Contents

[**POINT 1** 2](#_Toc71918444)

[**POINT 2** 4](#_Toc71918445)

[**POINT 3** 6](#_Toc71918446)

[**POINT 5** 7](#_Toc71918447)

[**POINT 6** 8](#_Toc71918448)

# **POINT 1**

A new software application that can benefit from Services 4.0 is a pet industry-based application. More specifically, domestic animals. This application can cater to multiple types of users – pet owners, pet stores or vendors, and veterinarians. The application functions mainly as an e-commerce platform and data tracking software. The application varies depending on the type of account made.

Pet owners will be able to specify they are a pet owner and enter details about their pet(s). Using this information, they can purchase and compare a range of products suited for their pet(s) through e-banking. This includes pet food, toys, and animal cages. Transactions are made the same way many e-commerce platforms do, with authentication and security measures included. In addition, this application allows medical information about the pet(s) to be entered. Pet owners will be able to track their pet(s)’s health and book an appointment for a check-up with a trusted veterinarian near the area.

The second type of user is the vendors or pet stores. The application will check and manage their stocks frequently and sent daily updates to the employees. It allows these users to order stocks instantly from suppliers within a few clicks. These transactions are handled within the system and is secure from outside interference. This data is collected and added to their expenditure. Financial reports can also be generated when needed.

Other than that, veterinarians can also use this application. Veterinarians can open an account and enter their personal details as a certified veterinarian. The application takes this information and allows pet owners to relate their accounts to their preferred veterinarian. Thus, both sides can view certain and relevant information about each other. For example, the pet owner can understand the credentials of the veterinarian, where they work and work experience. In return, the veterinarians are able to see their customers’ and pet(s)’s profiles and medical history.

All the users’ data, vendors’ data and veterinarians’ data will be sent to the application’s database and analysed for patterns and themes. This is where Services 4.0 takes up its role in making seamless tasks for the workers and the users. In this application, bots can be implemented to support this initiative.

For the users, bots will send recommendations of products according to the users’ preferences and considering the type of pet that they have. This includes suitable brands of food, toys, and animal cages. The application will send warnings to the user if they detect a sudden increase in spending that is over their average budget. It may also send options of products that are cheaper but equal in quality. Furthermore, the application will be able to predict the next veterinarian appointment of the pet and send a reminder to the user, whether it is a regular check-up or a mandatory vaccination. If there is an increase in diseases or medical risks based on the data of other users, users will be given a heads-up and recommended step of precaution.

For the vendors or pet stores, when the system ‘thinks’ it is time to order new stock of a certain amount, bots will alert them and allow immediate transactions with the suppliers. If any stock is nearing the expiry date, such as pet food, it will send a notification. The application will be able to take the users’ data into context, and thus determine whether additional stock is needed or recommend less depending on the market. This allows employees to focus less on repetitive tasks, like managing stock and shipping orders. They can afford to spend more resources on servicing customers which require human involvement. All this data can also be used an evidence or support when companies make business decisions, such as partnering with more reliable or customer-preferred brands.

For veterinarians, they will be notified of any appointments by customers and details of the appointment. The application can analyse patterns in medical history and may aid veterinarians in making diagnosis. They can also view past records of their customers and see analytic reports, such as the number of appointments and details about those appointments.

# **POINT 2**

In a lifecycle model, there are 4 basic interaction design activities – Discovering Requirements, Designing Alternatives, Prototyping and Evaluating.

The following diagram shows the 4 interaction design activities from start to finish. The numbers in the diagram show the process of this model.

1

START

5

2

DISCOVERING REQUIREMENTS

2

5

EVALUATING

DESIGNING ALTERNATIVES

6

PROTOTYPING

4

3

END

When designing a product, there is a need to understand why this product is necessary to solve a certain problem. Such a problem includes having to do extensive research on pet products, like comparisons and budget managing. Vendors also need to go through repetitive tasks from making orders to the suppliers until the stock is delivered. Even then, there is heavy workload to manage those stocks and analyse those data. This is where the idea of the application is thought of to solve the mentioned problems.

