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1. Risk, quality and communication management – Takeaway Restaurant Project

1.1. Risk management

Risk can be defined as an uncertain event which may occur in the future and can delay or prevent the achievement of the project's goal.
In order to manage risk in our project first we need to identify, assess and prioritize risks, then we need to develop a plan to prevent risks and limit their impact on the project.
The most important document of risk management is the Risk Register.
The Risk Register highlights the most likely threats to a software project with regards to each user story.

ID, Corresponding User story ID	Date	Risk Description	Likelihood	Impact	Owner	Action
R1, S01	01 April	Browse menu page is not displayed fast enough causing frustration to customer	Medium	High	Scrum Master	Ensure enough server resources are provided
R2, S02	02 April	Registration is process overly complicated, discourages user from proceeding	Medium	High	Scrum Master	Ensure that registration form is easy to use
R3, S03	02 April	Login process too slow, discourages user from proceeding	Medium	High	Scrum Master	Ensure that login form is easy to use
R4, S04	03 April	Structure of user account page is too complicated and difficult to update	Medium	Medium	Scrum Master	Ensure clear and concise structure of user account page
R5, S05	04 April	Content of shopping basked is not displayed correctly causing confusion to customer	Medium	High	Scrum team	Ensure correct functionality of page components by testing
R6, S06	05 April	Order status is not displayed correctly	Medium	Medium	Scrum team	Ensure fast and correct status display through testing
R7, S07	06 April	Payment options are not	High	High	Scrum team	Excessive

		listed correctly				testing on all features regarding payment options
R8, S08	07 April	Cash payment option prompts customer to pay in advance	Low	Medium	Scrum team	Thoroughly test all payment options
R9, S09	08 April	Card payment authorization process is too slow	Medium	High	Scrum master	Provide enough resources to process online payments fast
R10, S10	09 April	System does not process discount codes correctly	High	High	Scrum master	Thoroughly test code that processes discount codes/vouchers
R11, S11	10 April	Customer orders are not displayed correctly to staff members	Medium	High	Scrum team	Test all system display functionality
R12, S12	11 April	Update order status functionality works too slow	Medium	Medium	Scrum team	Provide sufficient resources to ensure speedy system response
R13, S13	12 April	Manage menu functionality works too slow	Medium	Medium	Scrum team	Test add, delete, update menu functions
R14, S15	13 April	View transactions page updates slowly	Medium	High	Scrum team	Provide minimal amount of code and speedy execution through TDD

1.2. Quality management

Project quality includes two main considerations: **conformance to requirements** outlined in the project specification and **fitness to use**.

In our project we wish to maintain high quality standards by continuously performing Software Quality Assurance and Quality Control.
Software Quality Assurance ensures that work items are monitored and comply with the industry standards, such as ISO 9000.
With regards to **Quality Control**, the most important activity is **testing**, which will be carried out in every phase of the development process.
The incremental and iterative nature of our chosen development methodology, agile, will help ensure that testing is done on each and every software component.

Testing process must cover the testing of each software component (**unit testing**); **integration testing, system testing and user acceptance testing**.

1.3. Communication management

Communication management plays a crucial role in software project management.
It ensures that all relevant project information is generated, distributed and stored appropriately.
Our communication strategy towards the stakeholders is detailed in the **Communication Management Plan**.
The Communication Management Plan is the responsibility of the project manager and outlines the information needs of the stakeholders, the methods for distributing information and contains the frequency and expected outcomes.

Stakeholder	Information to convey	Speaker	Tool to convey information	Frequency	Expected outcome
Project team	Project updates	Project manager	Project communication plan	Monthly	All deadline are within the expectations
Project manager	Proposed project changes	Senior company management	Emails	As often as changes require	Change requests implemented within reasonable timeframe
Customer	Project status updates	Project manager	Face-to-face meeting, reports, presentations	Monthly	Customer feedback and change requests

Communication plays a major role in agile software development methodology. Agile Scrum framework emphasises the importance of **face-to-face interaction** over written methods of communication in the form of **Project Kickoff Meeting, Sprint Planning Meetings and Daily Scrum Meetings.** We would utilize all the mentioned information distribution methods in order to enhance productivity and ensure that changes are implemented with minimum delay.

