Project Description

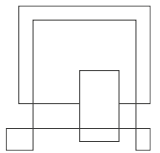Semester Project: Heterogeneous System for *The Happy Pig* company's time logging system

Supervisors:
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Students:
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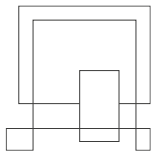Lyons Leviticus – 275171
Marcel Notenboom – 279963

Third Semester SoftwareEngineering

30th September 2019

Table of content

30th September 2019

Background Description

A rising trend of vegetarianism and a general reduction of consumption of meat in modern diets is the main reason for the growth of both the number and size of the companies producing meat substitutes.(Mintel, 2018).

It is estimated that the value of the global meat substitutes market is expected to increase substantially in the coming years from approximately USD 4.6 bn in 2018(Marketline, 2019)
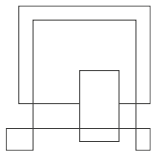
As a part of this growing industry, **The Happy Pig** is a Danish based producer of meat-free sausages. Founded in 2015 with an initial workforce of 10 employees, it has grown year on year and now has plants across multiple countries (Lithuania, Germany).

In Denmark the company manages a total number of around 100 employees including, production employees that consists of approximately 70 factory workers who deal with the manufacture of the products as well as the production management. The rest of the employees are spread across the Management, HR, Research and Design and, Sales and Marketing Department.

At the facility, the majority of the employees (production) work **fixed hours** (based on 3 shift/day system) some of them working **flexible hours** (engineering teams) with both **full time** and **part time** employees.

Some of the employees (mostly the Sales Team) **work remotely**, with again fixed and flexible hours as well as full time and part time workers. As a result of this growing workforce the company has found it increasingly difficult to manage and keep track of the hours worked by its staff.

At present, employees that work at the facility with fixed and flexible hours register their hours via weekly timesheets, which then need to be checked and authorised by a manager and finally submitted to the Accounting Department for inclusion on the payroll.

The employees that work remotely (Sales Team) have to send a weekly e-mail to their Supervisors, that will make their weekly timesheets and submit them to the Accounting with specification of hours per day worked.

This method is inefficient and costly as it often results in incorrect data being input to the payroll. This is predominantly down to human error, be it on the part of the Accounting Department misreading a timesheet, an employee and /or their manager incorrectly remembering and recording the actual hours worked and also that of time theft, whereby employees deliberately falsify hours in order to gain payment for work they haven't done.

These problems have led the company to look for alternative methods that are available on the market for time logging.

The traditional punch card clock systems where employees each have individual cards that they use to stamp time and date for logging in and out, are not a viable option anymore. It is inefficient and difficult to maintain, additionally it creates space for errors since the staff has to manually input data that will be retrieved later on. In a 2017 survey of 500 small business owners, roughly 80 percent of the businesses surveyed admitted they regularly have to make corrections before they can run payroll.(Soco Tax, 2019)

Moreover, they prone to abuse from dishonest employees who can commit time theft by what is commonly known as 'buddy punching'. This is the widespread practise of using a colleague's card to 'punch in' for them when they are not present.(TSheets, 2017).

A digitally based system can decrease the human error cases as well as decrease the time spent for punching in the cards, at the same time increasing efficiency by having a centralized system.

In regards to preventing and/or decreasing the cases of time theft, there are different techniques that can be applied, but it is still down to the Management of the company to ensure a proper discipline in the company.

Currently there are different, systems that use biometric authentication such as biometric terminals, proximity terminals, web-based clocking, mobile clocking, etc.
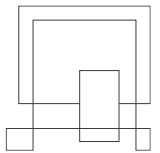
Biometric terminals do have the advantage of practically eliminating the problem of time theft via buddy punching, on the other hand it usually involves relatively high costs for the equipment particularly iris and retina scanners.

Fingerprint authentication systems at the lower end of the market can be purchased and set up relatively cheaply, however performance can be a problem. Environmental factors can play a major role in the accuracy of these systems, which can lead to one of two errors, A false reject (FR) error is the rejection of an authorized person trying to access the system. A false accept (FA) error is the acceptance of a person who is not in fact who he or she claims to be.(sestek., 2019).In addition, regular maintenance of biometric systems is also important to ensure optimum performance, that add up to the costs of the system.

In regard to other systems, it is down to company's needs to determine which system will fit best their situation and will improve the current state.

