Extreme Makeover: Tech Edition

by

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The Business Technology Transformation of

Four Source Restoration & Remodeling

Presented By:

TABLE OF CONTENTS

LIST OF FIGURES

ABSTRACT

Extreme Makeover: Tech Edition is an initiative to help a small business develop a technology presence. According to the Small Business Administration, approximately 33% of all small business owners are 35-49 years old and 51% are 50-88 years old. Studies, such as the "Older Adults and Technology Use" study conducted by *Pew Research Center*, have shown that the majority of older adults need assistance when learning new technology. At the rate that technology progresses, some business owners do not know where to start. The owner of *Four Source Restoration and Remodeling* fell into this category. Kelly Winhoven is a 48-year-old, small business owner with limited technology skills. Winhoven was looking for a way to improve the technology within his small business. Our team partnered with him to achieve this goal. We created a website to enhance and increase customer engagement. We built a database to organize the data structure to ease management and optimize data. We secured the company's network and devices to protect the company from threats and vulnerabilities. We also modernized the company's logo and gave them a social media presence. All these factors came together to create a full business technology makeover for *Four Source Restoration and Remodeling.*

1. INTRODUCTION

1.1 Introduction

Small business owners struggle to keep up with the newest technologies available to help their businesses prosper. Some owners do not know where to begin. There is a variety of options available to small business owners that can help with this problem, such as free-lance IT professionals, graphic designers, and marketing companies. However, these options can become expensive and overwhelming, especially when having to use multiple vendors. There is a need for a company that does it all for a reasonable price. Our goal was to become that company for our project. We evaluated a small business, *Four Source Restoration and Remodeling*, and proposed a custom solution to the owner. We provided insight to the owner about what available technologies were the best options for his business. Then, we implemented those technologies and educated the owner during the whole process so that he can maintain the solutions post-completion of the project.

1.2 Problem

According to the Small Business Administration, there are 30.2 million small businesses in the United States. That is 99.9% of all businesses in the U.S. They are crucial for the economy to thrive. However, 20% of small businesses fail within the first year, and 50% fail within the first 5 years. There are several factors that contribute to small business failures. According to Investopedia's *"The 4 Most Common Reasons a Small Business Fails"*, the most common reasons include poor management, lack of cost-effective marketing, lack of capital, and infrastructure issue.

Four Source Restoration and Remodeling is a construction business based in Dayton, Ohio that is no stranger to small business struggles. The business opened in 2011 and operated until 2014. Despite the struggle of having to close its doors, it reopened in 2017 and is currently still in operation. Four Source has never utilized available technology to help ease the common problems small businesses face. We helped them develop a technological presence that will play a key role in maintaining success this time around.

1.3 Solution

Extreme Makeover: Tech Edition is our initiative to modernize *Four Source Restoration and Remodeling's* technology presence. The main aspects of the project included developing a website that is compatible with mobile browsers, building a database, and securing the network and devices. Smaller aspects of the project included revamping the business's social media pages and logo. The website includes general information, before and after pictures of remodeling jobs, employment opportunities, and a place for customers to request a consultation. The database includes customers, employees, materials, labor, and jobs data. Security includes securing the network, mitigating threats, and educating the users. The social media pages are used for advertising to increase traffic flow on the website that will lead to more jobs. Developing a technology presence gave *Four Source* some of the tools it needs to succeed.

1.4 Project Goals

The main goals for *Extreme Makeover: Tech Edition* were to enhance customer experience, ease management, and provide cybersecurity for *Four Source Restoration and Remodeling*. This included developing a web application, building a database, and securing the

network. Other aspects of the project included enhancing the company's appeal by redesigning the logo and social media pages. The goal was for our solutions to be cost-effective and easy to maintain by the owner once the project was completed.

1.5 Overview

Throughout this final report, there will be information on how the project was completed. The report includes in-depth processes and includes the following sections: design objectives, methodology, budget, timeline, problems encountered, and future recommendations.

2. DISCUSSION

2.1 Project Concept

The concept for *Extreme Makeover: Tech Edition* was inspired by the old, HGTV show *Extreme Makeover: Home Edition* where a team would completely gut a home and renovate the layout to make it function and flow properly. This is what our team did for *Four Source Restoration and Remodeling* on a technology level. We evaluated *Four Source's* technological architecture prior to starting the project to determine the best technologies to implement. This included developing a web application, building a database, securing the network, and redesigning the company's logo and social media presence. Our improvements will help the company function more efficiently and increase consumer interest in the services they provide.

2.2 Design Objectives

Our team's design objectives evolved throughout the project. Initially, we approached the problem with complex solutions. We wanted to build everything from scratch. However, after our initial meetings with the owner of *Four Source*, we realized those solutions would not be realistic for the owner to maintain once we reached the completion of the project. We researched solutions that would continue to benefit the business beyond the project completion.

We decided to develop the website using Wix, as opposed to developing it from scratch. This allows the owner to easily maintain the website. We decided to use SQL Server Express for the database portion of the project. Originally, we were going to connect our SQL Server database to GCP, Google Cloud Platform. We wanted to do this because cloud computing services are continuing to grow, especially in the world of data. However, GCP's free tier did not allow us to successfully connect to SQL Server. One of our goals throughout this entire process

was to implement cost-effective solutions, and it was not in the owner's budget to pay for GCP. This is what ultimately led to our decision to only use SQL Server Express. The security portion includes easy to use tools, such as LastPass and ProtonVPN to keep the technical learning curve low. These technologies will continue to benefit *Four Source* for years to come.

2.3 Methodology and Technical Approach

Web Application

Four Source had no prior web application. The goal for the website was that it needed to be easy to maintain post-completion of the project. After research and meetings with the business owner, our team decided to use Wix. Wix is a cloud-based web development platform. It allowed us to create a HTML5 website for Four Source that is compatible with mobile devices. The website includes the following tabs:

- "Home"- Contains general information
- "About"- Allows customers to learn about the company
- "Gallery"- Contains before and after pictures from past projects
- "Services"- Allows customers to request a consultation
- "Employment"- Allows subcontractors to apply for jobs
- "Contact"- Allows customers to contact the owner

Database

Four Source had no prior database. All the company's records were kept on paper documentation or excel spreadsheets. The goal of the database was to digitalize the company's data and create an organized data structure. Our team decided to use SQL Server Express for the

database. It provides scalability, no cost, and technical support. *Four Source's* database is small enough that SQL Server is free to use. The database includes the following tables:

- Customers
- Employees
- Jobs
- Materials
- Labor

Security

Four Source has a simple network infrastructure consisting of two laptops, one wireless router, and one modem. The goal for the security portion of our project was to better secure *Four Source's* technical assets without introducing a technical learning curve for the business owner. Most of the security we have provided was done through the router in order to keep user interaction low. All the tools that were installed on devices were picked with an easy user interface and minimal maintenance in mind. Educating the business owner was the most critical requirement. Teaching him how to think more securely will better increase *Four Source's* security. Technologies were updated and scanned for vulnerabilities. Any vulnerabilities found were handled appropriately.

Logo and Social Media Redesign

Four Source's original logo, as shown in *Figure 1*, lacked appeal. It was outdated and didn't capture the company's essence. We wanted the new logo to exhibit professionalism and purpose. Initial renderings were developed and edited until the owner was happy with the final

logo, as shown in *Figure 2*. To present the new logo, we developed a few product concepts, as shown in *Figure 3*.

Figure 1: Original Company Logo *The following figure shows Four Source Restoration and Remodeling's original logo. It was created when the company was founded in 2011 and had not been updated since.*

Figure 1: Original Company Logo

Figure 2: New Company Logo *The following figure shows Four Source Restoration and Remodeling's new logo. We created a new logo to enhance the company's image.*

Figure 2: New Company Logo

Figure 3: Product Concepts *The following figure shows product concepts utilizing Four Source Restoration and Remodeling's new logo. It shows a business card and tee shirt design.*

Figure 3: Product Concepts

Four Source's social media presence was also enhanced. Previously, the company only had a Facebook page that had very little activity. We increased activity on the Facebook page. We also created the company an Instagram page to help increase marketing and customer interaction.

2.4 User Profile

Project

Extreme Makeover: Tech Edition

Potential Users

- Business Owners
- Consumers
  - Home Owners
  - Property Investors/Flippers
  - Realtors

Software, Interface, and Related Experience

Extreme Makeover: Tech Edition is meant to teach small business owners how to utilize technology to benefit their business. We provide training on the technologies we implement. No previous experience is expected. However, basic computer skills are beneficial, such as navigating through a desktop and using a web browser.

