CS916: Initial Evaluation and Redesign

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1 Introduction

After attempting to use the original website, the team members identified several issues with the website's interface style and logical functionality. In the early development stage, as both developers and evaluators of the website, they needed to select an evaluation method that did not involve users. Nielsen's Ten Usability Heuristics [1] and Cognitive Walkthrough [2], both representing methods that do not require user participation, were considered. The team eventually chose heuristic analysis for evaluating the website's user interface. This decision was based on the fact that heuristic evaluation is typically faster and requires fewer resources than Cognitive Walkthrough. Developers could perform the evaluation directly based on a set of predefined principles without the need for actual user participation. Furthermore, given that the website, E-veg, had relatively limited functionality, heuristic evaluation was deemed more effective for quickly identifying obvious issues. Additionally, the modifications made to the original website were relatively minor, focusing more on appearance and layout aspects. Since Cognitive Walkthrough tends to evaluate the overall task completion on websites, heuristic analysis was more suitable for a more general and comprehensive evaluation approach.

The redesigned website is now fully functional in both Firefox and Chrome browsers. All screenshots presented in this report are taken from Firefox.

The original website can be viewed at: https://www.dcs.warwick.ac.uk/ u5525549/eveg-old/.

The redesigned website can be viewed at: https://www.dcs.warwick.ac.uk/ u5525549/eveg/.

2 Problems and Solutions

The team conducted a critical analysis of the original website's appearance and functionality based on the principles listed in Nielsen's Ten Usability Heuristics. The team members identified several significant web page issues with corresponding brief explanations, highlighted how these issues violated one or more principles from the heuristic evaluation, and proposed modifications and presented screenshots comparing the original and redesigned web pages.

2.1 Insufficient Interactive Feedback of Buttons and Links

- **Problem:** When the cursor hovers over or clicks on buttons or links on the page, aside from the navigation bar items like Contact, About, and Checkout, which change the cursor to the shape of a hand, other buttons and the accept cookies link all exhibit varying degrees of insufficient interactive feedback.
- **Principles Violated:** Visibility of system status.
- **Reason:** It is important to inform the users immediately about "What happened", like "Here is a button can be clicked", "Click this link to direct to another page". If there is insufficient interactive feedback, users may be unsure if their actions have been registered by the system.
- **Solution:** The team has addressed these identified issues by changing the cursor shape, deepening the background color, among other methods, thereby enhancing the page's real-time interactivity.

2.2 Homepage Lacks Total Number of Items in Basket

- **Problem:** Although the number of items added to the basket is updated in real time in the text box below each product, the total number of products in the basket is not displayed.
- **Principles Violated:** Visibility of system status, Consistency and standard.

- **Reason:** There are too many product cards, and customers may forget the total number of items they have selected. Therefore, in addition to the real-time update of the quantity of each product added to the basket displayed in the input box on the original website, customers still require interactive feedback for the total number of items. Moreover, this also violates the Consistency and Standards principle, as other online shopping websites display the total number of items at the basket icon. As a similar type of website, E-Veg should maintain consistency with other sites.
- **Solution:** The team added parentheses after the "Checkout" navigation link to display the total number of items selected by the user. Figure 1 shows the original navigation link, Figure 2 shows the modified one.

Figure 1: Before

Figure 2: After

2.3 Invalid Links in Navigation Bar

- **Problem:** In the original website, the Contact and About links in the navigation bar were invalid, as clicking on them did not redirect to any new page or window.
- **Principles Violated:** Visibility of system status.
- **Reason:** When the cursor hovers over these two navigation links, it changes into the shape of a hand, signalling to the user that these are interactive links. However, upon clicking, the system does not provide any intuitive response, nor is there any informative feedback to alert the user that these are dummy links. This is an issue of both invisible and conflicting feedback, which leads to users questioning the validity of their actions and lowers their evaluation of the website.
- **Solution:** The team merged these two links into a single About & Contact link, which upon clicking, displays a popup window, updating the page status in real-time. This is illustrated in Figure 3. The other links in the navigation bar shown in the figure, namely Help and Basket, also have similar popup windows created. These modifications will be discussed in subsequent subsections.

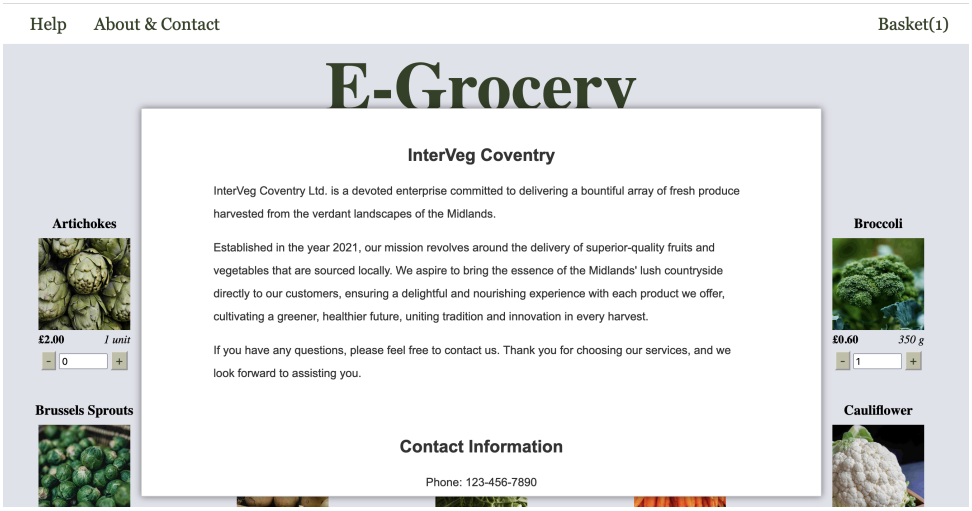

Figure 3: About and Contact popup window

2.4 Inappropriate Website Name

- **Problem:** The website's name cannot encompass the full range of product categories.
- **Principles Violated:** Match between system and the real world.
- **Reason:** The name of the website, E-Veg, could easily mislead people into thinking that it is a site that sells only vegetables or vegetarian products, but that is not the case. The products on the website include vegetables, fruits, meats, baked goods, and more. Therefore, using E-Veg as the name of the website is inappropriate.

- **Solution:** The team has decided to change the title to E-Grocery in order to cover all types of products. Figure 4 shows the old title, and Figure 5 shows the revised title.

Figure 4: Title E-Veg

Figure 5: Title E-Grocery

2.5 Inappropriate Navigation Link Name

- **Problem:** The "Checkout" navigation link in the top-right corner can easily cause misunderstanding among users.
- **Principles Violated:** Match between system and the real world.
- **Reason:** Similar to how people shop in a supermarket, where customers first place items in a trolley and then proceed to the counter for checkout. When customers wish to review and adjust their selections, they should do so within the Basket, not on the checkout page. Naming the navigation link "Checkout" could mislead users into thinking they are concluding their shopping with payment.
- **Solution:** The team thought that "Basket" might be a better term here. This is as shown in Figure 2. Broader changes based on this will be discussed in Section 2.11.

2.6 Unlimited Stock

- **Problem:** In the original website, the quantity of purchasable items is unlimited.
- **Principles Violated:** Match between system and the real world.
- **Reason:** Unlimited stock is inconsistent with real-life scenarios; products on an online shopping website are not virtual, and real food resources are limited.
- **Solution:** The team introduced a "stock availability" setting for the products.

2.7 Sub-pages Lack Exit Options

- **Problem:** Building upon the popup windows added for navigation bar links in Section 2.3, there is no way to return to the Homepage after opening a popup window.
- **Principles Violated:** User control and freedom.
- **Reason:** The website must provide users with ample choice, allowing them to undo and redo actions. If clicking on the navigation links of the main page leads to a popup window, there must also be a way to return from the popup window to the Homepage.
- **Solution:** Taking the About & Contact popup window as an example, as shown in Figure 6, once users have finished browsing all the contents, a Close button is available at the bottom of the window to close it. Additionally, if users wish to switch to another popup window, such as the Help window, they can directly click the Help link in the navigation bar to make the switch, automatically closing the About & Contact popup window. The interaction switch with the Basket window follows the same logic.

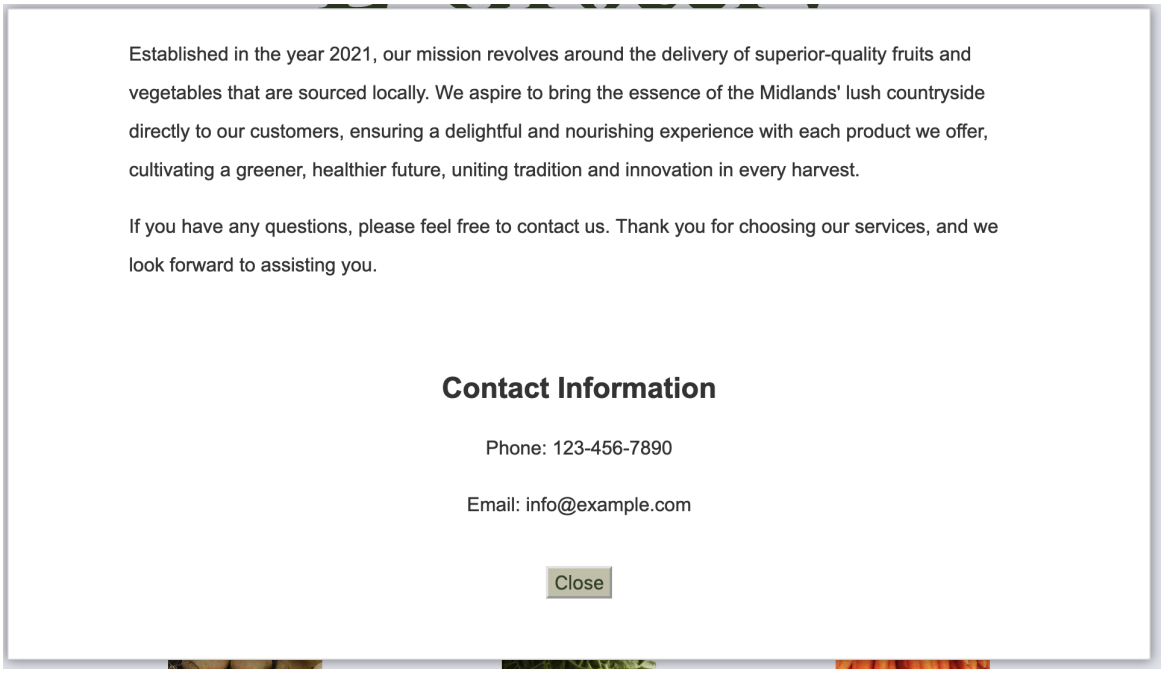

Figure 6: Close option for About and Contact popup window

2.8 Lack of Regret Mechanism During Bill Payment

- **Problem:** The original website, after proceeding to the Payment page by clicking the "Pay by Credit Card" button on the Checkout page, lacks an option to cancel the order.
- **Principles Violated:** User control and freedom.
- **Reason:** Simply using the browser's back button does not alleviate users' concerns about credit card charges, which is not a precise exit.
- **Solution:** The team added two buttons to the Payment page: a "Cancel Payment" button and a "Confirm Payment" button for secondary confirmation before proceeding with the order payment. Clicking the "Cancel Payment" button allows users to explicitly refuse the charge and direct back to Checkout page. Clicking the "Confirm Payment" button allows users to pay the bill and triggers a popup window displaying a successful payment message. Upon clicking the "OK" button to close the popup, users will be directed back to the Homepage. Figure 7 shows the modified Payment page and Figure 8 shows the "Payment successful" popup window.

