

# Advanced Software Project Management

## Assignment 2 - Project Management Plan

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### I. Introduction

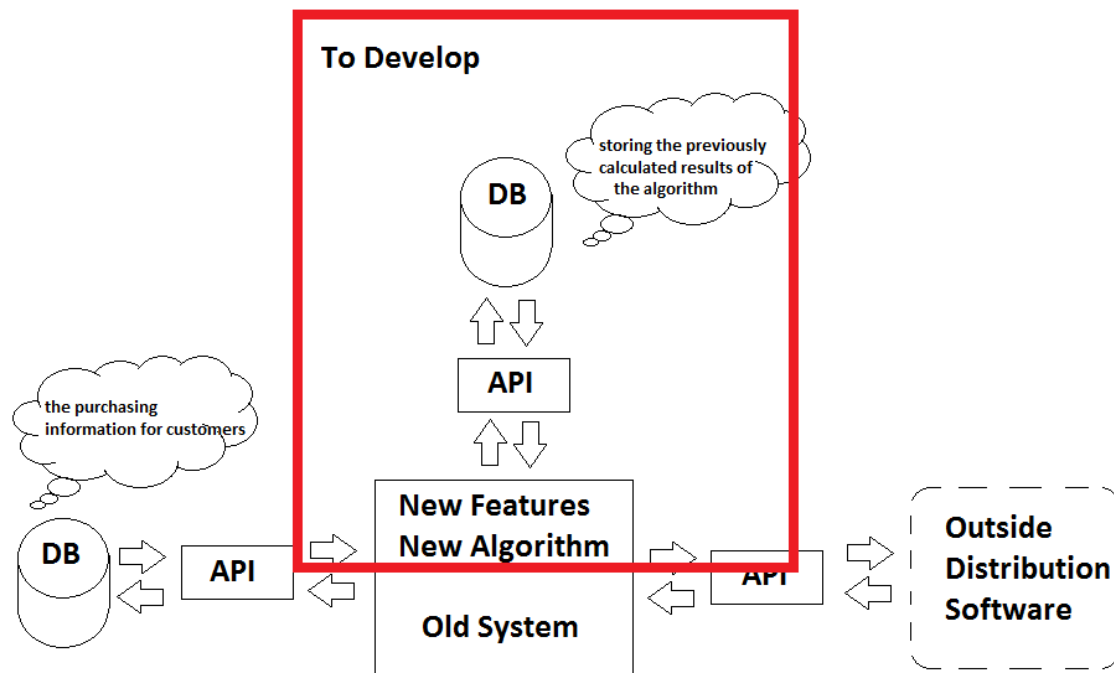
#### Description:

ICA which is a nationwide supermarket chain, which offer products ranging from basic home pantry goods to clothes and outdoor equipment. The existing system is a customer logging system with direct advertising features. The system currently only stores information about the purchases being made by the customer with an ICA-card and creates discounts based on these purchases, where an item purchased often will have a discounted price for that specific customer.

#### Scope and Objectives:

- i. This system is currently lacking as it bases discounts only on previously made purchases. An improvement would be if the system also considered purchases made by other ICA-card customers with similar purchasing habits.
- ii. By finding patterns in purchases made by groups of similar customers, directed advertisements could be created for a larger group based on an individual's purchases. With this approach new suggestions could be made for customers used to buying a certain range of items, or simply suggest new purchases which could be of interest, potentially increasing sales.
- iii. To achieve this functionality, a learning algorithm would need to be developed. With access to data about both previous and current customers and their purchases, it could learn and identify groups based on common denominators. After iterating and analyzing the data available the suggested algorithm will have made a base grouping of the customers and their purchase habits. When allowed to learn on all data available, the algorithm could create patterns between e.g. age, location and a certain purchase, marking that group as interested in this item. If people in this group now start buying another item, the system would see this and be able to generate directed advertisements to the group, based on these few new additions to the data.
- iv. An individual customer could belong in many groups, or only have a certain attachment to a group of buyers, depending on the common denominator. Taken into practice, customer A could be identified as having a 70 percent relation to a group which often buys fruit and a 20 percent relation to a group which often buys chicken and soda. Such approach would open up for directed advertisements for multiple customers in different groups.