2. Development methodology

In our project we would like to employ the principles of the agile software development methodology.

Agile development is software development methodology that responds to change and unpredictability through ***iterative and incremental*** work cadences. It consists of 5 basic steps: **analysis, design, development, testing and release.** These steps are repeated iteratively during the development of a software product in order to best respond to change.

The process is also incremental in nature as new features are added in each iteration, resulting in a potentially working piece of software.

As client requirements may change at any stage, development process must be fast and flexible.

Agile development has several well-defined principles.

The most important one is ***customer satisfaction***, where early and continuous delivery of working software is the main goal. This brings the advantage of early feedback from the client and increases the quality of the final product.

Agile as a methodology also ***welcomes changes*** **at any stage** of the development process. Change may bring competitive advantage for the client, as it helps understand market requirements.

In order to best accommodate changing requirements, software development teams keep **software structure as simple and flexible as possible** to ensure that the impact of change remains minimal.

Working *software product is delivered as early as possible* in regular intervals during the development process. This practice ensures that the client can provide feedback early and changes can be accommodated immediately.

Agile processes emphasize the importance **of *face-to-face communication*** over written methods of information exchange.

Other core agile principles include ***sustainable development*** where the development team paces itself to maintain the highest quality coding standards; ***self-organizing teams***, where responsibilities are communicated to the team as whole and team members decide how to best fulfil these requirements; and ***regular reflection on effectiveness***, where the team regularly adjusts its organisation and methods in order to meet the requirements.

Agile development is an umbrella term that has several well-developed subsets.
The most commonly used agile process frameworks are Extreme Programming, Feature-Driven Development, Kanban and Scrum.

As our project is geared towards the development of an online food ordering system for a takeaway restaurant, it is highly likely that client requirements would change during the development process.
In order to best accommodate changing client requirements; in our project we will follow the main practices of ***Scrum methodology***.
Scrum is lightweight, easy-to-adopt agile framework where work is organized into smaller, manageable pieces, completed by cross-functional teams in a given timeframe. The timeframes are called ***sprints*****,** with a typical duration of 2-4 weeks.
Scrum process is based on the production of several important **artefacts**, including the Product Backlog, sprint backlogs, user stories and progress burndown charts.
Product Backlog is the most important document of the development process, containing all the required functionality of the proposed software system.
As the master list of all features, Product Backlog outlines requirements in a form of a prioritized list of **Product Backlog Items (PBIs).**
Sprint backlogs are based on the content of the Product Backlog; PBIs that the team wants to complete during a given sprint are selected and broken down into individual tasks in this document.