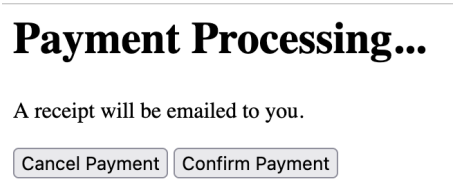

Figure 7: Redesigned Payment page

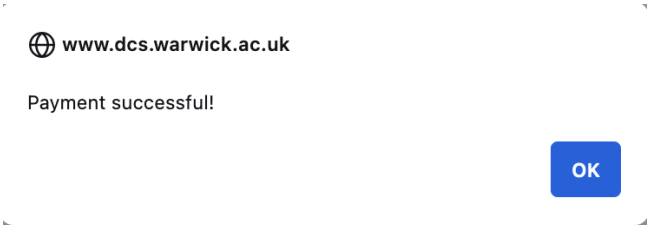

Figure 8: Payment successful message

2.9 Lack of Internal Method of Continuous Switching among Pages

- **Problem:** The original website lacks internal page switching functionality.
- **Principles Violated:** Consistency and standards, User control and freedom, Flexibility and efficiency of use.
- **Reason:** The absence of smooth transfer between page levels hinders "Consistency and standards", causing user confusion by deviating from common return patterns, leading to a disjointed and unpredictable user experience. Moreover, even though browsers inherently have a "Back" button, having an internal page-switching feature within the website not only ensures flexibility of the site but also guarantees the freedom of user navigation.

- **Solution:** To navigate back to the Homepage from the Checkout Page, users can either use the browser's back button in the top left corner or click on the 'Quit Checkout' button as shown in Figure 9. This action will redirect them back to the Homepage. If the user wants to direct to Homepage from Payment page, when "Confirm Payment" button is clicked, the "Payment successful" message will pop up, and the user will be directed to the Homepage after clicking "OK". At this time, the contents of the shopping basket will be cleared (the old website does not provide a way to return from the payment to the initial interface, and the modified website has achieved a complete loop). Also, if the user clicks "Cancel Payment" button, it will be directed to Checkout page, which has the same function as "Back" button. The screenshots of Payment page can be checked in Figure 7 and Figure 8.

Figure 9: Quit button in Checkout page

2.10 Hidden Search Bar

- **Problem:** In the original website, the search bar only appears when the Search link in the navigation bar is clicked, remaining invisible at other times.
- **Principles Violated:** Consistency and standards, Aesthetic and minimalist Design.
- **Reason:** In line with user habits and the layout design of other websites, it is preferable for the search bar to be always visible for user convenience and ease of information retrieval. Furthermore, the search bar occupies a small area, negating the need for it to be hidden. This redundant operation violates the Minimalist Design principle.
- **Solution:** The team removed the Search link from the navigation bar and retained a permanently visible search bar instead. Figure 10 shows the original website's search mode, and Figure 11 depicts the revised, always-visible search bar.

Figure 10: Sometimes-visible search bar

Figure 11: Always-visible search bar

2.11 Lack of Basket Page as an Intermediate Medium

- **Problem:** The E-Veg website lacks an intermediary, allowing only direct transition from the product page to the Checkout page, with no capability to edit the already chosen products in the product preview table.
- **Principles Violated:** Consistency and standards, Match between the system and the real world.

- **Reason:** Drawing from similar shopping websites like Amazon, Shein, and Tesco online, all without exception, have a basket preview page serving as an intermediate medium between the product interface and the payment interface. In real life, customers first place items in a trolley and then proceed to the counter for checkout. This provides ample buffer time for users to review the products they have picked, manage items in the basket, including adding, reducing, deleting items, as well as clearing the basket in one go. The developer should try to address this deficiency, align with user habits, and maintain consistency with other online shopping website structures.
- **Solution:** The team added a Basket popup window, as shown in Figure 12. In this window, the format of the Basket Contents table is consistent with the table on the Checkout page; the minus and plus buttons in the table allow incrementing and decrementing product quantities by one unit; the cross button enables direct removal of an item type from the basket; the Clear button is for emptying all items in the basket, resetting quantities to zero; the presence of the Close button follows the User Control and Freedom principle, closing the Basket popup window upon clicking; the Checkout button is the access to the Checkout page.

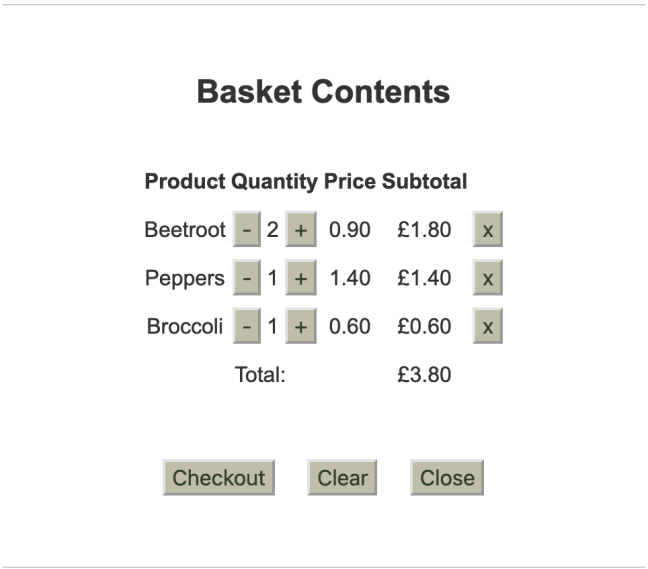

Figure 12: Basket popup window

2.12 Checkout Page Always Accessible

- **Problem:** In the original website, the Checkout page is accessible through the Checkout navigation link regardless of whether customers had selected items or not.
- **Principles Violated:** Error prevention.
- **Reason:** The checkout page should be inaccessible to users when the shopping basket is empty, a preventative measure against errors that the original website did not implement.
- **Solution:** When the shopping basket is empty, the team disabled the Checkout button and set it to a grey color to prevent user access. Figure 13 shows the modified checkout button when the basket is empty.

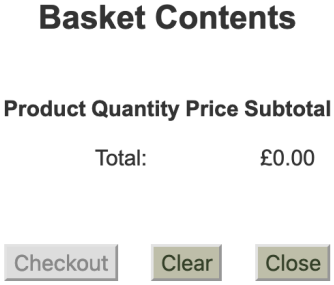

Figure 13: Checkout button restriction

2.13 The Basket Contents Table on Checkout Page Lacks Headers

- **Problem:** In the original website, the Basket Contents table on the Checkout page lacks headers.
- **Principles Violated:** Recognition rather than recall, Match between the system and the real world.
- **Reason:** The absence of headers may cause confusion, especially if users forget the quantity and price of the items they have selected. They might mix up the meaning of the two columns of numbers.
- **Solution:** The team has added headers to this table. Figure 14 shows the original table, and Figure 15 displays the table after modification.

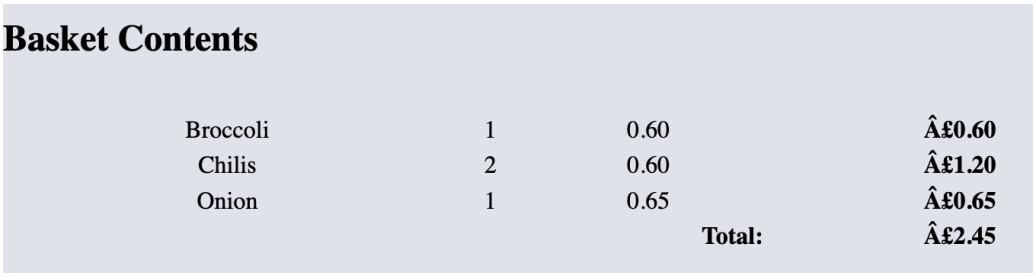

Figure 14: Table without headers

Figure 15: Table with headers

2.14 Abnormal Reset of Home Page Data

- **Problem:** When users return to the Home page from the Checkout page without any payments, all product basket data is reset to 0, and Cookies are not properly utilized to remember their selection.
- **Principles Violated:** Recognition rather than recall, Consistency and standards, Flexibility and efficiency of use.
- **Reason:** The website should assist users in remembering key information, thereby allowing users to review and modify their previous choices. Additionally, the data in the basket should remain consistent across different internal pages of the website; otherwise, it could lead to confusion among users and a breakdown of the payment system. Having users recall and restore items in their Basket can lead to reduced purchasing efficiency.
- **Solution:** The team has corrected this bug by applying cookies across pages. The personal information entered in the form will be saved as a cookie and recovered on the next load. In the redesigned website, no matter how the pages are switched, both the Checkout page and the Homepage will maintain the same user's basket data.

2.15 The Search Bar Lacks a Shortcut

- **Problem:** The only way for users to perform product searches is by clicking the 'Search' button.
- **Principles Violated:** Flexibility and efficiency of use, Consistency and standards.

- **Reason:** Users must click the Search button to perform a search, which can cause inconvenient and inflexible interactions. Additionally, the common practice for website search bars is to offer two ways to trigger a search: one is by clicking the search button, and the other is by hitting the Enter key on the keyboard. This website needs to maintain operational consistency with other external websites.
- **Solution:** The team has added the Enter key search function, allowing users to choose between clicking the search button or using the Enter key on the keyboard to search.

