

Open to Negotiation

## **Proposal – 08**

Part. Main

## 1. Introduction

This proposal aims to find a commercial sponsorship for a development project.

In order to achieve better conversion rate at e-commerce platforms,  
we are ready to develop AI solutions.

Specifically, we can either

- equip an existing general multi-vendor e-commerce platform, or
- develop a multi-vendor ecommerce platform that is equipped

with the following functionalities:

- smart product search,
- smart product assessment/comparison,
- smart retention control of ecosystem – vendors, consumers, reviewers.

This proposal aims to find a commercial sponsorship for the development and marketing of a Smart Multi-vendor E-commerce Platform (SMEP).

Helpful business vision and precise problem definition from anyone are welcome, as it will allow us to focus on solution.

## 2. Background

E-commerce is one of the pioneering areas that adopt Computer Vision and Natural Language Processing techniques. Vision and language seem to be the foremost means of reaching consumers, until online touch and smell is developed in the future.

The following features are identified in e-commerce:

- visual product search
- automatic product assessment and comparison
- rewards and retention control

While the first two of the above features are not a new idea, rewards and retention control might be a brand-new, challenging problem worth solving. Few giant e-commerce platforms, like Amazon, are likely to have rewards and retention control, backstage.

There are already myriads of e-commerce platforms operational and their count is steadily increasing, while the count of vendors and consumers doesn't grow as fast. This necessarily and directly leads to little vendors and consumers are "allotted" to each average e-commerce platform. Rewards and retention control for vendors, consumers, and sponsored reviewers, therefore, is emerging to be a strategic competitive factor for e-commerce platforms. The task of rewards and retention is challenging more as their immediate interest often conflicts with each other.

Although automatic product assessment and comparison is generally not a new idea, the techniques employed is found not fully exploiting the potential of the state-of-the-art AI techniques and there is a constant need for new solutions. The so-called state-of-the-art NLP techniques themselves would take little care of industry problems, like automatic product assessment and comparison, as opposed to academic problems.

We are a team of AI experts who prefer freelancing to employment, and who are capable of both exploiting the modern AI techniques and improving them. We feel that e-commerce NLP has been shaping as a concrete concept in recent years. At this dawn of AI era, which seems to be booming for a decade, we are committed to fill in the gap between the academic achievements of AI and the industry.

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### 3. Executive Summary

- Project scope: Develop an SMEP (Smart Multi-vendor E-commerce Platform).
- Project timeframe, cost/budget:
  - o Total timeframe: 17 weeks continuous
  - o Total man power: 101 MW (Man x Week).
    - ✓ 40.4 WM of App engineers,
    - ✓ 60.8 WM of AI engineers.
  - o Total budget: \$75,728
    - ✓  $\$16,160 = \$10/\text{ManHour} \times 40 \text{ Hour/Week} \times 40.4 \text{ ManWeek}$ , for App.
    - ✓  $\$58,368 = \$24.00/\text{ManHour} \times 40 \text{ Hour/Week} \times 60.8 \text{ ManWeek}$ , for AI.

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\$74,528

  - ✓  $\$1,200 = \$0.04/\text{Sentence} \times 30,000 \text{ Sentences}$ , for opinion labeling.

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**\$75,728**
- Total **\$35,000**, if we only develop AI engines for Product Assessment & Comparison and Rewards & Retention, which are core modules than can be sold or served independently. See Appendix-1 and Appendix-2 for more.
- The project team is comprised of well-seasoned developers:
  - o 4 AI experts with decades of experience in software industry, Machine Learning, and Natural Language Processing.
  - o 4 veteran software engineers with proven full-stack software and management skills.
- We will focus on core value:
  - o The core value will be created in the AI part, as opposed to the App part.
  - o The App part will be built with the existing concepts and conventions.
- Challenges in the development:
  - o Developing smart Product Assessment & Comparison; for consumers and vendors,
  - o Developing smart Rewards & Retention control; for vendors, consumers, and reviewers.
- The following three branches of AI technology will guarantee the success of project:
  - o Natural Language Processing, for PAC (Product Assessment & Comparison).
  - o Deep/Reinforcement Learning, for R&R (Rewards & Retention control).
  - o Computer Vision, for Visual Product Search.