Consumers are expected to have web browser and social media experience to see the business's website and social media pages.

Experience with Similar Applications

Business owners may have experience with website builders, such as Wix; social media, such as Facebook; and spreadsheet software, such as Excel.

Consumers may have experience with social media, such as Facebook; web browsers, such as Google; and construction websites, such as PowerChina.

Task Experience

Business owners aren't expected to have previous experience in performing tasks. We will train them to perform tasks, such as network monitoring and maintaining the website, database, and social media.

Consumers should have experience with tasks like navigating through websites and social media pages to see the content.

Frequency of Use

Business owners will need to use frequently to maintain all the aspects; network security, website, database, and social media. This will ensure the technologies are up-to-date with current business information. This will help ease business management

Consumers will frequently use the website and social media pages to stay informed on the business. They can view current remodeling projects, general pricing, reviews, etc.

Key Project Design Requirements that the Profile Suggests

- Appealing, modern UI for the website to give customers confidence in the business
- Organized database to ease management for business owner
- Setup for network security to ease maintenance
- Enhanced business social media to increase customer engagement

2.5 Use Case Diagram

Figure 4: Use Case Diagram *The following diagram demonstrates the use case for Extreme Makeover: Tech Edition. The diagram shows all possible users with corresponding tasks.*

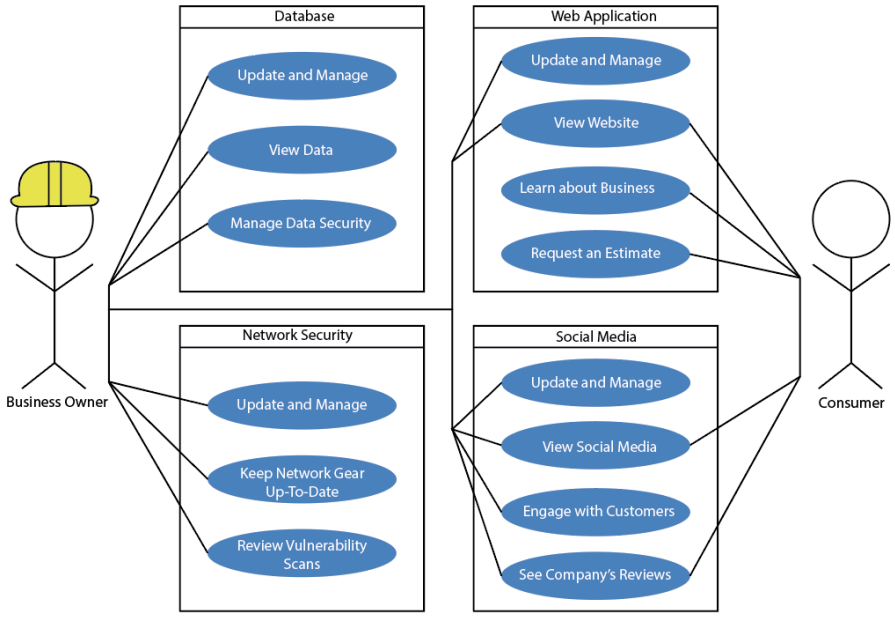


Figure 4: Use Case Diagram

2.6 Technical Architecture

Our team strategically chose the technologies we would use for our project. These technologies cover the Website, Database, and Security architecture. Though they all require training to use, many of them are easy to learn. To keep the technologies updated and relevant, the business owner will need to be able to understand them. This explains the reasoning behind our technical architecture.

Website

The architecture of the website was built from Wix.com. This was not the most technical choice for our project, but it is maintainable for the business owner to manage going forward and was requested by the business owner after going over the first website design. We have a few scripts set up within Wix to allow for custom functions. This includes a custom book feature that will link to the business owners' calendar, and an employment page that can upload resumes and email the owner when a new application comes in, and statistics for anyone that interacts with the page. Another reason we went with Wix over another site was because of the analytics that are automatically collected, as seen in Figure 6. As you can see, there was a spike right around the time that we were active on social media.

Figure 5: Booking Calendar *The following is an image that pulls set times for available times, set by the business owner.*

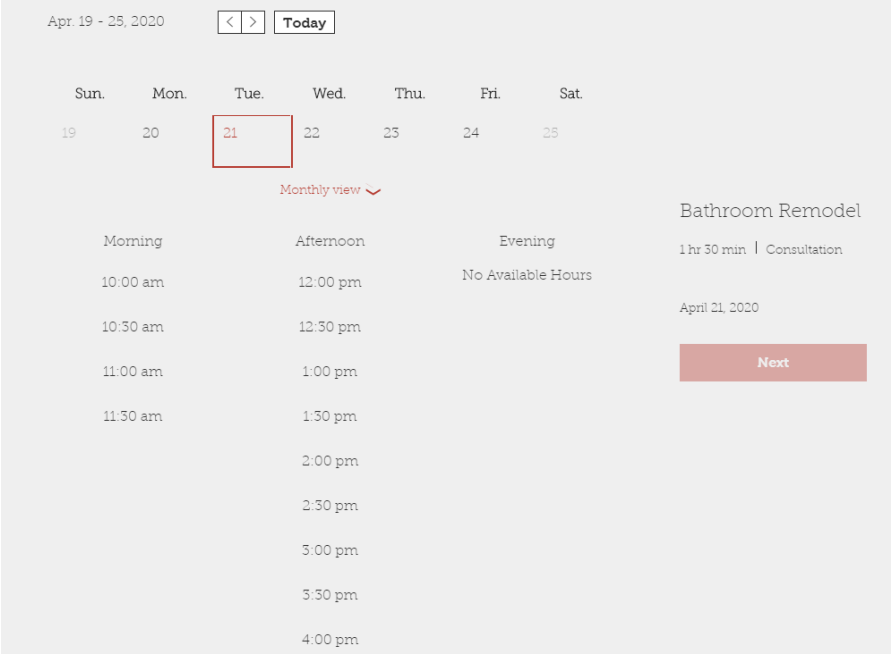


Figure 5: Booking Calendar

Figure 6: Site Analytics *The following a basic layout of one of the analytics pages that are provided to the business owner.*

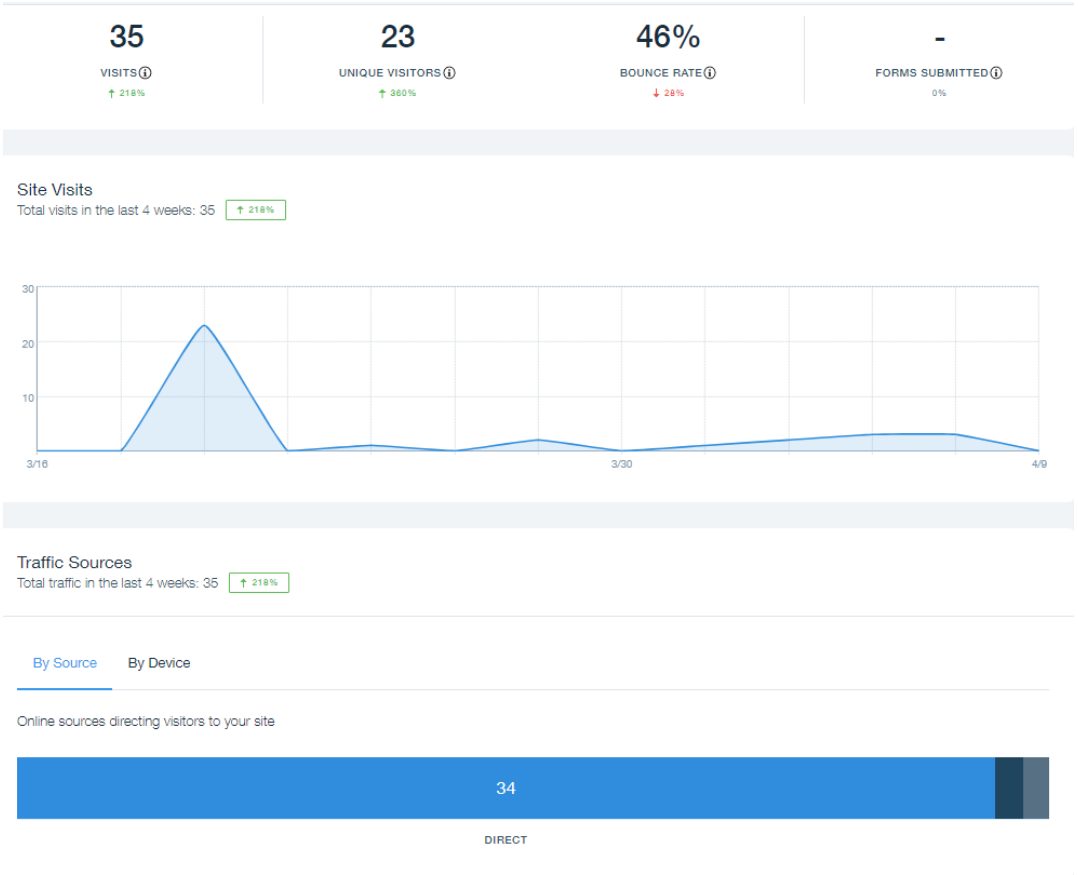


Figure 6: Site Analytics

Figure 7: Website Footer *The following is an image of the footer of Foursourceremodeling.com. It provides a direct line of contact and social media links*

