paz	58
18	MinEducación	85	39	Superintendencia Financiera de Colombia	54
18	MinRelaciones	85	40	MinVivienda	52
18	De Cero a Siempre	85	41	Fondo Adaptación	50
21	RTVC Sistema de Medios Públicos	81	42	Colombia Productiva	45

RECOMMENDATIONS

This report shows that all tested Colombian government websites fail at least one basic test.[64] The Colombian government can improve its websites in numerous ways, including by:

- Creating security requirements
- Establishing a mobile-first strategy
- Moving all websites to the cloud
- Testing the accessibility of websites with local partners
- Launching a website modernization sprint
- Authorizing websites to operate for a set period

Creating Security Requirements

Many Colombian government websites performed poorly on the security tests. One-third of the sites we tested had not implemented HTTPS at all or had configured it poorly. In addition, all but one website had not adequately implemented DNSSEC. Colombian government websites should be able to implement these standards with relative ease. For example, 88 percent of U.S. federal government websites had correctly enabled DNSSEC in 2017.[65]

The Colombian government should mandate that all government websites implement HTTPS and DNSSEC appropriately for all pages—not just ones that collect user data—to ensure user privacy. Many agencies we spoke said they would consider adding additional website security features as they update their security protocols. The Ministry of Information Technologies and Communications (MinTIC) noted that it is in the process of developing a new information security and privacy policy as well as guidelines for the adoption of IPv6. As it rolls out these new policies it should annually review which government websites have properly implemented these security standards and publish its findings.

Establishing a Mobile-First Strategy

Many Colombian government websites performed poorly on mobile-friendliness and mobile page-load speed. Indeed, more than 40 percent of Colombian government sites failed the mobile-friendliness test. Several still had not implemented basic best practices, such as ensuring that all text fits on a page on a mobile device. Furthermore, Colombian government sites performed significantly better on desktop page-load speed than mobile page load speed.

Poor performance on mobile devices is a problem because more than half of Colombian citizens access the Internet using a mobile device.[66] Indeed, government agencies estimated during our interviews that between 20 to 30 percent of online traffic to their websites comes from mobile devices. The Colombian government should require that government websites implement a mobile-first design strategy. A mobile-first design requires agencies to design applications to work first for mobile devices, and then use responsive design to optimize the content for different-sized screens, including desktops.[67] To ensure compliance, MinTIC should check government websites annually to ensure they load quickly and display properly on mobile devices.

Moving All Websites to the Cloud

Although some government agencies have already begun to migrate to the cloud, the Colombian government should move all of its websites and web applications to the cloud to improve performance, including page load speed both during normal operations and during surges in online traffic. In particular, it is important that agencies have the ability to quickly scale the capacity of websites in times of emergency. For example, the Ministry of Health and Social Protection (MinSalud) crashed in March due to an increase in traffic caused by coronavirus.[68] MinTIC should update its Digital Government Policy Manual, along with its Enterprise Architecture Reference Framework, to recommend that government agencies move their IT operations to the cloud, and government agencies should move quickly to align their IT strategies to this goal.

Testing the Accessibility of Websites with Local Partners

Colombia's Digital Government Manual states that website's should be accessible, however, more than half of the Colombian government sites failed the accessibility test.[69] . MinTIC should test the accessibility of government websites with users with disabilities and work with other agencies to ensure their sites adhere to accessibility guidelines. MinTIC itself scored among the top ten websites for accessibility, in part because when it redesigned its website in 2013, it followed the government's accessibility guidelines.

Launching a Website Modernization Sprint

Many of the issues with Colombian government websites have clear solutions. For example, slow websites can remove unnecessary code, use picture formats, such as JPEG 2000, that provide better compression than JPEG, and eliminate render-blocking resources. Moreover, websites can implement HSTS to prevent web browsers from switching to an unencrypted channel when handling data. MinTIC should identify other easily remediable fixes that can improve the speed, usability, and security of Colombian government websites. It should then create a six-month sprint in which government agencies implement the necessary changes. Government agencies should use automated tools to assess and publicly report the performance of their websites before and after their modernization sprint.

Authorizing Websites to Operate for a Set Period

Many Colombian government websites use outdated design or technology. For example, several websites do not use responsive design, meaning that the sites do not automatically change their appearance depending on the size and orientation of a device's screen.[70] In addition, 31 percent of Colombian government sites do not encrypt their data, leaving significant amounts of user data unprotected.[71] Lastly, at least 40 percent of websites use servers that supported older, vulnerable versions of TLS. For example, some websites support TLS 1.0, which browsers from Google, Microsoft, Apple, and Mozilla stopped supporting in March 2020.[72]

Newer websites tend to avoid these problems because they follow updated best practices. For example, the Ministry of Science (MinCiencias) website, which was launched this year, ranked among the top ten Colombian government websites, and the Superintendency of Corporation (SuperSociedades), which redesigned its website in 2017 with the goal of improving access on mobile devices, ranked among the top ten for mobile design.

To avoid the problem of outdated websites and to create more accountability, heads of government agencies should be required to sign off on authorizations to operate a website and these authorizations should only last for a relatively short fixed period of time, such as two or three years. When these authorizations expire, heads of government agencies should be expected to validate that the websites meet the standards of the most recent Digital Government Manual, replace the websites with new ones that meet the updated standards, or sign off on known deficiencies and specific steps that will be taken to mitigate them.[73]

CONCLUSION

This report outlines a number of opportunities for improving Colombian government websites. Achieving these improvements will not be easy. Government agencies will not only need to develop new policies, but also obtain funding and recruit and retain staff with the necessary skills to design and implement secure, user-friendly, and accessible websites. Given the importance of ensuring everyone has access to government information and services, Colombian government agencies should continue to pursue this goal.