The problems faced by **The Happy Pig** company are certainly not unique and the process of developing a solution to this multifaceted problem through an exploration of required technologies and techniques should impart a knowledge onto the team that can be adapted and utilised across a wide variety of possible future scenarios.
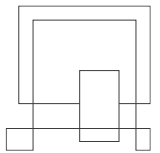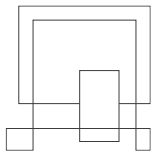
Problem Statement

Main problem

The time logging system used by The Happy Pig company is inefficient, prone to error, hard to store/access/maintain and easy to cheat, thus leading to a variety of negative outcomes for the company.

Sub-problems

- What are the different access levels for the information to which type of data?
- How should different type of workers (fix vs flexible schedule, facility vs remote location, full-time vs part-time) log their work-time?
- How and where should the information be stored, accessed and retrieved so that it is private and secure?
- Which type of reports or statistics must be created for different end users?
- What information in regard to employees, time and statistics should be stored?
- What are the different types of exceptions and how should the exceptions be handled (e.g. overtime, human error)?
- What measures can be made to prevent and/or identify attempts to cheat the system?
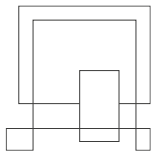
Definition of purpose

The purpose of this project is to provide **The Happy Pig** with an improved time logging system that will focus on the problems that the current system has, thus decreasing the number of issues as well as reducing the likelihood and frequency of erroneous data in their records.

Delimitation

To have a better understanding of the scope of this project, it is necessary to describe what this project will not focus on providing. Below the delimitations for this project will be described:

- The solution will not be for the facilities and/or employee in countries where the company has facilities;
- The solution will not involve any kind of biometric terminals (included but not limited to fingerprint terminals, retina terminal, etc.);
- The solution will not have a mobile application or any kind of mobile clocking;
- The solution will not have a Danish interface (only English);
- The solution will not include any kind of near-field communication technologies;

Methodology

When considering the methodologies and tools used for the software development process it is important to specify that it will be tailored towards the needs and/or size of the team. It will be done to ensure the best outcome of the work input during the project period.
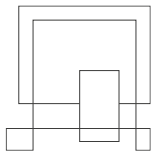
Kanban Software Development Methodology

After considering different options it was decided that the best software development process that will allow the team to operate at its fullest potential is **Kanban Software Development.** (Radigan, 2019)

The main reasons for using this system as the development methodology for this project are:
- A relatively small team consisting of only 3 members which makes it inefficient and hard to take full advantage of ceremonies and artifacts defined by Scrum;
- The flexibility of the Kanban Methodology by having iterations, based on needs rather than fixed size allows the team to work more efficiently and deliver consistently, as well as taking advantage of changing number of hours for a week dedicated to the project;
- Being only 3 people in the team it is easier to communicate and have the overall picture as well as the small details shared between us, in addition the rules defined in the *Section 3. Management* of the *Group Contract* (Appendix A) fit perfectly with Kanban's *No predesigned roles* policy, which rather focuses on having cross-functional teams that auto-manage themselves;
- Even if not related to the project, it is important to understand that the semester project does not have the main focus on the quality of the software (even though its importance shall not be undermined or/and dismissed)the main focus of this project is to ensure that the group members develop new skills and gain new knowledge and having the opportunity to learn a new methodology will facilitate the team to gain experience in this sense;
- As a final reason, the relatively small amount of time for this project (deadline on 20th of December) means that Kanban cadence based on continuous workflow and delivery keeps the teams focused and ready to fit the changing

priorities, which makes it great with a rather small amount of time for a project(Rehkopf, 2019);

When it comes to how the team will operate there are a few points to underline:

- There will be estimations (hours) done based on the proposed time schedule that will be discussed in the next section as well as available time when the product backlog is ready (in its first form);
- *Work in progress* principles will be used to define a limited number of tasks that the team will be working at any given time as well ensuring that each task is completed before starting a new one;
- Meetings will be made to ensure a proper development, it will include: Planning Sessions, Weekly Standups (during the semester and Daily Standups for the last 3 weeks and standing up during the meeting is not a priority), Iteration Reviews (including logging and Retrospective meeting);

The boar *Kanban Cheat Sheet* by **eylean**(Appendix B) will be used as a guideline for how to work with Kanban Methodology, as well as other guidelines.

## The Unified Software Development Process

UP will be used to allow an iterative and incremental development of the software when considering a certain cycle and/or task. It will also be used to define a what a completed task is.

Work Breakdown Structure

WBS will be used for breaking down the items from the Product Backlog into smaller tasks, making them more easily achievable, trackable and sharable between the member of the group based on the needs.