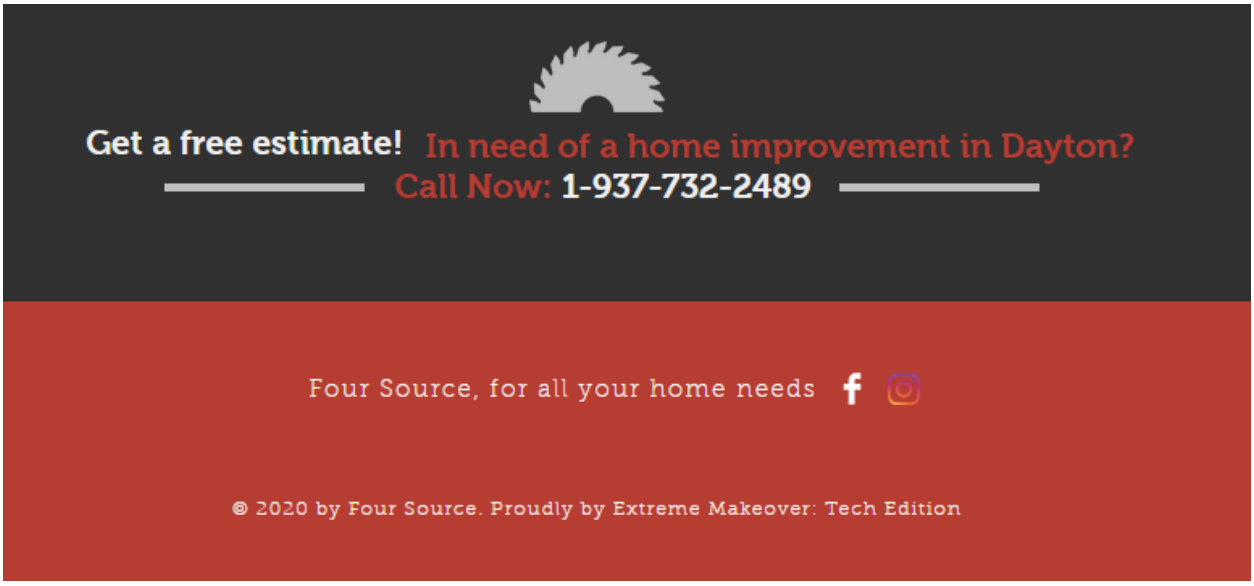


Figure 7 Website Footer

Database

The database was built using SQL Server Express. It is the free version of Microsoft's SQL Server relational database management system. For the foreseeable future, *Four Source's* data will not outgrow the free version of SQL Server. The software we used to connect to SQL Server Express is SQL Server Management Studio. SSMS is a popular choice of software for connecting to SQL Server. This means there will be plenty of support for the business owner post completion of this project. We downloaded SQL Server Express and SSMS to the owner's business computer. We educated him on how to use the software so that he can maintain the database on his own. We also showed him helpful websites and forums that he can use for any errors he may encounter in the future.

The database structure consists of five tables: Employees, Customers, Jobs, Materials, and Labor. *Figure 8* shows the tables, columns they contain, and relationships between the tables.

Figure 8: Database Diagram *The following diagram demonstrates Four Source's data structure within SSMS.*

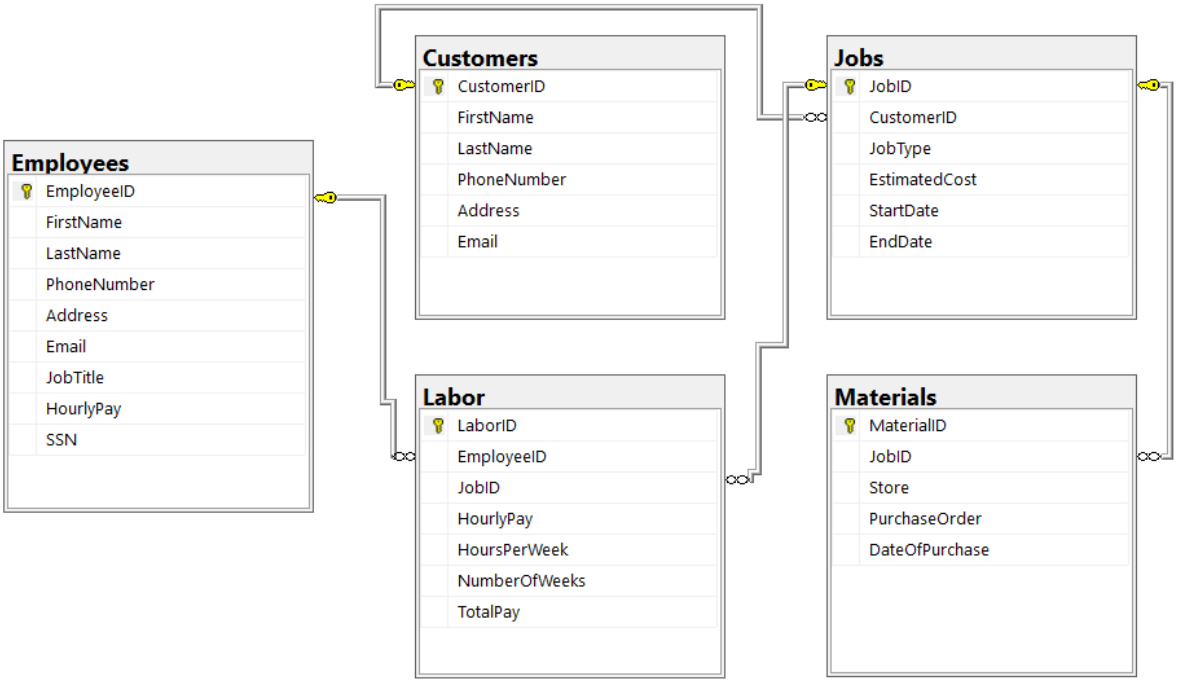
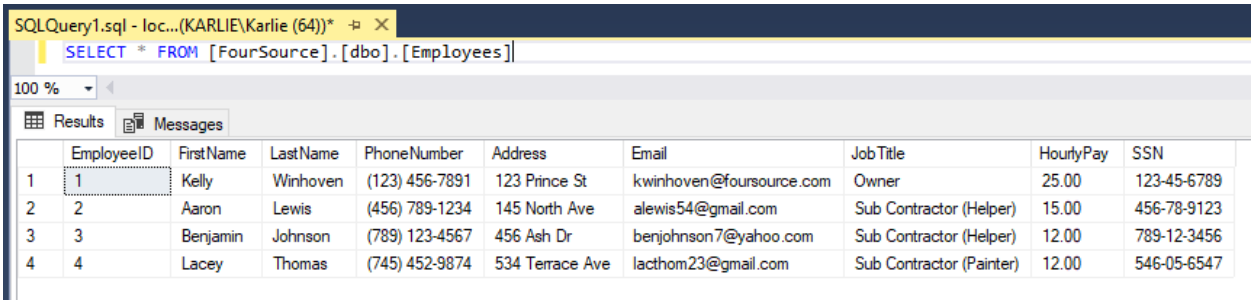


Figure 8: Database Diagram

Figures 9-13 display real *Four Source* data that was entered into the database. Data in the "Employees" and "Customers" tables were altered to maintain security and protect the privacy of the individuals. The tables were queried to show the data from a bathroom remodeling job. This shows how much essential data is recorded from just one job at *Four Source.*

