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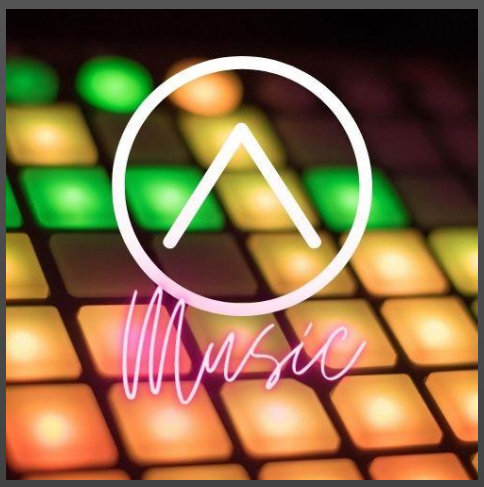

ACME MUSIC STORE Version 1.4 E-COMMERCE WEB APPLICATION: Performance and Methodologies Report

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Contents

Introduction

This report is an extension of the “Requirements and Design/Architecture Patterns Report” previously presented to ACME’s bid committee for their upcoming ecommerce website project. This report focuses on the prototype developed for ACME and on methodologies and frameworks that can be used in the final development of ACME’s website.

The following is an overview of what the report covers:

- **Optimizing Prototype Performance** – this section assesses how the prototype can be further optimised to establish a higher performance version in final development of ACME’s website.
- **Software Development Methodology** – this section discusses the motivation behind choosing Agile SCRUM as the software development methodology that should be used in final development.
- **DevOps** – this section discusses the motivation behind using DevOps and how DevOps can be integrated with Agile SCRUM to further accelerate development speed and efficiency.
- **Enterprise Architecture** – this section discusses the motivation behind using TOGAF and Zachman together in final development.
- **Prototype Solution** – This section discusses the technical solution of the prototype and how it can deliver busines value to ACME.

Optimizing Prototype Performance

This section discusses guidelines that should be followed to ensure that ACME Music store website is optimised to produce satisfactory performance results at the end of final development. These guidelines were derived from a review of the prototype developed in Task 2.

Implementing caching – The task 2 prototype does not make use of caching. A cache is a data storage layer where previously retrieved data is stored for fast access and reusability near the application (Amazon Web Services, 2020) . With caching implemented, bottle necks can be avoided as the database will not have to be queried repeatedly for the same data, instead it can be quickly retrieved from the cache memory store. Therefore, to improve the scalability of the website and improve traffic handling of multiple user requests**,** Asp.Net Cache – Output caching and Data caching - should be used to implement caching in final development (Bochicchio, et al., 2011).

Implementing Asynchronous Methods – The task 2 prototype does not make use of asynchronous methods. Asynchronous methods allow for further service calls to be made on the same thread whereas a synchronous method will hold up future calls till the initial request is completed (Microsoft, 2012). Since the website will have to perform remote operations, requests can get lost along the way. Thus, asynchronous methods can allow a second request to be made just in case the first request experiences a time out (Torgerson, 2010). Therefore, to improve responsiveness in the website in final development, asynchronous methods should be used.

Configuring HTTP Compression – The task 2 prototype does not make use of HTTP Compression. The benefits of HTTP compression are lighter web pages which means faster page loading times. HTTP Compression can be configured easily in ASP.Net through the application Web.config file. Here the developer can use the **httpCompression** tag to enable compression for the website and can fine tune compression settings such as setting which file types should be compressed. HTTP Compression should be implemented for ACME Music store in final development to reduce the size of each HTTP request which can optimize front-end performance (Hume, 2013).

Website Image Optimization – Images used in the Task 2 prototype have not yet been fully optimized. Images used for a web page can make up a large portion of a web pages total memory size. Therefore, optimizing website images can bring on page performance improvements. In final development, Lossless Optimization Tools can be used for website Image Optimization. Website images such as product images can be run through Lossless optimization tools to reduce file size without impacting image quality (Hume, 2013).

Software Development Methodology

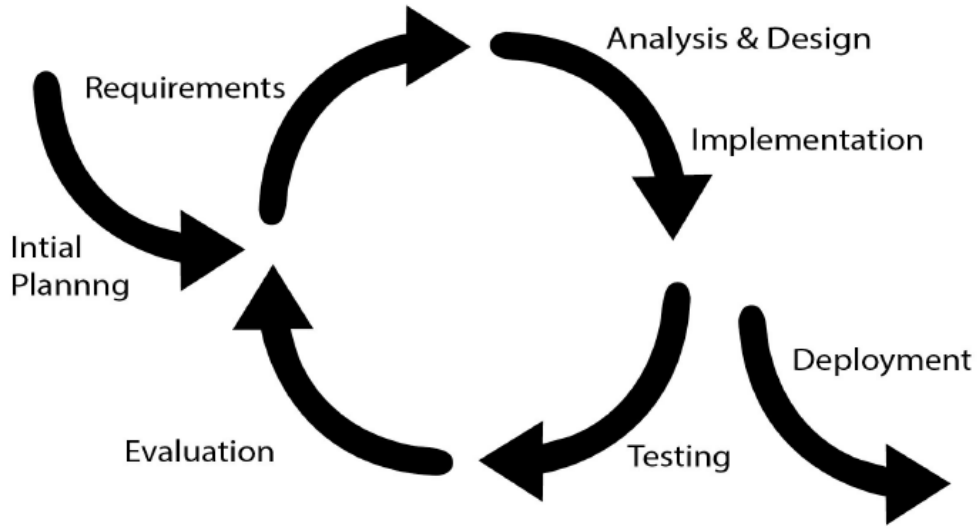
A Software Development Methodology is defined as a set of regulations that assist the development team in performing all system development life cycle activities necessary to research, build, deploy and maintain a software system (Satzinger, et al., 2015).

The purpose of this section is to present the motivation behind deciding on the Agile SCRUM Development Methodology, as the choice for the development of ACME's website.

Client criteria that have guided this decision are:

- The structure of the development methodology should be iterative as this will support going back to development using the prototype as a starting point for further iterations to create a refined website for ACME.
- The methodology should support developer interaction with stakeholders , and website users throughout the project to ensure requirements are achieved successfully.

Why an Agile Development Methodology in particular?



(Stanley & Gross, 2020)

An Agile development methodology takes on a non-linear development structure, it does not follow a step by step process like a traditional Waterfall methodology does. Instead, it is incremental in nature, all phases of the system development life cycle (requirements, analysis, design, implementation, testing, and evaluation) are continuously repeated till the software system is deemed refined and complete. This structure allows for adaptive planning, fast delivery, continuous improvement, and a rapid and flexible response to development changes (Stanley & Gross, 2020).

The *Manifesto of the Agile Alliance* was developed by industry experts in 2001 to identify which values and principles could guide project development teams to respond to change and work efficiently. From these values and principles, the Agile Development Methodology formed (Martin, 2014).

The following Agile principles inspired by the *Manifesto* have motivated the decision for the development team to follow an Agile based Methodology :

The project should have a high focus on building the project team – Agile recognizes that the most important factor contributing towards project success is people. Therefore, Agile prioritises team building over building the project environment which leads to a motivated, supported, and well-gelled development team. (Martin, 2014).

The project must be continuously guided – Agile ensures project requirements are always met through frequent interactions with stakeholders and software users. This will ensure that the client's concerns are always addressed appropriately at the end of each iteration (Martin, 2014).

The project should release early, and updates should be continuously delivered – Agile allows for fast release of a proposed software system within weeks. The functionality of the system may be rudimentary at first but as deliveries are rolled out, the end results is a high-quality, fully functional system. Stakeholders can decide if the initial release is good enough to be put into production or can provide developers with feedback on what they would like to see changed in the next release (Martin, 2014).

Requirement changes are welcome at any time – Agile methodologies are flexible and allow for new requirements at any time during production. This can also put companies using agile development methodologies at an advantage to their competitors. This is because agile developers can quickly adapt their systems to meet rising market expectations (Martin, 2014).

The decision was further enforced by the following statistics reported on 2 top contending software methodologies used in industry today – Agile versus Waterfall. This report comes from data recorded from 2011 – 2015 (Standish Group, 2015)**.**

CHAOS RESOLUTION BY AGILE VERSUS WATERFALL

SIZE	METHOD	SUCCESSFUL	CHALLENGED	FAILED
All Size Projects	Agile	39%	52%	9%
	Waterfall	11%	60%	29%
Large Size Projects	Agile	18%	59%	23%
	Waterfall	3%	55%	42%
Medium Size Projects	Agile	27%	62%	11%
	Waterfall	7%	68%	25%
Small Size Projects	Agile	58%	38%	4%
	Waterfall	44%	45%	11%

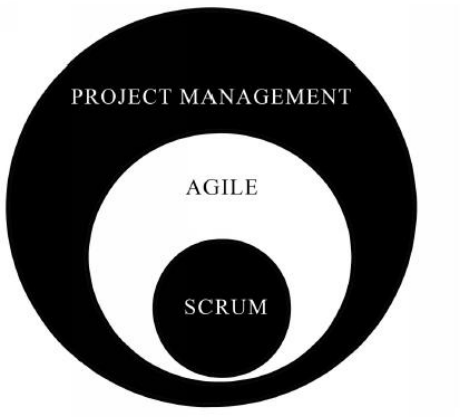
The resolution of all software projects from FY2011–2015 within the new CHAOS database, segmented by the agile process and waterfall method. The total number of software projects is over 10,000.

(Standish Group, 2015)

As one can note, the total projects developed using Agile were reported to have a higher project success rate than traditional Waterfall developed projects. The failure rate of Agile projects was also much lower. With only 9% of Agile projects failing during the time.

It is evident from the principles and characteristics mentioned above and from the statistics provided that Agile will be a valuable software methodology to pick as it has a higher project success and lower failure rate than traditional waterfall methodologies and it encourages teamwork, client collaboration, iterative project enhancement and adaptability.

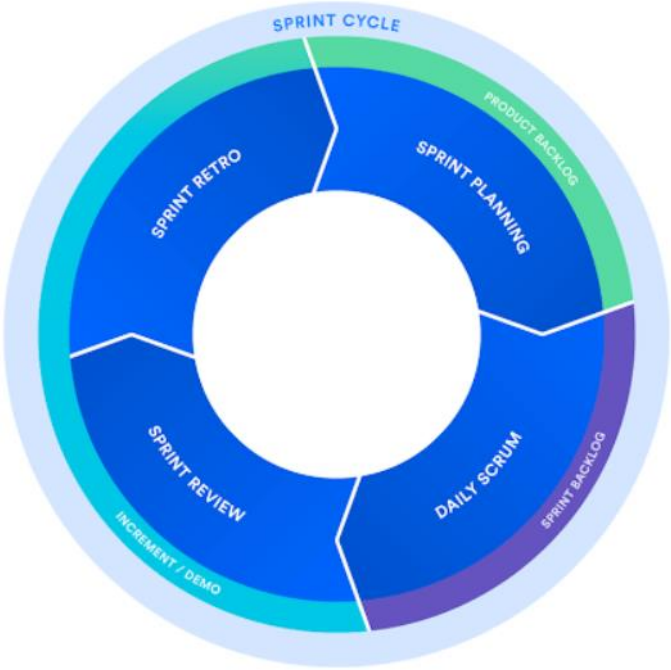
Why SCRUM?



(Stanley & Gross, 2020)

SCRUM is a popular Agile Framework that is focused on completing projects through continuous improvement, client demands and strong teamwork (Stanley & Gross, 2020). These principles alone suggest that this framework is well suited for the development of ACME's website as developers will be working closely with requirements defined by ACME stakeholders to ensure project success. The framework is heuristic in nature, in other words, at the beginning of the project requirements are not fully known to the team, but through experience, project requirements are learnt and adjusted. The SCRUM process of learning and adapting user requirements, and providing continuous application improvement, is done through short release cycles known as sprints (Drumond, 2020).

Below the model describes activities performed during a sprint cycle.



(Drumond, 2020)

The following benefits have motivated the decision to use the SCRUM Framework:

SCRUM allows flexibility and adaptability through defining and refining project requirements and design as the project progresses instead of at the start of the project (Cobb, 2020) .