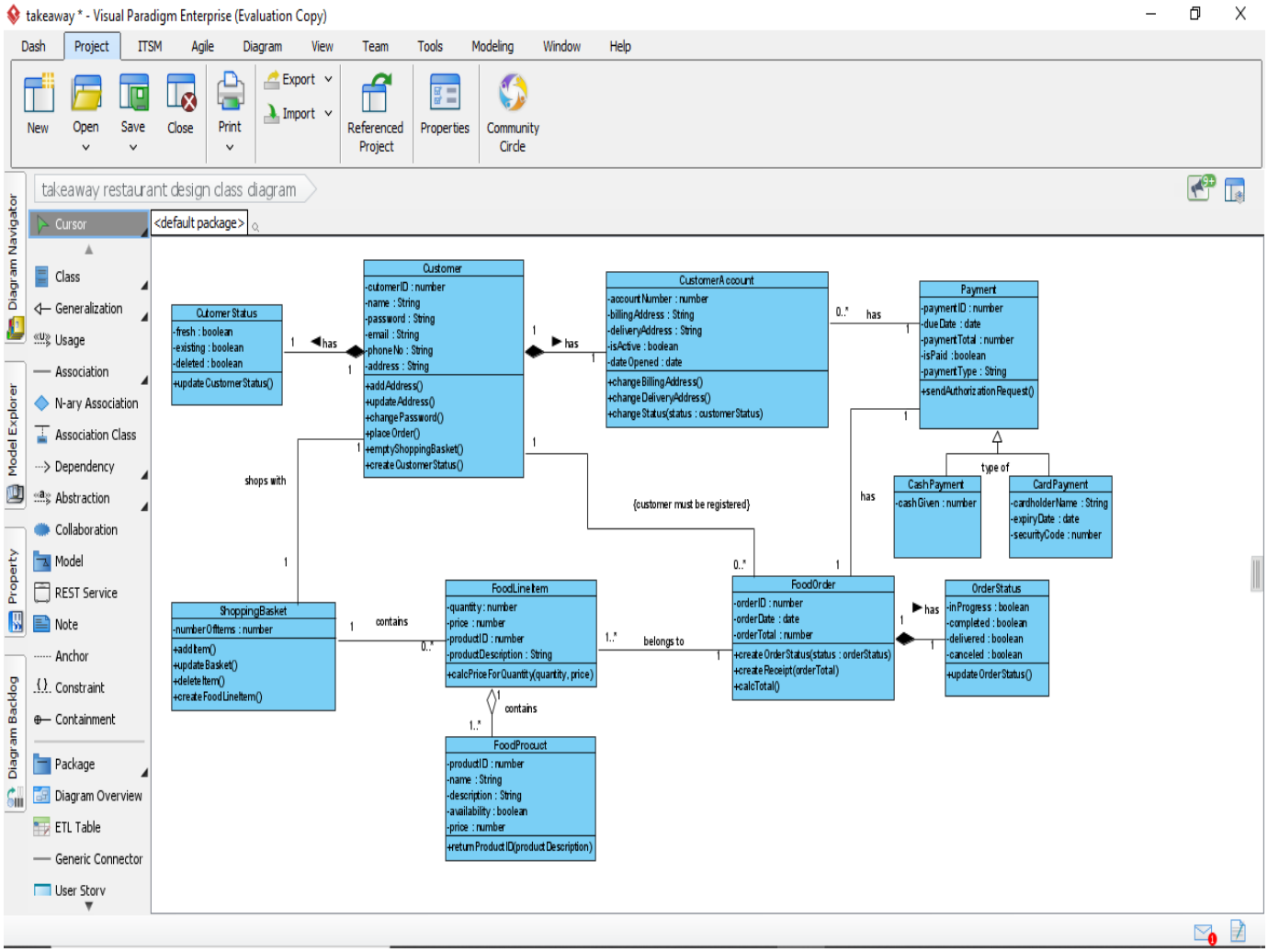
User stories are the high-level definitions of customer requirement, written from the client's point of view. These stories must provide enough information for the development team to produce an effort estimate to implement them.
User stories are usually assigned with an indication of priority (high, medium, low), a unique story ID and a story point. These story points are then used to estimate the effort required for the implementation of a given story.
Burndown charts are the graphical representation of progress and remaining work during a sprint. These charts are produced daily in order to monitor progress and provide transparency to the team.

3. Java implementation of “Place Order” use case

3.1. Design Class Diagram

Design class diagram is usually created after the completion of interaction diagrams during the object oriented process of software engineering. Design class diagrams are based on the conceptual class diagram, but while conceptual class diagrams illustrate real world concepts and contain attributes of the classes, design class diagrams contains **software components** and in addition to **attributes**, we include **operations** (methods) associated with the behaviour of each class.

Naturally, associations, navigability, generalisation and inheritance between classes are shown in the design class diagram as well.



3.2. Java classes for “Place Order”

Our chosen CASE tool, Visual Paradigm offers a functionality to turn design class diagram into computer code, using either Java or C++ programming languages.