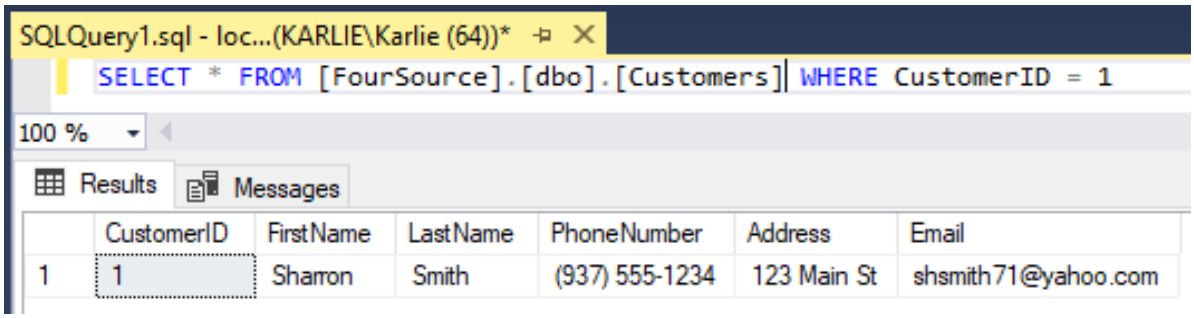
Figure 9: Employees Table *The following image shows Four Source's "Employees" table in SSMS. Data was altered to protect the privacy of the individuals.*



	EmployeeID	FirstName	LastName	PhoneNumber	Address	Email	JobTitle	HourlyPay	SSN
1	1	Kelly	Winhoven	(123) 456-7891	123 Prince St	kwinhoven@foursource.com	Owner	25.00	123-45-6789
2	2	Aaron	Lewis	(456) 789-1234	145 North Ave	alewis54@gmail.com	Sub Contractor (Helper)	15.00	456-78-9123
3	3	Benjamin	Johnson	(789) 123-4567	456 Ash Dr	benjohnson7@yahoo.com	Sub Contractor (Helper)	12.00	789-12-3456
4	4	Lacey	Thomas	(745) 452-9874	534 Terrace Ave	lacthom23@gmail.com	Sub Contractor (Painter)	12.00	546-05-6547

Figure 9: Employees Table

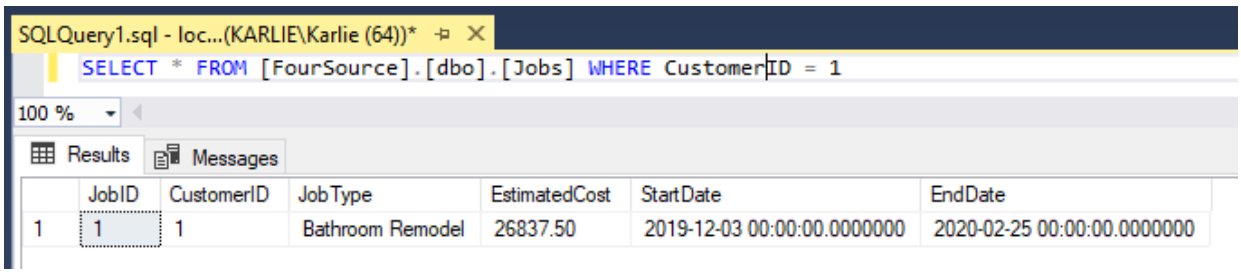
Figure 10: Customers Table *The following image shows Four Source's "Customers" table in SSMS. Data was altered to protect the privacy of the individuals.*



	CustomerID	FirstName	LastName	PhoneNumber	Address	Email
1	1	Sharron	Smith	(937) 555-1234	123 Main St	shsmith71@yahoo.com

Figure 10: Customers Table

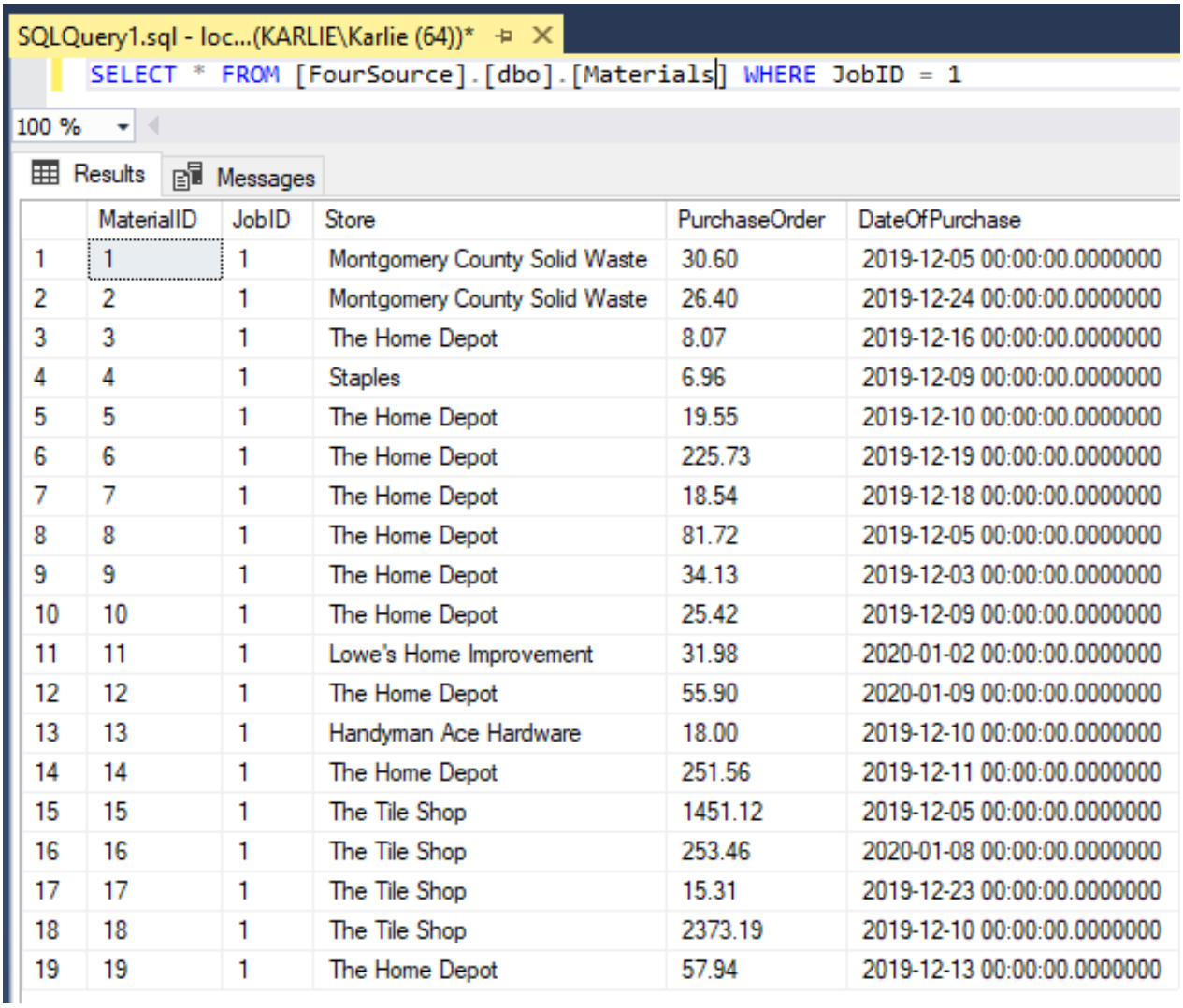
Figure 11: Jobs Table *The following image shows Four Source's "Jobs" table in SSMS. This is real Four Source data.*



	JobID	CustomerID	JobType	EstimatedCost	StartDate	EndDate
1	1	1	Bathroom Remodel	26837.50	2019-12-03 00:00:00.0000000	2020-02-25 00:00:00.0000000

Figure 11: Jobs Table

Figure 12: Materials Table *The following image shows Four Source's "Materials" table in SSMS. This is real Four Source data.*



SQLQuery1.sql - loc...(KARLIE\Karlie (64))*

```
SELECT * FROM [FourSource].[dbo].[Materials] WHERE JobID = 1
```