## Architectural overview



Assumptions to narrow down the project and/or project scope

<i>ID</i>	<i>Description</i>
A0	The development team consist of 5 software engineers with different background and experience. 2 team members have knowledge and experience working with databases and data mining. 3 team members have knowledge and experience in datastructure and algorithms as well as machine learning and creating learning systems.
A1	There already exist a system that monitor and store the purchase data in a reference database for each ICA-card customer.
A2	There already exist a system to distribute the discount information to the customer. This system distribute the discount information either by email or regular mail and display machines found in the ICA stores
A3	The learning system today only looks at the purchases being made by the customer and creates discounts based on these purchases, where an item purchased often will have a discounted price for that specific customer.

## II. Stakeholders

### Stakeholder 1 - The ICA company

The ICA company is in need of a new system feature that will lead to increased sales, preferably by a more attractive advertisement feature, thus increasing the profit for the company. A negative effect of the new system feature could be the cost of maintaining the new software or that their customers find the new advertising system to be manipulative and intrusive, discouraging them from buying at the ICA stores.

### Stakeholder 2 - ICA-card customers

The ICA customers need a system which can tailor good discounts for products that they often purchase, to increase the benefit of shopping at the ICA stores. The new feature of the system will allow more direct advertising with discounts on products that the customer needs and will therefore positively affect that customer's budget. A negative effect the new system feature could have is to make the customer feel monitored or manipulated by the store to a certain purchasing behavior.

### Stakeholder 3 - Project management team

The project management team needs a software which lives up to the set requirements and their expectation of the new system feature, which in the end will generate better marketing conditions and a broader variety of sold products.

The influence of the project management team on the project is extremely large, since they are the funders of the software and in charge of the money invested into it.

### Stakeholder 4 - Project development team

The project development team is in need of well structured documentation which explains the availability and limitations of the system which currently in use. Additionally the team needs clear requirements to develop the new feature. For the best possible solution, they also need access to hardware where the system can be tested and reasonable licences which will help them to work and deliver the product on time.

### Stakeholder 5 - The ICA employees

They need a briefing session in how the new features in their company's software will function towards customers to be able to answer possible questions from customers shopping in their store. To satisfy this need, good user guides of the new features will be needed so that ICA can teach their employees around the nation about the details they need to know about the system.

## **III. Product Backlog**

### Product backlog

<i>ID</i>	<i>Description</i>
<i>Functional Requirements</i>	
R101	There <i>shall</i> be an API towards the database (A1) to receive the purchasing information for customers and which contains the necessary functionality for the new system features.
R102	There <i>shall</i> exist an algorithm to learn and draw conclusions from the purchasing information of the customers.
R103	The algorithm <i>shall</i> output discounts for the customer based on purchasing habits of customers with similar purchasing information/history
R104	The output <i>shall</i> suggest a percentage discount on items for a specific customer based on purchasing information.
R105	The system <i>shall</i> suggest a percentage on how well suited a group is for a specific customer.
R106	The system <i>shall</i> adapt continuously on incoming data
R107	All calculated results for individual customers <i>shall</i> be stored in a reference database.

R108	There <i>shall</i> exist an API to store and receive previously calculated results of the algorithm.
R109	Data in the database <i>shall</i> be updated upon new calculations.
R110	There <i>shall</i> exist an API to provide stand-alone systems with discount information for customers with a unified format.
<i>Non-Functional Requirements</i>	
R201	The availability of the system <i>shall</i> be 99,99% (“four nines”), providing an average downtime of 52,56 minutes per year.
R202	The number of ICA-card users are expected to increase with 120% and the scalability of the system is therefore required to accommodate an increasing amount of ICA-card users with the same percentage increase.
R203	It <i>should</i> not take more than 24 hours after new information is added to the database for it to be processed by the system.
R204	The data stored in the database <i>shall</i> be compressed with a minimum of 20% gain compared to a non compressed database.

#### IV. Sprint backlog

This project is planned to be developed during two four-week sprints. With a team of 5 developers (A0) working full-time on this project, that equals 40 weeks in total to be assigned to the development.