2.16 Alignment Issues of Web Components

- **Problem:** In the original webpage, most elements are left-aligned, lacking a centered alignment approach.
- **Principles Violated:** Aesthetic and minimalist design, Consistency and standards.
- **Reason:** Since this is a website and not a textual document, a persistent left or right alignment could lead to an imbalance in the page's visual equilibrium. This could make the page appear discordant, affecting the overall aesthetic experience of the user. Moreover, in reference to alignment methods on other websites, centered alignment is more common. Hence, the layout of this website should also maintain consistency with external websites, providing users with a visual experience similar to other websites.
- **Solution:** The team changed the alignment of certain elements to make the overall page appear center-aligned. For example, adjusting the alignment of the components within the product card to make the entire card appear symmetrically balanced from left to right, aligning the product cards around the central axis of the page and centering the Basket contents table, Customer Details form and their inside components on the Checkout page. The original layout of Homepage is shown in Figure 16, and the redesigned one is shown in Figure 17.

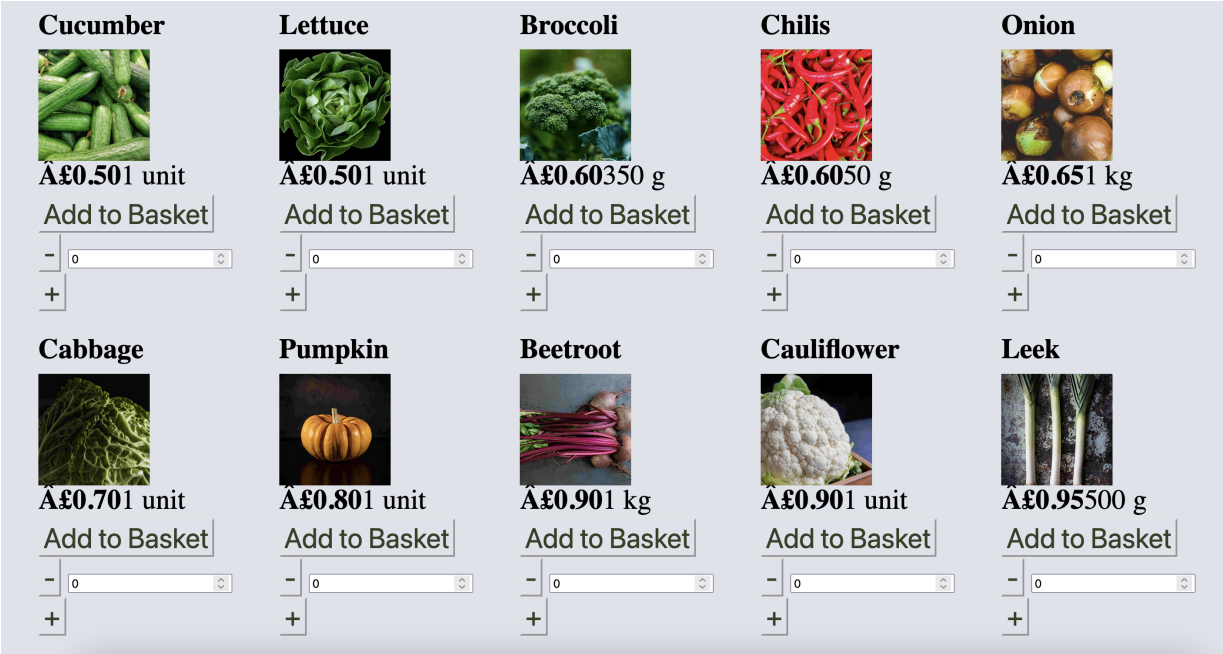

Figure 16: Before - Messy layout

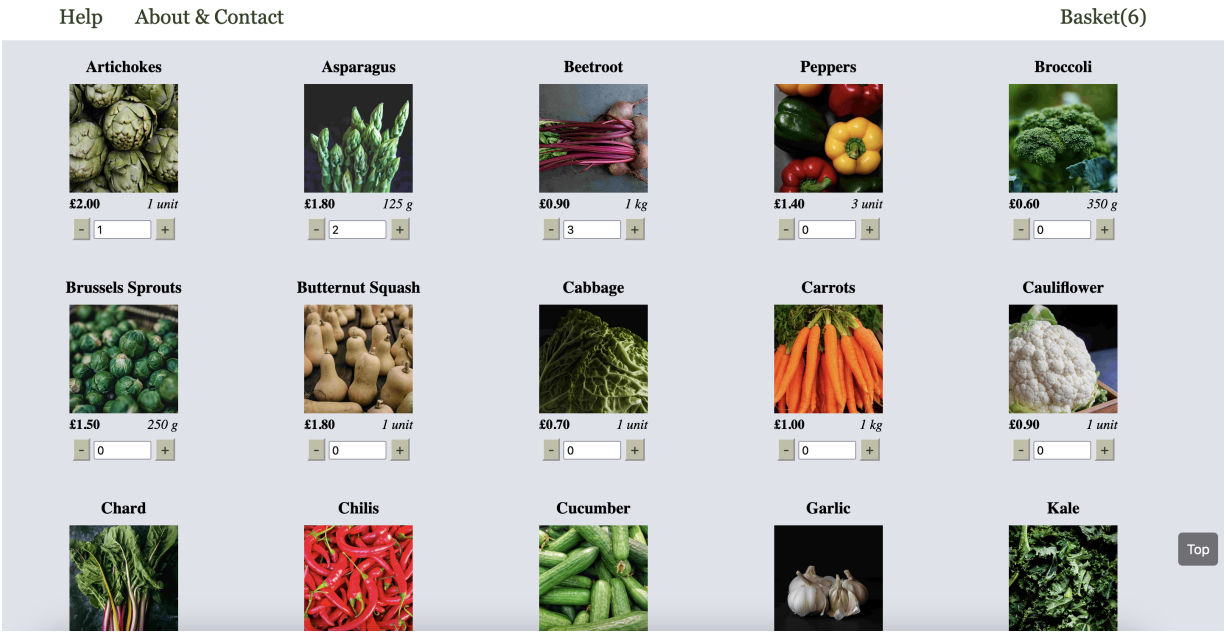

Figure 17: After - Structured layout

2.17 Unnecessary "Add to Basket" Buttons

- **Problem:** The functionality of the "Add to Basket" buttons duplicated that of the "+" buttons, as both could be used to increase the quantity of an item in the shopping basket.
- **Principles Violated:** Aesthetic and minimalist design.
- **Reason:** In cases of conflicting functionality between components, one should retain only one component to reduce unnecessary occupancy on the page.
- **Solution:** The team decided to retain only the "+" buttons, which correspond with the "-" buttons for decreasing the quantity of items in the basket, and removed the "Add to Basket" buttons. Just as shown in Figure 18 and Figure 19.

2.18 Lack of Distinction in Font Usage

- **Problem:** The original webpage's font style is quite monotonous and lacks contrast.
- **Principles Violated:** Aesthetic and minimalist design.
- **Reason:** The design of the user interface should provide necessary visual differentiation to guide users. A uniform font style can make the interface appear monotonous, lacking emphasis and hierarchy, thus affecting the visual experience and information recognition ability of users.
- **Solution:** The team addressed this by differentiating various types of content through adjustments in font style, size, color, boldness, underline, and italics, thereby enhancing the overall readability of the interface and user experience. For example, in the original Home page's product card section, there is not much distinction between the font of the product's price and the unit, as shown in Figure 18, which could easily lead to user misreading. Therefore, the team changed the font of the product unit to italic, as shown in Figure 19, creating a contrast with the bold font of the product price, making it easier for visual differentiation. Moreover, in the Cookies popup window at the bottom of the page, the original page's Accept link in the bottom left corner is invisible to the eye due to the font color matching the background color, as shown in Figure 20. Hence, the team increased the size of the Accept link font and transformed it into a more prominent Accept button, while also converting the privacy policy into a link format, specifically in blue italic with an underline, in order to attract user clicks. The result shows in Figure 21. Overall, the purpose of adjusting the fonts is to make the page appear more cohesive and aligned with public aesthetics.

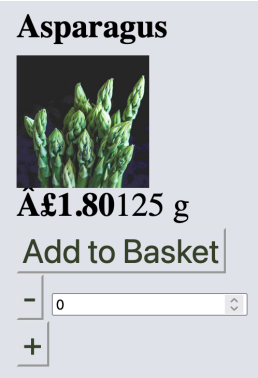

Figure 18: Original product card

Figure 19: Redesigned product card

Figure 20: Original cookies popup window

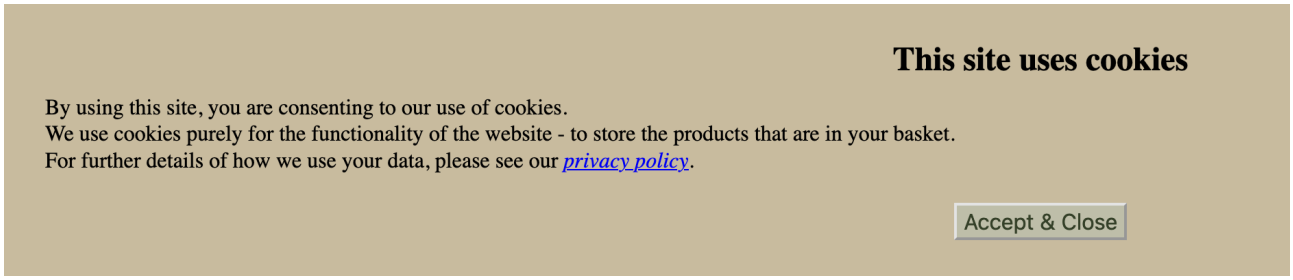

Figure 21: Redesigned cookies popup window

2.19 Homepage Product Card Input Boxes Lack Input Type Restrictions

- **Problem:** In the original website, the input box can accept any character type.
- **Principles Violated:** Help users recognize, diagnose, and recover from errors.
- **Reason:** Based on the stock attribute added in Section 2.6, for product quantities, only non-negative integer inputs that do not exceed the stock quantity should be accepted.
- **Solution:** The team restricted inputs of decimals, negative numbers, numbers exceeding stock quantities, and text-based entries. If users inadvertently enter incorrect data types, the system will display a popup warning and prompt the user to modify the content. Figure 22 shows the scenario of entering a decimal, Figure 23 shows the scenario of entering a negative number, Figure 24 shows the scenario of entering a quantity exceeding the stock, and Figure 25 shows the scenario of entering text-based strings.