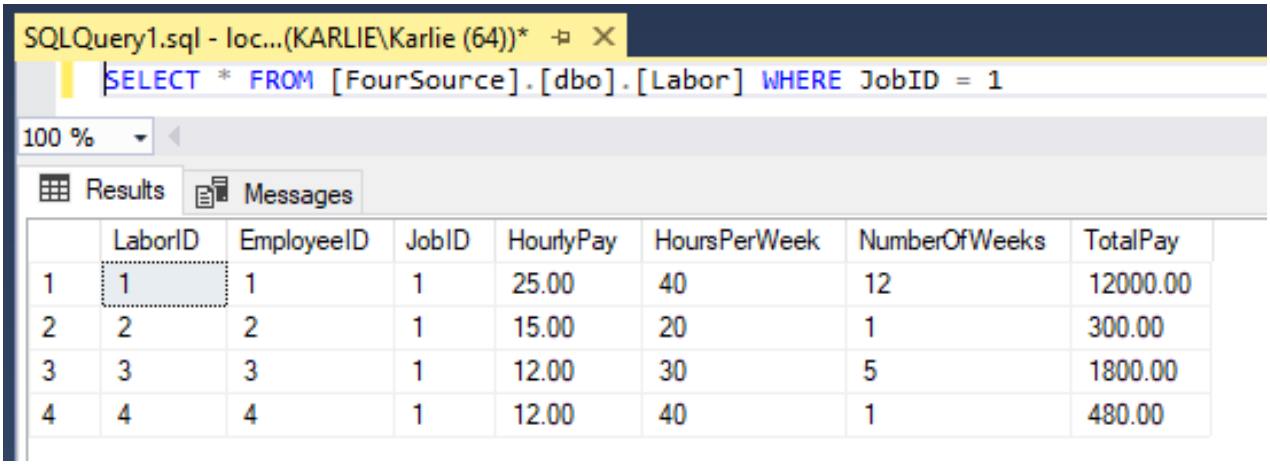
100 %

Results | Messages

	MaterialID	JobID	Store	PurchaseOrder	DateOfPurchase
1	1	1	Montgomery County Solid Waste	30.60	2019-12-05 00:00:00.0000000
2	2	1	Montgomery County Solid Waste	26.40	2019-12-24 00:00:00.0000000
3	3	1	The Home Depot	8.07	2019-12-16 00:00:00.0000000
4	4	1	Staples	6.96	2019-12-09 00:00:00.0000000
5	5	1	The Home Depot	19.55	2019-12-10 00:00:00.0000000
6	6	1	The Home Depot	225.73	2019-12-19 00:00:00.0000000
7	7	1	The Home Depot	18.54	2019-12-18 00:00:00.0000000
8	8	1	The Home Depot	81.72	2019-12-05 00:00:00.0000000
9	9	1	The Home Depot	34.13	2019-12-03 00:00:00.0000000
10	10	1	The Home Depot	25.42	2019-12-09 00:00:00.0000000
11	11	1	Lowe's Home Improvement	31.98	2020-01-02 00:00:00.0000000
12	12	1	The Home Depot	55.90	2020-01-09 00:00:00.0000000
13	13	1	Handyman Ace Hardware	18.00	2019-12-10 00:00:00.0000000
14	14	1	The Home Depot	251.56	2019-12-11 00:00:00.0000000
15	15	1	The Tile Shop	1451.12	2019-12-05 00:00:00.0000000
16	16	1	The Tile Shop	253.46	2020-01-08 00:00:00.0000000
17	17	1	The Tile Shop	15.31	2019-12-23 00:00:00.0000000
18	18	1	The Tile Shop	2373.19	2019-12-10 00:00:00.0000000
19	19	1	The Home Depot	57.94	2019-12-13 00:00:00.0000000

Figure 12: Materials Table

Figure 13: Labor Table *The following image shows Four Source's "Labor" table in SSMS. This is real Four Source data.*



	LaborID	EmployeeID	JobID	HourlyPay	HoursPerWeek	NumberOfWeeks	TotalPay
1	1	1	1	25.00	40	12	12000.00
2	2	2	1	15.00	20	1	300.00
3	3	3	1	12.00	30	5	1800.00
4	4	4	1	12.00	40	1	480.00

Figure 13: Labor Table

Security

The security architecture is minimal by design. Most of the security is implemented within *Four Source's* router. The router was configured with WPA2 EAS encryption and a software firewall. Other steps that were taken to provide better router security are:

1. Changed default admin login
2. Changed router SSID
3. Hid the network
4. Disabled UPnP
5. Disabled remote access
6. Disabled SSH
7. Disabled Ping (stealth)
8. Disabled WPS on the router interface

9. Monthly check for firmware update
11. Closed port 32764
12. Scheduled monthly firmware check and update

After the router was secured, we moved onto securing *Four Source's* computers. The first step was to do a full malware scan on the computers to ensure that no previous Malware existed. Once this was done, we installed McAfee Anti-virus to provide malware and malicious website protection. The anti-virus was scheduled to do a full scan once a week. After the scan, any malicious files or programs are then quarantined and removed. Next, we installed LastPass password manager to keep online passwords strong and hard to crack. All previously known accounts were migrated to LastPass. Any weak passwords were updated to a minimum sixteen characters. In addition to LastPass, Google authenticator was integrated with any critical accounts.

Another step that was taken was to provide *Four Source* with a custom configured browser. The browser is meant to limit data tracking and provide protection from harmful websites. It is also only meant to be used for critical business transactions. Normal browsing and shopping will be done on a separate browser. This is because the custom browser eliminates many features that make regular browsers convenient to use. Firefox was chosen due to its ability to be easily customized. Ublock Origin was installed and configured to block most ads, scripts, and popups deemed non-critical. McAfee Endpoint Security Control was also installed to block malicious webpages. Browsing containers were set up so that individual tabs cannot share cookies with one another. Third-party cookies were disabled, and data tracking was set to strict. History is cleaned

after every session, including browsing data, cached images and cookies. The browser does not save any passwords.

The last step of device security was a vulnerability assessment. This assessment was done using OpenVAS. I used a Kali Linux machine with OpenVAS to target *Four Source's* end devices. The tool probes the machines to find any existing exploitable vulnerabilities. It then generates a full report that can be used to determine what needs to be done to better secure the system. The report resulted in us performing a windows update, and a few other minor updates.

2.7 Testing

Overview and Methodology

This section contains in-depth testing details for Extreme Makeover: Tech Edition. Our testing methodology is divided into three sections: security, website, and database testing. The security testing uses a combination of manual and automated tests. The website and database testing use test cases.

Scope and Objectives

The scope of this testing covers all aspects of the project: security, website, and database. It ranges from testing the software to the business owner's capability of maintaining the operations. This will ensure our additions to the business are functional and beneficial. The testing will provide stability to help the system remain intact post completion of this project.

2.7.1 Security Testing

2.7.1.1 Network Security

The website and database have many built-in security features that are monitored by the services that own them. Therefore, we were most worried about *Four Source's* network security. The main areas that we tested for network security were:

- Port Scans
- Malware protection
- DNS hijacking
- Browser data tracking

To ensure that no critical ports were left open on four sources router we performed two tests. One is GRC's Shields Up test. This tests to see if the most attacked ports are open or closed.

Figure 14: GRC Shields Up Port Scan *The following image shows that designated common ports 0-1055 are either closed or in stealth mode. An open port would be identified by a red square.*

