CSU22041 UML Report

Table of Contents

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1. Introduction

1.1 Background Research

One of the first tasks we agreed upon in our first group meeting was to research our domain ‘Bord Gáis Energy’. We decided to all do individual research and discuss later what we could work with. A few examples of systems that we debated about: ‘Electricity Supply System’, ‘Gas Supply System’ and ‘Bord Gáis Website’. Our chosen system was the Website as some of the advantages were that there were a lot of potential clases/cases etc. In addition to that was it’s versatility to suit our information models.

After choosing our primary focus we researched the Bord Gáis Energy Website, checking how to register an account, the different services depending on what type of customer you were and in general explored other parts of the website. Each of us added our own observations and ideas into a shared file between us, so that we could combine our findings into groupable data.

1.2 Communication and Software

Group Communication: Another goal met in our initial meeting was establishing a means of contact between us. We quickly ran through our options and settled on 'Facebook Messenger' as were all active and comfortable on the platform and thus could respond to any of our individual queries quickly.

Cloud Platform: We also decided to store all of our findings, sources, scripts and links to all of the information models into a 'Google Doc' on 'Google Drive'. Our reasons for using this as our cloud space mirrors those of our Group Communication. As in that we were familiar with the software and satisfied with the tools it could provide us with.

Software used for Models: The software we employed was 'Lucidchart'. We choose this particular software because of the following points.

- Official tutorials were available online showing how to use the tools provided to implement our models
- Tools and services were free and powerful, in addition very accessible.
- Gave us a lot of freedom and flexibility on how we wanted our models to look.

We agreed that these merits outweighed any of our other options.

1.3 Work Distribution

A crucial thing that we wanted to have in place from the very beginning was a clear and fair delegation of tasks and responsibilities. To do this we did two things.

1. We choose not to elect a group leader so that all of our members inputs were equal and fair
2. That we meet up in a call to check each other's progress each week and to decide next week's goals and who should take on that responsibility.

We felt that by doing this in such a transparent way, we could eliminate any feelings of injustice and unfairness. Down below is the workload we distributed amongst ourselves across the weeks.

Week 1: Our first meet up. We got to know each other, set up communications and focused our research on a particular aspect of our domain.

Member	Task(s)
Luke Seckerson	Background Research
Brian Sharkey	Research (focus on classes)
April Sheeran	Set up Google Drive, Research
Prathamesh Sai	Research (focus on cases)
Tom Roberts	Background Research

Week 2: We met up at the same time and asked ourselves who was comfortable with which Information Model and assigned the tasks accordingly.

Member	Task(s)
Luke Seckerson	Start UML class diagram
Brian Sharkey	Start Activity Diagram #2
April Sheeran	UML case diagram
Prathamesh Sai	Start Activity Diagram #1
Tom Roberts	Background Research

Week 3: We met up and checked on each other's progress. We discussed issues we found and potential solutions.

Member	Task(s)
Luke Seckerson	Finish UML Class
Brain Sharkey	Refined Activity diagram
April Sheeran	Writing up documentation
Prathamesh Sai	Finish Activity Diagram
Tom Roberts	Finish Ethics Canvas

Week 4: This was the week of the deadline for our recording. After looking through our different models. We decided on our UML Class diagram as we felt it was fleshed out and complete.

Member	Task(s)
Luke Seckerson	Writing Script, Recorded Intro+Outro
Brian Sharkey	Proofreading, Recorded Research Created the Slides for Presentation
April Sheeran	Writing Script, Recorded Design Choices
Prathamesh Sai	Editing Recordings, Recorded Strengths
Tom Roberts	Recorded Weaknesses. Finish Ethics Canvas

Week 5: This is the week of the deadline for this report. We thought it best for the report if we each did the sections we focused on during the project.