The estimations of effort were obtained by planning poker, which allowed for fair and agreed upon estimates. The unit of the estimates were in weeks, as each developer has 8 weeks to contribute with.

To better prioritize the requirements an impact-scale was introduced where each functionally listed was valued with its importance towards a functional system. The scale was high, medium or low depending on the requirement’s impact for the system functionality. E.g. R102 was rated High as it’s the backbone of the system, while R101 was rated Low, as receiving data isn’t crucial for the system to be ready for process data.

As the team assigned had different expert competence, either in database systems or self-learning algorithms (A0), each task was labeled with whether it was a database-related task or a machine learning-related task. For each sprint, tasks from both groups should be available so that each developer can be assigned an appropriate task.

#### Backlog

<i>ID</i>	<i>Description</i>	<i>Estimated effort</i>	<i>Impact</i>	<i>Task type</i>	<i>Dependency</i>
R101	There <i>shall</i> be an API towards the database (A1) to receive the purchasing information for customers and which contains the necessary functionality for the new system features.	1	High	DB	
R102	There <i>shall</i> exist an algorithm to learn and draw conclusions from the purchasing information of the customers.	13	High	ML	
R103	The algorithm <i>shall</i> output discounts for the	7	High	ML	R102

	customer based on purchasing habits of customers with similar purchasing information/history				
R104	The output <i>shall</i> suggest a percentage discount on items for a specific customer based on purchasing information.	2	Medium	ML	R103
R105	The system <i>shall</i> suggest a percentage on how well suited a group is for a specific customer.	1	Low	ML	R102
R106	The system <i>shall</i> adapt continuously on incoming data	5	Medium	Both	R102
R107	All calculated results for individual customers <i>shall</i> be stored in a reference database.	4	High	DB	
R108	There <i>shall</i> exist an API to store and receive previously calculated results of the algorithm.	2	Medium	DB	R107
R109	Data in the database <i>shall</i> be updated upon new calculations.	1	High	DB	R102, R107
R110	There <i>shall</i> exist an API to provide stand-alone systems with discount information for customers with a unified format.	4	High	DB	R103

For the final prioritization, all variables had to be considered, including dependencies, the task type, the impact and the estimated weeks for the task. For the first sprint, high-impact tasks with no dependencies were optimal. Due to this, R102 and R107 can be found in the first sprint. Then following both the estimated impact and the type of task (for even division of labor) were valued when adding more tasks, which made R101 and R108 good options as they were important and required database-expertise. From this, the first sprint could be constructed with an estimated effort of 20 weeks.