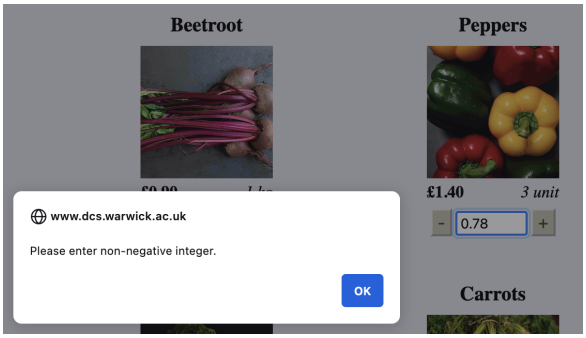

Figure 22: Warning message when entering decimals

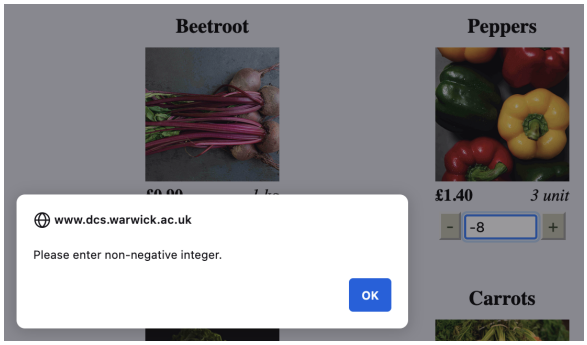

Figure 23: Warning message when entering negative numbers

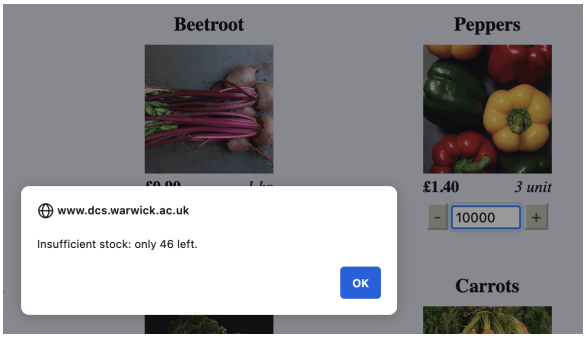

Figure 24: Warning message when entering exceeding numbers

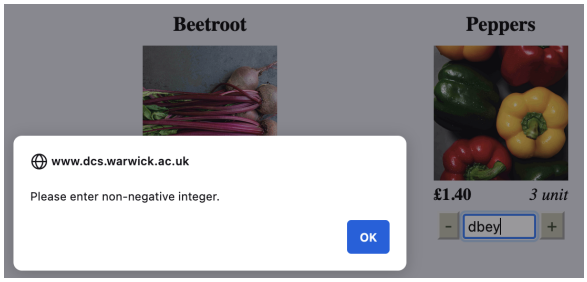

Figure 25: Warning message when entering text-based strings

2.20 The Plus Button on the Home Page Product Card Lacks an Upper Limit for Increment

- **Problem:** In the original website, the quantity of products in the basket can be increased indefinitely using the plus button.
- **Principles Violated:** Help users recognize, diagnose, and recover from errors.
- **Reason:** Based on the stock attribute added in Section 2.6, the plus button also needed a restriction.
- **Solution:** The team set up a feature where, when the product stock runs out, clicking the plus button again will trigger a warning message to prevent further user action, as shown in Figure 26.

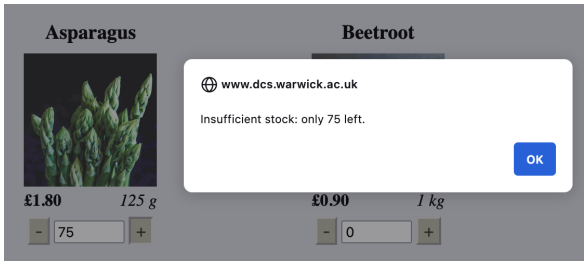

Figure 26: Warning message when pressing plus button with no stock

2.21 Not Implementing Sticky Positioning for the Navigation Bar

- **Problem:** The content of the navigation bar is not clear, and it is not fixed at the top of the screen, so the user has to slide to the top of the page to check out, which is very inconvenient.
- **Principles Violated:** Flexibility and efficiency of use, Fitts's law.
- **Reason:** Unclear navigation bar content and its non-fixed position at the top hinder efficient website use, especially during checkout. This setup forces users to scroll back up, reducing the flexibility and

efficiency that seasoned users expect for quick navigation and transactions, directly impacting usability. The problem described violates Fitts's Law primarily because it significantly increases the distance the user must navigate to reach the target (in this case, the navigation bar). According to Fitts's Law, the time required to move to a target is a function of the distance to the target and the size of the target. When the navigation bar is not fixed at the top of the page and the content is unclear, users are forced to scroll back to the top of the page to access it. This action increases the "distance" the user's pointer (or attention) must travel to reach the navigation bar, thereby increasing the time and effort required to perform this task.

Moreover, if the content of the navigation bar is not clear, it could be interpreted as reducing the size of the target in a metaphorical sense because unclear content makes it harder for users to quickly identify and select the options they need. This could further increase the time and effort required for navigation, making the interface less efficient and more frustrating to use.

By violating Fitts's Law in these ways, the design creates an inconvenient and inefficient user experience. A fixed navigation bar with clear content would decrease the distance and effort required to navigate the site, adhering more closely to Fitts's Law and improving usability.

- **Solution:** The welcome message is placed in a separate line with the store name. 'Help', 'About & Contact' and 'Basket' are fixed in a navigation bar at the top of the page. Figure 27 shows the revised navigation bar, which separates the welcome message and the navigation links compared to Figure 10. Figure 28 illustrates the original website when scrolled down to the bottom, where the navigation bar is not visible. In contrast, Figure 29 depicts the user interface of the redesigned website following the same action, showcasing that the navigation bar remains fixed at the top of the screen. This design enhancement allows users to easily access the navigation bar at any time for convenient page navigation.