SCRUM encourages creativity and innovation which will ensure ACME's website stands out from its competitors. This is because it does not focus on spending too much effort on project control and planning as this can limit creativity and innovation (Cobb, 2020).

SCRUM delivers an initial solution to market quickly due to not spending too much time on planning at the beginning of the project (Cobb, 2020).

ACME will save on project costs with SCRUM for the following reasons (Cobb, 2020):

- Overheads are reduced as documentation and control requirements are low.
- Productivity levels are noted to be high using SCRUM .
- Through prioritisation of requirements and incremental development approach "feature bloat" is reduced which saves on development costs.

The SCRUM development process always integrates quality into the development process and not just as a quality checking activity. This ensures the quality value of the system is ever improving throughout development of ACME's website (Cobb, 2020).

Scrum is a collaborative process which means throughout development, developers are working with ACME's customers and their feedback to refine requirements. This will ensure ACME will deliver a final website that will bring complete customer satisfaction (Cobb, 2020).

SCRUM gives developers empowerment and responsibility which leads to satisfied employees. The happier the employee the higher quality work they will deliver to the project (Cobb, 2020).

DevOps

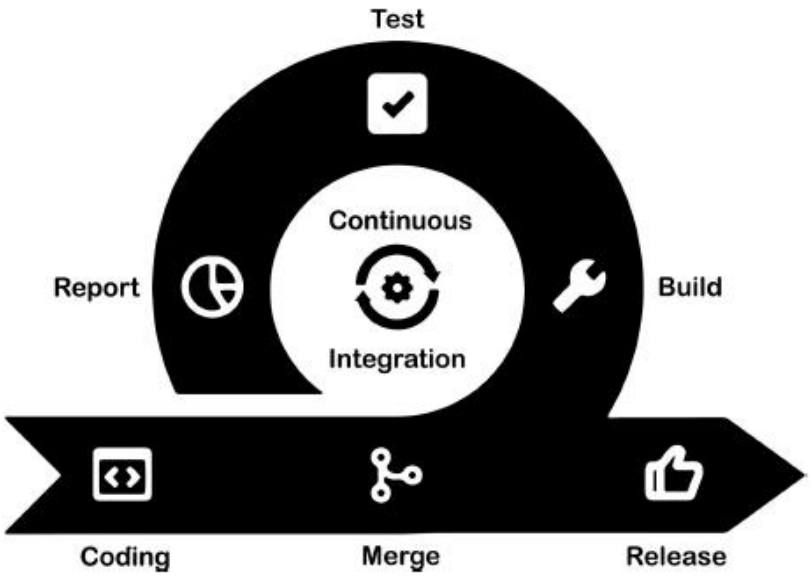
The purpose of this section is to discuss DevOps and the motivation for it to be used with an Agile Scrum methodology.

What is DevOps?

DevOps is a collaboration of business practices, tools and cultural philosophies created for the purpose of accelerating development speed and for improving software quality. The name DevOps is a short form of meaning development and operations. Development and operations are 2 divisions in an IT company. DevOps assists in merging IT divisions together to bring a great level of co-operation and co-ordination (Stanley & Gross, 2020). Through DevOps tools and practices, traditional tedious processes that had to be performed manually by IT divisions can now be automated. DevOps service providers, like Amazon web Services, can be utilised to allow ACME's IT divisions to quickly and reliably update and operate on the website (Amazon Web Services, 2020).

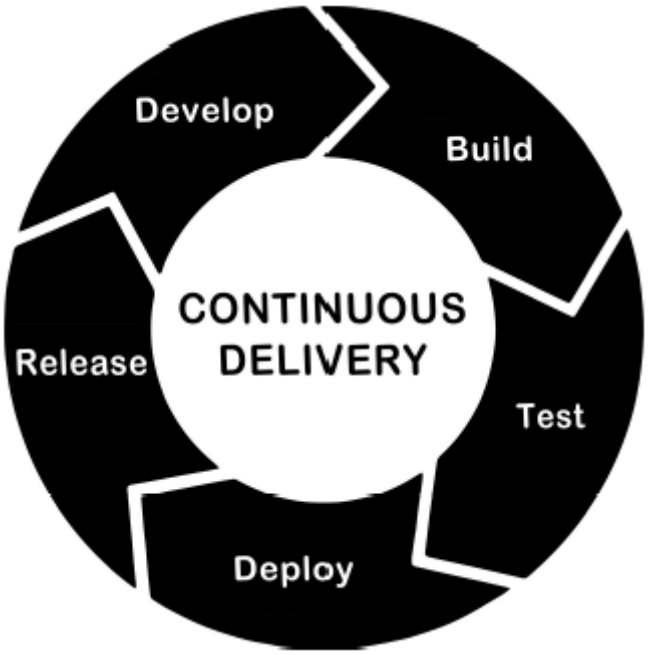
The following are 2 examples of DevOps practices summarized to demonstrate how DevOps can be greatly beneficial when combined with an Agile Scrum methodology:

Continuous Integration – This practice encourages developers to continuously commit code to a version control repository to avoid problems that result from late integration such as merge conflicts, bugs, and code duplication. This practice ensures that every time a repository receives changes, tests and builds are automatically run on the code, known as continuous testing. This ensures that the product delivered to users is error free at the end of development (Stanley & Gross, 2020). An increase in team productivity, faster bug finding, and fast delivery of updates are some of the benefits this practise has to offer (Amazon Web Service, 2020).



(Stanley & Gross, 2020)

Continuous Delivery – Production of software through brief cycles is encouraged by this practise. This practise ensure delivery of software to its relevant test or production environment is automated. This practise also makes use of continuous testing (Stanley & Gross, 2020). Fast delivery of updates, an increase in team productivity, automated software releases and fast bug discovery are some of the benefits this practise has to offer (Amazon Web Services, 2020).



(Stanley & Gross, 2020)

The following business benefits have motivated the decision to use DevOps with Agile SCRUM:

Increased Development Speed and rapid delivery – DevOps practises such as continuous integration and delivery, accelerate development processes such as code deployment and application improvement. This increase in speed can give ACME a competitive advantage as they can adapt to markets faster and improve customer satisfaction as they can respond to customer concerns faster (Stanley & Gross, 2020). Using DevOps tools and practices in the context of a SCRUM sprint cycle can further speed up development cycles.

Improved quality and reliability through monitoring and testing – DevOps tools and practices such as continuous integration and continuous delivery can be used to perform functionality testing. Application performance can also be tracked in real-time with DevOps monitoring and logging practices. Therefore, through utilising the DevOps practises mentioned above during development, will allow ACME to maintain a user experience that is positive and ensure quality updates are delivered on time (Amazon Web Services, 2020).

Improved team collaboration and communication – DevOps enables cross-functional collaboration between teams and allows teams to share resources which leads to improved collaboration and communication. DevOps creates transparency between development and operations teams through exposing resources traditionally hidden. This increases speed of development as it allows both teams to access and contribute to resources easier and solve issues faster. Through cross-team exposure, holistic understanding of the development environment and architecture can contribute to operational efficiency and drive knowledge of the organisation for better communication and collaboration between teams (Holloran, 2018). Since SCRUM is a very team orientated framework, DevOps will be greatly benefit team collaboration and communication which in turn will contribute to development efficiency.

Enterprise Architecture

What is enterprise architecture?

Enterprise architecture is a structured framework that assists organisations in analysing, planning, developing, and implementing their information technology resources strategically. This allows organisations to improve performance by enabling them to align their short-term and long-term business goals with relative infrastructure and information technology systems (Bernard, 2012). The decision to utilise an enterprise architecture framework will enable ACME to obtain the full potential of its company's information technology resources and obtain the most business value from them.

The following enterprise architecture frameworks were considered :

Information Technology Infrastructure Library (ITIL):

ITIL, developed in the 1980's by the British government's Central Computer and Telecommunications Agency (CCTA), guides organisations in delivering IT services through a library of best practices that covers various IT service lifecycle stages and processes. When ITIL was initially created it took the form of 30 books, however, over many years of refinement and downscaling it reached 5 volumes in 2011. The latest version of the framework was released in 2019 as ITIL 4 (White & Greiner, 2019).

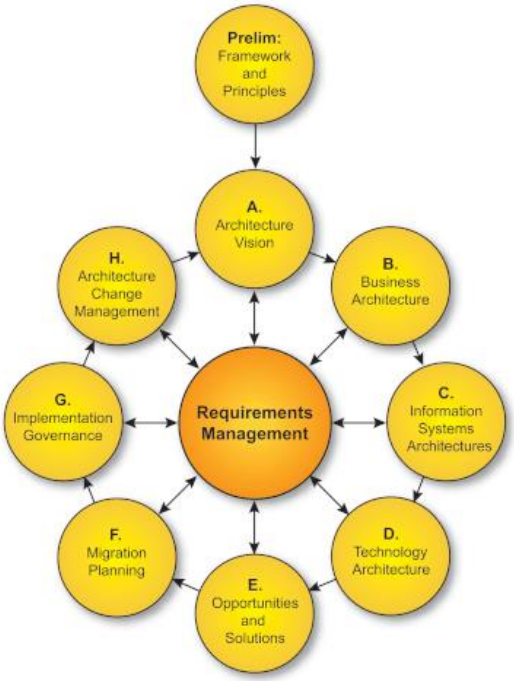
The Open Group Architecture Framework(TOGAF)

TOGAF, developed in 1995 by The Open Group, is a popular framework used by businesses today to assist them with their enterprise development process. TOGAF helps businesses move through processes fast through the organization and defining of requirements before the beginning of a project. TOGAF's systematic approach can assist businesses in error reduction, stay on time, align IT goals with business goals, and stay within budget (White, 2018). TOGAF utilises the Architecture Development Method(ADM) to guide businesses in change or development of their enterprise architecture. The ADM method is a step by step process that covers 10 phases of the architecture development cycle. The ADM model can be used to better visualize these steps for easier guidance and takes the form of a crop circle (see ADM model diagram below). It is important that the ADM is adapted when using this framework to achieve architectural needs (OrbusSoftware, 2016).

2 ADM phases are summarized below as an example to demonstrate how phases work and can be followed step by step to achieve architectural needs.

Preliminary Phase – At this phase, an organisation is required to do work to adapt the ADM to the framework of the organization, or if required, with other architecture frameworks – like the Zachman Framework (The Open Group, 2006). Also this phase requires that a request for architecture work is well defined so that everything is prepared sufficiently so that the request can be completed (OrbusSoftware, 2016).

Requirement Management Phase – This phase is referred to at every step of the ADM process and sits in the middle of the model (see ADM model diagram below), it is a process that is continuous and ongoing. The purpose of this phase is to govern requirement changes and to ensure that all phases reflect these changes (OrbusSoftware, 2016).



(The Open Group, 2006)

The Zachman Framework

The Zachman Framework, developed in 1987 by John Zachman while working at IBM, assists businesses in enterprise architecture artifact organization. For example, artifacts would be things such as models or specifications. This allows a business to catalogue all its organization's architecture. The Zachman template is the tool used to help businesses achieve the above. The template is a 36 category 2-dimensional matrix (**see image below).** Categories describe architecture assets such as products or software. Categories are organized by 6 rows and 6 columns. Each column asks a fundamental question about something in the architecture – "Who? What? How? When? Where? Why?". For example, the question, "what?", Is where one would identify objects or conceptual ideas necessary for the project such as requirements, business data or information. Each row describes a stakeholder's perspective or a perspective on the project. For example, row 4 would describe the Engineers Perspective or the technology physics of the project and would contain information such as what tools, technology, or materials the teams will be using for the project. Through this template, detailed insight into the IT assets of a business is achieved and can help a business be flexible, agile and make informed decisions towards architectural change (White, 2020).

(Zachman, 2008)

The following table highlights the benefits and business value that each framework could add to the project.