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About ITIF

The Information Technology and Innovation Foundation (ITIF) is a nonprofit, nonpartisan research and educational institute focusing on the intersection of technological innovation and public policy. Recognized as the world's leading science and technology think tank, ITIF's mission is to formulate and promote policy solutions that accelerate innovation and boost productivity to spur growth, opportunity, and progress.

For more information, visit us at itif.org.

About TicTac

TicTac is the premier think tank regarding the digital economy in Colombia. Established in 2016 by the Colombian Chamber of IT and Telecom (CCIT), TicTac proposes public policy initiatives aimed at the digital transformation of the country, based on the principles of sustainability, economic competitiveness, social inclusion, and government efficiency.

For more information, visit us at ccit.org.co/tictac/.

ENDNOTES

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33. RankWatch's tool could not test the Ministry of Finance and Public Credit website. We manually reviewed the website's homepage to see if a mobile viewport was set, if text was not too small to read, if the website avoided using incompatible plugins, if content was not wider than the screen, and if links were not too close together. We gave each of these categories a weight of 20 points, and docked 5 points for each violation. The Ministry of Finance and Public Credit had text that was tool small to read and multiple instances where content was wider than the screen. We give it a score of 80.

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53. The manual states: "Accesibilidad y usabilidad: de acuerdo con la caracterización de usuarios, ciudadanos y grupos de interés de la entidad, ésta debe garantizar que las páginas web, portales web y sistemas de información web con sus respectivos contenidos, cuenten con características técnicas y funcionales que permitan al usuario percibir, entender, navegar e interactuar adecuadamente. Esto también incluye que las personas con discapacidad sensorial puedan acceder de manera autónoma e independiente a dichas páginas, portales y sistemas de información web. Implemente pruebas de accesibilidad y usabilidad con los usuarios, para determinar ajustes a realizar y atributos a incorporar," Ministry of Information Technologies and Communications, "Manual De Gobierno Digital," April 2019, https://estrategia.gobiernoenlinea.gov.co/623/articles-81473_recurso_1.pdf.

54. "Web Accessibility Checker," AChecker, accessed April 1, 2020, http://achecker.ca/checker/.

55. The formula to calculate the 0-100 score is: =(0.95^(Number of Known Issues ^0.5))*100; The popular non-government websites averaged a score of 83.1.

56. We used alexa.com to determine the 20 of the most visited Colombian government websites. The websites we tested using AChecker are google.com, youtube.com, pulzo.com, outlook.live.com/owa/, minuto30.com, las2orillas.co, facebook.com, netflix.com, wikipedia.org, eltiempo.com, mercadolibre.com.co, thestartmagazine.com, mileroticos.com, yahoo.com, office.com, zoom.us, blogspot.com, microsoft.com, instagram.com, whatsapp.com; "Top Sites in Colombia," Alexa, accessed April 8, 2020, https://www.alexa.com/topsites/countries/CO.

57. Sitemorse checked roughly 125 webpages for each Colombian government website for compliance with WCAG 2.1 (Level A). Sitemorse started at a website's homepage and analyzed webpages that were linked to on the home page and on successive pages.

58. The tool only checks if webpages meet standards that can be checked by an automated tool. Some standards required manual assessment. We provided Sitemorse the the URLs for the 42 Colombian government websites and the 20 popular non-government websites. Sitemorse than tested each site using its automated tool and provided us data detailing the percentage of websites that passed different WCAG standards; "What's New in WCAG 2.1," World Wide Web Consortium, accessed May 26, 2020, https://www.w3.org/WAI/standards-guidelines/wcag/new-in-21/#introduction.

59. "Web Content Accessibility Guidelines (WCAG) 2.1), World Wide Web Consortium, June 5, 2018, https://www.w3.org/TR/WCAG21/.

60. Daniel Castro, Galia Nurko, and Alan McQuinn, "Benchmarking U.S. Government Websites" (Information Technology & Innovation Foundation), November 2017, http://www2.itif.org/2017-benchmarking-us- government-websites.pdf.

61. Sitemorse's tool could not test four Colombian government websites: https://www.supersalud.gov.co/, http://www.mintrabajo.gov.co/, https://www.mindefensa.gov.co/, https://id.presidencia.gov.co/.

62. "Designing for Web Accessibility," World Wide Web Consortium, accessed May 26, 2020, https://www.w3.org/WAI/tips/designing/#ensure-that-interactive-elements-are-easy-to-identify.

63. "W3C Web Content Accessibility Guidelines (WCAG) 2.1", World Wide Web Consortium, accessed May 26, 2020, https://www.w3.org/TR/WCAG21/#time-based-media.

64. We tested 42 websites using six different tests for a total of 252 tests. Colombian government websites passed 86 of the tests (34 percent).

65. Daniel Castro, Galia Nurko, and Alan McQuinn, "Benchmarking U.S. Government Websites" (Information Technology & Innovation Foundation), November 2017, http://www2.itif.org/2017-benchmarking-usgovernment-websites.pdf.

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