Based on our previous studies of the Java programming language, we generated the following Java classes from the design class diagram with regards to the most important use case, Place Order:

```
public class Customer {
    private int customerID;
    private String name;
    private String password;
    private String email;
    private String phoneNo;
    private String address;

    public void addAddress() {
        // TODO - implement Customer.addAddress
    }
    public void updateAddress() {
        // TODO - implement Customer.updateAddress
    }
    public void changePassword() {
        // TODO - implement Customer.changePassword
    }
    public void placeOrder() {
        // TODO - implement Customer.placeOrder
    }
```

```
	public void emptyShoppingBasket() {
		// TODO - implement Customer.emptyShoppingBasket
	}
	public void createCustomerStatus() {
		// TODO - implement Customer.createCustomerStatus
	}
}
public class ShoppingBasket {
	private int numberOfItems;
	public void addItem() {
		// TODO - implement ShoppingBasket.addItem
	}
	public void updateBasket() {
		// TODO - implement ShoppingBasket.updateBasket
	}
	public void deleteItem() {
		// TODO - implement ShoppingBasket.deleteItem
	}
	public void createFoodLineItem() {
		// TODO - implement ShoppingBasket.createFoodLineItem
	}
}
public class FoodLineItem {
	private int quantity;
	private double price;
	private int productID;
	private String productDescription;
```

```
        public void calcPriceForQuantity() {
                // TODO - implement FoodLineItem.calcPriceForQuantity
                }
}
public class FoodProduct {
        private int productID;
        private String name;
        private String description;
        private boolean availability;
        private double price;

        public void returnProductID() {
                // TODO - implement FoodProcuct.returnProductID
        }
}
public class FoodOrder {
        private int orderID;
        private date orderDate;
        private double orderTotal;

        public void createOrderStatus(orderStatus status) {
                // TODO - implement FoodOrder.createOrderStatus
        }
        public void createReceipt() {
                // TODO - implement FoodOrder.createReceipt
        }
        public void calcTotal() {
```

```
            // TODO - implement FoodOrder.calcTotal
        }
}
public class OrderStatus {
        private boolean inProgress;
        private boolean completed;
        private boolean delivered;
        private boolean canceled;

        public void updateOrderStatus() {
            // TODO - implement OrderStatus.updateOrderStatus
        }
}
public class Payment {
        private int paymentID;
        private date dueDate;
        private double paymentTotal;
        private boolean isPaid;
        private String paymentType;

        public void sendAuthorizationRequest() {
            // TODO - implement Payment.sendAuthorizationRequest
        }
}
```

4. Artefacts of agile scrum methodology

4.1. User stories

User stories are high level definitions of client requirements and they serve as building blocks in the Product Backlog. These stories are written from the user's point of view and represent the lowest level of functional decomposition.

Typically a user story is written in a **role-functionality-benefit format**, where the role represents an actual human who interacts with the system, functionality describes the action the user wants to take and benefit outlines a result the user wishes to achieve through the action.

User stories usually have a story ID, a level of importance (priority) and story points assigned to them. Story points will be used the create effort estimates during sprints.

Role, functionality, benefit	Story ID	Priority	Story points
As a user I want to browse the menu of the restaurant so that I can choose my food	S01	High	4
As a user I want to register as a customer so that I can place a food order	S02	High	4
As a user I want to login, so that I can view my orders	S03	High	6
As a user I want to see my user account so that I can update my details	S04	High	6
As a user I want to see the content of my shopping basket so that I can update it	S05	High	5

As a user, I want to check the status of my order so that I know if it's ready	S06	Medium	2
As a user I want to see payment options so that I can choose one	S07	High	4
As a user I want to have cash payment option on collection so that I don't have to pay in advance	S08	High	2
As user I want to pay for my order online using a credit/debit card so that I can process the entire order online	S09	High	6
As a user I want to use promotional codes to get discount from the price	S10	Medium	2
As a staff member I want to view the orders the users placed	S011	High	3
As a staff member I want to update the status of orders	S12	Medium	4
As a system admin I want to manage the menu so that I can add, change and delete a food item	S13	High	4
As a system admin I want to manage customers so that I can add, update or delete a customers' details	S14	High	8
As a system admin I want to view transactions to that I can see which orders have been paid for	S15	High	6

4.2. Backlogs

Agile scrum methodology uses 2 basic types of backlogs: **Product Backlog** and **sprint backlogs**.