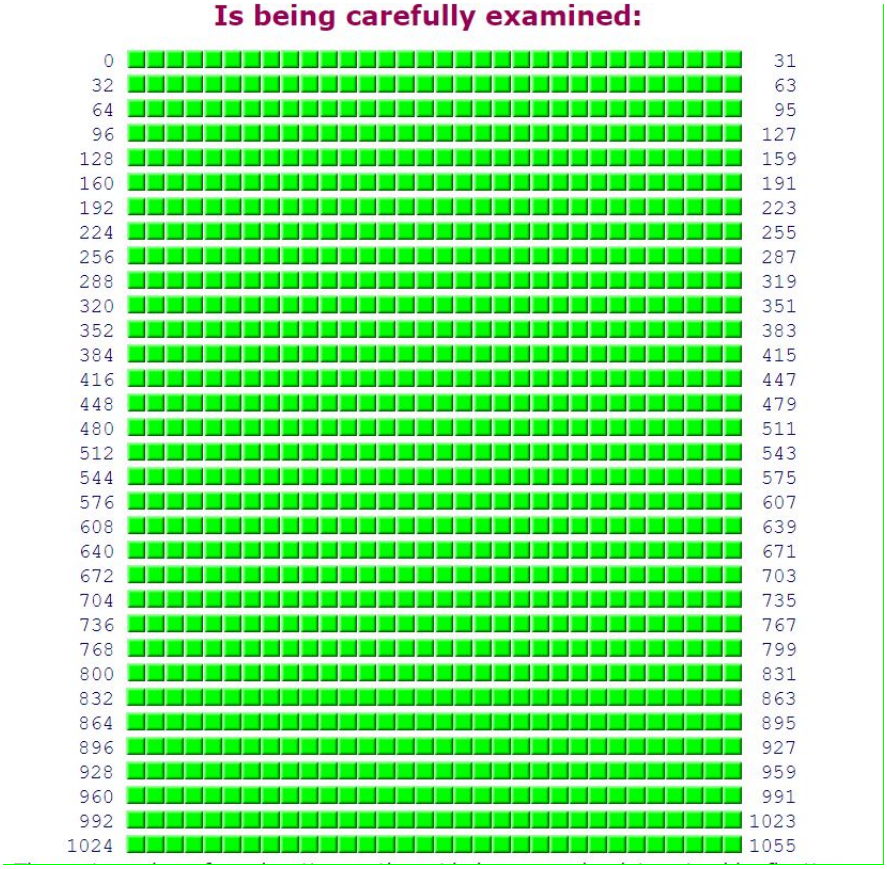


Figure 14: GRC Shields Up Port Scan

Next, we needed to test the anti-virus running on Four Sources PC's. To do this, we used multiple tools from the Anti-Malware Testing Standards Organization (AMSTO) and Spyshelter Anti-Keylogger program. AMSTO uses EICAR files to test virus detection in different mediums. The files contain code that most antivirus software should flag as malicious. Spyshelter simulates methods used by sophisticated malware to steal personal data. Spyshelter runs as an executable on a live machine.

Table 1: Anti-Malware Test Cases: *The following table shows the results of multiple anti-malware/antivirus tests performed on Four Source's computers.*

Anti-Virus Test Cases					
ID	**Work Item Type**	**Tool**	**Title**	**State**	**Result**
1	Test Case	AMSTO	Protection from malicious manual file download	Completed	Pass
2	Test Case	AMSTO	Protection from malicious drive-by download	Completed	Pass
3	Test Case	AMSTO	Protection from malicious .zip file	Completed	Pass
4	Test Case	AMSTO	Protection from download over HTTPS	Completed	Pass
5	Test Case	AMSTO	Protection from malicious program	Completed	Pass
6	Test Case	AMSTO	Protection from phishing pages	Completed	Pass
7	Test Case	SpyShelter	Protection from keyloggers	Completed	Pass
8	Test Case	SpyShelter	Protection from webcam captures	Completed	Pass
9	Test Case	SpyShelter	Protection from screen capture	Completed	Pass
10	Test Case	SpyShelter	Protection from clipoboard capture	Completed	Pass
11	Test Case	SpyShelter	Protection from sound recording	Completed	Pass
12	Test Case	SpyShelter	Protection from registry access	Completed	Pass

Table 1: Anti-Malware Test cases

Then, we checked the router for possible DNS hijacking. DNS hijacking can lead to man-in-the-middle attacks and can cause personal data to be stolen. To check for DNS hijacking we used F-Secure Router Checker. It is an automated test that confirms your routers ISP and DNS servers to make sure that they match.

Figure 15: F-Secure DNS Test *The following screenshot shows the results of the anti-DNS hijacking test performed on Four Source's network.*

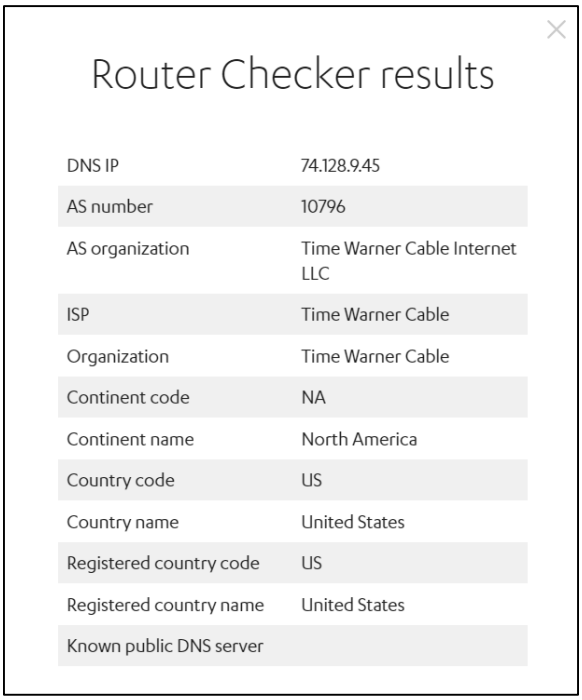


Figure 15: F-Secure DNS Test

The last test we performed for network security was a browser data test. We created a custom configured version of Firefox that is meant to track as little data as possible. This browser is meant to be used for critical business transactions. To test browser data tracking we used Panopticlick. Panopticlick checks for multiple facets of browser tracking. Some results were skewed because of the custom ad blocking settings used in some browser extensions.

Table 2: Panopticlick Browser Test *The following table shows the results of Panoticlicks automated browser fingerprint and browser data test.*

Test	Result
Is your browser blocking tracking ads?	✓ yes
Is your browser blocking invisible trackers?	✓ yes
Does your blocker stop trackers that are included in the so-called "acceptable ads" whitelist?	✓ yes
Does your browser unblock 3rd parties that promise to honor Do Not Track?	✗ no
Does your browser protect from fingerprinting?	✗ your browser has a nearly-unique fingerprint

Table 2: ***Panopticlick Browser Test***

2.7.1.2 Website Security

The main security features that need to be tested for the website include:

- Active SSL encryption
- Protection against cross-site scripting
- Protection against bots

To test an active SSL encryption, we used Wireshark to capture network traffic to and from the website to confirm that traffic was going through port 443 (HTTPS). Wireshark is a packet capturing tool that helps the user analyze details of web traffic. The websites SSL certificate is provided by Sectigo and the traffic shown goes through Wix's servers. The SSL certificate uses SHA-256 as the hashing algorithm. In the following figure, you will see a

complete connection from the client to the server including the key exchange. At the bottom of the figure, you will see that the application data is, in fact, encrypted.

Figure 16: Wireshark results *This screenshot shows that traffic to and from the Wix server is encrypted and uses port 443.*

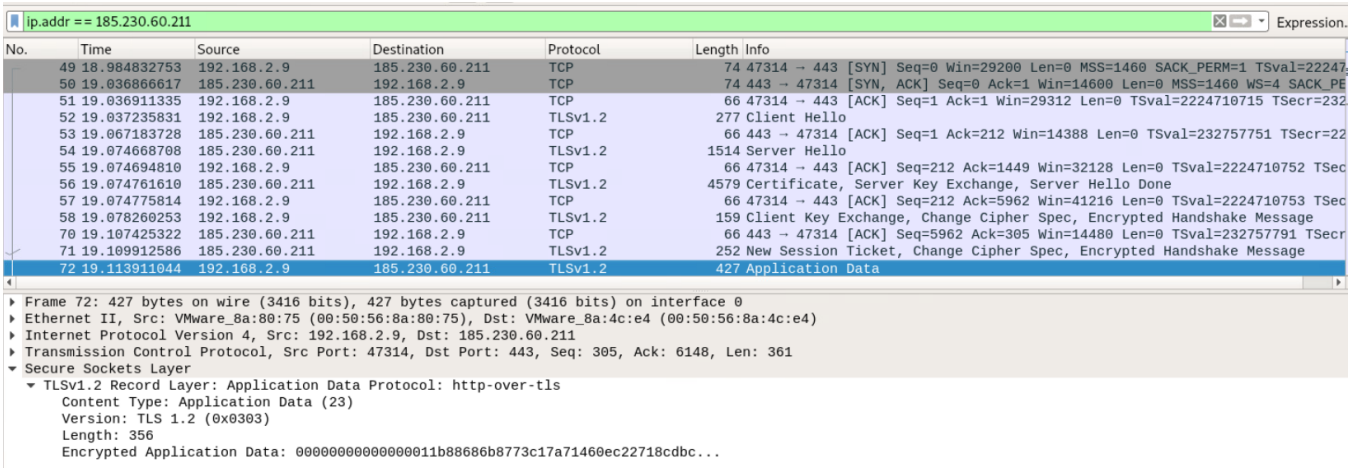


Figure 16: Wireshark Results

Wix ensures that their sites are secure against cross-site scripting but to prove this we used an automated XSS vulnerability assessment through pentest-tools.com. The tool spiders through the website's pages to check for the ability to enable scripts on the backend. As the results show the website does not allow custom scripts and therefore is protected against XSS.