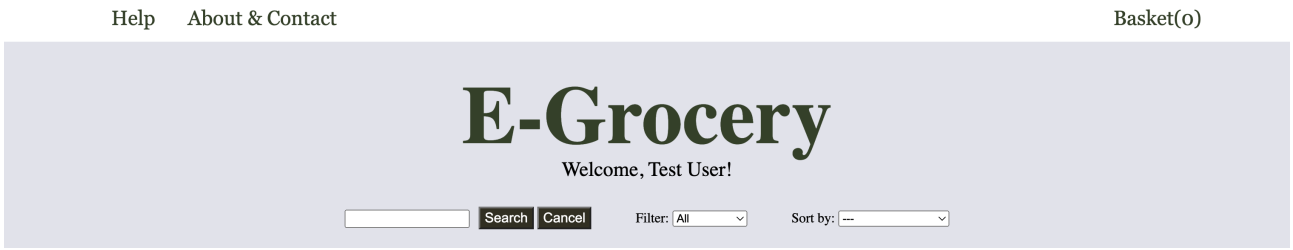

Figure 27: After - Navigation bar without welcome message

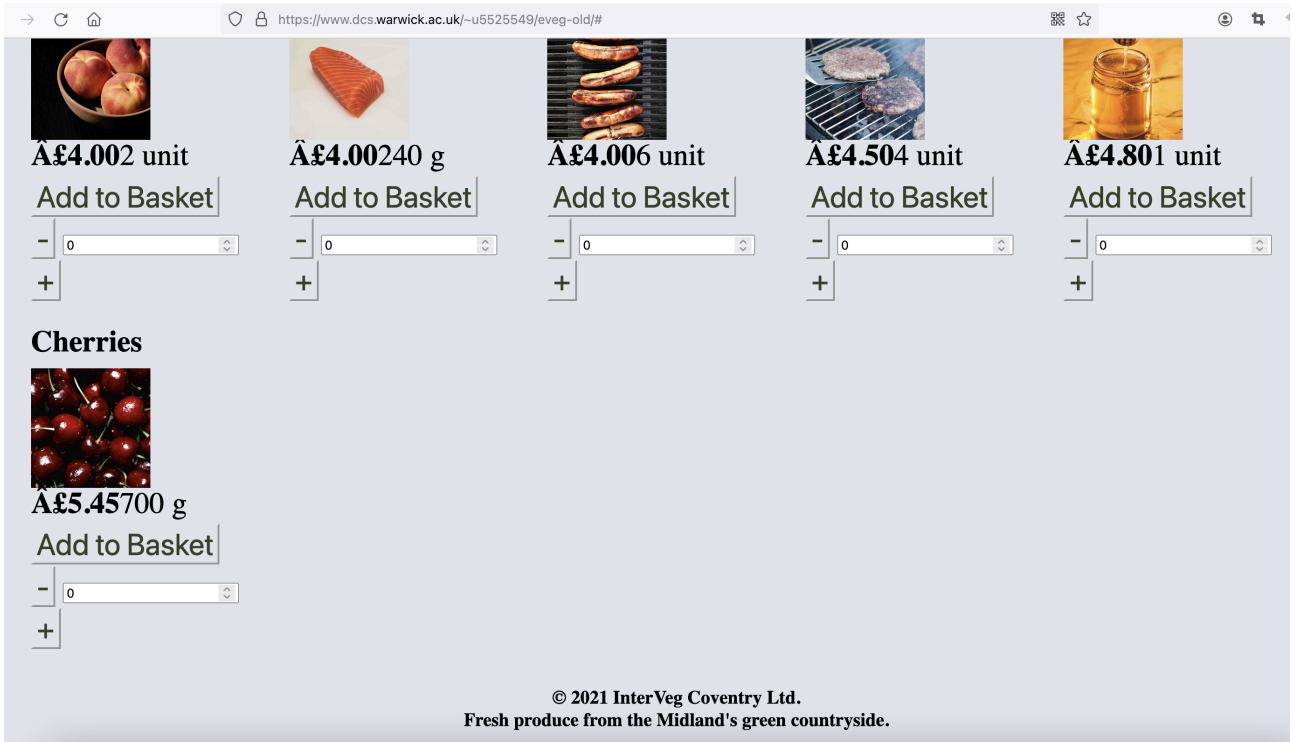

Figure 28: Before - Navigation bar, not fixed at the top of the page

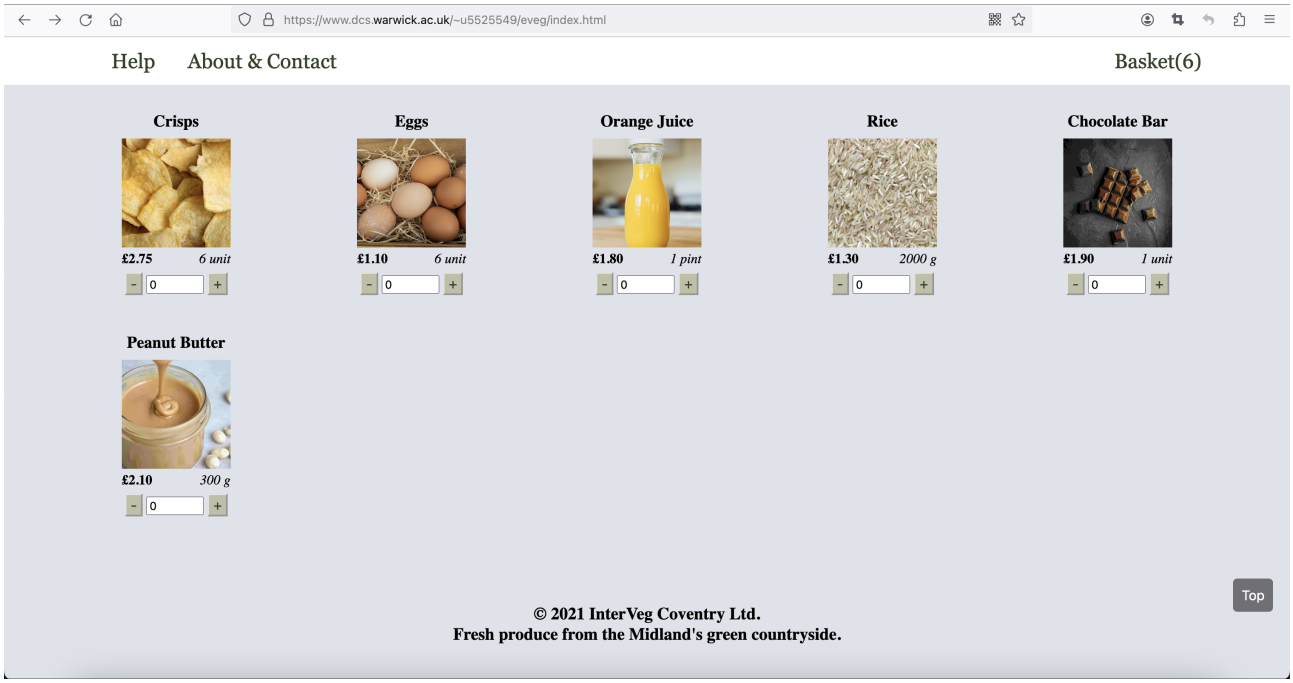

Figure 29: After - Navigation bar fixed at the top of the page

2.22 Lack of Product Categorization

- **Problem:** The page does not support product classifications and screening according to type, which cannot improve user retrieval efficiency.
- **Principles Violated:** Flexibility and efficiency of use.
- **Reason:** Lacking the ability to filter and categorize products hampers user efficiency, making it tough to quickly find specific items, directly contradicting the principle of "Flexibility and efficiency of use" by slowing down the search process and complicating the shopping experience.
- **Solution:** The problem has been solved by adding the filter drop-down menu, which supports filtering by 'all', 'fruit', 'vegetable', and 'other'. The original retrieval method is shown in Figure 30, and the newly added filter can be seen in Figure 31.

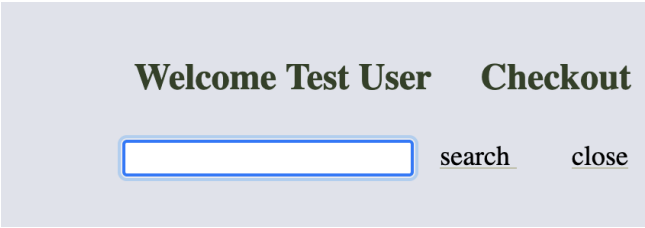

Figure 30: Before - No product classifications and screening according to type

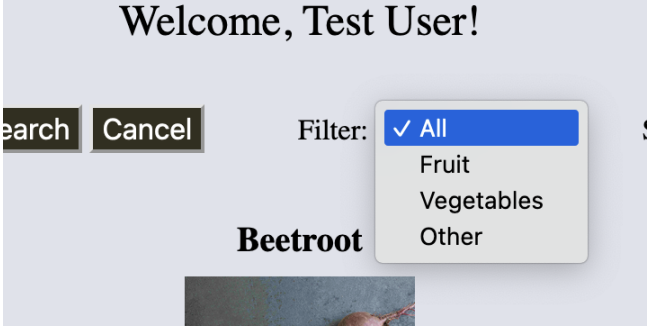

Figure 31: After - Able to sort by name and price

2.23 Lack of Sorting Functionality

- **Problem:** According to the filtering conditions, the pages does not support the ranking according to the price, which cannot improve the search efficiency of any users with specific search needs.
- **Principles Violated:** Flexibility and efficiency of use.
- **Reason:** Not offering price-based sorting for products overlooks the needs of users with specific search preferences, diminishing search efficiency. This oversight violates the "Flexibility and efficiency of use" principle by not catering to varied user strategies for finding products, ultimately complicating the shopping journey for those prioritizing cost.
- **Solution:** The problem has been solved by adding sorting functions by supporting items in 'name', 'price high to low', and 'price low to high' orders in the dropdown menu. The newly added dropdown component can be seen in Figure 32.

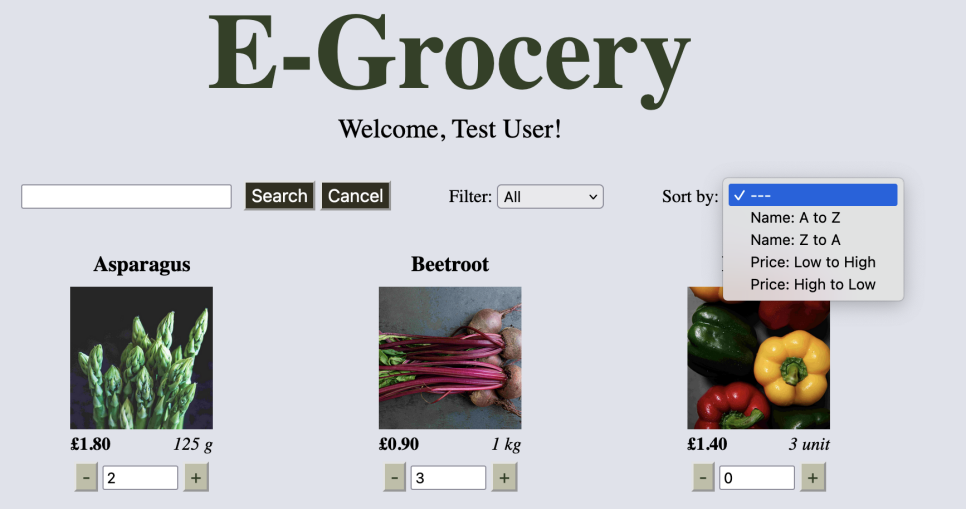

Figure 32: After - Able to sort by Name and Price

2.24 Tight Spacing

- **Problem:** The distance between the unit price of the product and the unit font is too close and the same, so it is not easy for users to distinguish them, which affects the user's browsing experience, and it is easy for users to feel tired when watching.
- **Principles Violated:** Help users recognize, diagnose, and Recover from errors, Aesthetic and minimalist design.
- **Reason:** When product unit prices and units are too close in proximity and use the same font, it blurs distinction, straining users' ability to differentiate them easily. This impacts browsing comfort, potentially leading to user fatigue, which aligns with concerns about "Help users recognize, diagnose, and recover from errors". Clear differentiation aids error prevention by improving readability, thus enhancing user experience and reducing potential confusion. In this case, the close proximity and identical appearance of the unit price of the product and the unit font make it difficult for users to distinguish between them, thus affecting the user's browsing experience and causing potential fatigue. In aesthetic and minimalist design, designers should minimize unnecessary decorations and complexity to ensure a clear and concise interface, enabling users to easily differentiate between different elements and information. Therefore, by increasing the distance between the unit price of the product and the unit font, we can improve the user's browsing experience and better adhere to the principles of aesthetic and minimalist design.
- **Solution:** The unit price is placed on the left side of the unit, with plenty of space between the unit price and the unit, which are separately typed and distinguished by bold and italics. The original tight spacing is shown in Figure 33, and the redesigned one can be checked in Figure 34.

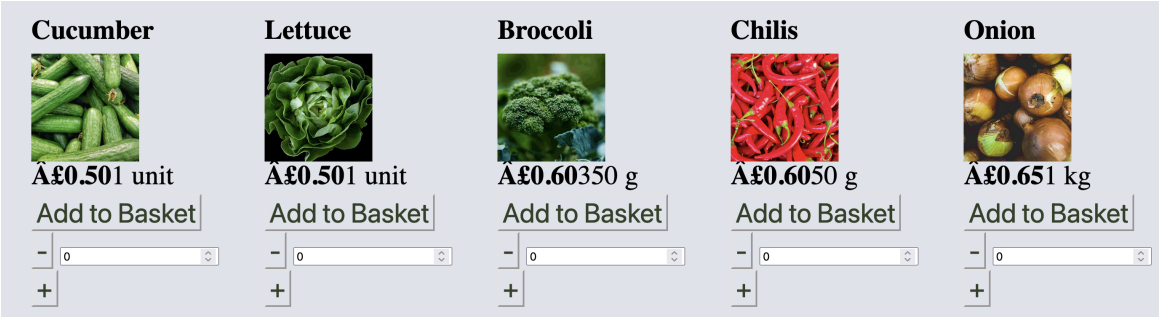

Figure 33: Before - Difficult for users to distinguish product information

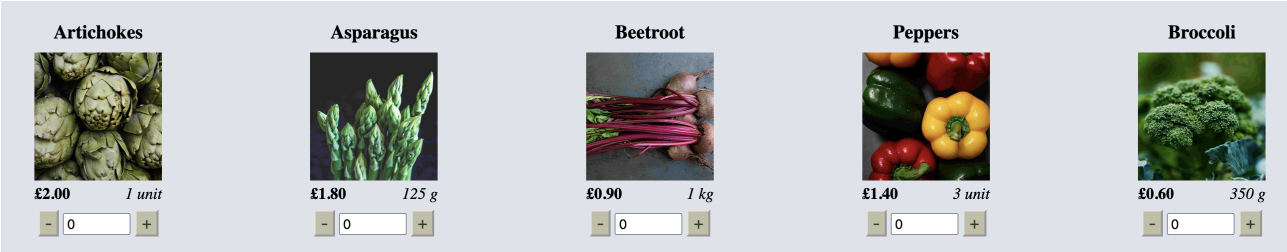

Figure 34: After - Plenty of space between the unit price and the unit

2.25 Lack of Scroll Shortcut

- **Problem:** When the user has viewed many products and wants to return to the top of the page, it is very troublesome and takes a long time to return to the top of the page from the current location.
- **Principles Violated:** User control and freedom, Flexibility and efficiency of use.
- **Reason:** Requiring users to manually scroll back to the top after extensive browsing can be cumbersome, These principles emphasize enabling users to navigate freely and efficiently, suggesting that features like a “back to top” button could significantly enhance user autonomy and satisfaction by allowing quick and effortless return to the starting point, improving overall navigation and user experience.
- **Solution:** In the figure, the Top button is fixed at the bottom right of the screen. No matter the user swipes up and down to browse the product list on any device, he can return to the top of the page by clicking the button. The newly added “Top” button is shown in Figure 35.