Member	Task(s)
Luke Seckerson	Writing Report (1, 4, 7)
Brian Sharkey	Writing Report (2)
April Sheeran	Writing Report (3)
Prathamesh Sai	Writing Report (6)
Tom Roberts	Writing report (5)

2. Ethics Canvas

Our Ethics Canvas identifies all of the relevant stakeholders that would be affected by our system and describes how their **behavior and relationships** with each other may change if our system was to ever be implemented.

The **macro impacts** that would affect collectives and social structures are also defined within the ethics canvas. The negative impacts in the event of a product or service failure and problematic uses of resources are also listed within our ethics canvas. We've also addressed what could be done to mitigate some of the problems brought within the ethics canvas and improve our model.

Ethics Canvas, Group: 18 Title: Bord Gais Energy Date: 5/11/20

Individuals Affected:

Home Owners

Business Owners

Business Employees

Repairmen (Qualified Technicians)

Behaviour:

Increased use of electricity or gas

Accessible energy leads to an increased use of that energy. Which in turn leads into causing more greenhouse gases.

More reliance on computers/smartphones and data services

Relations:

Users seek less face to face contact

Difficult for potential customers with no internet access

What can we do?:

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Focus on sustainability and reducing carbon footprint.

Be transparent about how data is stored and managed.

Instead of employing qualified technicians full time, employ Bord Gais approved freelance technicians in the local area of the repair request on a repair to repair basis.

Worldviews:

Use of fossil fuel

Comfort at any time of day (light and heat)

Working hours.

Group Conflicts:

-

Automated payment and customer support systems could put employees out of work.

The local freelance qualified technicians may lose work due to the system distributing repair requests to those employed by Bord Gais.

Groups affected:

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Other energy supplying companies

Advertisers using cookies on Bord Gais website.

Companies using Rewards

Product or Service Failure:

Product Failure such as a domestic boiler malfunction can lead to the house being without hot water and/or water damages. .

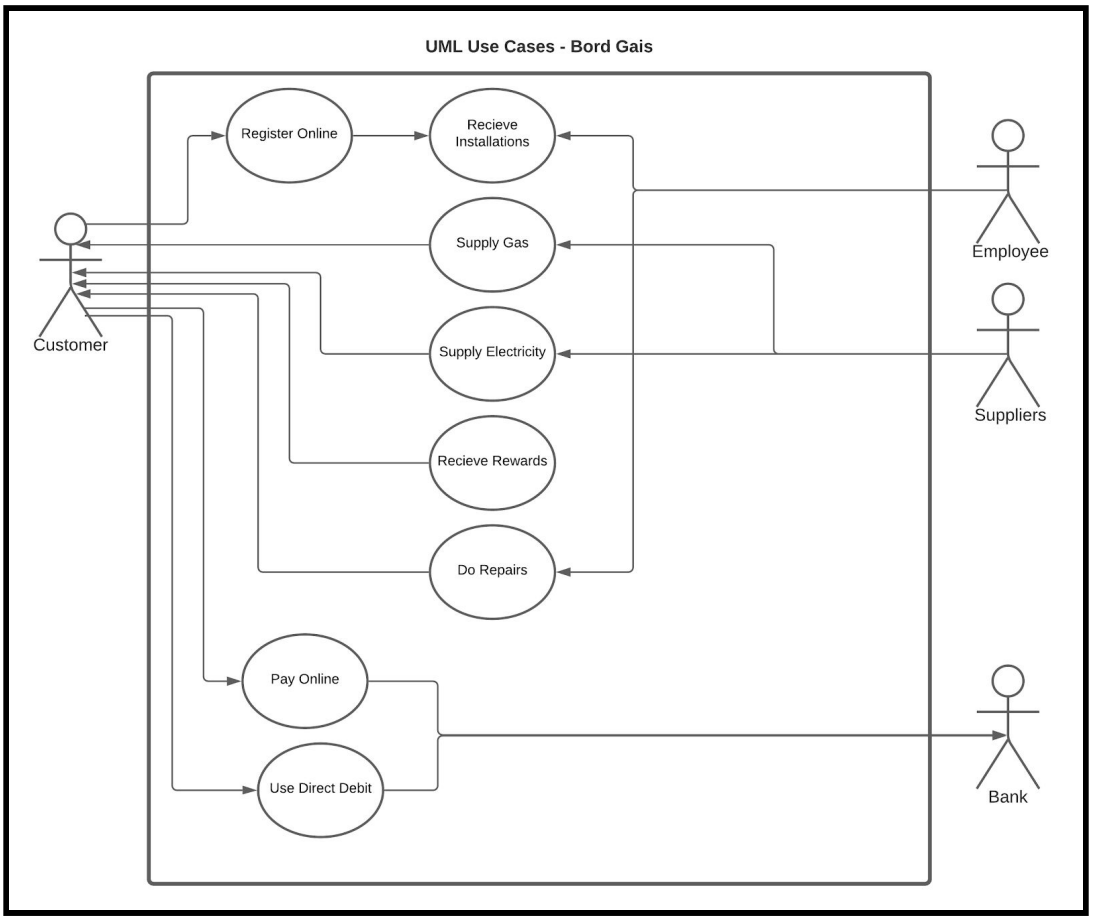
If the failure is unknown, the customer may be subject to penalties due to late payments