Figure 17: XSS Vulnerability Assessment *The following screenshot below shows the results of the automated cross-site scripting test performed by pentest-tools.com.*

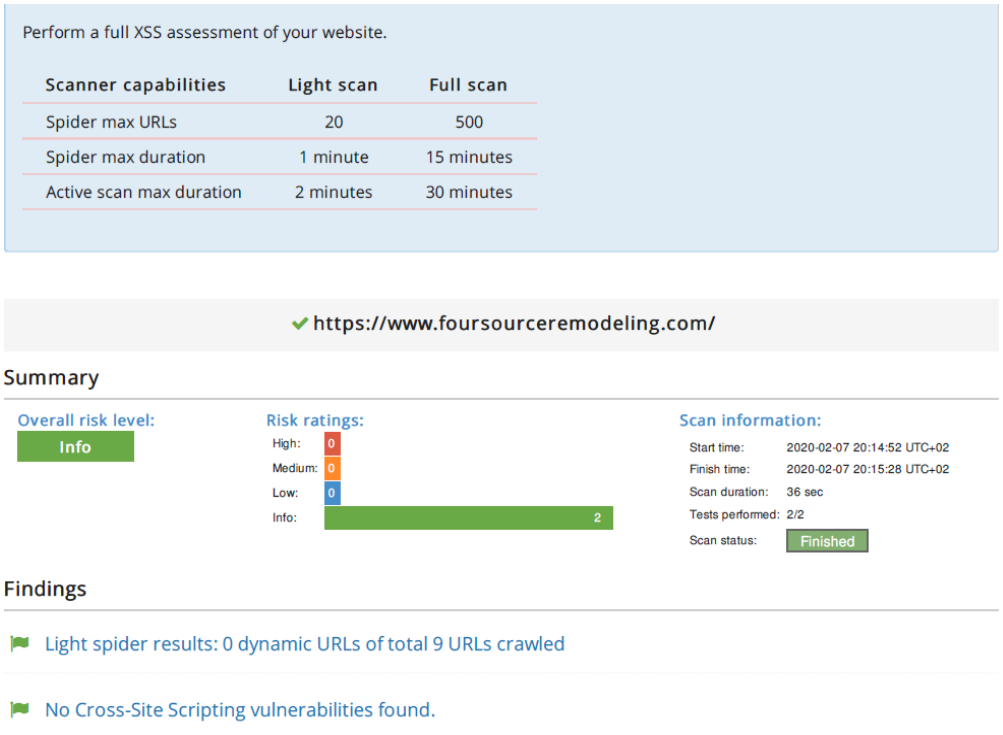


Figure 17: XSS Vulnerability Assessment

Web bots are a common problem for sites with multiple forms. Because Four Source's website has forms for contacting and employment opportunities, we made sure to include ReCaptcha submissions on all forms. To test that the ReCaptcha work, we submitted both employment and contact forms.

Table 3: ReCaptcha Test *The following table shows the status of ReCaptcha for forms hosted on Foursourceremodeling.com.*

Form	ReCaptcha Enabled	Successful Form Submission
Employment	Yes	Yes
Contact	Yes	Yes

Table 3: ReCaptcha Test

2.7.1.3 Database Security

The database security is managed within the SQL Server Management Studio. Four Source is a small company with small data sets. Database security is easy to regulate and manage. Most database security vulnerabilities and breaches occur because the rule of least privilege is not considered. The only person that has full control of the database is the owner of *Four Source*, Kelly Winhoven. Our team educated him on safe database practices. All the database security testing requirements are included in section 2.7.3 Database Testing.

2.7.2 Website Testing

We used several test cases to verify that all the functions of the website operate at the fullest capabilities and that the business owner was able to independently maintain the system. Along with the test cases, we performed server QA tests. The QA tests verified that each task was simple enough for users to perform with X amount of time.

Table 4: Website Test Cases *The following table shows our completed test cases for the website.*

Website Test Cases				
ID	**Work Item Type**	**Title**	**State**	**Result**
1	Test Case	Home page load on computer and phone	Completed	Pass
2	Test Case	About page loads on computer and phone	Completed	Pass
3	Test Case	Gallery page loads on computer and phone	Completed	Pass
4	Test Case	Services page loads on computer and phone	Completed	Pass
5	Test Case	Employment page loads on computer and phone	Completed	Pass
6	Test Case	Contact page loads on computer and phone	Completed	Pass
7	Test Case	Book now button (Home page) takes you to services tab	Completed	Pass
8	Test Case	Social media links functioning properly	Completed	Pass
9	Test Case	Gallery rotates through pictures	Completed	Pass
10	Test Case	Kelly Winhoven is able to update pictures	Completed	Pass
11	Test Case	Service "Book Now" take you to schedule online	Completed	Pass
12	Test Case	Service is bookable by available time	Completed	Pass
13	Test Case	Once a time is booked, it is no longer available	Completed	Pass
14	Test Case	Booking autofills time and Kelly Winhoven as the contact	Completed	Pass
15	Test Case	Location is always the booker's address	Completed	Pass
16	Test Case	User receives email upon booking	Completed	Pass
17	Test Case	Kelly Winhoven receives email upon booking	Completed	Pass
18	Test Case	"Check out more services" takes back to Services tab	Completed	Pass
19	Test Case	Application sends information to Kelly Winhoven	Completed	Pass
20	Test Case	Kelly Winhoven is able to remove Employment page when needed	Completed	Pass
21	Test Case	Submitting a contact form sends information to Kelly Winhoven	Completed	Pass
22	Test Case	Kelly Winhoven is able to update content	Completed	Pass

Table 4: Website Test Cases

Table 5: Website QA Test *The following table shows our completed QA tests for the website.*

Website QA Testing					
ID	**Work Item Type**	**Task**	**Test User**	**Estimated time**	**Result**
23	QA Testing	Access gallery	User	5 Seconds	3 Seconds
24	QA Testing	Access the gallery to edit	Owner	10 Seconds	12 Seconds
25	QA Testing	View employment applications	Owner	8 Seconds	12 Seconds
26	QA Testing	Apply through the website	User	15 seconds	30 Seconds
27	QA Testing	Access the Dev page	Owner	5 seconds	5 Seconds
28	QA Testing	Find social media link	User	10 Seconds	4 Seconds
29	QA Testing	Find Four Source location	User	8 seconds	5 Seconds
30	QA Testing	Book a consultation	User	30 seconds	35 Seconds

Table 5: Website QA Tests

2.7.3 Database Testing

The database used several test cases to ensure the database met functional requirements. The test cases included SELECT statements to verify the tables contain the correct data sets, no data is missing, and the variable types are correct. The test cases also included cases to verify the business owner can maintain database operations. Table 6 lists all database tests that were conducted. All tests passed.

Table 6: Database Test Cases *The following table shows our completed test cases for the database.*

Database Test Cases				
ID	**Work Item Type**	**Title**	**State**	**Result**
1	Test Case	SELECT * from Customers	Completed	Pass
2	Test Case	SELECT * from Employees	Completed	Pass
3	Test Case	SELECT * from Jobs	Completed	Pass
4	Test Case	SELECT * from Labor	Completed	Pass
5	Test Case	SELECT * from Materials	Completed	Pass
6	Test Case	SELECT COUNT(*) from Customers	Completed	Pass
7	Test Case	SELECT COUNT(*) from Employees	Completed	Pass
8	Test Case	SELECT COUNT(*) from Jobs	Completed	Pass
9	Test Case	SELECT COUNT(*) from Labor	Completed	Pass
10	Test Case	SELECT COUNT(*) from Materials	Completed	Pass
11	Test Case	SELECT * from information_schema.columns	Completed	Pass
12	Test Case	Kelly Winhoven is able to navigate the SSMS environment	Completed	Pass
13	Test Case	Kelly Winhoven is able to access the database	Completed	Pass
14	Test Case	Kelly Winhoven inserts/updates/deletes data in Customers table	Completed	Pass
15	Test Case	Kelly Winhoven inserts/updates/deletes data in Employees table	Completed	Pass
16	Test Case	Kelly Winhoven inserts/updates/deletes data in Jobs table	Completed	Pass
17	Test Case	Kelly Winhoven inserts/updates/deletes data in Labor table	Completed	Pass
18	Test Case	Kelly Winhoven inserts/updates/deletes data in Materials table	Completed	Pass
19	Test Case	Kelly Winhoven adds/deletes table in database	Completed	Pass
20	Test Case	Kelly Winhoven is educated on safe database practices	Completed	Pass

Table 6: Database Test Cases

Conclusion of Testing

The testing process taught us the importance of testing every aspect throughout the entire duration of a project. It helped us catch issues early on. This prevented the issues from becoming unmanageable. It set us up for a successful launch. Also, testing the business owner's ability to complete tasks helped us learn what we successfully taught him and what we needed to improve his skills on.