## 4. Terminology

- SMEP: Smart Multi-vendor E-commerce Platform.
- App: Web applications and mobile applications integrated.
- Sponsor: An entity that provides funding for the Project in exchange with business achievements.
- Team: A group of experts and engineers who collectively undertake the Project.
- Contract: An agreement between the Sponsor and the Team that will bind them in terms of sponsorship, development, maintenance, and marketing.
- Project: The ICT development activity that will be carried out by the Team in order to fulfil the development part of the Contract.
- Platform: An instance of SMEP that is running on particular facilities.
- IDR: Image Detection & Recognition
- PBE: Product Baseline Engine
- PAC: Product Assessment & Comparison
- SME: Subject Matter Expert

## 5. Team, Vision, Mission

### - Development team

The Team is comprised of skilled freelancers, who have an enough range of experience in project management, AI, e-commerce, software engineering, and programming.

CVs for the Team members will be available during negotiation with particular potential Sponsor.

### - Business vision to share with the Sponsor

- Stand on its own: The app will not dependent on 3rd party services.
- Sell exhaustively: Individual key modules, as well as the whole app, will be served as an independent API.
- Core value: The system will help shoppers save time with Smart Product Assessment & Comparison.
- Sustainability: The system will intelligently build and maintain a healthy ecosystem of vendors, consumers, Subject Matter Experts (SMEs), and the Sponsor.

### - Team's Business Vision

While the Team will keep its vision tuned in to the Sponsor's vision, it will have additional aspects as an implementor.

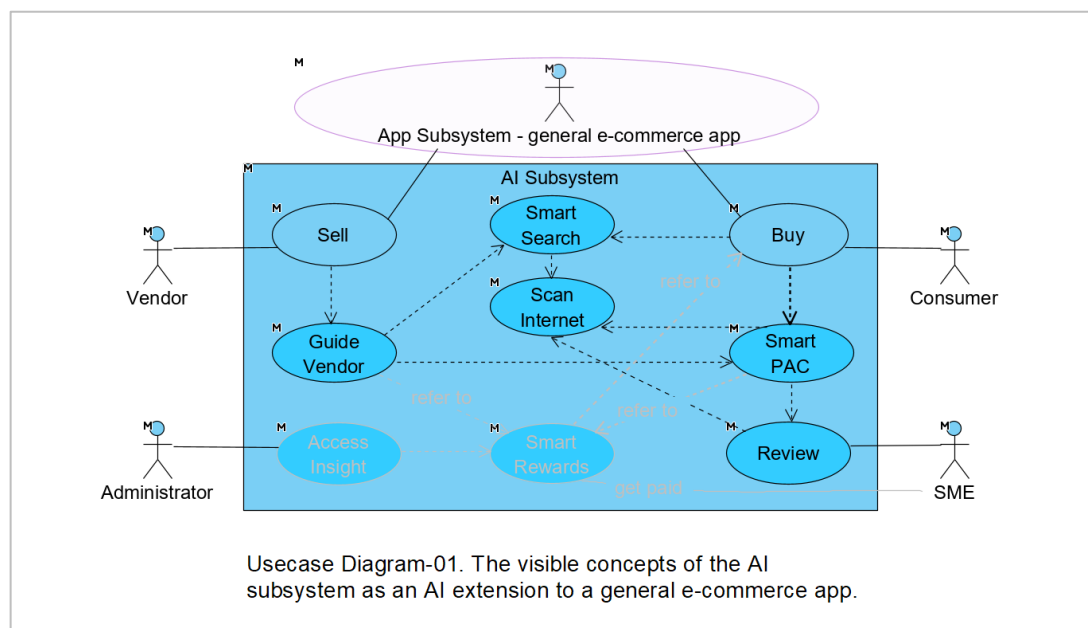
- AI is all about the performance, not fashion. The Team will connect between the state-of-the-art techniques and the needs of consumers.
- Publicly available AI knowledge and resources cannot directly lead to competitive performance. The Team will stay innovative.
- The Team will not simply deliver services, but join the Sponsor to their success.



## 6. Use-Case View – Methodology

This section aims to suggest high-level concepts and requirements for SMEP (Smart Multi-vendor E-commerce Platform)

The conceptual structure of SMEP can be described in the form of UML Use-Case Diagram. We assume that the reader is familiar with the general concepts of e-commerce system.