Data breach might leak personal information such as bank details.

Problematic Use of Resources:

Global warming
Gas causes pollution to the atmosphere (nitrogen oxides - NOx)
Using finite resources like natural gas is not a sustainable energy source
Methane released into the air

UML Use Cases



Use Case descriptions

Name: Register Online

Participating actor: Customer

Entry Conditions:

- Customer goes online to website
- Customer has correct details

Exit condition:

- Customer has an online account

Normal Scenario:

1. Customer inputs details
2. Customer chooses plan
3. Customer chooses payment options
4. Customer may join rewards Club
5. Customer has created online account

Error Scenario:

- Customer does not have correct details
- Customer does not have ability to pay
- Online account cannot be created

Name: Receive Installations

Participating actors: Customer, Employee

Entry condition:

- Customer has online account
- Customer needs an appliance installed

Exit Condition:

- Appliance has been installed

Normal Scenario:

1. Customer requests an installation
2. Customer selects a suitable time
3. Employee is sent to home
4. Employee carries out installations
5. Installation is completed

Error Scenario:

- Appliance is wrong or incompatible
- Correct appliance is installed

Name: Supply Gas
Participating Actors: Suppliers, Customer
Entry Condition:
- Customer has gas plan
- Supplier has gas

Exit Condition:
- Customer has been supplied with gas

Normal Scenario:
1. Supplier supplies gas to customer
2. Customer uses gas
3. Meter counts gas usage

Error Scenario:
- Issue in gas flow gas pipes fixed

Name: Supply Electricity
Participating Actors: Suppliers, Customer
Entry Condition:
- Customer has electricity plan
- Supplier has electricity

Exit Condition:
- Customer has been supplied with electricity

Normal Scenario:
1. Supplier supplies electricity to customer
2. Customer uses electricity
3. Meter counts electricity usage

Error Scenario:
- Issue with supply Electricity wires fixed

Name: Receive Rewards
Participating Actors: Customer
Entry Condition:
- Customer is a customer of Bord Gáis
- Customer has joined rewards Club

Exit Condition:
- Customer has received a reward

Normal Scenario:
1. Customer logs into online account
2. Customer chooses reward
3. Reward is given to Customer

Error Scenario:
- Reward is unavailable or error occurs
- Customer reloads page
- Customer contacts customer services

Name: Do Repairs
Participating Actors: Customer, Employee
Entry Condition:
- Customer requires repairs

Exit Condition:
- repairs are completed

Normal Scenario:
1. Customer requests repairs
2. Customer selects suitable time
3. Employee is sent to home
4. Employee carries out repairs