### Sprint 1

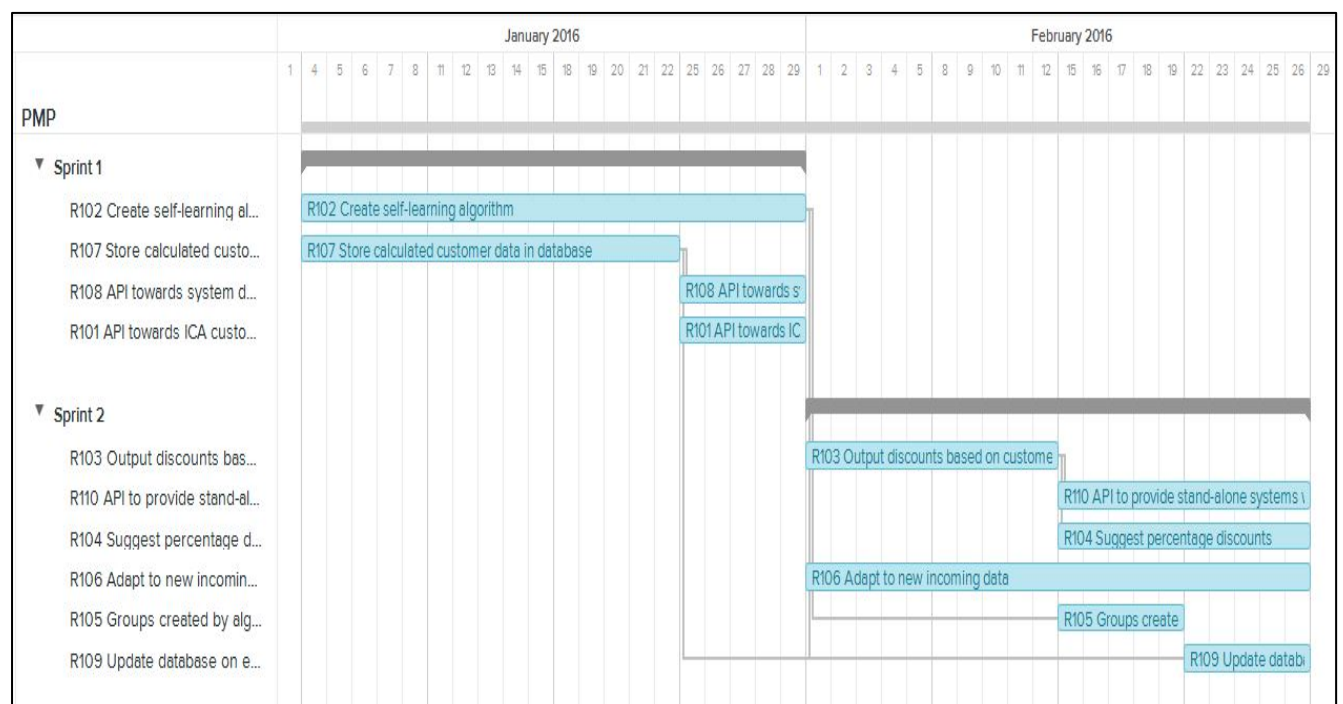
<i>ID</i>	<i>Short description</i>	<i>Effort</i>	<i>Task type</i>	<i>Impact</i>
R101	API towards ICA customer database	1	DB	High
R102	Create self-learning algorithm	13	ML	High
R107	Store calculated customer data in database	4	DB	High
R108	API towards system database	2	DB	Medium

## Sprint 2

<i>ID</i>	<i>Short description</i>	<i>Effort</i>	<i>Task type</i>	<i>Impact</i>
R103	Output discounts based on customer purchases	7	ML	High
R109	Update database on each calculation	1	DB	High
R110	API to provide stand-alone systems with discounts	4	DB	High
R104	Suggest percentage discounts	2	ML	Medium
R106	Adapt to new incoming data	5	Both	Medium
R105	Groups created by algorithm should be readable	1	ML	Low

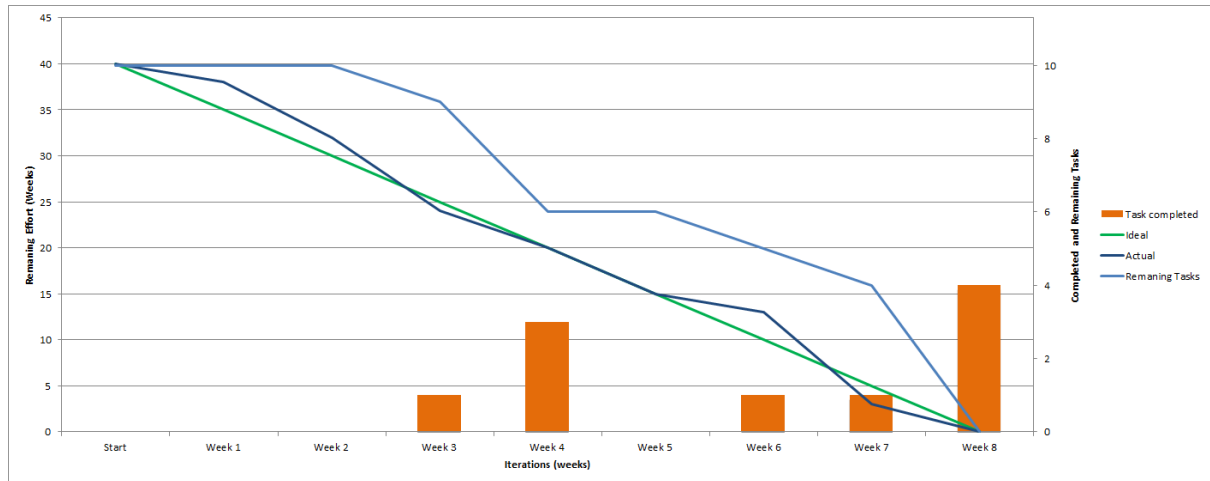
## V. Gantt chart

After the effort estimation and sprint planning, a Gantt chart was illustrated providing a clear view when each activity is planned to be completed. The chart is based on the resources (heading VII) where the resources assigned to each activity are specified.