2.8 Budget

Table 7: Original Project Budget *The following table displays the original budget for our project. The original budget was revised throughout the fall and spring semesters as our project changed and as our understanding of real-world costs evolved.*

Extreme Makeover: Tech Edition Budget				
NO.	ITEM	UNIT, HOURS	UNIT PRICE	TOTAL
SOFTWARE				
1	Wix	1	$156 (yearly)	$156
2	Google Cloud Platform	1	$0	$0
3	McAfee Antivirus	1	$34.99	$34.99
	Subtotal			$190.99
LABOR				
4	Logo Design	1	$250 (flat fee)	$250
5	Website & Social Media Build	1	$400 (flat fee)	$400
6	Database Build	1	$500 (flat fee)	$500
7	Security Modifications	1	$350 (flat fee)	$350
	Subtotal			$1500
	Total			**$1690.99**

Table 7: Original Project Budget

Table 8: Final Project Budget *The following table displays the final budget for our project. It is an estimation of real-world costs. The budget represents what the small business would be billed for the services our company provided, as well as the costs to maintain the services we implemented.*

Extreme Makeover: Tech Edition Budget				
NO.	ITEM	UNIT, HOURS	UNIT PRICE	TOTAL
SOFTWARE				
1	Wix	1	$156 (yearly)	$156
2	SQL Server Express	1	$0	$0
3	SQL Server Management Studio	1	$0	$0
4	McAfee Antivirus	1	$34.99	$34.99
	Subtotal			$190.99
LABOR				
5	Logo Design	1	$250 (flat fee)	$250
6	Website & Social Media Build	1	$500 (flat fee)	$500
7	Database Build	1	$500 (flat fee)	$500
8	Security Modifications	1	$500 (flat fee)	$500
9	Training for Technologies	1	$350 (flat fee)	$350
	Subtotal			$2100.00
	Total			**$2290.99**

Table 8: Final Project Budget

2.9 Gantt Chart

Figure 18: Gantt Chart *The following figure shows the Gantt Chart for Extreme Makeover: Tech Edition. The Gantt Chart shows the project schedule for the fall and spring semesters.*

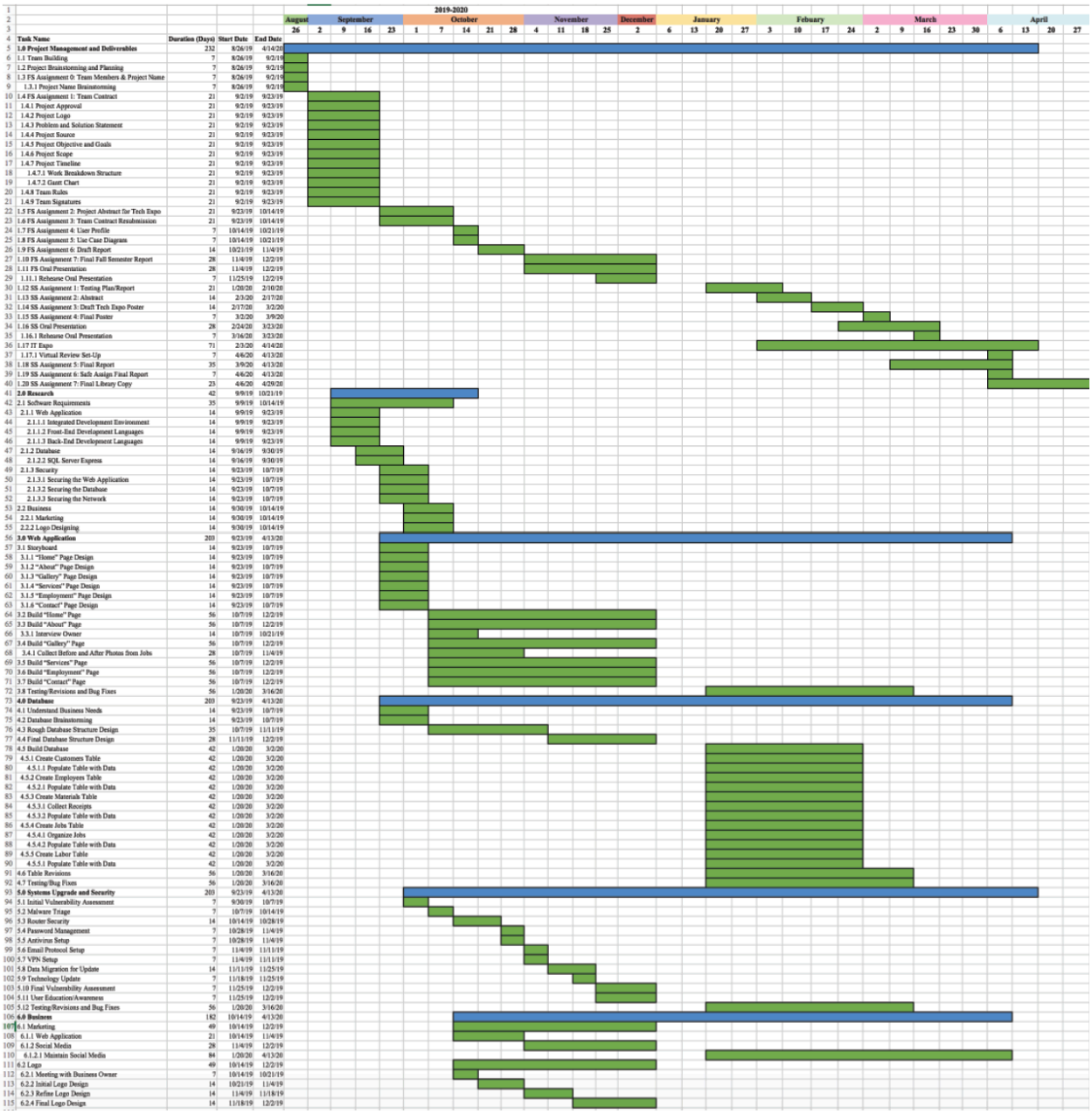


Figure 18: Gantt Chart

2.10 Problems Encountered and Analysis of Problems Solved

One problem we encountered was scheduling. Small business owners are extremely busy people. It can be difficult to figure out meeting times to discuss business needs and the best technologies to implement. This required us to develop a level of trust with the business owner. We wanted the business owner to have confidence in us and our decisions. Once he did, the project moved along smoothly.

Another problem we encountered was understanding the level of knowledge the business owner had about technologies. After debating on approaches to take, we decided to go with the solutions that would be easy and realistic for the business owner to maintain.

2.11 Recommendations for Improvement

We are very happy with the outcome of our project. However, there is always room for improvement. If we were to start over, I think we would promote heavier on *Four Source's* social media from the start. This would have increased the interaction on social media and we would have gotten more customer feedback on the new logo and website. Something else we could have done was taken professional photos for the website. Most photos we used were provided to us by the owner and they weren't the highest quality. This would have ensured that the website had the highest quality of professionalism. We encouraged the owner to get high-quality photos of his jobs moving forward to enhance the website even more.

3. CONCLUSION

3.1 Lessons Learned

Throughout this project, we learned a lot about implementing technologies in a small business. Attention to detail was extremely important. Small businesses don't have much room for mistakes. Choosing technologies that are easy to maintain and affordable were the most important aspects. Working with a small business made us appreciate how much work goes into operations and management. Small business owners need to be motivated and determined individuals. The owner of *Four Source* is amazing, and we are thankful he let us work with him for this project.

3.2 Abilities and Skills Developed Throughout Project

We learned a lot about the business side of technology throughout the project. This is an important skill to have because no matter where you work in the field of IT, business is always going to have a prominent role. We learned how to be aware of the costs and benefits of a project. Time management was also a skill that we continued to develop throughout the project. Especially with the current events of COVID-19, we had to rapidly change our schedule.

3.3 Completed during Spring

In the Spring, our main focus was to complete the website and database. We also conducted and passed all the testing for all portions of the project. Along with completing the remaining portions and testing, we worked on educating the business owner on all the technologies we implemented. This ensures *Four Source* will be able to maintain the solutions post-completion of the project.

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4.2 Appendix

Figure 19: Tech Expo Poster *The following figure shows our final poster that was presented at Tech Expo 2020. It displays an overview of our entire project.*

Figure 19: Tech Expo Poster