Tools

- **#Slack** – official communication platform;
- **BitBucket**– version control server;
- **SourceTree** – version control interface;
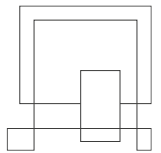
- **Jira Software(server)** – Kanban Methodology organization platform;
- **Intelij IDEA** – Java integrated development environment;
- **Rider/Visual Studio** – C# integrated development environment;
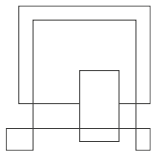- **pgAdmin**– PostgreSQL development and administration platform;
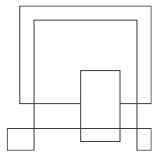
Time schedule

For ensuring a proper development of the project a few milestones are set in place to provide a framework as well as a reference point in the future. The current milestones are a generalized list of achievements that are needed to ensure the successfulness of the project, rather than a development plan for the project.

Milestone (Description)	Deadline (Date)
Pre-inception phase	
Group Formation / Contract	11th of September 2019
Project Proposal	18th of September 2019
Project Description	7th of October 2019
Inception Phase	
User Stories & Requirements	9th of October 2019
Low Activity Period (Autumn Break)	14th – 18th of October 2019
Domain Model & Initial Analysis	23rd of October 2019
Elaboration Phase	
Architecture in place (3 - Tier System)	28th of October 2019
In-Depth Analysis (Diagrams)	6th of November 2019
Security Assignment	27th of November 2019
Construction Phase	
Minimum Viable Product (Inc. basic GUI)	6th of November 2019
Working Product	10th of December 2019
Transition Phase	
Deployment	13th of December 2019
Project Report	16th of December 2019 (Ongoing through the entire project period)
Process Report	18th of December 2019 (Ongoing through the entire project period)
Hand-in	20th of December 2019

Some important facts to consider about the time schedule is that the phases (with the exception of the *Pre-Inception Phase)* are iterative rather than linear. As mentioned in the milestones the Project and Process Report is in continuous development through

Semester Project: Heterogeneous System

VIA University College – Software Engineering 2019

the entire semester which means that in the final period of the time it will be only gathering all the parts together rather than making it from the scratch.

In consideration to the amount of work needed for this project, it will be assessed using the standard data of 27.5 hours/ECTS/student, the courses ECTS value (10 ECTS) and the fact that we are 3 members in the team, the project will make up an approximation of 825+ hours of work needed. (VIA University College, 2019)

The theoretical time schedule for the working on the project, is on Wednesdays (with some exceptions) of each week (~8h/day), plus three full weeks starting from the beginning of the December month (~37h/week). Considering the number of members in the group, it will account for around 625 hours. This will mean that at least 200 extra hours will be needed, which will be split between the members of the group and will consist of individual work.

The main deadline is on the 20th of December with the hand-in of the entire project, even so, there are intermittent milestones that need to be met for the project to be successful.
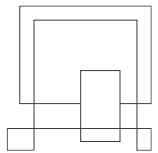
Risk assessment

Below are presented and analyzed risks that are likely to be encountered during the development of the project.

ID	Description	Risk Impact			Prevention Plan	Identifiers	Contingency Plan
		L^1	S^2	P^3			
1	Deviation from the purpose of the project	2	5	10	Internal/External continuous feedback	Negative feedback in regards to the purpose of the project; Significant differences between the development of the project and its initial defined purpose;	Correction of the work that was done so it fits the purpose of the project – DO NOT CONTINUE UNTIL FIXED
8	Employees can access/modify another employees' information	3	5	15	Develop a security/privacy system that will ensure the necessary level of security	Other employees can access/modify restricted (to them) data	Identify where the security measurements fail
2	Not achieving 3-tier architecture	4	5	20	Initial focus on developing the architecture as a backbone for the project; Proper analysis and design	Incapacity of demonstrating the 3-tier architecture in action by the imposed deadline	Consult with supervisors and focus all the manpower towards achieving a working architecture of the system
4	Incapacity of achieving a proof of concept	3	5	15	Achieve the minimal viable product and pilot-test it to demonstrate the feasibility of the project ASAP	An unattainable product that has considerable differences with its purpose and does not address the problem statement	Reassess the project description and apply counter-actions for bringing the project back on track
5	Impossibility of making a connection between the servers/clients of the software	3	4	12	Ensure a connection between the serves/clients as soon as possible	No being able to make servers/clients communicate with each other	Consult with the supervisors to guide the team towards a solution – DO NOT CONTINUE UNTIL FIXED
6	System registers wrong data/time at punch in/out	3	3	9	Ensure the correctness of the input data at all the levels (Client, Server, Database);	The registered data is not in conformity with the reality	Follow backwards at every point where the input is passed and check where it gets wrong
3	Using unappropriated technologies	2	3	6	Making an in-depth analysis and design	Overcomplicated product that underperforms due to misuse of the technologies	Re-analyze the system to identify misused technologies and fix them (use supervisor for assistance)
7	System cannot find a registered employee	3	4	12	Choose an appropriate search algorithm based on how the employee is identified	No results for an employee that is registered	Do the search at different levels to locate the problem