Error Scenario:
- Repairs cannot be carried out
- New appliance is installed

Name: Pay Online **Participating Actors:** Customer, Bank **Entry Condition:** ● Customer selected online payment plan ● Customer has received bill ● Customer has sufficient money to pay bill **Exit Condition:** ● Bill is paid **Normal Scenario:** 1. Customer logs into online account 2. Customer makes payment on bill 3. Bank takes money from Customer account **Error Scenario:** ● Insufficient funds to pay ● Customer puts more money in bank	**Name:** Use Direct debit **Participating Actors:** Customer, Bank **Entry Condition:** ● Customer selected direct debit payment plan **Exit Condition:** ● Bill is paid **Normal Scenario:** 1. Bill is issued to Customer 2. Wait for 14 days 3. Total amount on bill is debited from Bank **Error Scenario:** ● Insufficient funds to pay ● Customer puts more money in bank

Above is the use case diagram to describe our system. It clearly shows the **scope of the system**, the tasks it can perform and how the customer and other actors interact with the system. It is clear and concise and shows the **functionality of the system** without being crowded and difficult to follow.

We chose these cases because we deemed them as the **essential cases** in the system. Customers registering, supplying gas or electricity and carrying out installations/repairs are all normal day to day activities of Bord Gáis.

4. UML Class Diagram

4.1 Introduction

As mentioned previously in our presentation, we brainstormed several different ideas of how our UML class diagram should look like. We eventually settled on focusing on the Customer and how they would interact with the Bord Gáis Website as a whole.

4.2 Design Choices

- To realise our idea, we made some design decisions to put further emphasis on what we wanted to focus on. For example we had 3 customer classes, detailed with many associations. In addition we put emphasis on these classes by emboldening them and placing them in the centre of the model.

- Furthermore we split the customer class into 2 sub-classes, giving them more detail and attributes. This was done at the cost of some other potential classes such as the different sized Businesses (4.3). To compensate for these cut classes we designed a class (Business Tariffs) that handles all the different rates a business would have. We also allowed the Business Client 'flexible' attributes to handle different sizes.

- We also let the association classes be in dotted lines instead of solid lines, the idea behind that was to vary the look of the model as a whole to make it a little more appealing and interesting since the use of colours was limited.

- The constraint OR is used and the reason for that is to handle all possible cases of the domestic user. In the case that they do not have an energy plan neither tariff class applies to them (0/false). If they do have an energy plan then they'll have that respective tariff class apply to them (10/true). And if they have a 'duel fuel plan' they'll have both tariffs classes applied to them. (11/true).

4.3 Potential and Cut Classes

We felt that we could only add so many classes before the focus on our customer was lost. In addition, due to imposed restrictions such as only having so many sub-classes and aggregations we needed to cut some content that could've given the model more depth. For example some of the following were considered…