Framework	Business value and benefits
ITIL	**ITIL can benefit ACME in the following ways** (White & Greiner, 2019)**:** o Decrease costs of IT o Improvement of IT services o Productivity Improvements o Disruption, failure, and risk management o Customer Relations Strengthening o Cost-effective practises o Constructing an IT environment that is scalable, adaptable and allows growth.
TOGAF	**TOGAF can benefit ACME in the following ways :** o Saves time, cost and risk associated with development of enterprise infrastructure (Architecture Center, 2019). o Through a framework that is flexible and scalable, businesses can easily restructure and see steady growth (Architecture Center, 2019). o Improves communication within the organisation, assists everyone to reach complete agreement in understanding (White, 2018). o The framework is free to use internally but not for commercial purposes (White, 2018). o Can work with other architecture frameworks (The Open Group, 2006)
Zachman	o Provides detailed insight into the IT assets of a business and can help a business be flexible, agile and make informed decisions towards architectural change (White, 2020).

Which Framework(s) Should ACME use?

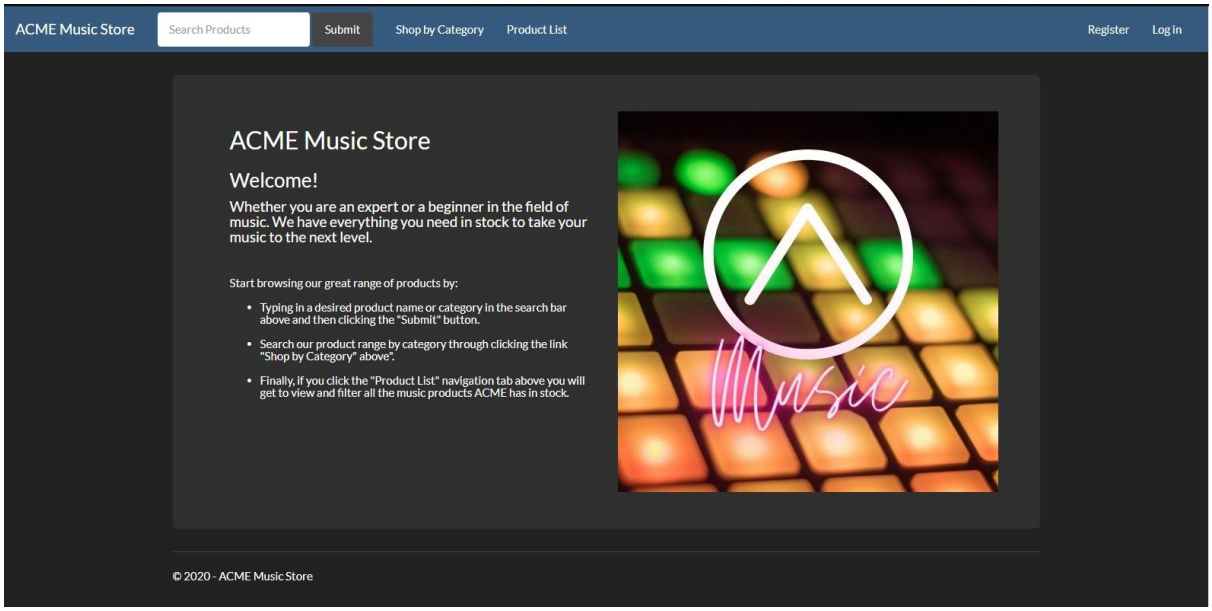
Although, ITIL is a credible, and reliable framework that offers a great deal of benefits, ITIL as a package can be quite costly - subscriptions fees, certificate, training, re-engineering, etc- and can take weeks or months to implement (White & Greiner, 2019). Therefore, ITIL will not be suitable for ACME.

A combination of TOGAF and the Zachman Frameworks will be used for the website project. TOGAF works with other architecture frameworks and therefore the benefits mentioned above can be utilised from both frameworks. In summary, TOGAF can allow ACME to save time, risk, and cost in the process of developing the project architecture. ACME can feel confident that TOGAF will allow them to restructure and scale the architecture with the least hassle. TOGAF and Zachman are both great frameworks for helping team members understand, visualize, and communicate better on architectural decisions. The cost of implementing each framework is also low.

Prototype Solution

Technical Description

Home Page



When a user first visits the ACME Music Store website, they are presented with the home page. Here the user is displayed a welcome message and provided with helpful information to help them get started with using the websites product browsing functionality.

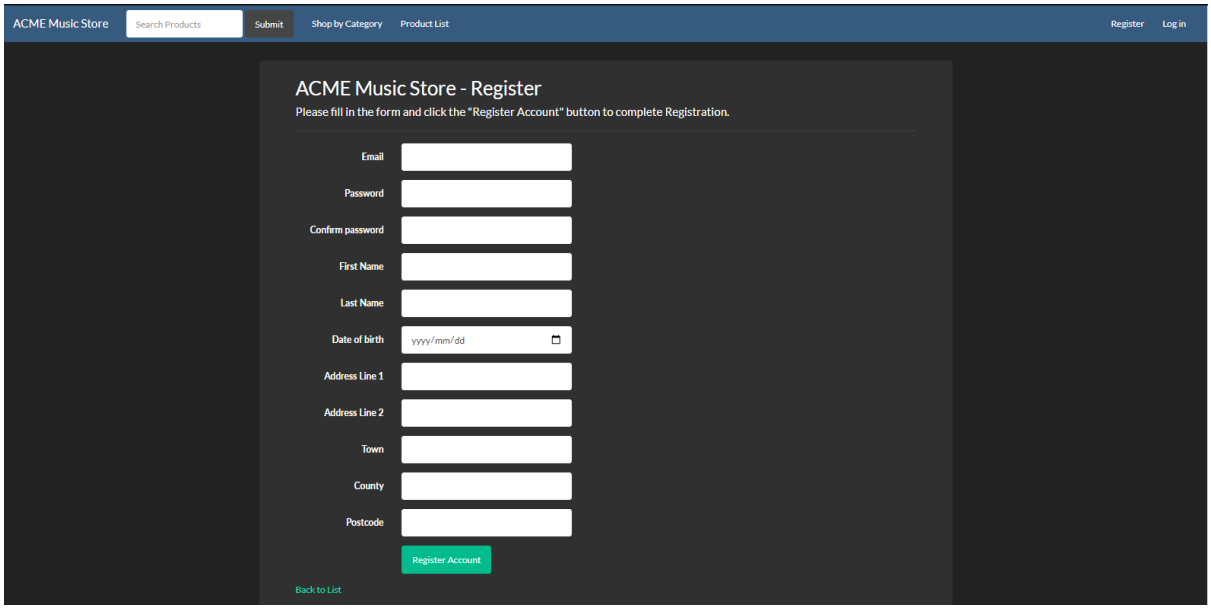
User Registration

Registration – Registering a user in the role of customer

The register page allows a non-employee user to register a new account. This will assign them to the user role customer upon completing account registration.

To navigate to the register page the user can click the “Register” tab displayed on the navigation bar top right of the screen.

Here the user is required to fill in all form fields relating to authentication and their personal information and then click the “Register Account” button to complete registration.



It is important that the user remembers the email and address field they enter here as these details will be required to gain access to their newly created account later

Registration – Registering a user in the role of administrator

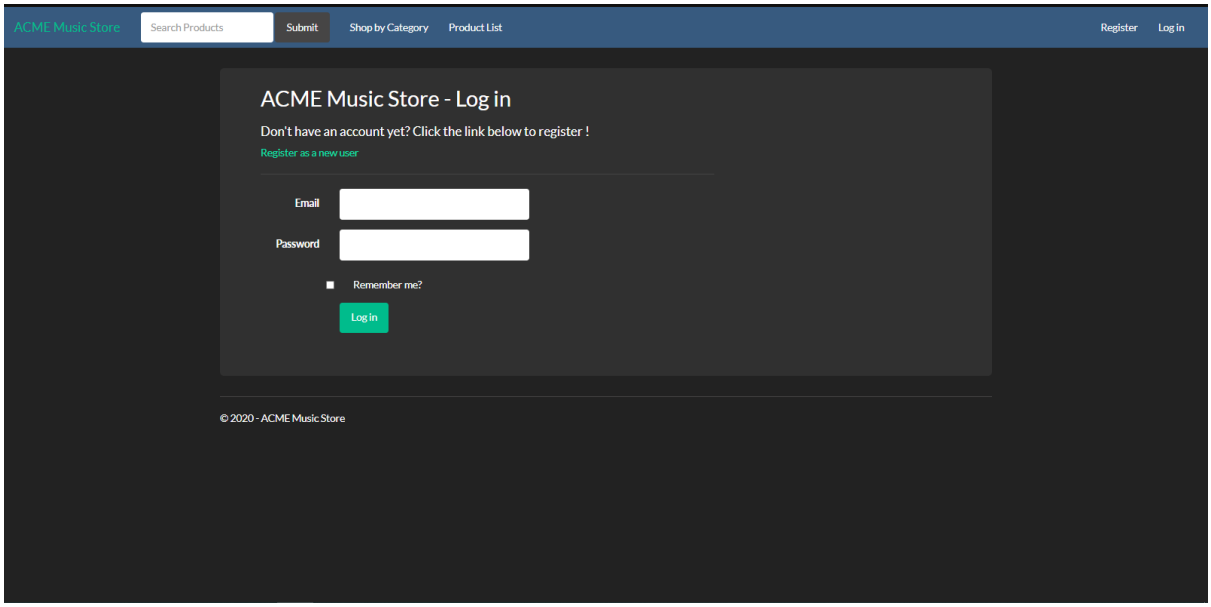
To register a new ACME employee user in the role of administrator, an existing user in the role of administrator will be required to use the **Admin Page - User Manager – Create New** feature (See **Administrator Menu** section).

User Login

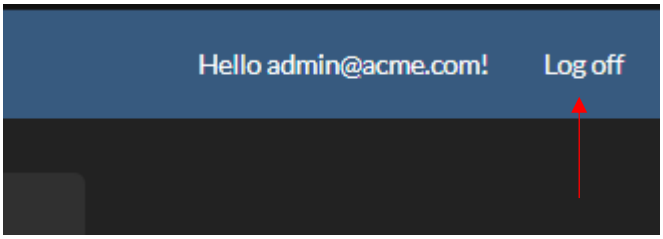
The Login Page allows all users to login and gain access to their account.

To navigate to the login page the user can click the “Log in” tab displayed on the navigation bar top right of the screen.

Once the user has navigated to the login page, they will be required to enter the email and password they registered with. Once entered they can now click the “Log in” button.



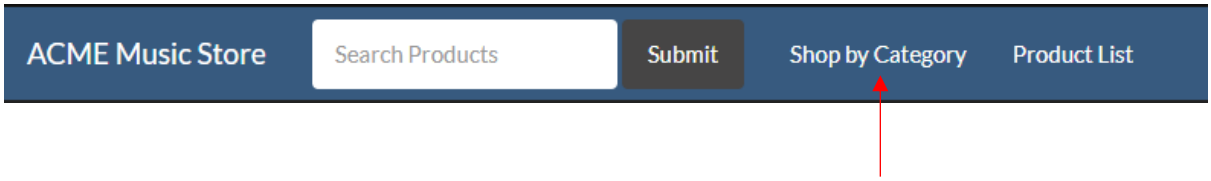
If the user successfully logged in, they will be redirected to the websites home page and their email address will display top right of the screen in the navigation bar.