The Product Backlog is an overall, prioritized list of all features a proposed software system needs to include, in a form of Product Backlog Items (PBIs). PBIs are often written in a form of a user story.

This document can include all functional, non-functional and technical requirements as well as knowledge acquisition methods.

The Product Backlog is created during the project kickoff meeting and is the responsibility of the product owner and the scrum master.

Sprint backlogs outline the PBIs that the development team wants to complete during a given sprint. PBIs are usually broken down into smaller tasks (sprint tasks).

Sprints tasks specify a unit of work to be completed by one team member and typically represent a workload of 4-16 hours.

Sprints backlogs are created during the sprint planning meetings by the product owner, scrum master and team members.

Product Backlog

Priority	PBI	Related user story	Backlog ID	Story points	Effort estimate (*2.5 hours)
1	Create Database	As a system admin I want to manage customers so that I can add, update or delete customers' details	S14	8	20
2	Create menu page	As a user I want to browse the menu of the restaurant so that I can choose my food	S01	4	10
3	Create registration page	As a user I want to register as a customer so that I can place a food order	S02	4	10
4	Create login page	As a user I want to login, so that I can view my orders	S03	6	15
5	Create User Accounts page	As a user I want to see my user account so that I can update my details	S04	6	15
6	Create Shopping	As a user I want to see the content of my shopping	S05	5	12.5

	Basket	basket so that I can update it			
7	Create order status	As a user, I want to check the status of my order so that I know if it's ready	S06	2	5
8	Create payment options	As a user I want to see payment options so that I can choose one	S07	4	10
9	Create cash payment	As a user I want to have cash payment option on collection so that I don't have to pay in advance	S08	2	5
10	Create card payment	As user I want to pay for my order online using a credit/debit card so that I can process the entire order online	S09	6	15
11	Create redeem voucher	As a user I want to use promotional code so that I can get discount from the price	S10	2	5
12	Create view orders	As a staff member I want to view the orders the users	S11	3	7.5

		placed so that I can complete them			
13	Create manage order status	As a staff member I want to update the status of orders so that I can inform customers of order status	S12	4	10
14	Create manage menu	As a system admin I want to manage the menu so that I can add, change and delete a food item	S13	4	10
15	Create view transactions	As a system admin I want to view transactions so that I can see which orders have been paid for	S15	5	10