Figure 35: “Top” button at the bottom right of the screen

2.26 Checkout Page Lacks the Secondary Modification Function for Basket

- **Problem:** When the user is checking out, the items in the shopping basket cannot be modified. If the user wants to modify the goods in the shopping basket, they can only return to the upper level page and search for the goods one by one to modify, which is very inconvenient.
- **Principles Violated:** Flexibility and efficiency of use.
- **Reason:** Restricting item modifications in the checkout process hinders the "Flexibility and efficiency of use", as it forces users to backtrack through the site to alter their selections, leading to a frustrating and inefficient shopping experience. This setup undermines user control and the ability to easily adjust choices, essential for a seamless online shopping journey.
- **Solution:** The functions to modify items in the shopping basket in the payment interface has been added, and the ability to empty the shopping basket with one click has been added. Figure 36 shows the original Basket Contents table, Figure 37 shows the updated version.

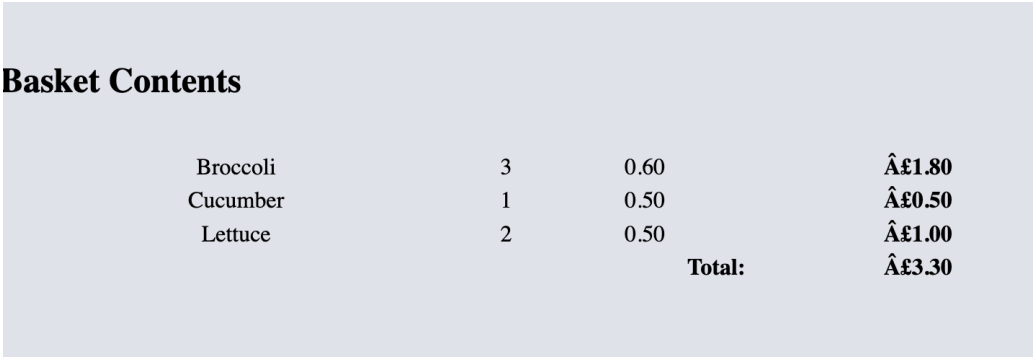

Figure 36: Before - Basket items cannot be modified

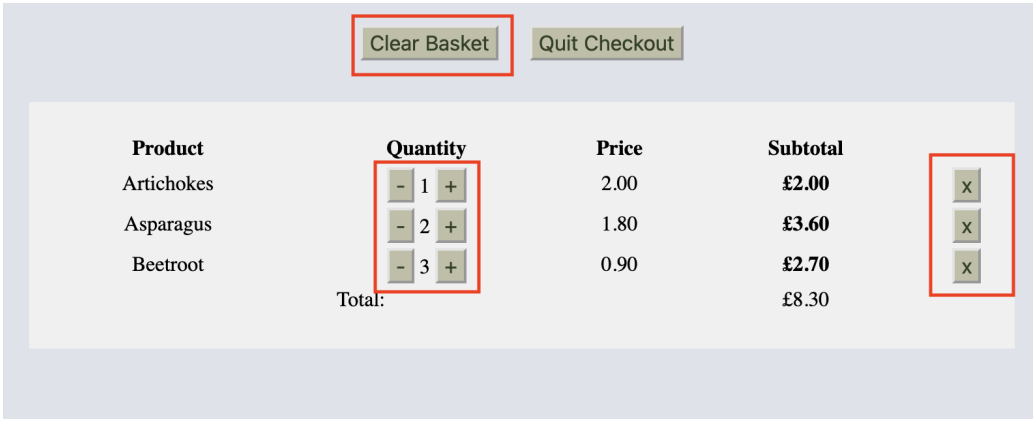

Figure 37: After - Basket items can be modified or cleared easily

2.27 Lack of Input Monitoring and Restrictions in the Customer Details Form

- **Problem:** When the user submits the Customer Details form, if the system input information is incomplete or the format is faulty, the system will not report an error.
- **Principles Violated:** Help users recognize, diagnose, and recover from errors.
- **Reason:** Not flagging incomplete or incorrect format entries during checkout misses crucial error recovery opportunities. This overlooks guiding users through mistakes — essential for seamless navigation and ensuring confidence in the transaction process, aligning with principles focusing on minimizing user errors and aiding in their resolution.
- **Solution:** If users click "Pay" button to submit the form, the system will check the format and integrity of the input information if it is different from the requirements, a message will pop up to remind them. After clicking "Pay" button, Figure 38 shows the warning message when there is no input in the Customer Details form, Figure 39 shows the message when the form is partially empty, Figure 40 is the warning

popup when the format of email address is not correct (e.g. No '@' symbol, No '.com' at the end), Figure 41 is the warning message when the length of input contact number is smaller than 4, and Figure 42 is the standard format of the form, it can be successfully submitted by the user.