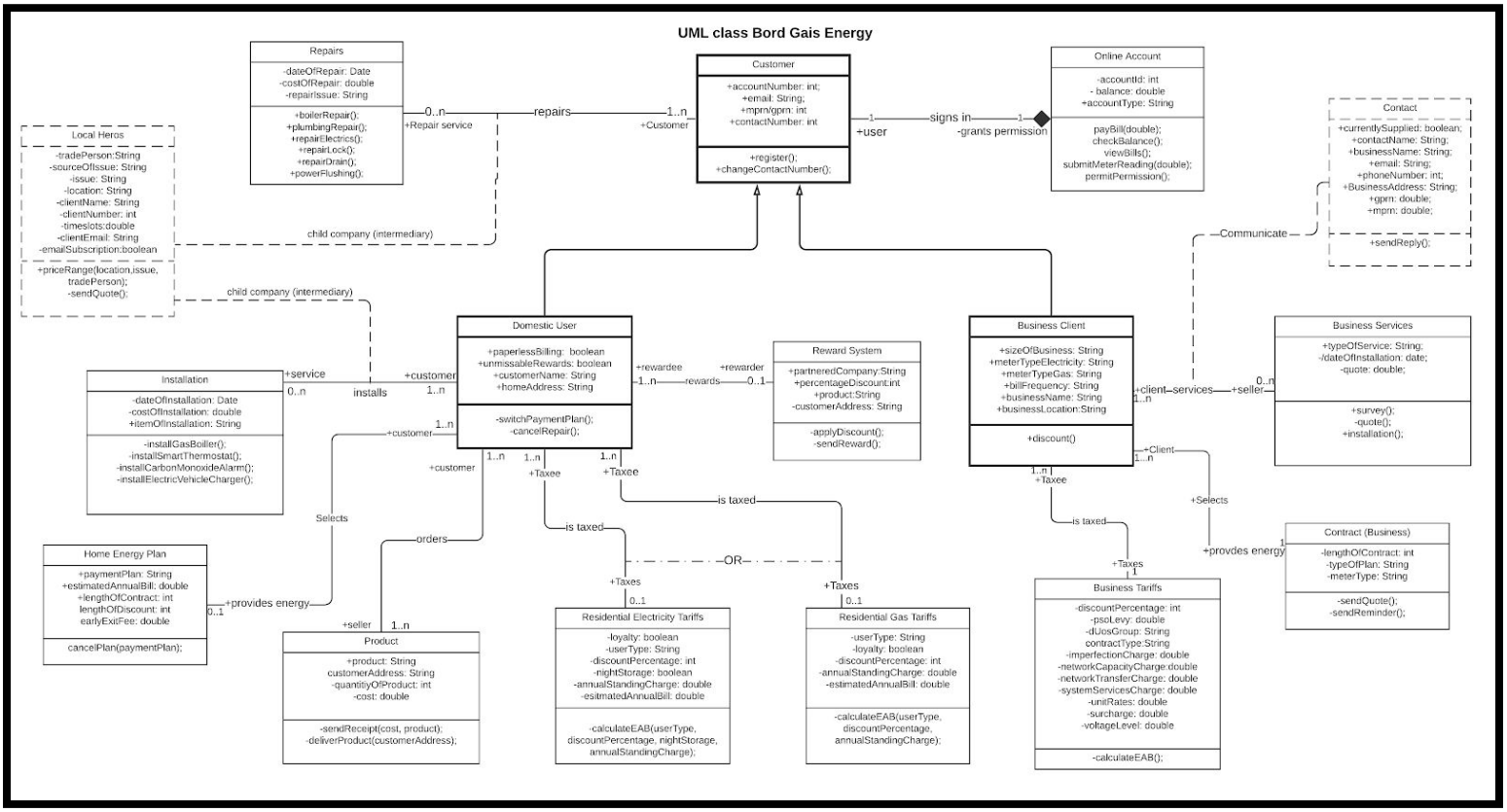
Small/Medium/Large Business: When researching the website we noted that different rates apply to different sized businesses. So one of our very first ideas was to have Business Client (subclass of Customer) to split off into those 3 subclasses. However due to our constraint of having a limited number of sub-classes allowed. We chose to keep the 2 Customer subclasses to keep in line with the initial plan.

Hive: This was going to be another association class for smart products. We initially thought it was going to mirror the Local Heros class. One crucial difference is that Local Heroes is a child company of Bord Gáis and can be considered apart of that 'umberalle' in a broad sense. However we couldn't find any direct association between Hive or Bord Gáis on either website. Given that some smart products could be ordered from Bord Gáis directly we decided to cut the Hive class to be safe.

Business Tariffs (Attributes): This class made it into the final draft however many of the attributes did not. The original list had over 20 attributes, obviously not feasible to put them into a single class. The reason for the large number was the nature of the class. As in that many taxes, discounts and different rates apply to businesses. We had trouble determining which attributes held more weight than others. So we decided to cut all of the attributes like standing charges or levies that stayed the same year to year. We kept rates that varied, taxes imposed based on circumstance and discounts applied on conditions. This was because we felt that the remaining charges would be unique to that Business Client.