Sprint backlog 1

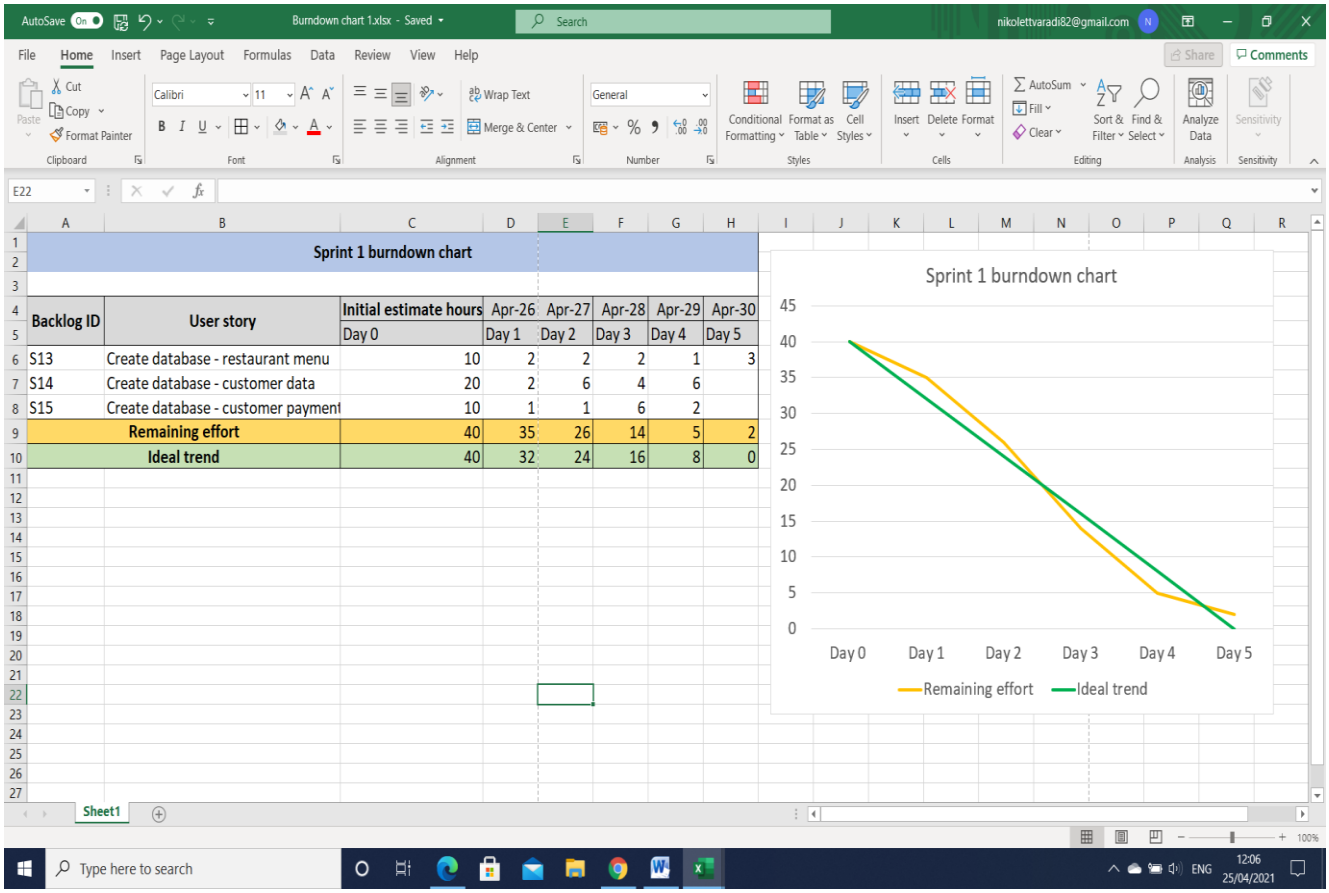
Priority	PBI and task breakdown	Backlog ID	Effort estimate (hours)
1	**Create Database**	S14	20
	Design CustomerData table		5
	Design CustomerOrders table		5
	Create CustomerData table		5
	Create CustomerOrders table		5
2	**Create Database**	S13	10
	Design RestaurantMenu table		5
	Create ResturantMenu table		5
3	**Create Database**	S15	10
	Design CustomerPayments table		5
	Create CustomerPayments table		5