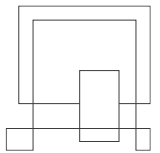[1]L – Likelihood – The probability of the risk occurring (1 – 5 scale);
[2]S – Severity – The impact that risk will have on the project when occurring (1 – 5 scale)
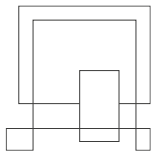[3]P – Product – The product of severity and likelihood, denoting the overall weight of the risk
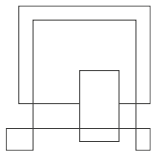
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Appendices

Appendix A – Group Contract

THIS GROUP AGREEMENT (this *Agreement*) is made as of the 4ᵗʰ day of September 2019, by and between **Gais El-AAsi, Marcel Valentijn Daniel Notenboom** and **Leviticus Lyons** further referred as *Group Members* for the third semester project *Heterogenous System*.

WHEREAS, upon formation of the Group, the Group Members are aware of the fact that this agreement is a binding document and governs the Group until receiving the final grading for the underlined project. If the Group separates, or a member decided to leave from the Group, the basic Group agreements remain intact for the remaining party.

WHEREAS, having a Group Member being removed may cause work responsibilities to shift between the remaining Group Members.

**THEREFORE**, it is mutually agreed as follows:

SECTION 1.

Absence

1.1. In the situation of a Group Member failing to be physically or digitally present on a day in which work is due, the Group Member informs the Group in good time, depending on the situation. In addition, the Group Member is bind to have all work that the Group Member is responsible for turned in.

1.2. All Group Members must adhere to the provided work distribution having their share of work completed on time. If there will be an unexpected absence, the Group Member is to complete the work individually and inform the Group Members about the absence as well as turning in the completed work.

1.3. In the situation of impossibility to complete the share of work distributed to the Group Member due to absence, the Group Member must inform the Group as soon as possible depending on the situation so that counteractions can be made to ameliorate the situation and control the damage.

1.4. Failing to inform the Group about an absence as well as failing to turn in the work share due to absence will be punished.

SECTION 2.

Work Policy

2.1. Any Group Member that is able to prove the incapacity to complete by themselves their share of work, due to Group accepted reasons, may acquire assistance from other Group Member as long as it will not negatively affect the overall progress of the project.

2.2. Each Group Member will work to the best their ability, ensuring a high quality of the completed work as well as respecting the Group's proposed deadlines.

2.3. If a Group Member commits plagiarism, the Group Member is solely responsible and will incur the punishment on for their actions.

2.4. Any Group Member has the right of requesting assistance when proving, with reasoning accepted by the Group Members, that they do not have the capacity to complete the work until the imposed deadline or that the quality of the work will not be of the imposed quality.

2.5. Any Group Member is bound to do their best in assisting other Group Members unless it will affect their own work share. Rejecting to provide assistance or intention of deserting from assisting a Group Member will result in severe punishment, unless reasons accepted by the Group are provided.
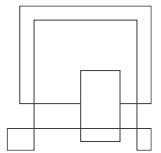
2.6. Failing to inform in good time the Group about incapacity if completing the work within the deadlines or incapacity of completing the work to the imposed quality will be punished, unless reasons accepted by the Group are provided.

2.7. The main online communication platform for the Group Members is **#Slack** and all members must be reached on it within reasonable time, other online communication tools or methods are not accepted as being official and cannot be used a prof of any kind.

SECTION 3.

Management

3.1. The hierarchical structure of the Group will follow Valve's policy, name *Flatland*, in regards to this issue that is described in the *New Employee Handbook by Valve*. The Group will not have any type of formal management and nobody (Group Members) is bound to *report to* anyone. Any Group Member has the same equal right to the management of the Group without any regards to their personal achievements, contributions to the overall progress of the project, etc. An illustration can be observed in the bellow figure.