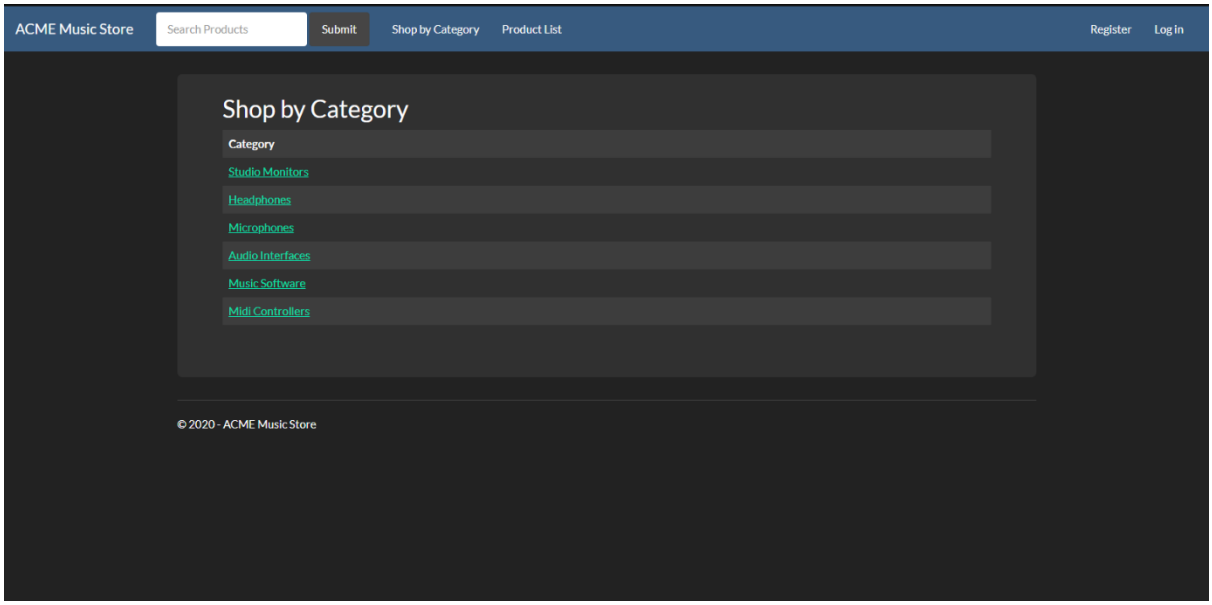
Navigation Bar Product Search and Filtering – Shop by Category

The Shop by Category website page allows the user to perform a product search based on the product category name they choose from a list of all available product categories.

To navigate to this page, the user is required to click the “Shop by Category” tab displayed in the navigation menu at the top of their screen.



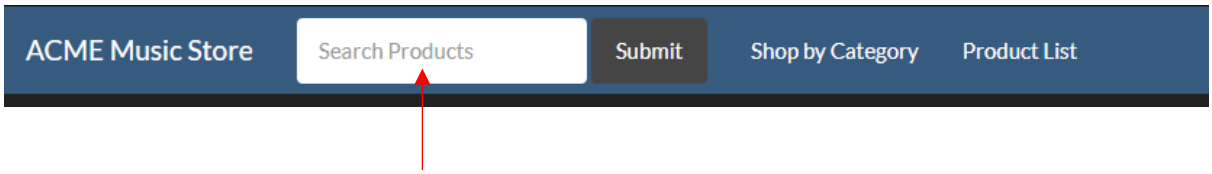
The Shop by Category screen will now be displayed to the user. They can simply click a category name which will direct them to the resulting product list page filtered by their category choice.



Navigation Bar Product Search and Filtering – Product Search

The navigation product search feature allows the user to quickly perform a product search from any page on the website.

This feature can be seen in the navigation bar at the top of the user's screen.

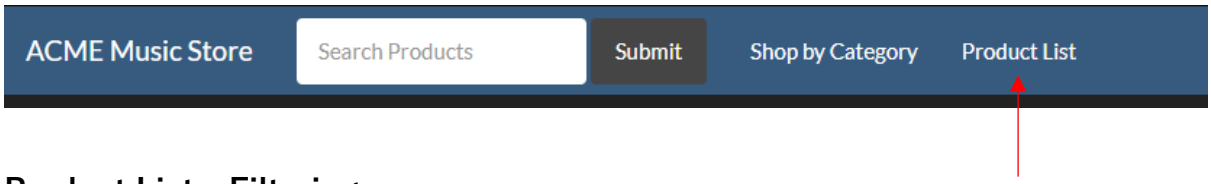


To search for a product using this feature, the user is required to enter a search phrase related to a product such as the product name or category in the text field labelled "Search Products". Once a search phrase has been entered the user can then click the "Submit" button to the right of the search field. This will display the products list page to the user with a list of products if their search phrase finds a match in the website database.

Product List

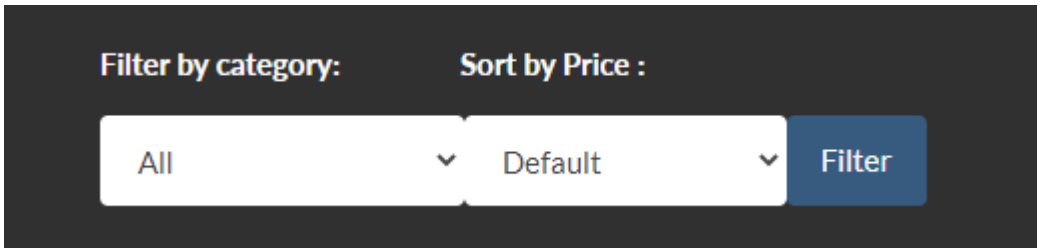
The product list page allows the user to view and filter all available products that the website has to offer.

To navigate to this page the user can click the “Product List” tab displayed on the website’s navigation bar at the top of the screen.



Product List – Filtering

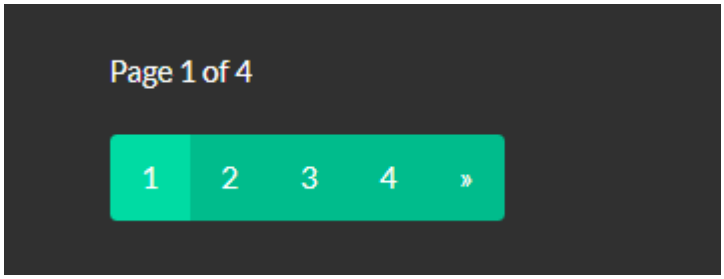
To filter the product list the user is required to select an option from either 1, or both filter option drop-down lists and then click the button labelled “Filter”.



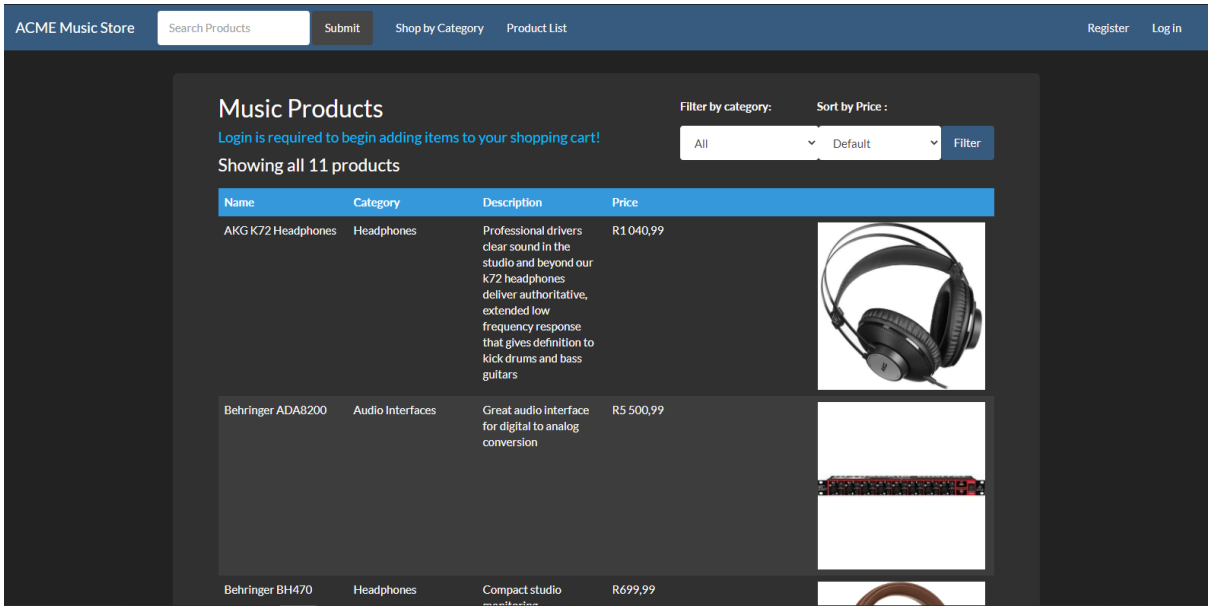
Product List – Pagination

The product list is split into pages through the pagination feature. This can save the user scrolling time and can allow them to quickly browse back to a product through clicking the page number where they last saw the product.

This feature can be found at the bottom of the product list.



Product List – Anonymous User

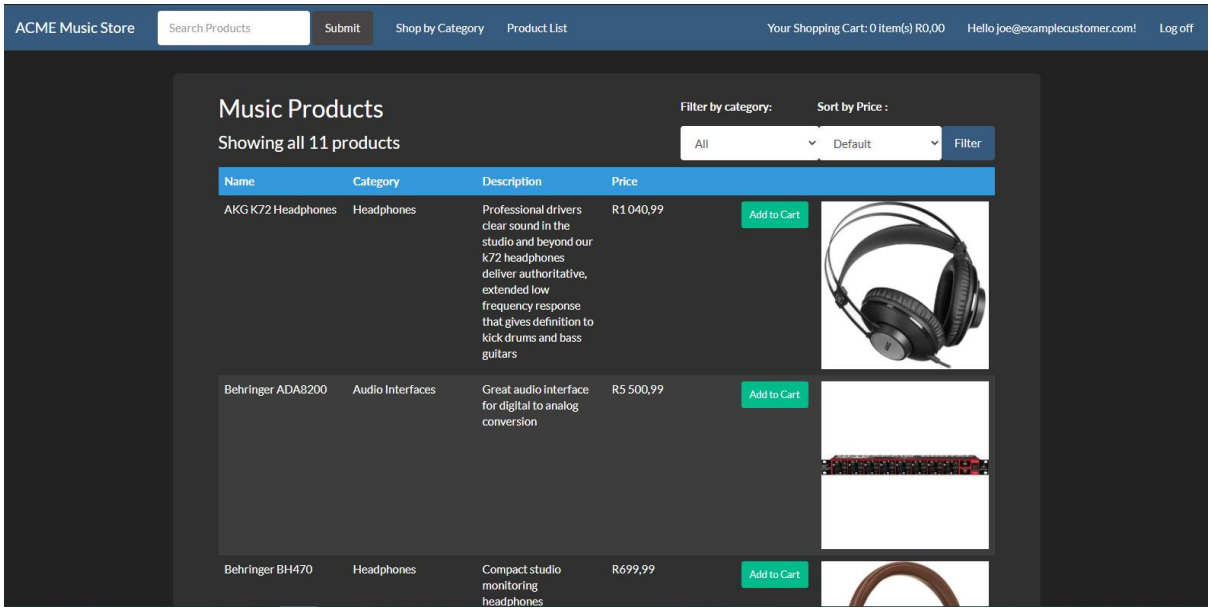


A user who has not yet registered or signed into the website is limited to the following product list page features:

- View products
- Product Filtering

For an anonymous user to create and checkout an order they will need to register a new account as a customer user and then login (See **Register Page** – **Registering a user in the role of customer** of User Manual).