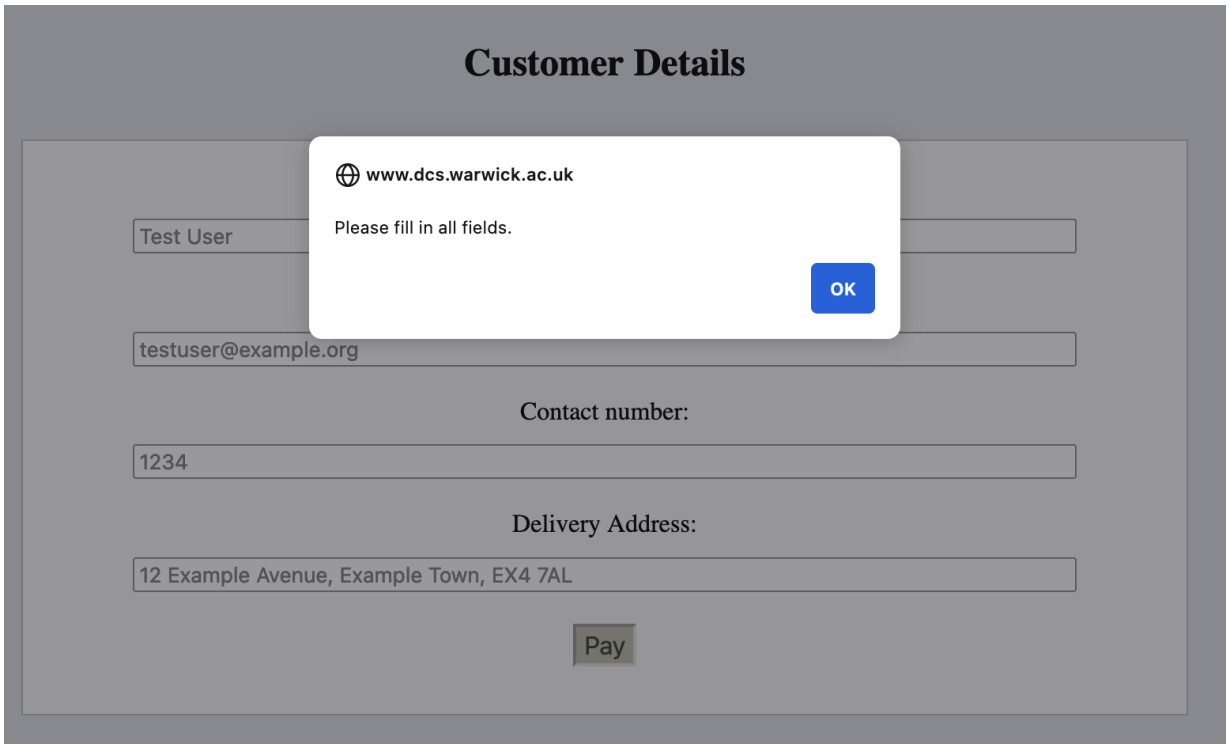

Figure 38: Warning message when the form is completely empty

Figure 39: Warning message when the form is partially empty

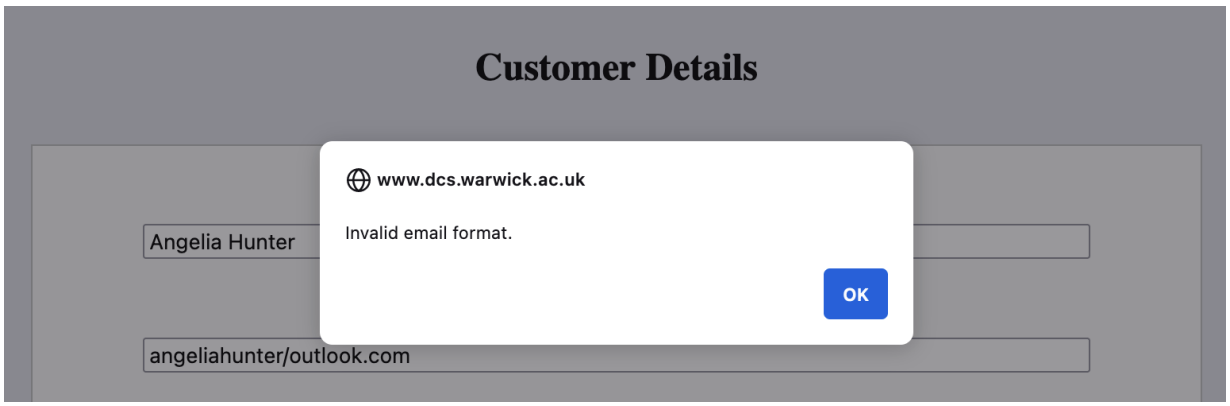

Figure 40: Warning message when the format of email address is wrong

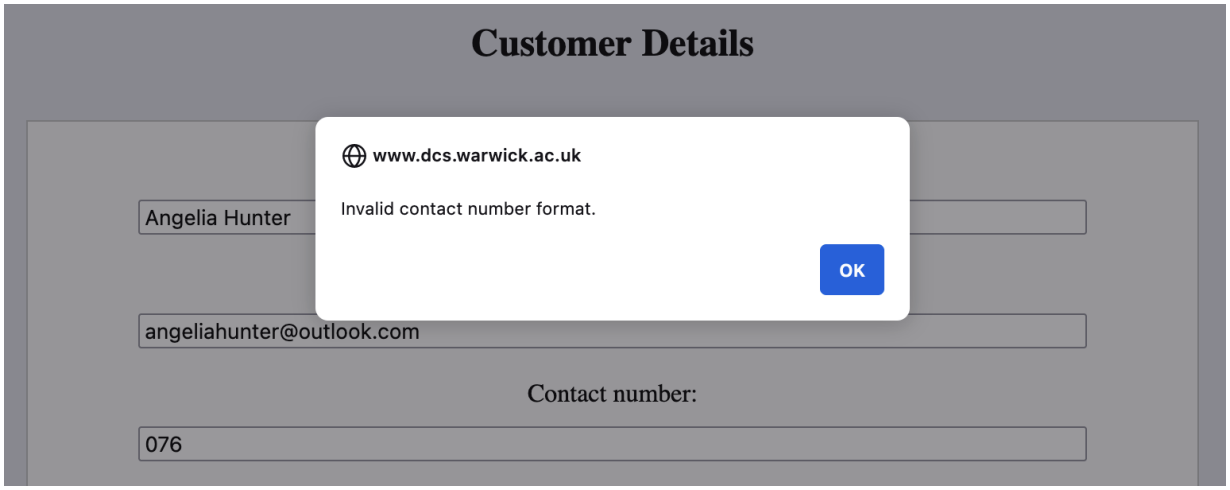

Figure 41: Warning message when the format of contact number is wrong

Figure 42: Standard format

2.28 Lack of Help and Documentation

- **Problem:** Lack of Help and documentation.
- **Principles Violated:** Help and documentation.
- **Reason:** The original webpage lacking a "HELP" section presents a problem as users may not be able to access assistance and solutions promptly when encountering issues, thereby diminishing the user experience. Adding a "Help" section reflects the principle of "Help and Documentation", which involves providing users with easily accessible and understandable help documents, as well as supporting users in obtaining assistance when needed. Through such modification, the webpage offers additional support and assistance, contributing to an improved user experience and increased user satisfaction.
- **Solution:** Added a "HELP" section in the top left corner of the webpage and providing help information within it. By clicking it, users can now conveniently access relevant documents or resources to resolve their issues. Figure 43 shows the Help popup window.

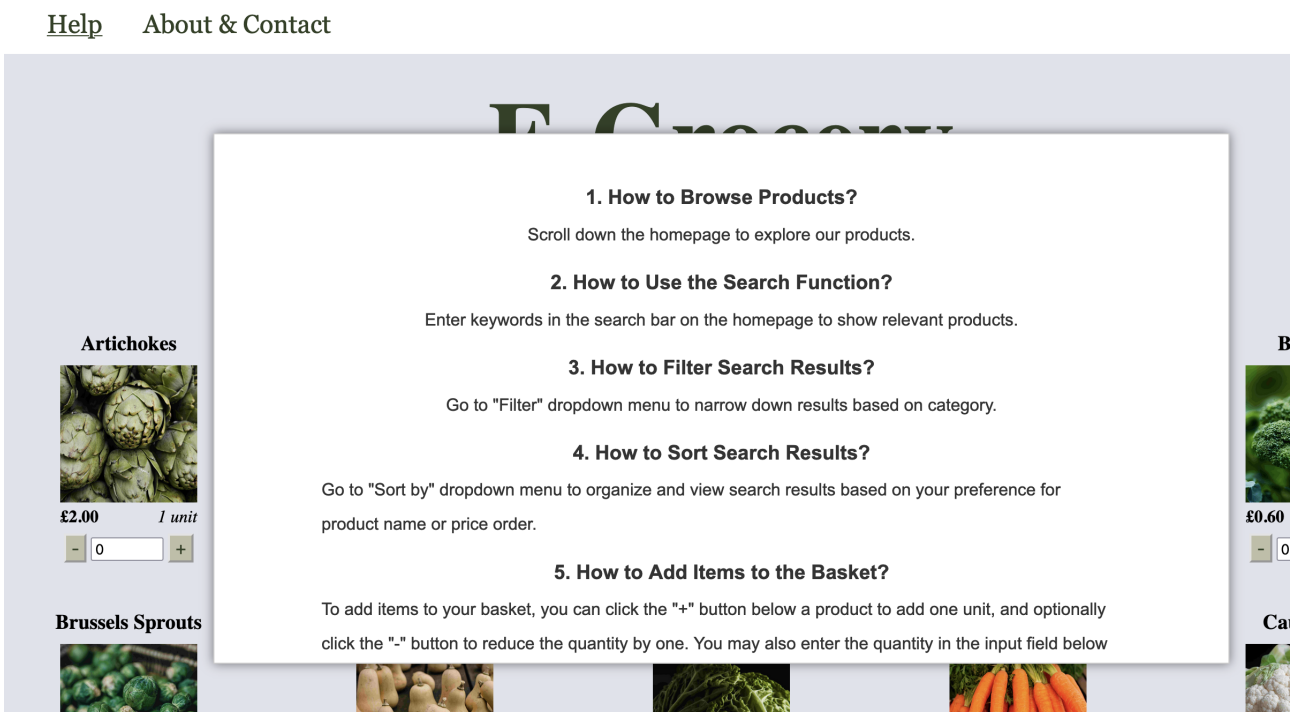

Figure 43: Popup window of help documentation

2.29 Lack of Responsive Design

- **Problem:** Web pages have screen adaptation problems. The old site fixed a row of five items, which would overlap when the screen width is narrow. In addition, there is no guarantee that the website will have the same user-friendly interface on different devices.
- **Principles Violated:** Aesthetic and minimalist design, Consistency and standards.
- **Reason:** Screen adaptation issues and a fixed item layout that overlaps on narrower screens clash with "Aesthetic and minimalist design" by compromising visual clarity and functional simplicity, especially across different devices, detracting from a universally intuitive and appealing user interface.The problem of web pages having screen adaptation issues, particularly where a fixed row of five items overlaps on narrower screens and the absence of a uniform user-friendly interface across different devices, violates the principle of consistency and standards. This principle is fundamental in user interface design and emphasizes that systems should follow platform conventions and standards to ensure users know what to expect when interacting with different elements, thereby reducing the learning curve and confusion.
- **Solution:** As the screen width decreases, the number of items displayed in each line will be reduced. In addition, the size will be reduced and the spacing and alignment of the search, filtering, and sorting columns will be adjusted to achieve flexible and beautiful display effects. Additionally, according to principles in Usability Heuristics for Touchscreen-based Mobile Devices [3], the new website has a good display effect on both iPad and mobile device.

Figure 44 displays the non-full-screen Homepage layout of the original website on a laptop, with varying degrees of component overlapping and compression observed in both the left and right windows. Figure 45 shows the non-full-screen homepage layout of the redesigned website on a laptop, where the left and right windows appear normal. Figure 46 presents the Homepage layout of the redesigned website when accessed on an iPad. Figure 47 demonstrates the Homepage layout of the redesigned website as seen on a mobile device.