Figure 1 – Management

3.2. In the situation, of a Group Member emerging as the *lead* for certain parts or phases of the project, the Group Member's role will not be a traditional managerial one, but rather the Group Member will have the role of a clearinghouse of information, with responsibility of keeping the whole part of the project/phase in their sight so that other Group Members can use them as a resource to check decisions against.

3.3. In the situation of different roles emerging (not imposed) in the Group for different parts and/or phases of the project that will suit the team, it is important to underline that the Group Members themselves are solely responsible for crafting the description of the role that will fit best their vision for the role. The description of the role is not fixed and can morph without any reasoning. An illustration can be observed bellow.
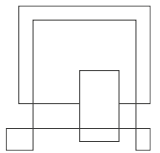
Figure 2 - Group Roles

3.4. The mistakes of the Group Members are not punishable with exception for certain situations that will be discussed further. It is important to underline that everyone has the opportunity to make decisions and sometimes this will result in mistakes. The mistakes will be treated by the Group Members as an opportunity to learn.

3.5. The only punishable mistakes are in the cases of a Group Member repeating the same mistake (not necessarily previously made by him/her) over and over again. Ignoring the evidences (especially peer's and supervisors' feedback or advices), particularly when it underlines that the Group Member is about to commit a mistake will be reviewed and potentially punished.

3.6. Anyone has the right to review/give feedback to any other member on any matter with or without approval or/and request in any non-extreme violent forms (Passive Aggressive is tolerated).

SECTION 4

Conflict resolution and member dismissal

4.1. A Group Member cannot and will not be dismissed from the Group unless it is Group Member's decision to leave or if the Group Member is forces to do so by other reasons.

4.2. In cases of conflicts if the involved parties cannot agree on a resolution even with the entire Group participating to the debate, a third party (supervisors) will be used to guide for a best possible resolution.
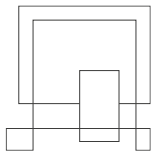
By **SIGNING** this **AGREEMENT**, the following Group Members abide to the articles listed here. If any member fails to abide by the articles of this contract counteraction will be made.

Gais El-A'Asi   Levi Lyons   MVD Notenboom
_____   _____   _____

Appendix B – Kanban Cheat Sheet

KANBAN
CHEAT SHEET

PROCESS

Kanban projects run on need based iterations during which the team produces incremental value to the end product.

TASK SIZE

There is no particular size a task should fit, instead it should have a clear goal for a team member to complete.

TASK ASSIGNMENT

Team members pull tasks from priority columns based on their skillset.

NEW TASKS IN ITERATION

New tasks can be added to a running iteration.

ROLES

Kanban does not have any predesigned roles, but focuses on a cross-functional team to plan and complete the work.

ITERATIONS

Kanban iterations are planned on the need basis and ended once a team feels they have added substantial value to the product.

ESTIMATION

Optional, usually done in hours or broad size metrics, such as small, medium & large.

S M L

WORK IN PROGRESS

Limits the number of tasks the team can work on at any given point. Guarantees each task is completed before the next one is started.

SCOPE LIMITS

Work In Progress (WIP) limits the current work amount.

P2 P1 | WIP 3

TERMS

Planning Trigger
Based on the number of tasks left in the backlog, alarms the team to arrange planning session.

Bottleneck
A task or another obstacle that prevents the team from making further progress within a project.

Lead Time
Total time from the initial customer request to the final product delivery.

Cycle Time
Total time it takes to finish a task once the team has started working on it, including delays.

Cumulative Flow CFD
A stacked line chart that shows the quantity of work in a given state - arrivals, queue, departure.

Swim Lane
A horizontal lane along which cards flow on the board. Represent categories, features, etc.

MEETINGS

All Kanban meetings are held once the team needs them and do not occur on a planned schedule.
Planning Session – set off by a planning trigger is for filling the backlog and prioritizing tasks.
Daily Standup – a 15 minute standup where team members present what they have done and will do.
Iteration review – presentation of the completed work to see if the set goals were met.
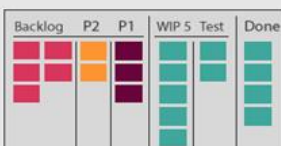**Retrospective** – discussion between the team members about the process and how it can be improved.

PRIORITIZATION

Backlog P2 P1

Optional. Done through priority columns in the backlog.

BOARD

Backlog P2 P1 | WIP 5 Test | Done

Usually combined out of 3 sections:
1. Backlog for planned and prioritized tasks.
2. Work In Progess for tasks the team is working on.
3. Done for completed tasks.