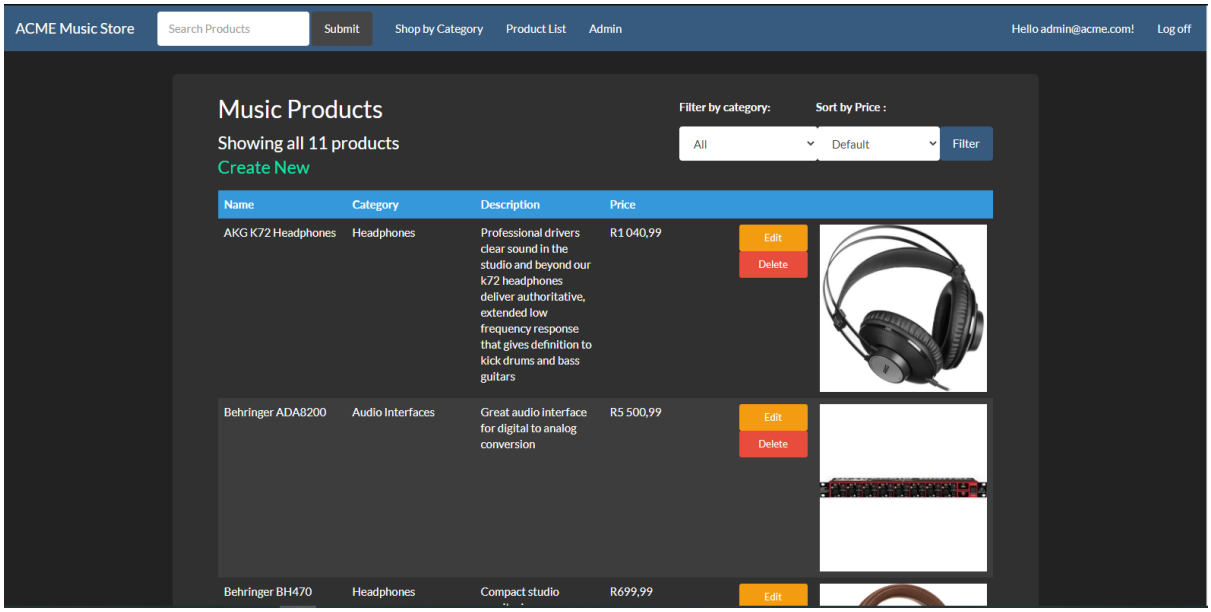
Product List – Customer User



A user who is assigned the role of customer and has logged in can perform the following Product List features:

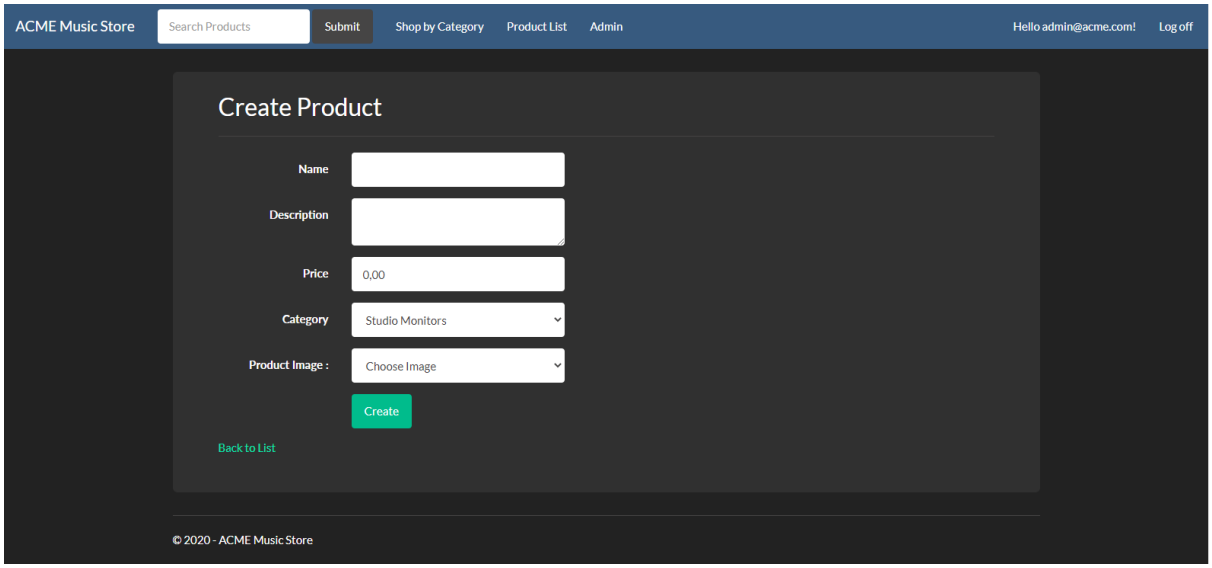
- View products
- Product Filtering
- Add product to cart

Product List – Administrator User

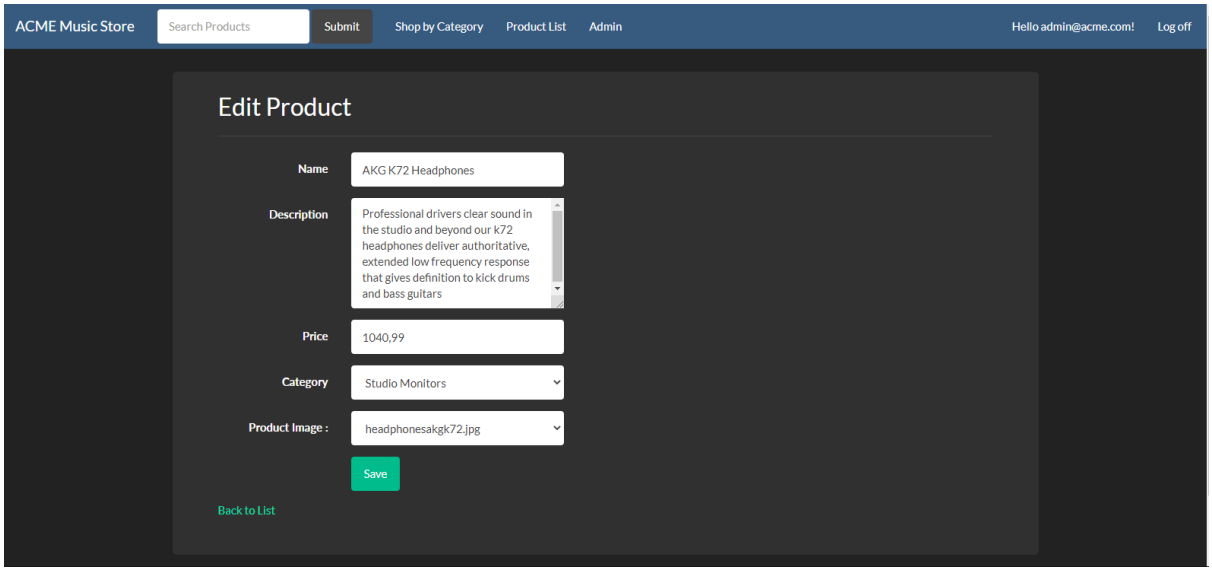


A user who is assigned the role of Administrator and has logged in can perform the following Product List features:

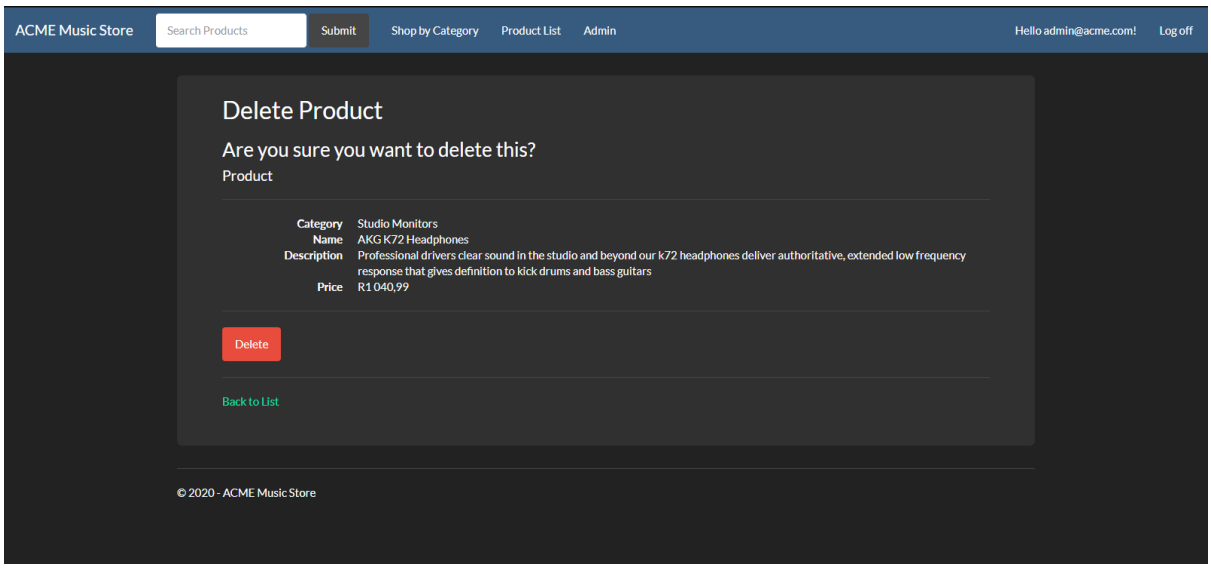
- View products
- Product Filtering
- Create New



- Edit Products



- Delete Products

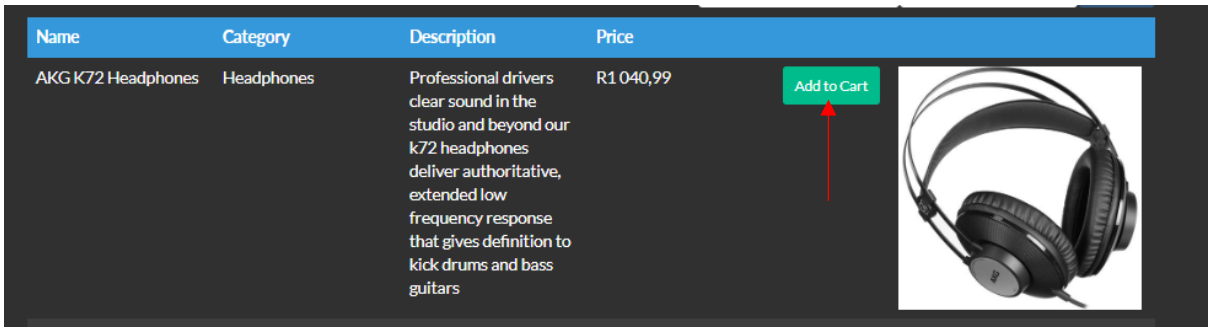


Customer Shopping Cart

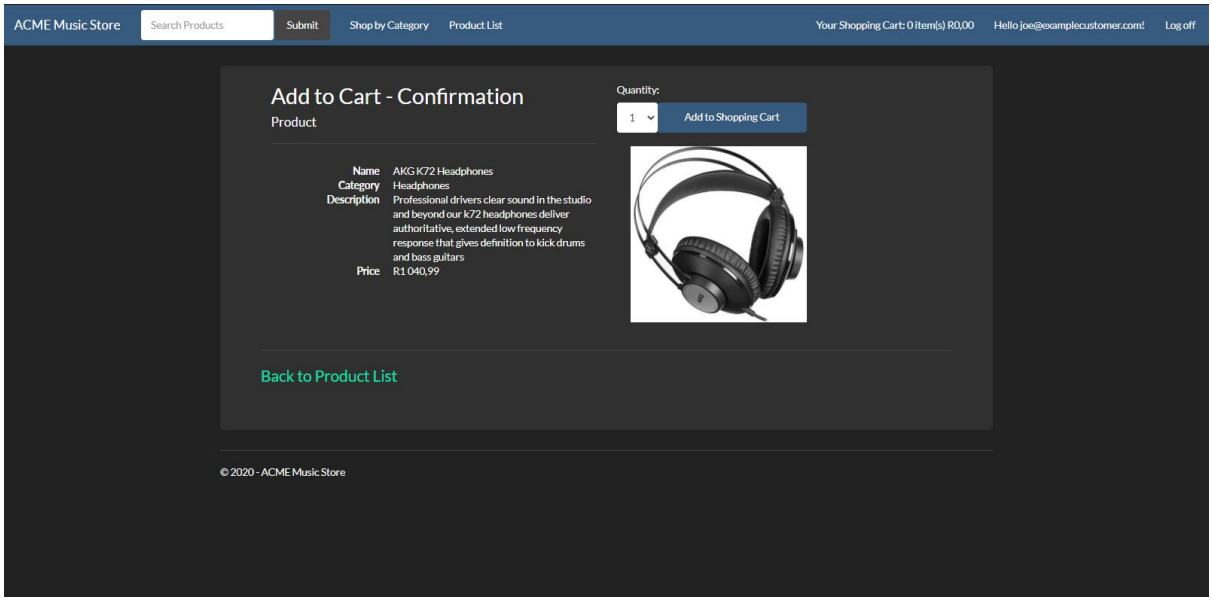
Customer Shopping Cart – Adding an item

Every user assigned to the customer role has a personal virtual shopping cart. A user can add products to their shopping cart and then review their shopping cart items before checking out an order – like a real-life store.

To add an item to the users shopping cart, the user can click the “Add to Cart” button displayed on the row of the product they like.



