**Title: Software Design**

1. **Write a pen portrait for a user of a driverless car.**

Pen portraits are informal descriptions of an individual or a group of individuals that may include coverage and other 'hard' information but emphasise more subjective characteristics like attitudes, appearance, and way of life. Pen portraits could result from a qualitative study, a term used to describe groups of respondents who exhibit specific behavioural, mental, or philosophical clusters, or be used to find the best people for a project (AQR, N.D.). However, 2112consulting (2017) stated that the pen portrait is a straightforward but efficient technique we employ to learn more about the strategy group members.

A pen portrait of a user in the context of a driverless car can assist in identifying the target market and developing software that satisfies their needs. For a user of a driverless car, consider the following pen portrait:

**User Pen Portrait: Sandra Cristina**

**History and characteristics:** Sandra, a customer service representative at a large corporation in Manchester, is 40 years old. She has three kids and lives with their partner in a modest home. Sandra loves innovations that simplify their busy urban lives and is incredibly passionate about marketing. They quickly accept new technology and commit to limiting their adverse environmental effects.

**Transportation requirements and daily routine:** Most of Sandra’s weekdays are occupied with her job and family obligations. They commute to work and drop the kids off at school in the mornings. They frequently go to meetings, run errands, and occasionally have lunch with friends or co-workers during the day. In the evenings,

Sandra picks up the kids from school, drives them to extracurricular activities, and takes care of housework.

**Preferences and Wishes:**

- **Safety and Reliability**: Sandra prioritises safety and dependability because she values her family. Advanced safety features, like robust collision avoidance systems and real-time monitoring capabilities, are anticipated for the driverless car.
- **Time Management:** Sandra respects their time and is eager to use the autonomous automobile to streamline everyday activities. They anticipate that the software will shorten travel times, develop effective routes, and consider traffic. Sandra also values prompt messages and reminders to ensure she arrives on time.
- **Convenience and Comfort:** Due to their busy schedule, Sandra values a driverless automobile's comfort and convenience. They anticipate the software will offer amenities like adjustable chairs, climate control, and simple controls. Additionally important is integration with web services and mobile devices.
- **Sustainability:** Sandra cares about the environment and supports programmes that cut carbon emissions and advance sustainability. They are drawn to functions like eco-friendly route suggestions, advanced charging options, and energy-efficient driving modes.
- **User-Friendly Interface:** Sandra, a tech enthusiast, values a simple, straightforward user interface. They anticipate the programme will be short, user-friendly and provide clear instructions and feedback. Sandra enjoys and finds the features of voice commands and natural language helpful in processing.
- **Objectives:** Sandra's main objective is to identify a dependable and effective transportation option that melds into their everyday routine. They want to spend more time with their families and worry less about driving in a crowded metropolis. Alex also expects that driving an autonomous vehicle will help people live more sustainably and lower their carbon footprint.

This pen portrait illustrates the expectations, tastes, and objectives of a typical user who would profit from an autonomous car. It aids in comprehending the user's demands and can guide the development of software that satisfies those goals, improving the user's entire experience with autonomous vehicles.

2. **Create a use case model which captures how a user needs to interact with the software system.**

The use-case model is characterised as a representation of how people interact with the system to address a challenge. The use case model thus defines the user's goal, the interactions between the system and the user, and the system behaviours necessary to achieve these goals (JavaTpoint, N.D.). IBM (2020) states that model components, including actors, use cases, classes, packages, and one or more diagrams illustrating various system perspectives, are all included in UML models. A model may also include additional, more comprehensive models.

However, use case medalling's ability to assist in system design from the end user's standpoint is a crucial idea. Describing all externally observable system behaviour efficiently communicates system behaviour in the user's words (Visual Paradigm, 2019).