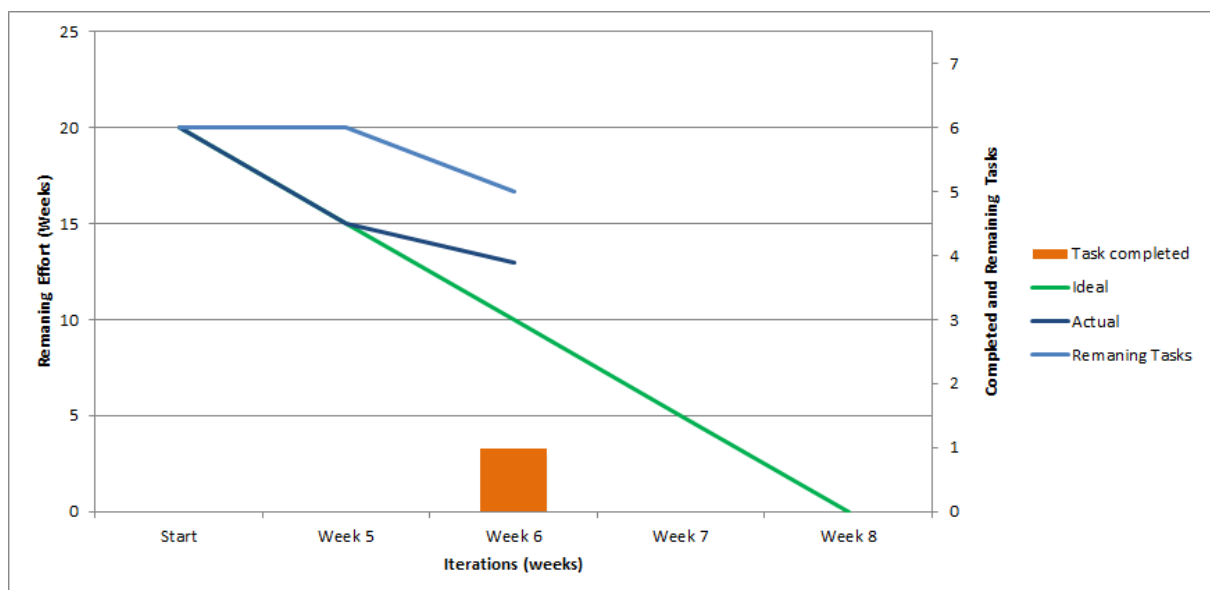


## VI. Burn Down Charts

This chart represents the work done for the entire release.



This chart is a representation of half the work done, i.e., work done until week 6.



## VII. Resources assigned to each activity in the Gantt Chart

### Sprint 1 (2016-01-04 - 2016-01-29)

Dep.	Task	Start	Dur.	D1	D2	D3	D4	D5	Effort	End
	R102	2016-01-04	4	3	3	3	3	1	13	2016-01-29
	R107	2016-01-04	3	0	0	0	1	3	4	2016-01-22
	R101	2016-01-25	1	0	0	1	0	0	1	2016-01-29
R107	R108	2016-01-25	1	1	1	0	0	0	2	2016-01-29

### Sprint 2 (2016-02-01 - 2016-02-26)

Dep.	Task	Start	Dur.	D1	D2	D3	D4	D5	Effort	End
R102	R103	2016-02-01	2	2	2	2	1	0	7	2016-02-12
R103	R110	2016-02-12	2	2	2	0	0	0	4	2016-02-26
R103	R104	2016-02-12	2	0	0	2	0	0	2	2016-02-26
R102	R106	2016-02-01	4	0	0	0	1	4	5	2016-02-26
R102	R105	2016-02-15	1	0	0	0	1	0	1	2016-02-19
R102, R107	R109	2016-02-22	1	0	0	0	1	0	1	2016-02-26

## VIII. Quality criteria

The project has been classified into two areas: functional and non- functional to keep the quality requirements under control. The quality criteria have been listed for both functional and non-functional areas below. The rating(1 being least and 5 being highest) has been done on the level of satisfaction to their respective functions.