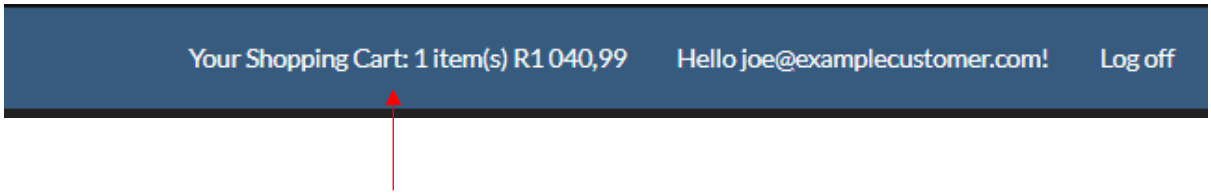
Once clicked, the user will be directed to a confirmation page where they can confirm adding the item to their shopping cart as well as choose the quantity of that item they would like to add from the drop-down list. Once satisfied the user can now click the “Add to Shopping Cart” button.



Customer Shopping Cart – View, Remove, Update and Order

Once a user has finished adding product items to their shopping cart, they can review what they added before confirming their order through the “Your Shopping Cart” page. Once an item is added, the website will direct the user to this page automatically, however it can also be accessed through clicking the “Your Shopping Cart” tab in the navigation bar at the top right of the users screen.

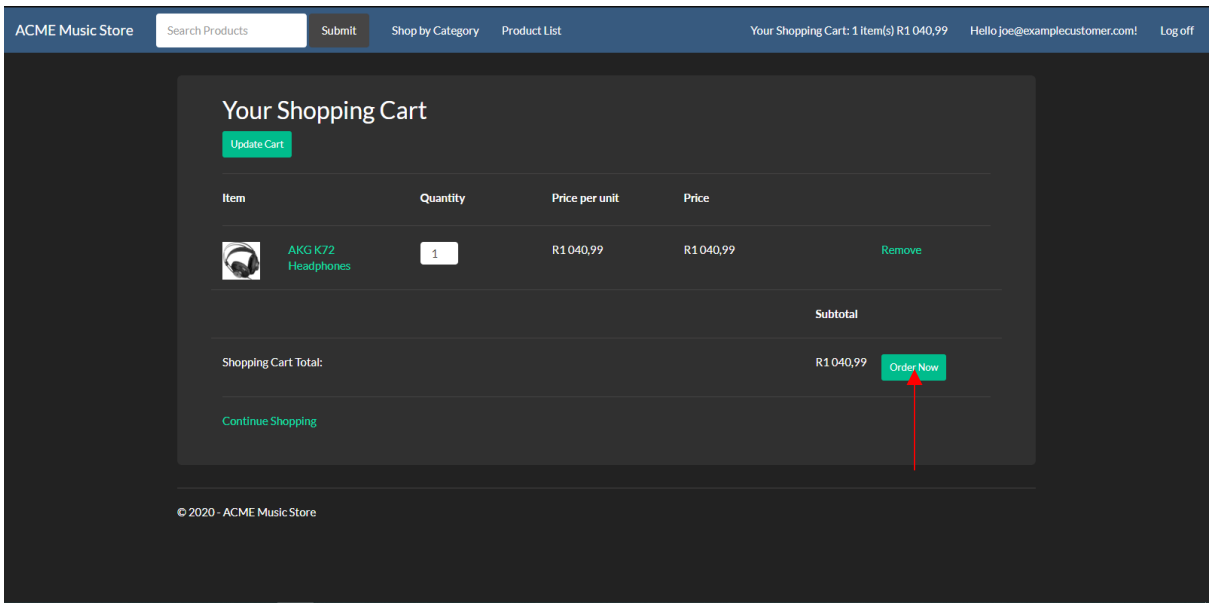
This tab also displays the number of items in the users shopping cart and the total cost.



The “Your Shopping Cart” page allows the user to perform the following functionality :

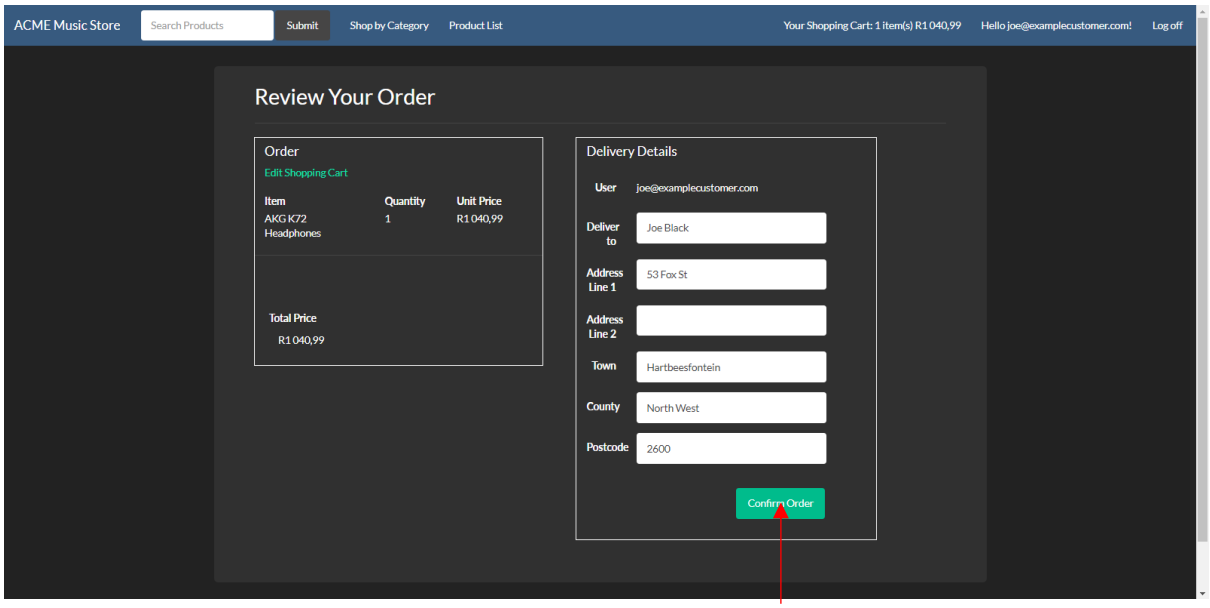
- Update Cart - Product Item Quantity.
- Remove a Product item from cart.
- View Shopping Cart details such as total cost or order.

When a user is satisfied with their shopping cart, they can click the “Order Now” button to proceed to the “review your order” page.

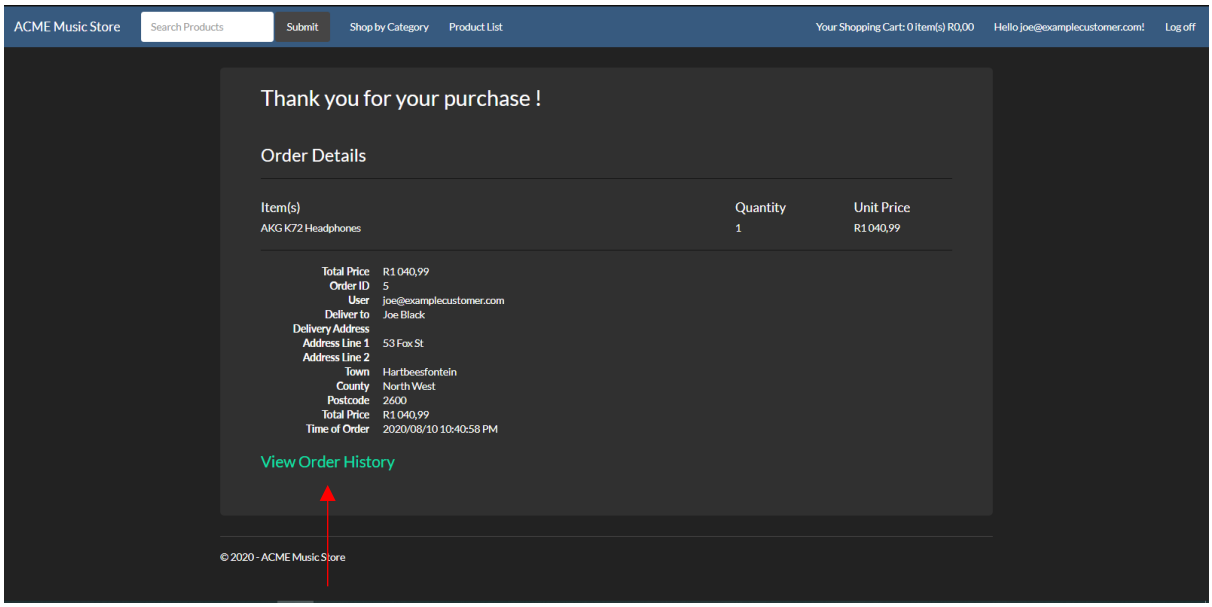


Customer User - Shopping Cart – Review Your Order

The review your order page allows the user to ensure that the product items and delivery details of the order are accurate before the order is finalized. This allows the user to make any final changes to the order or update their delivery details if necessary. Once the user has reviewed their order and is happy with it they can then click the “Confirm Order” button to checkout.



If check out is successful, the following electronic receipt page will be displayed summarizing the order details. From this page the user can view their previous order history by clicking the “View Order History” link.

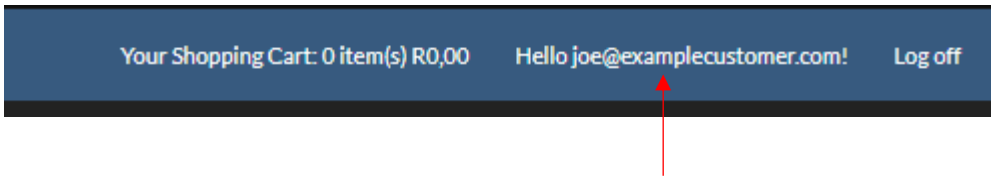


Customer User - Personal Order History

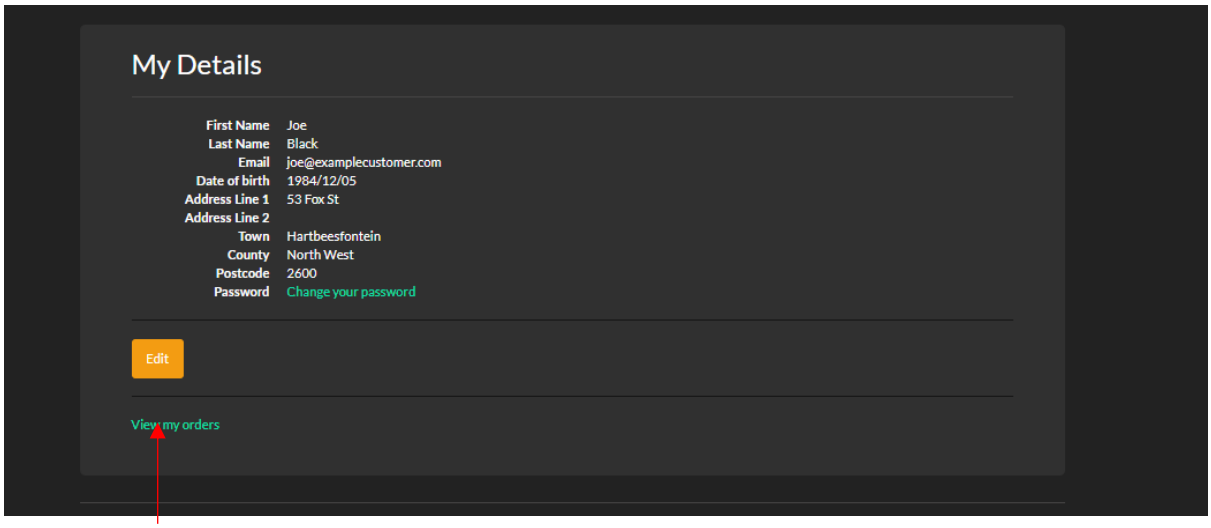
The website allows a user in the role of customer to view their personal order history.