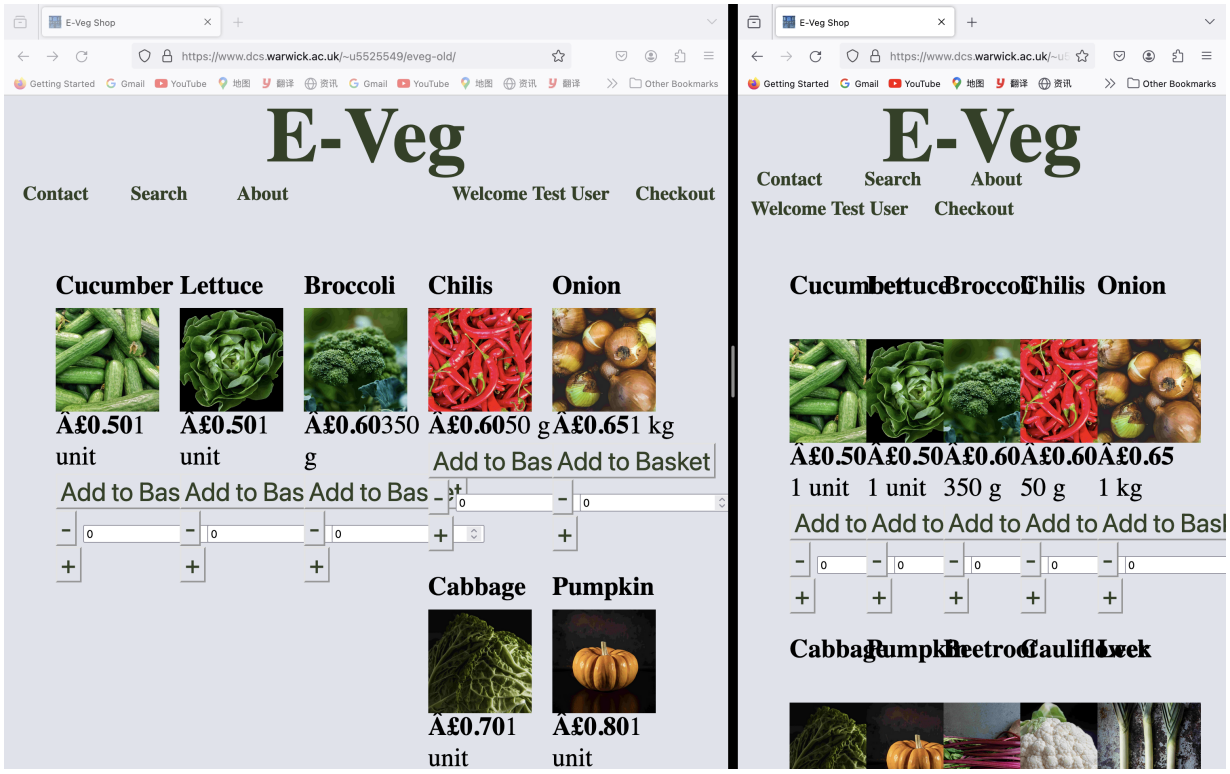

Figure 44: Non-full-screen Homepage layout of the original website

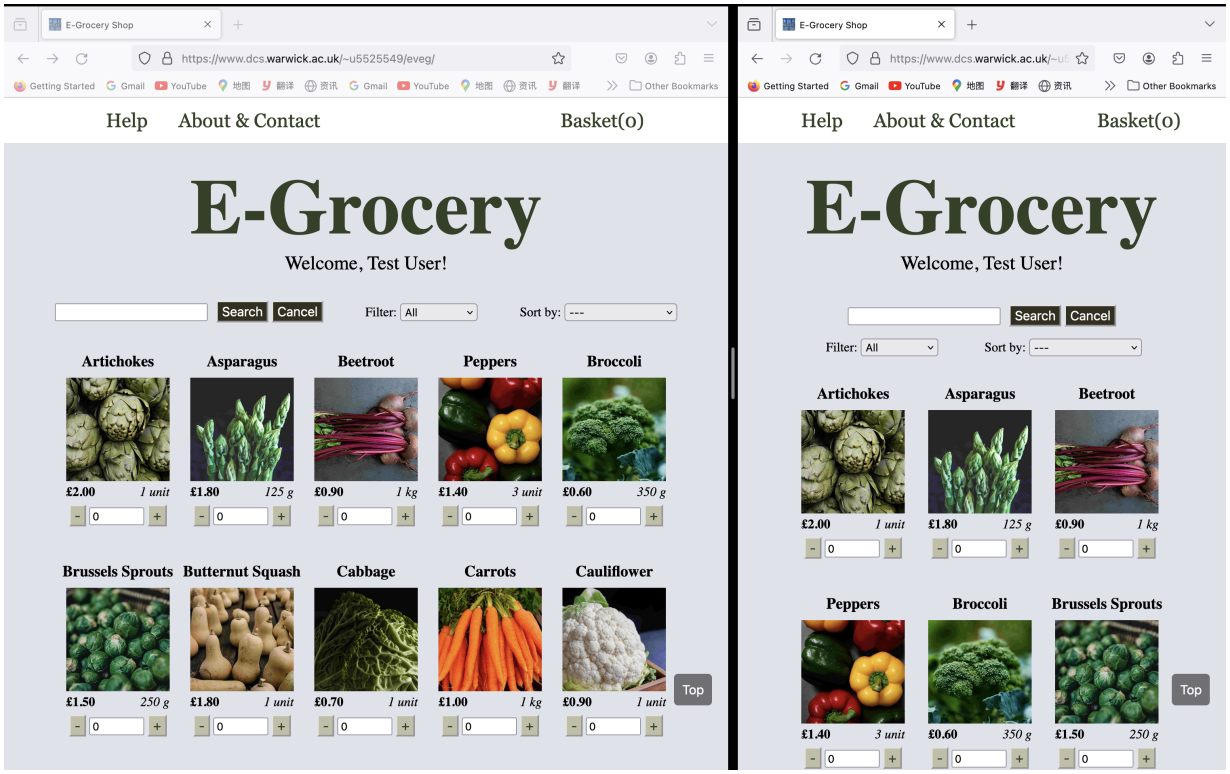

Figure 45: Non-full-screen Homepage layout of the redesigned website

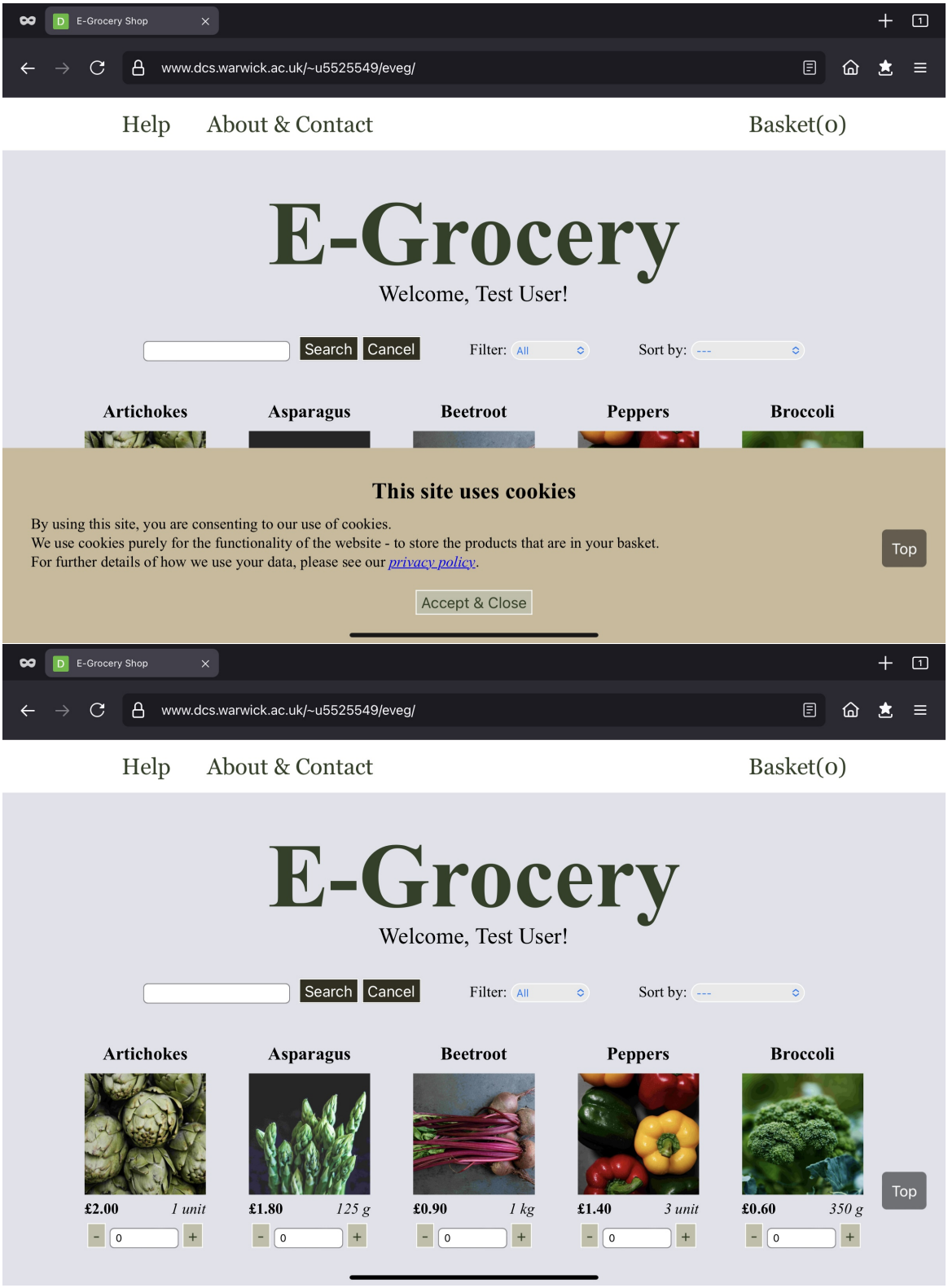

Figure 46: Homepage layout on iPad

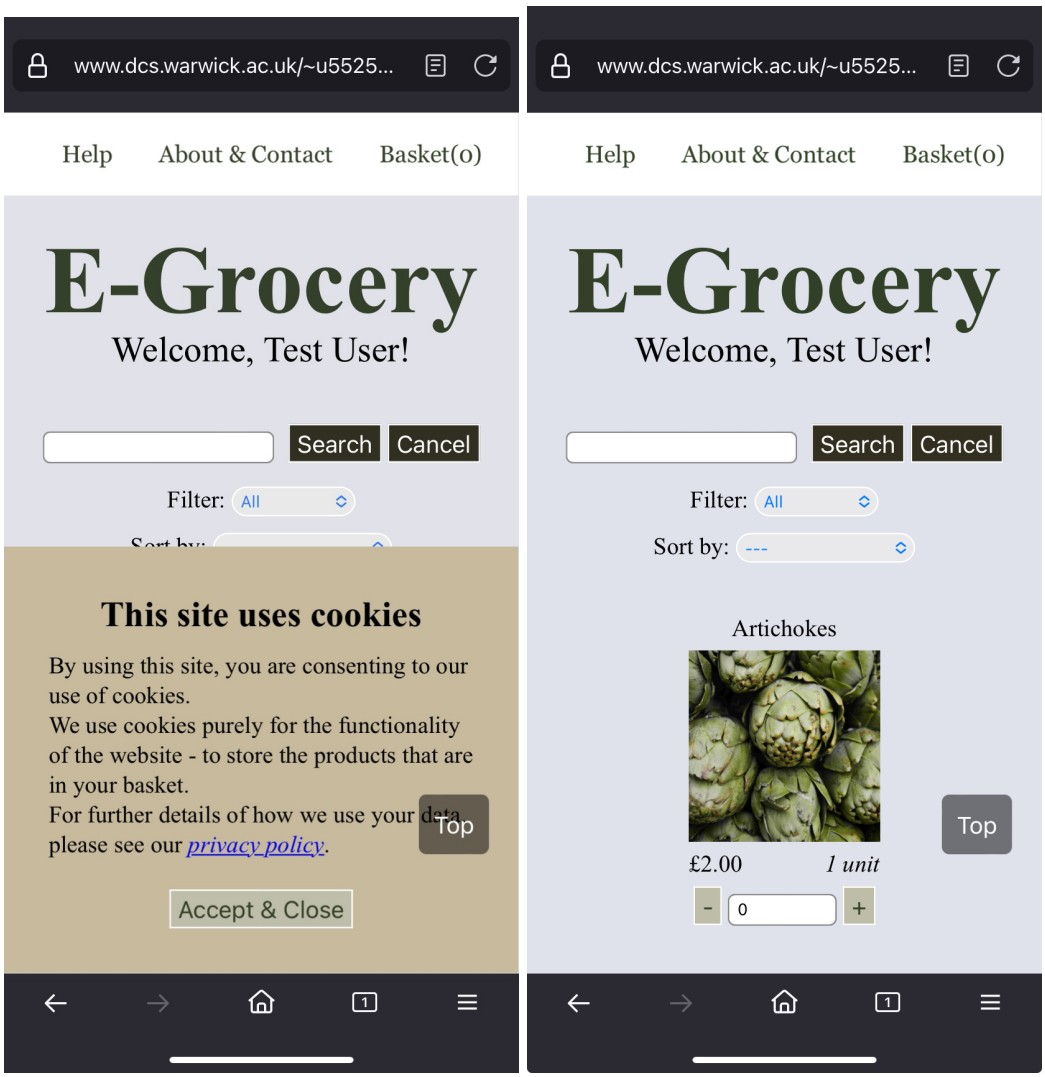

Figure 47: Homepage layout on mobile device

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[1] J. Nielsen, Ten usability heuristics, https://pdfs.semanticscholar.org/5f03/b251093aee730ab9772db2e1a8a7eb8522cb.pdf. (2005).

[2] C. Wharton, J. Rieman, C. Lewis, P. Polson, The cognitive walkthrough method: a practitioner's guide, in: Usability inspection methods, 1994, pp. 105–140.

[3] R. Inostroza, C. Rusu, S. Roncagliolo, C. Jimenez, V. Rusu, Usability heuristics for touchscreen-based mobile devices, in: 2012 ninth international conference on information technology-new generations, IEEE, 2012, pp. 662–667.