According to Brush (2022), each use case includes these three crucial components:

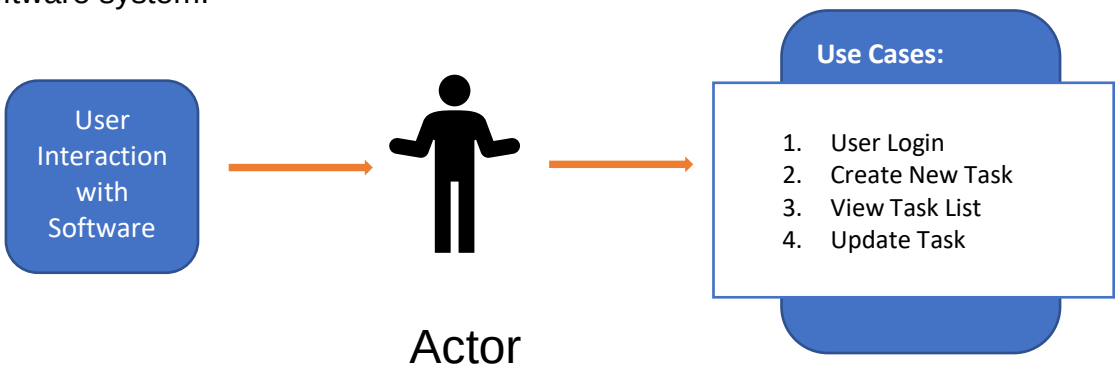
- **The Actor:** A single person or group interacting with the process might be considered system users.
- **The Goal:** The process is finished when the result is successful.
- **The System**: The procedures that must be completed to achieve the ultimate result include the necessary functional requirements and the expected behaviour for those requirements.

Developers can gain from a single use case by learning how the system should operate and using it to spot potential flaws. Additionally, by mapping the usual route and alternate courses and collecting test data for each scenario, use cases may be readily converted into test cases. The development team will use these functional test cases to help ensure that the test plan covers the system's operational needs.

Furthermore, Usability.gov (2019) stated that use cases represent a combination of the following components, depending on how detailed and sophisticated you want to or need to get:

- **Actor:** Anyone or anything that performs a behaviour (while utilising the system) is an actor.
- **Stakeholder:** A person or entity with a stake in how the system under consideration behaves.
- **Primary Actor:** A stakeholder who starts conversing with the system to accomplish something.
- **Preconditions** are the things that need to be accurate or occur before and after the use case executes.
- **Triggers**: this occurrence starts the use case.
- Use case in which nothing goes wrong is one of the main success possibilities **(Basic Flow).**
- An adaptation of the main subject is alternative paths **(Alternative Flow).** When something goes wrong at the system level, it manifests as these exceptions.

The use case model that follows shows a basic example of how a user interacts with a software system:




**Use Case Model:** User Interaction with Software System

1. **Use Case:** User Login
- **Description:** The user must log in to the App using his credentials.
- **Actors:** User
- **Basic flow:**
  - The user inserts his username and password; the system verifies his credentials, and the user gains access to his account.

2. **Use Case:** Create New Task
- **Description:** Enables the user to create a new task in the system.
- **Actors:** User
- **Basic flow:**

- The user inserts the task details, such as title, description, and due date; the user saves the task, and the system validates the input data and creates a new task.

3. **Use Case:** View Task List

- **Description:** Allows the user to view his list of tasks.
- **Actors:** User
- **Basic flow:**
  - The user selects the task list option, and the system retrieves and displays the user's tasks.

4. **Use Case:** Update Task

- **Description:** Allows the user to modify an existing task.
- **Actors:** User
- **Basic flow:**
  - The user selects a task to update from the task list; the user modifies the task details; the user saves the changes, and the system validates the input and updates the task.

**References:**

AQR (N.D.). *Definition: Pen portrait*. [online] Association for Qualitative Research (AQR). Available at: https://www.aqr.org.uk/glossary/pen-portrait.

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JavaTpoint (N.D). *Use-Case Model - Javatpoint*. [online] Available at: https://www.javatpoint.com/use-case-model.

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Usability.gov (2019). *Use Cases | Usability.gov*. [online] Usability.gov. Available at: https://www.usability.gov/how-to-and-tools/methods/use-cases.html.