Sprint backlog 2

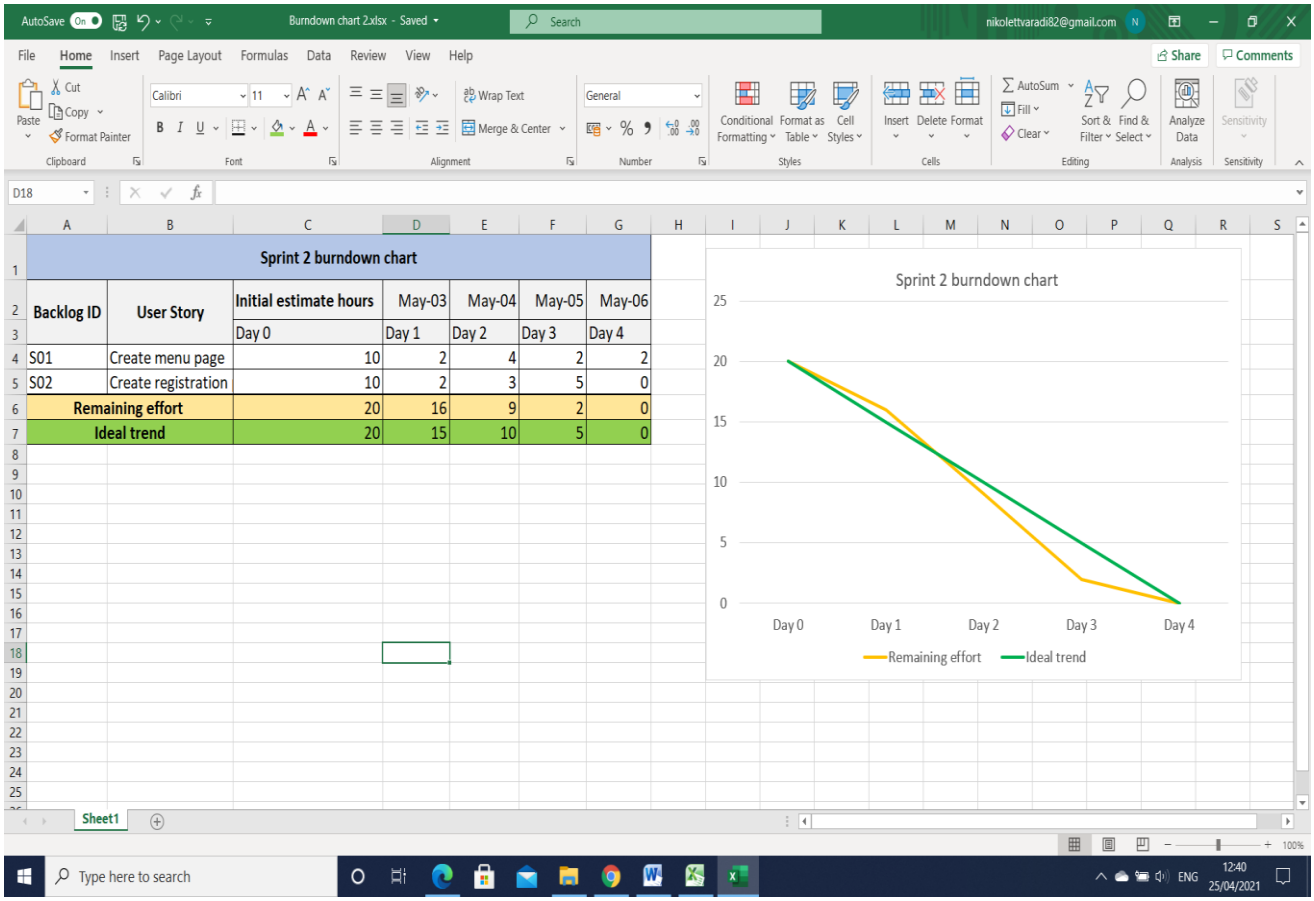
Priority	PBI and task breakdown	Backlog ID	Effort estimate (hours)
4	**Create menu page**	S01	10
	Develop HTML		2
	Create CSS styling		3
	Write JavaScript code for functionality		5
5	**Create registration page**	S02	10
	Create HTML		1
	Create Registration Form Components		2
	Create CSS styling		3
	Write JavaScript code for functionality		4

4.3. Burndown charts

The first burndown chart shows the progress of database creation, 40 hours of workload, during 5 working days:



The second burndown chart illustrates the creation of restaurant menu and registration page development, 20 hours workload in 4 days:



Sprint 2 burndown chart						
Backlog ID	User Story	Initial estimate hours	May-03	May-04	May-05	May-06
		Day 0	Day 1	Day 2	Day 3	Day 4
S01	Create menu page	10	2	4	2	2
S02	Create registration	10	2	3	5	0
Remaining effort		20	16	9	2	0
Ideal trend		20	15	10	5	0

5. Testing

5.1. Testing methodology

Testing is the process of running software in order to find errors and can only show the presence of faults.