### Functional:

QC 1- R101: Is the shopping pattern of customers clear enough to categorise them in the database properly?

QC 2- R102: How far is the algorithm perfect in giving proper conclusions?

QC 3- R103: Is the discounting scheme giving any profit to the investor over the product?

QC 4- R104: How far are the suggestions helpful to the customer, i.e., is the suggestion attracting any new business to the investor?

QC 5- R105: Is the suggestion close enough to the actual purchases made by the customer?

QC 6- R106: Is the system adapting properly and creating new meaningful schemes accordingly?

QC 7- R107: Is the reference database good enough to understand the retail mindset of the customer?

QC 8- R108: Is the storage of such results any help in calculating for the algorithm?



QC 9- R109: Is the updated data close enough to the existing model or does it demand a change?

QC 10-R110: Is the discount improving any sales?

QC 1	R101	3
QC 2	R102	3
QC 3	R103	5
QC 4	R104	4
QC 5	R105	4
QC 6	R106	3
QC 7	R107	3
QC 8	R108	4
QC 9	R109	2
QC 10	R110	5

It is safe to say that the software is performing well based on the quality assessment criteria as the average is clearly exceeding the threshold of 60%, which is a good sign of success.

#### Non-functional:

QC 11- R201: Is the 52,56 minutes breakdown affecting any sales?

QC 12-R202: Is the available database space enough for the forthcoming increase in customers?

QC 13-R203: How far is the delay of 24 hours acceptable by the customers?

QC 14-R204: Is the compression of data leading to loss of any important data from the database?

QC 11	R201	3
QC 12	R202	5
QC 13	R203	4
QC 14	R204	2

The results in the non-functional area also seem to fulfilling the requirements to maintain an average threshold. Hence, we can positively say that the software is satisfying all the objectives set.

## **IX. Risk plan**

The risks involved due to the development of this software system are very few, which can actually be solved if given proper concentration by the respective stakeholders.

- Relating to Stakeholder 1, the ICA Company, a risk of the new system feature could be the cost of maintaining the new software or that their customers find the new advertising system to be manipulative and intrusive, discouraging them from buying at the ICA stores.

- Associating with Stakeholder 2, ICA Card Customers is the risk that the customer feels monitored and manipulated by the store to a fixed behavior in their purchases.
- Allying with both Stakeholder 3 and Stakeholder 4, where most of the development in software is done, the risk in their work is that the team may create a very complex software due to the varied range of products and complex discounting system due to the fact that every customer has a special discount in the usual genre of their shopping.
- Correlating the fact that the customers need not show up at the billing counter if they own a card, can lead to theft in certain places. The Stakeholder 5- The ICA employees will be held responsible by the management if such a thing happens, which in fact, is not their work either. The risk of theft increases if there is no direct surveillance of the goods the customer intends to buy.

The table below describes the risk list in a more understandable format showing its severity, impact and possible attempts of mitigation.

S.No.	Risk	Risk Severity	Impact	Mitigation
1.	Cost of maintaining the new software	Low	Leads to increase in investment costs	divide the total investment on the price of all the products evenly to cover up extra expenses
2.	Customers find the new system manipulative	Medium	Customers get discouraged to buy at ICA stores	enhance marketing and publicity on all the products
3.	Customer feels monitored by the store which may lead to them feeling as an intrusion of privacy	High	Lose trust in the store eventually affecting business	ask for permission of the customer before monitoring their shopping pattern
4.	Team may create a complex software which may lead to slow responses by the system	High	Test patience of the customer	team should keep the working of the system simple and quick
5.	Theft	High	Lose business by the investor (ICA)	Surveillance of the store should be active