We believe that defining use-cases in such a way that they capture both the actors' interaction with system and the functionality of corresponding program modules will smooth the transition from requirements to implementation. There will, accordingly, be one-to-one mapping between high-level use-case and high-level components.

- For the purpose of productivity, we put aside a general e-commerce app for the moment.
  - o This allows us to seamlessly separate the AI part from the whole SMEP system, and focus on the innovative features that we try to build into the AI part.
  - o The App part (a general e-commerce app) will not take much innovation as there are pioneering apps.
- The whole SMEP system has now two subsystems:

- A general e-commerce app, or the App part.
  - It is the foundation of SMEP.
  - It will be called the App subsystem, App part, or a general e-commerce app, interchangeably.
- AI extension to the general e-commerce app, or the AI part.
  - It operates atop of the foundation.
  - It will be called the AI subsystem, AI part, or AI extension, interchangeably.
  - The “AI subsystem” is solely responsible for the AI-based functionalities, hence the name, that are newly added to the underlying general e-commerce app to form an SMEP. However, the name does *not* imply that it is comprised of pure AI modules. It *is* an App and *has* app code that, at least, glues and serves the AI models.

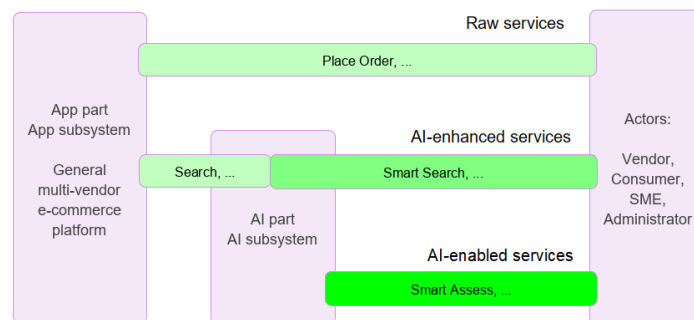


Figure. The integration of the AI part to App part.

- When we study the AI subsystem, its App counterpart becomes a black box and an actor to the AI subsystem.

Vendor and Consumer will have, and be not limited to, exactly the same interaction as they would have with the App subsystem (a general multi-vendor e-commerce platform) without the AI subsystem, but now *through and on behalf of* the AI subsystem.

From the underlying App subsystem’s viewpoint, its functionalities are simply relayed to Vendor and Consumer through the AI subsystem. *The functionalities of the App subsystem are actually enhanced by the AI subsystem before reaching actors.* The enhancement is transparent to the App subsystem.
- The interaction between Vendor/Consumer and the Platform is enhanced by the AI subsystem.
  - Sell use-case is now enhanced by Guide Vendor use-case, which, in turn, makes use of Smart Search and Smart PAC use-cases.
  - Sell use-case links Vendor to the general e-commerce app through the AI subsystem, as well as to the AI subsystem itself.
  - Buy use-case is also enhanced by Smart Search and Smart PAC use-cases.

- Buy use-case links Consumer both to the general e-commerce app through the AI subsystem, as well as to the AI subsystem itself.

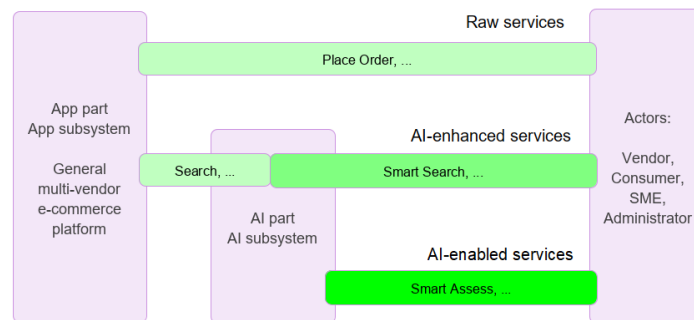


Figure. The integration of the AI part to App part.