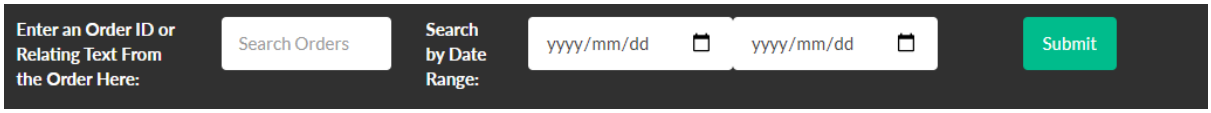
To navigate to Order History the user needs to first click the navigation bar tab displaying “Hello {user email}”. This will take them to the “My Details” page where they can click “View my orders” . Example shown below.

Step 1



Step 2

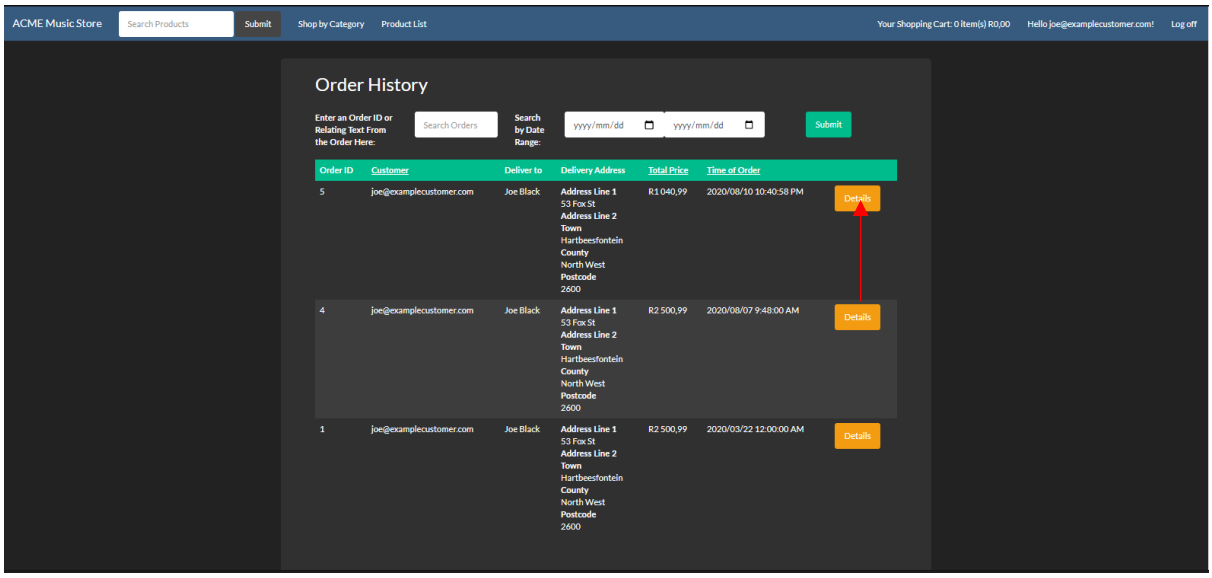




The user can filter their order history through 1 or both of the following options:

- entering a previous order Id or relating product phrase through a search field.
- selecting a date range.

The user can also navigate to see the details (electronic receipt) of an order by clicking the “Details” button displayed on an order history result.

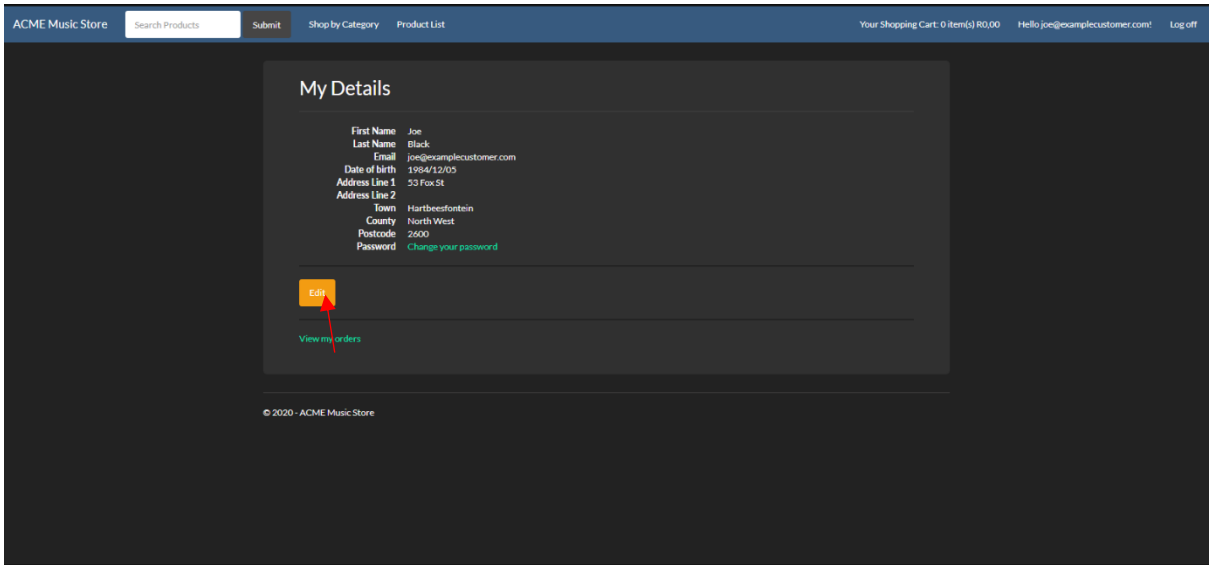


Edit Personal Account Information

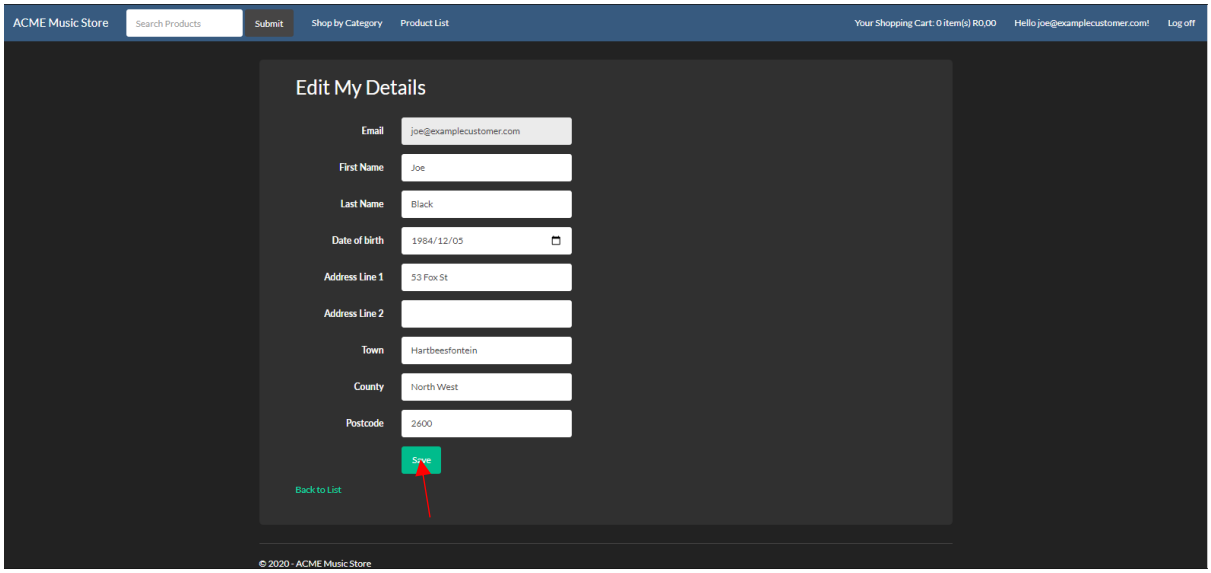
Any user type can view and update their personal account information if necessary.

To view the users currently saved account information the user can click the navigation bar tab displaying “Hello {user email}”.

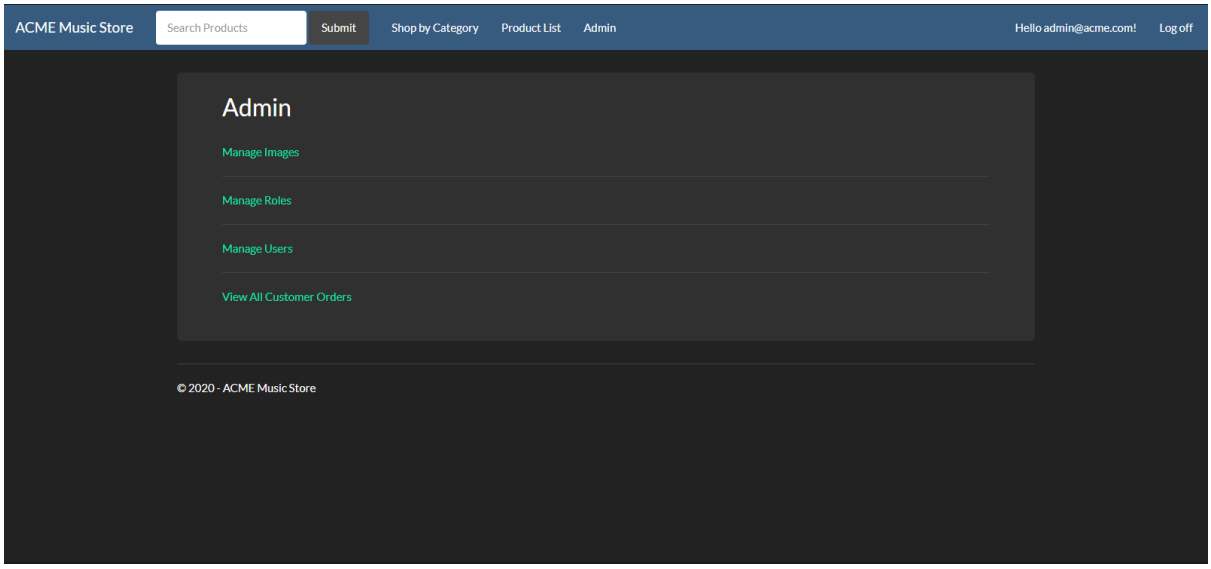
Once on the “My Details” page the user can update their personal information by clicking the edit button.



The user can now update any field they would like to change and then click save to complete updating their personal details.