4.4 Implementation

The diagram below shows our final draft. Unfortunately there are no copies of earlier drafts (more in 4.5) A link to the UML class diagram on the software we created it on is available in **sources and references (7.3).**



4.5 Reflections

Given that this was our first project, there were many things in hindsight that could have been immensely beneficial to us now. For example…

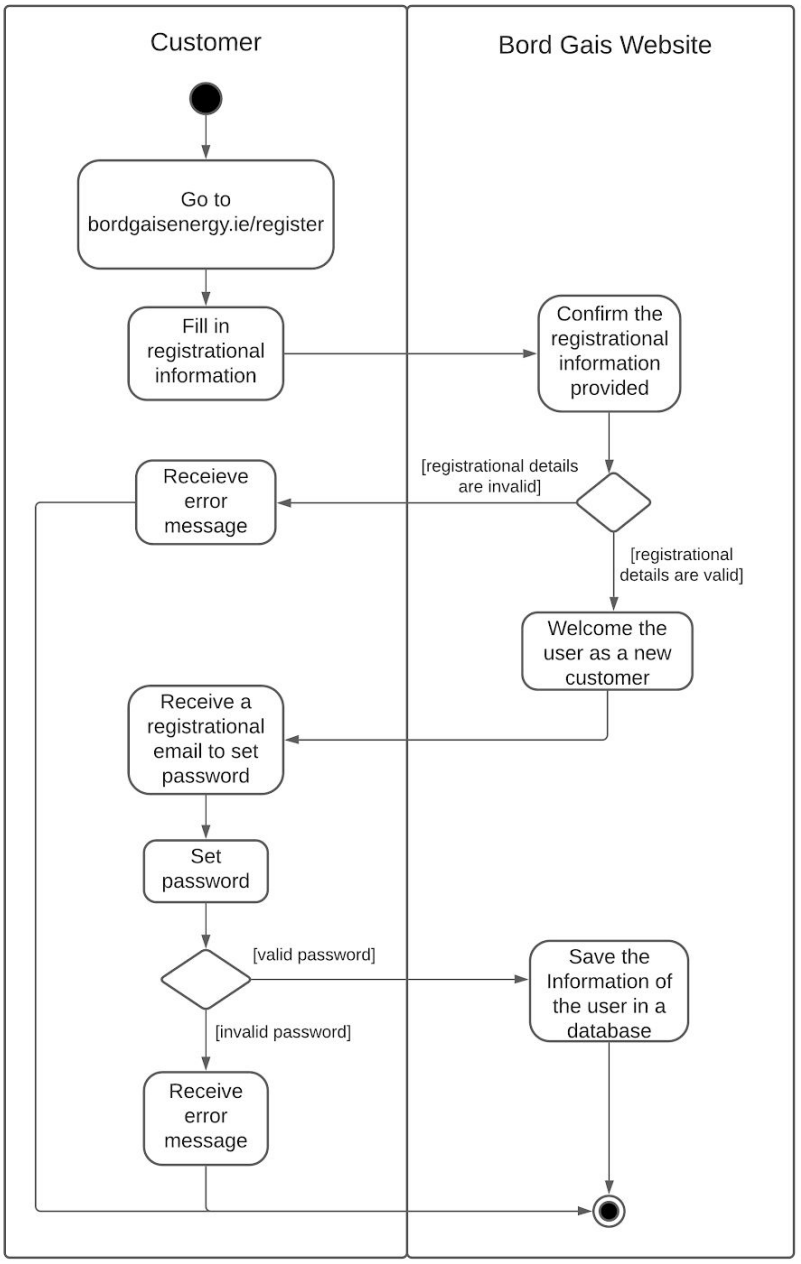
Earlier Drafts: Keeping earlier drafts would have added more to this report and would have better aided in the explanation of the development process and design choices.

Time management: We now have a better idea on the length of time needed to be spent on these models and hence can plan more efficiently in the future.

Design Choice: The initial idea to focus on the customer and their interaction with the website may have been flawed. As it constrained us to almost all the classes being from the 3 customers giving us trouble in terms of space of the model.