#### - Sell use-case

Sell use-case represents a general interaction between Vendor and the Platform. It includes all the basic interactions, like List Product, Withdraw, Process Order, Shipping, etc., that Vendor would have with the underlying multi-vendor general e-commerce platform without the AI extension subsystem, as well as the newly available Vendor interactions provided by the AI extension subsystem. Note that the basic interactions here are now enhanced by the AI subsystem.

*We are not going to elaborate on the conventional behavior of Sell use-case, as it is not so changing.* Newly available aspects of Sell use-case will be explained implicitly by those use-cases used by it.

#### - Buy use-case

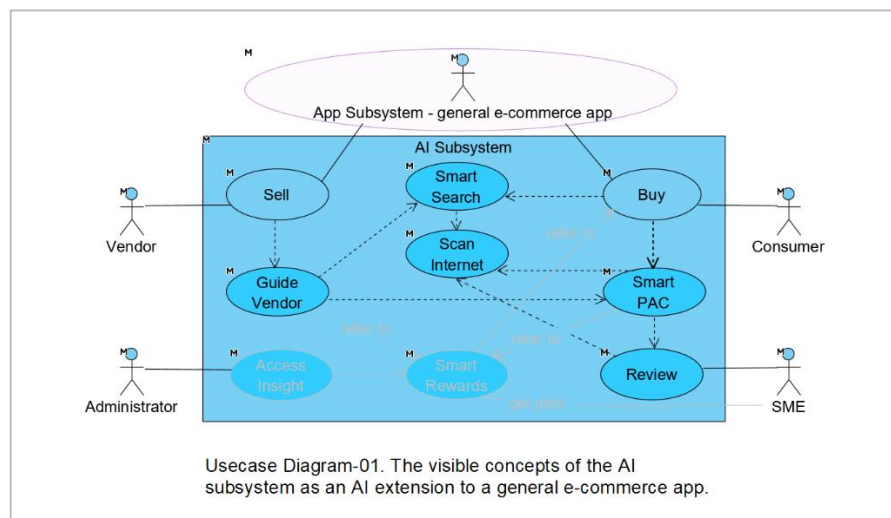
Buy use-case represents a general interaction between Consumer and the Platform. It includes all the basic interactions, like Place Order, Add to Cart, Pay, etc., that Consumer would have with the underlying multi-vendor general e-commerce platform without the AI extension, as well as the newly available Consumer interactions provided by the AI extension subsystem. The basic interactions are enhanced by the AI subsystem.

We are not going to elaborate on the conventional behavior of Buy use-case. Newly available aspects of Buy use-case will be explained implicitly by those use-cases used by it.

See Appendix-2 and Appendix-6 for the role Buy use-case plays in boosting the retention rate of the Platform.

## 7. Use-Case View – Enumeration

Hereinafter and throughout the project, use-cases will be indexed as “U.x”, where x is the number attached to the use-case’s description below. An example is “U.3”. Use-cases can also be indexed as [Name, U.x] for the readability purpose. An example is [Review, U.3].



### U.1. Sell use-case

Refer to the section Use-Case View – Methodology.

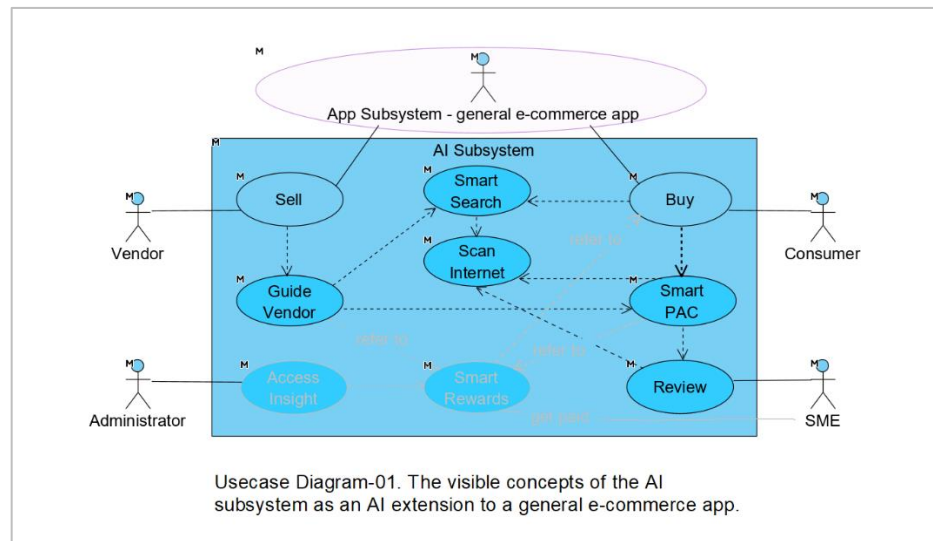
### U.2. Buy use-case

Refer to the section Use-Case View – Methodology.