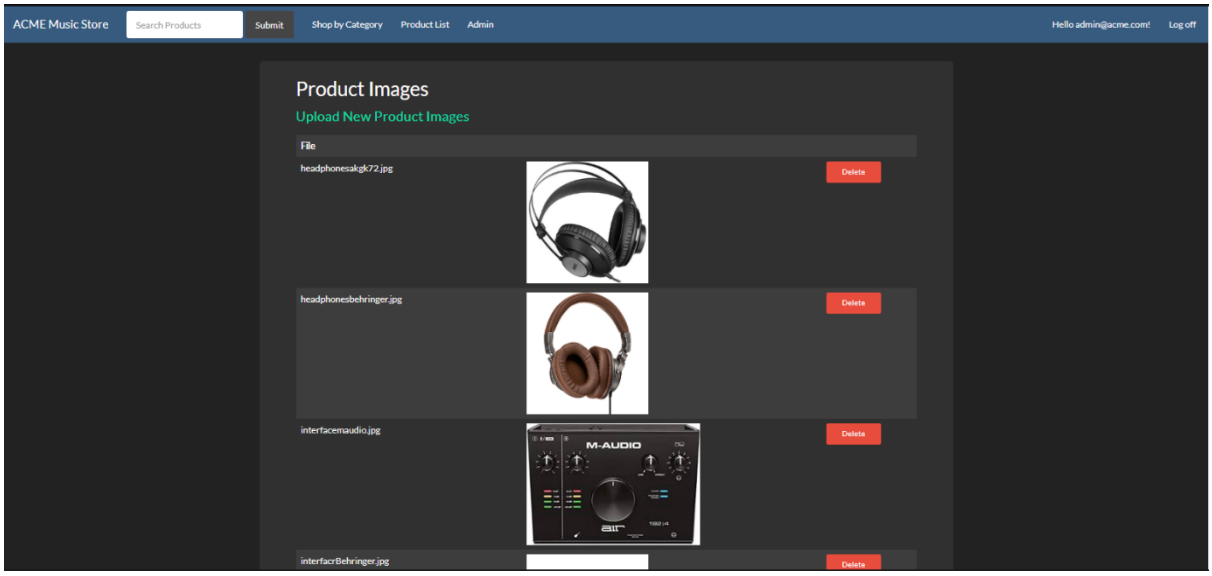


Administrator Menu

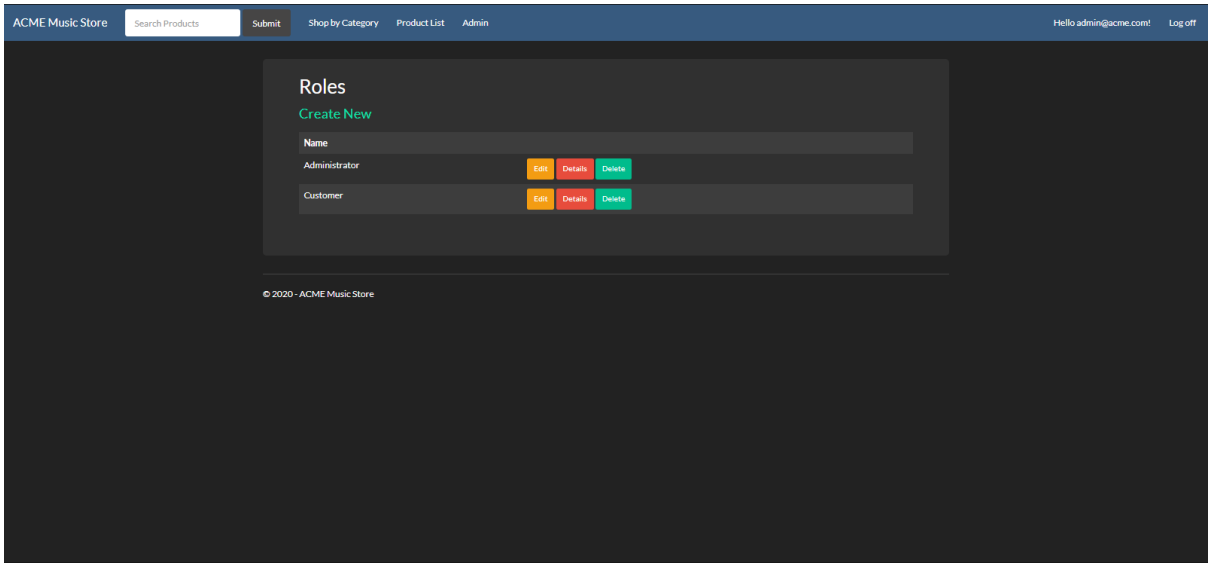


The Admin Page, allows an ACME Employee (Administrator User) to do the following:

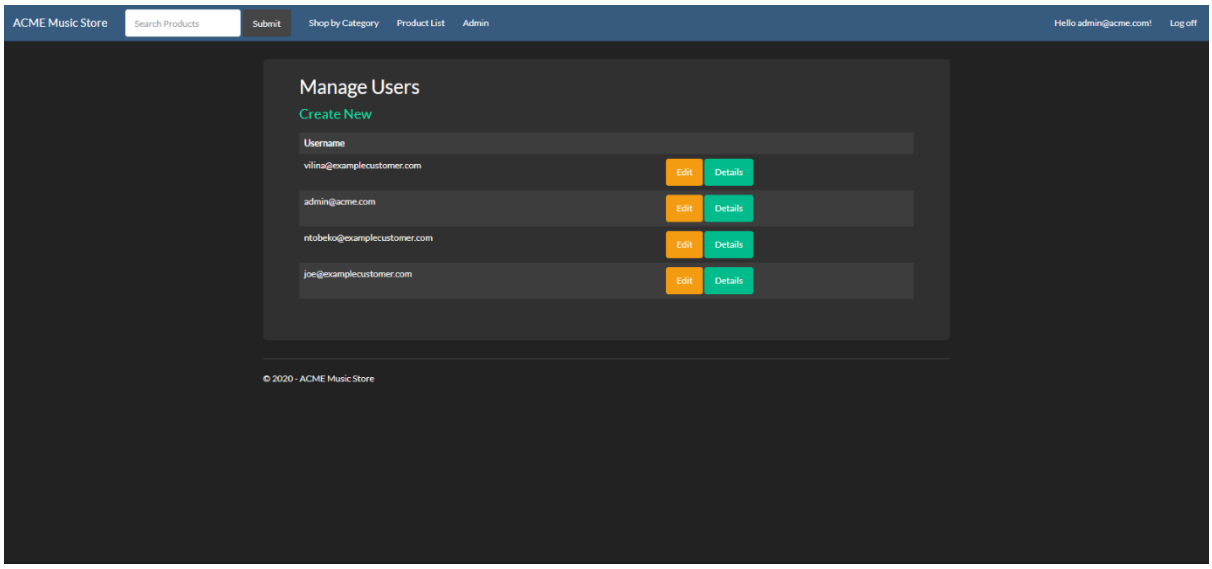
- **Manage Images** – Upload new or delete existing product images.



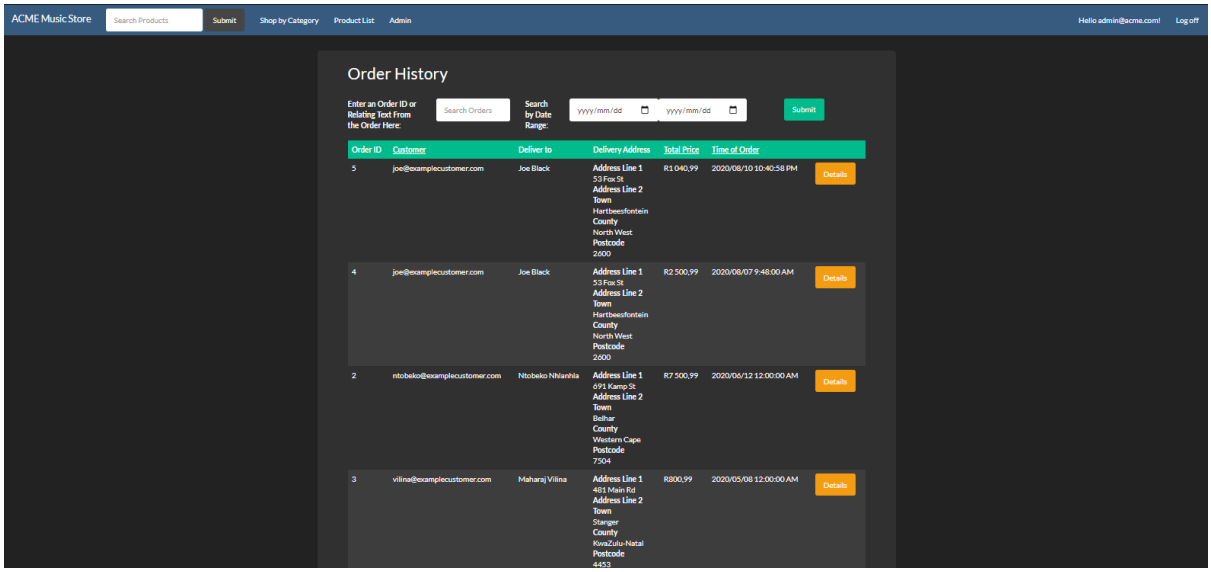
- **Manage Roles** – Edit, delete, or create a new user role for the website.



- **Manage Users** – Allows the user to create a new user and assign them an existing role. It also allows the user to view or edit the details of all existing website users.

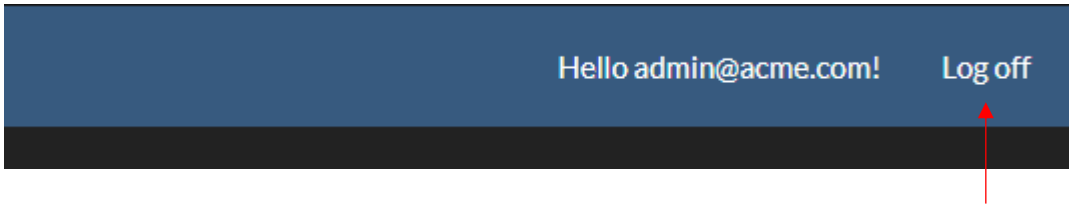


- **View All Customer Orders** – This allows ACME Employees to view the history of every order placed by a customer on the website. The functionality works the same as the **Personal Order History** page for customers except for the data not being limited to a single customer.



Log Off

The log off feature, located top right of the navigation bar, can be used by any user to sign out of their account once they have completed using the website.



Business Value

This section discusses how aspects of the technical solution provide ACME business value.

Data Accuracy

Accurate data can enhance ACME's credibility. Reliable and validated data can help ACME make the correct decisions when driving sales which in turn can increase revenue for the company. By having data that is accurate and always up to date can help ACME save on costs that would go towards decisions that were not accurately informed. Finally, customers appreciate a business with accurate data which can enforce a good perception of the company (Roberts, 2019). To ensure data integrity of data input and output by the website, the following measures were taken.

- Data integrity and accuracy is preserved using the following field validation techniques:
    - To assist the user in achieving the correct data format for a field, guiding error messages are displayed beneath the form field.
    - The application ensures all required form fields are filled before allowing a user to complete a task that either creates or edits database data.
    - To ensure database data constraints are met, regular expression and field input range limiting is used.
- To ensure data is, constrained to match the database schema, organized, and maintainable, the application uses data model classes.
- To ensure every new entry in a database table is unique, each entry is assigned a unique identity number.
- Testing was performed to ensure calculation algorithms on shopping cart and order totals were producing accurate results.

Marketing

A well-designed user-interface that looks appealing and professional, and is easy to use can provide ACME's with the following business value (Ross, 2014):

- increase sales
- increase customer satisfaction and loyalty
- decrease a need for training and documentation
- reduce support costs
- increase customer and employee productivity

The following examples were implemented into the application to ensure an interface that looks professional, appealing and is easy to use.

- A dark and colourful theme was chosen to ensure the application is appealing, consistent and easy on the user's eyes.
- A navigation bar is provided that is available on every web page to allow the user to easily navigate the application. Pagination is also used so that the user can easily navigate through product lists.
- Bootstrap and CSS was used for web page element styling to create an interface that is intuitive and that looks professional.
- Controls such as drop-down lists were used to promote ease-of-use.

Security

Through strong website security ACME will receive the following business value (Nouveau Solutions, 2019):

- customers can be confident that their personal data will not be compromised and thus this can improve customer loyalty and increase sales.
- ACME will save on costs of their website not going down due to attacks.

The following security measures were integrated to create a strong security environment for the website.

- Authentication functionality such as account registration, login and log off functionality has been implemented.
- Role Based Access control has been implemented to ensure that only ACME employees are authorised to perform administrator functionality such as updating, creating, or deleting products. External users that register with the application are assigned the Customer Role which only gives them access to application functionality designed for customers. Such as viewing products, adding items to a shopping cart, or viewing their personal order history.
- Microsoft Identity services are used to salt and hash passwords for user login and registration
- Cookie Authentication is used to validate users, maintain session state, and protect the website from session jacking. A cookie expiration time is set to automatically log off users after 30 minutes.
- Regular expression has been implemented to white list user input which protects the application from attacks such as cross site scripting.

Conclusion

This report provided information on the prototype developed for ACME and proposed development plans for the final website. In summary, further improvements such as caching, http compression configuration, and asynchronous methods can be applied in final development to optimise the prototypes performance further. An Agile SCRUM development methodology was deemed most suitable for the final development of the website. Agile's iterative and flexible nature will allow the prototype to be further refined through constant stakeholder and customer feedback. By the end of development ACME should be presented a quality website that ensures customer satisfaction and meets all requirement. DevOps tools and practises were recommended to be integrated with the agile SCRUM development methodology as it can further improve team collaboration, development speed and development quality. A combination of TOGAF and the Zachman Enterprise Frameworks will be used for the website project as they provide several benefits such as allowing ACME to save time, risk, and cost in the process of developing project architecture. Finally, the prototype technical solution was discussed. Specifically, how aspects of the technical solution provide ACME business value.

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