There are two basic types of testing, component testing and system testing.

Component testing (unit testing) is a process carried out by the developers themselves based on their experience on individual program components.

System testing on the other hand is the testing of groups of components, integrated into a subsystem, usually carried out by a team of independent testers.

Our goals during the testing process could be either **validation *testing***, where we demonstrate that the system meets its requirements; or ***defect testing,*** where the aim is to discover faults and the presence of bugs.

With regards to our project we wish to carry out component testing and defect testing so as to discover program anomalies and bugs.

Our chosen testing methodology is **Test Driven Development**.

This kind of testing is often associated with the practices of Extreme Programming.

In Test Driven Development tests are written prior to coding and just enough code is produced to pass the unit test.

Ideally, testing should be comprehensive, covering all object classes, their attributes, methods and states.

However, in practice exhaustive testing is not possible. Instead, testing policies highlight the most important features to be tested.

5.2. Test scenarios, test cases and description of tests

Scenario: Check add address functionality, “Customer” class							
Test case ID	**Description**	**Precondition**	**Test data**	**Expected result**	**Post condition**	**Actual result**	**Status**
T01	Enter a valid address	Customer must be logged in	<Valid address>	Address successfully added	Address added message shown	Address added successfully	Pass
T02	Enter invalid address	Customer must be logged in	<Invalid address>	Address not added	Address invalid message shown	Address not added	Pass
Scenario: Check empty shopping basket functionality, “Customer” class							
Test case ID	**Description**	**Precondition**	**Test data**	**Expected result**	**Post condition**	**Actual result**	**Status**
T03	Click “Empty Basket” button	There must be items already added into the basket	<Items in basket>	Items deleted from shopping basket	Shopping basket empty message shown	Items deleted from shopping basket	Pass
T04	Click “Empty Basket” button	Shopping basket is initially empty	<None>	No deletion carried out	Shopping basket empty message shown	No deletion, shopping basket empty message shown	Pass
Scenario: Check add item functionality, “ShoppingBasket” class							
Test case ID	**Description**	**Precondition**	**Test data**	**Expected result**	**Post condition**	**Actual result**	**Status**
T05	Click on “Add item” button under food item	There must be a food item chosen by customer	<Food item>	Item successfully added to basket	Item added to basket message shown	Item successfully added to basket	Pass
Scenario: Check calculate price for quantity functionality, “FoodLineItem” class							
Test case ID	**Description**	**Precondition**	**Test data**	**Expected result**	**Post condition**	**Actual result**	**Status**
T06	Click on calculate “Basket Total” button	There must be items in the basket	<Content of basket>	Grand total value of shopping basket calculated	Grand total displayed to customer	Grand total calculated, displayed	Pass

Scenario: Check send authorization request functionality, “Payment” class							
Test case ID	**Description**	**Precondition**	**Test data**	**Expected result**	**Post condition**	**Actual result**	**Status**
T07	Click on “Process payment” button	Total for basket is successfully calculated	<Total amount to pay>	Card payment processed successfully	“Payment successful” message displayed	Payment processes, appropriate message displayed	Pass
Scenario: Check create order status functionality, “FoodOrder” class							
Test case ID	**Description**	**Precondition**	**Test data**	**Expected result**	**Post condition**	**Actual result**	**Status**
T08	Click on “Order status” button	Order is successfully paid for	<Payment confirmation message>	Status of order is created and displayed	Appropriate message is displayed to customer: “In progress” or “Completed”	No message displayed	Failed
Scenario: Check update order status functionality, “OrderStatus” class							
Test case ID	**Description**	**Precondition**	**Test data**	**Expected result**	**Post condition**	**Actual result**	**Status**
T09	Click on dropdown menu containing status options	Customer order is successfully received and paid for	<Status options>	Status of order successfully changed	“Order status changed successfully” message appears on screen	No message appears, no update carried out	Failed

6. References

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