Once the requirements are determined and set in stone, various kinds of designs of the application is needed. These designs are usually sketched out as conceptual designs or concrete designs. In this case, this involves the different kinds of interface designs, with different colour themes, layout, and flows. The product placements should not be cluttered on the screen and neatly organized. Sometimes the designs might be scrapped as it does not fit the requirements, and the requirements will need to be referred to and revised.

Once an alternative has been chosen, a working prototype is made. For software, it can be in the form of a paper-based design. It will show every feature of the application and how it works. For example, clicking on the profile icon will take the user to their profile, and can scroll down to see their personal details and appointments. However, the prototype might not adhere to the design alternative completely and miss out on important features. For example, the chosen prototype might not highlight the user’s shopping cart enough to it be immediately visible. This may result in going back to the second phase of the lifecycle model to choose another alternative that satisfies the criteria.

After building the prototype, selected participants can use the prototype and give constructive feedback or reviews. This can be done through interviews after the participants have used the prototype. An example is that the users can interact with the prototype and try to understand the flows and processes of using it, from selecting a product until transaction.

Based on the feedback, it might indicate that revision should be made on the product. The users might say that the images for the products on display are too small. Some users might point out that the colour theme is too bright, so a softer theme will need to be considered. Another design alternative will need to be chosen. Once this is done, another prototype is made and another evaluation is held, specifically for the display and the colour theme.

This lifecycle can continue and repeat many times, but ultimately, a final product will be made in the end after determining that the product is usable and is desired by actual users.

# **POINT 3**

For this application, there are a few interface metaphors that can be implemented in it.

The first is the shopping cart, which is a popular metaphor for e-commerce platforms. It is a metaphor for buying something, as it is an item that is familiar to most people. When a user sees a shopping cart icon, they can almost immediately relate it to placing a product into the cart with the intention of buying it. For this application, using a shopping cart icon is an appropriate way to visualise putting a selected product into the virtual ‘cart’. The user can also view their ‘cart’ any time by clicking on the shopping cart icon, which relates to how they see physical products in real life.

The second is a bell. A bell is usually associated with alerting someone about something. A scenario in real life would be a bell placed in front of a shop’s front door. Whenever someone enters the shop, the bell will ring, notifying the people inside the shop. The same concept goes for a notification bell icon. The bell will indicate that the user is being notified of something and needs their attention.

The third is a bar graph. Graphs are used to display summarized information regarding collected data. In this application, it would be good to use a bar graph icon to symbolise it as the place where a user can view relevant reports of their data. This metaphor capitalizes the user’s mathematical knowledge learnt from a young age.

# **POINT 5**

The three interface types that are suitable for this application is Graphical User Interface (GUI), Mobile and Touchscreen.

GUI is where information is presented as a representation within a graphical interface. While GUI has evolved over the years, there are four core components within every GUI, which are windows, menus, icons, and pointers. This application can be displayed within a window in a smartphone. Then, it also has menus where information is ordered top down with fitting category headers. For example, a menu is displayed when a user swipes right to reveal additional functions, such as customizing the application’s colour theme, contacting customer service, and logging out. GUI also emphasizes on icon design, which is part of interface metaphors. These icons are essential as it does not require much cognitive effort to learn and recognize certain icons that represent certain functions. This includes the previously mentioned bell and shopping cart icons. These icons are designed to be familiar to users no matter the demographic.

Next, this application is suitable for mobile design. This application’s interface should be able to cater to all kinds of screen sizes. For example, it can be viewed easily on a smartphone as well as a tablet. The products displayed should be clear and organized even if the screen size is a small one. The font used should be neat, like Times New Roman instead of italic or cursive fonts, which can be more difficult to read. The icons should also be large enough so that it can be seen and clicked easily. The user should not have to zoom in and out constantly to view the interface, and instead should be dynamic and fit to scale as much as possible.