<u>UML Activity Diagrams</u>

Activity Diagram for the use case "Register Online"



Activity Diagram Description

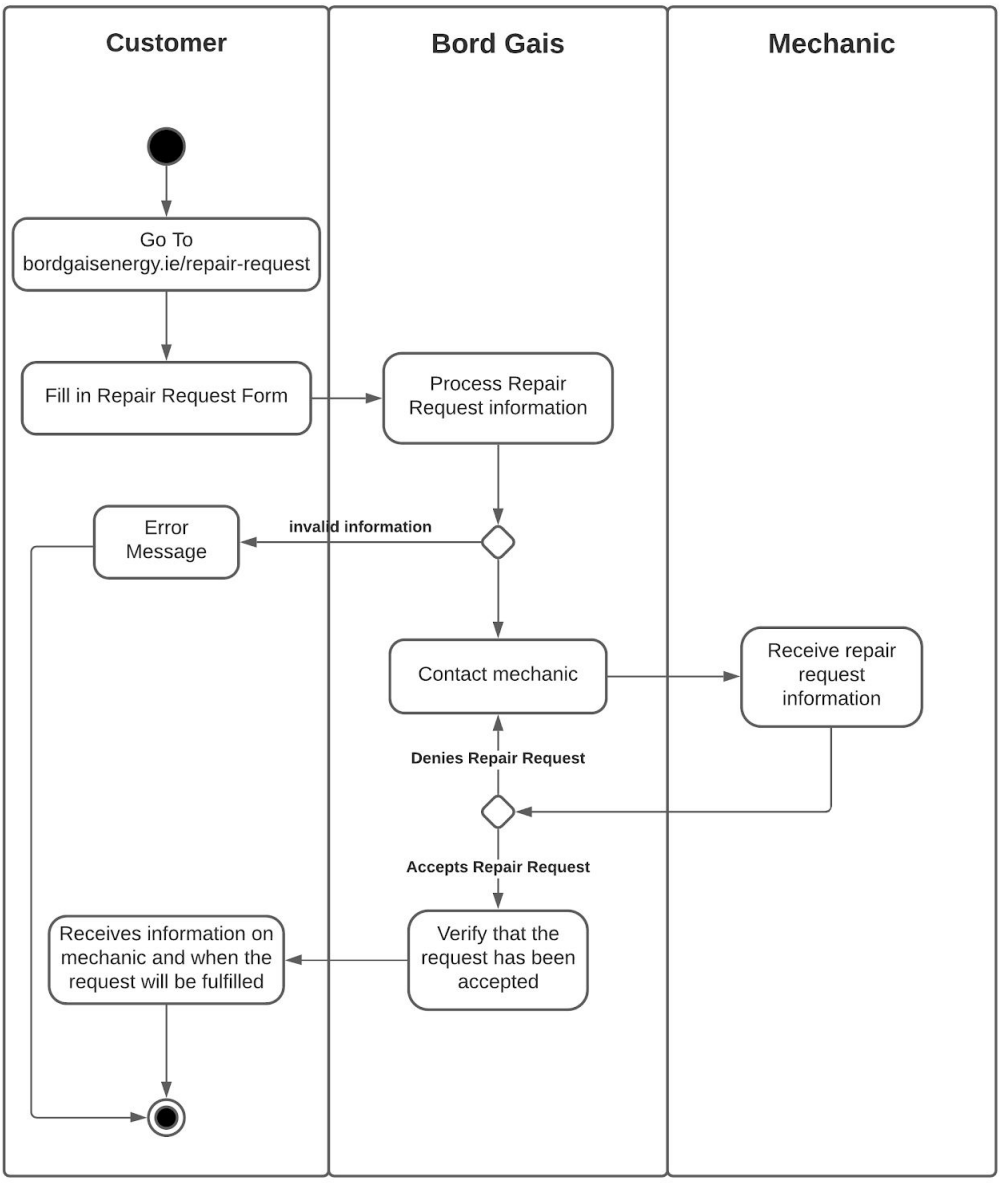
Title: Registering Online with Bord Gáis
Swimlanes: New upcoming customer, Bord Gáis Website
Summary: This activity diagram displays the workflow of the process of registering with Bord Gáis as a new customer.