This application is also suited for touchscreens. As this application is targeted for more interactive processes, like tapping and scrolling, multitouch touchscreens are appropriate. This is also because touchscreens are a more popular type of interface, with smartphones now being the norm. The system can detect the presence of a fingertip or multiple fingertips at one time on the screen, and quickly assess the exact location and respond to those actions. These actions can be tapping on a button, swiping the screen up and down, or using two fingers to zoom in and out. For instance, a user can tap on a chosen product’s card to see more information. They can scroll down to read the description and tap on the shopping cart icon to add it into their cart. Another scenario is a vendor can tap on the graph icon to view historical records and hold down on a particular bar on the bar graph to view the exact amount of stock bought during that month. Users can also swipe right to view the side menu and log out of their account.

# **POINT 6**

Both quantitative and qualitative analysis is important to Services 4.0 as it helps to make rational decisions supported by facts and evidence.

Quantitative data is used to measure numerical data, or any kind of data that can be transformed into a numeric state. For example, the number of times a user visits a website, how many users buy a certain product, and the time spent finishing a certain task are quantitative data. To gain accurate and helpful information from the collected data, quantitative analysis is needed. There are two basic types of this analysis, which are averages and percentages. Averages can be split into three types – mean, median and mode.

The first one is mean, which is an equation where all the figures are added and divided by the total number of figures. Mean is used to understand the interpretation of the average. An example is the average amount of money a user spends per month can be calculated by taking the total amount of money spend in that year and divide it by 12. This scenario is helpful in Services 4.0 as it allows the bank to understand and predict the monthly spending of their customers. They can then take appropriate action by suggesting users to take out a certain amount of money based on the calculation of mean via notifications.

The second is median. Median is used when there is a need to figure out the middle value of data when the data is in ascending order. An example of using median is a survey is conducted to determine the median salary among a certain group of people. There are 5 people, and earn $100, $100, $2000, $10000, and $200,000 respectively. If we try to determine the average of these 5 people using mean, it would be $42,440. If we use median, the average will be $10000, which is a much more appropriate average to represent a mid-tier salary. Median is not as affected by outliers compared to mean, so systems that can implement Service 4.0 will not be distracted by small outliers, or they can also realize that certain data is irregular and will inform users accordingly.

The third type of average is mode. Mode is used to identify the numbers or instances that occur the most frequently. An example can be made using the bank scenario. The bank wishes to know how long it takes for a customer’s invoice to be made to the bank. The sample data can be 3, 5, 5, 9, 9, 9 and 10 seconds. From the data, the mode is 9 seconds, so on average it takes 9 seconds for a bank to receive an invoice. This can aid Services 4.0 as it can help locate the data that happens often based on the context and create graphs and patterns.

Then, the second type of quantitative analysis is using percentages. Percentages are a useful way to compare multiple sets of responses at one glance. This may be prepared in a tabular format or represented as graphs. An example is the employees of an e-commerce website wants to know the percentage of users buying products at certain times, like during certain holidays. A pie chart can be drawn, and the categories of products will be shown. Knowing the percentages of data is useful for Services 4.0 because it can help the system to understand the differences between data and which one is prioritized.

Next, qualitative data is data that is in the form of images and words. Such data includes pictures, comments from interviewees, and ranges of emotions from users. There are three basic ways to analyse this data, and that is identifying themes, categorizing data, and analysing critical incidents.

Identifying themes involves finding patterns around a particular topic that appears frequently. These themes will emerge while conducting a study. There may be major themes and minor ones, and the core themes will need to be separated from the irrelevant ones. For example, a retail company can understand which clothing brands are more popular among a certain demographic and recommend more appropriate clothes to their customers. From understanding which themes to focus on to satisfy user requirement, this can increase the quality of Services 4.0 as ‘the customer is always right’. Not only that, the systems of Services 4.0 will be able to learn which themes are desirable and undesirable, thus making it more efficient and enhance productivity for the workers.

Next is categorizing data. This analysis involves using an analysis frame to categorize the interaction observed based on the study goal(s). This frame is selected beforehand. For Services 4.0, this is important as categorizing data makes analysis and retrieval more efficient.

The third method is to analyse critical incidents. This is used to identify and separate subsets of data within a large set of data for further analysis. This method focuses on key incidents that pique the interest of the researcher. This is important for Services 4.0 as the systems involved will need to process large amounts of data that may decrease performance and efficiency.