Creation Date: 27/10/20 **Date of Update:** 29/10/20

Preconditions:

- Must be a new customer to register

Activity Diagram for the use case "Repair Request"



Activity Diagram Description

Title: Repair Request
Swimlanes: Existing Customer, Bord Gáis Database, Mechanic employed by Bord Gáis.
Summary: This activity diagram describes the workflow of an existing customer requesting repairs through Bord Gáis.

Creation Date: 28/10/20 **Date of Update:** 28/10/20

Preconditions:

- Must be an existing customer.
- The customer must have a plan that includes repair requests.

6. Strengths and Weaknesses of our System

6.1 Strengths

Our system is very **detailed** owing to the fact that we did extended research beforehand. During every step of development, we ensured that we thought of all possible scenarios, to make sure that we started off with a good foundation; this was especially evident in our UML Class diagram. Afterwards, we condensed our initial ideas to make it compact but simple.

This **simplicity** was often a key point we brought up in our conversations. If you view any of our diagrams for our system, it is evident that we constructed each diagram in the most simplistic manner possible. This was done purposefully, as we found out early on that convoluted diagrams were not going to be effective.

Thus, whilst being effective, our system was also developed with all possible implications in mind. We ensured that we wrote down the ethical implications of our system during every step of development; our ethics canvas was a great medium to do this in. Therefore, our system is **well thought out**, as it was built with a wide scope in mind.

6.2 Weaknesses

Although we tried to be detailed in our system, this can potentially come off as complicated. We tried our best to implement as many preventative measures as we could to make our system as comprehensive as possible. However, some parts of our system may come off as complex because of **too much information** depending on the reader.

Another potential weakness of our system could be the fact that some things may appear **too simple**, which may lead to further questions. This is not necessarily a bad thing, as it allows room for more understanding. However, the implications of the simplicity in our system effect understandability.

These two problems were unavoidable because they vary depending on the reader. Some people may say that these problems exist, and some may not. However, it was important that we brought up these issues in our conversations to ensure that we can provide the best information model possible.

7. Reflections and Sources

7.1 Areas we could improve upon

Over the course of these few weeks there were many instances where we were unable to fully flesh out our information models due to time constraints. Perhaps a stricter deadline should have been agreed upon.

Additionally we felt that our experience in creating information models was lacking. The issue of overcomplicating the diagrams cropped up at times. In the future we should try to draw a rough or a practice model to give us a better idea on how it would look like and squash any design flaws then and there. It will help us save time which we could use it to advance our projects further.

Design wise, we are pleased with what we have achieved. However there were times where members weren't entirely sure about a particular aspect of their model. Due to our delegation of tasks (1.3) most members were entirely occupied with their own diagrams to learn about the issue and lend a hand. We could benefit from more time spent keeping up to date with everyone's progress.

7.2 Unavoidable Issues

As reported in 6.1, we felt that we could improve in some areas. However there are some challenges encountered that happened due to circumstances or unavoidable conditions. Some of these were…

- **Communication Issues:** Although we were satisfied with all the software that we set up. Communicating purely online didn't suit our style of work, as we benefit more from in-person meetings which couldn't happen due to Covid-19

- **Stress:** The new lockdown has lended itself to trouble focusing on the project. Coupled with several other assignments in a short period of time. We agreed that it may have caused a decrease in quality of the project overall.

- **Circumstance:** One of our members had trouble connecting to blackboard for a short period and thus couldn't access the notes of the various projects.

7.3 Sources and References

The following are the various links and references for this project.

- Ethics Canvas
- UML Use Cases
- UML Class Diagram (4.4) information model
- UML Activity Diagram #1
- UML Activity Diagram #2
- Document explaining different taxes for Business Electricity Customers (2020)
- Bord Gáis Website