### U.3. Review use-case

- Review use-case is the interaction between SME (Subject Matter Expert) and the Platform.
- SMEs can browse the product listed on the Platform, basically.
- SMEs will create, retrieve, update, and remove their reviews.
- They can also browse their competitors’ reviews, try [Smart PAC, U.6] that is visible to Consumer, and try to act as Consumer to check how their reviews are promoted.
- Review use-case will provide personalized service to SMEs in terms of subject matter, frequently visited sites, favorite category of products, competitors’ reviews, etc.
- Review use-case must contribute to [Smart PAC, U.6] use-case and must not depend on it.

- Review use-case may make use of Scan Internet use-case for its convenience, though it's not essential.



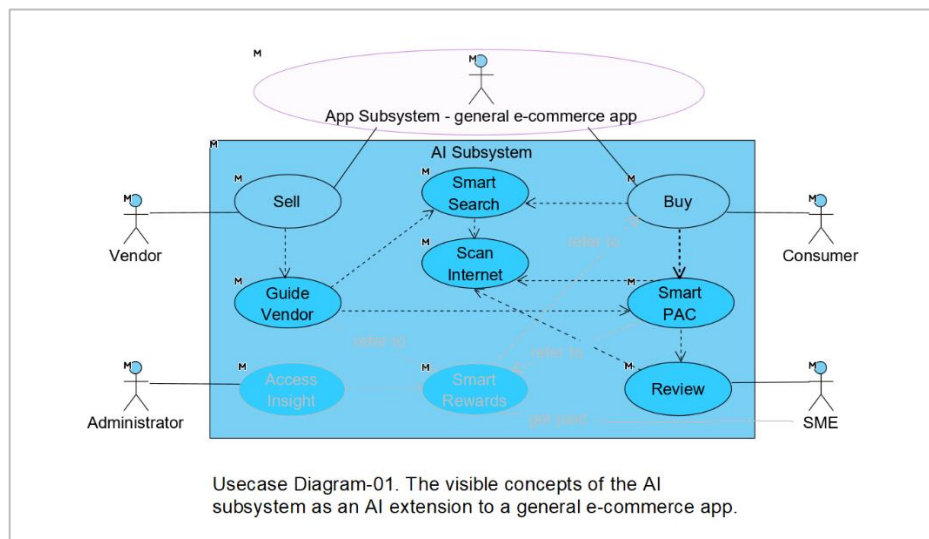
#### U.4. Scan Internet

- Scan Internet use-case is the interaction between the SMEP Platform and the Internet. Its behavior is further derived from other use-cases that request product information.
- Scan Internet use-case should collect, maintain, and serve product/market information in nearly real-time manner.
- Media feeds from the major social networking websites will be used as the main data source: Amazon, Facebook, Twitter, and Pinterest.
- Additional data sources should be able to join the Platform with ease.
- Product/market information collected by Scan Internet use-case should be direct or derived data about the products currently listed on the Platform.
- Standing on its own, Scan Internet use-case will be used by [Smart Search, U.5], [Smart PAC, U.6], and [Review, U.3] use-cases.

#### U.5. Smart Search

- Smart Search is a derived use-case that searches for products based on visual picture, barcode, QR code, product name/description/manufacture number, and brand.
- The use-case should intelligently find a best list of candidate products, based on the caller's search request, the identity of the caller, and the caller's history of search behavior.
- The use-case should learn a wide range of user behavior, *like what products were finally chosen by what people who walked through what search queries*. This knowledge will be accumulated and refined over time to improve its performance.
- The search result should not be affected by the retention goal of the Platform.

- It will use Scan Internet use-case and be used by [Buy, U.2] and [Guide Vendor, U.7] use-cases.



## U.6. Smart PAC

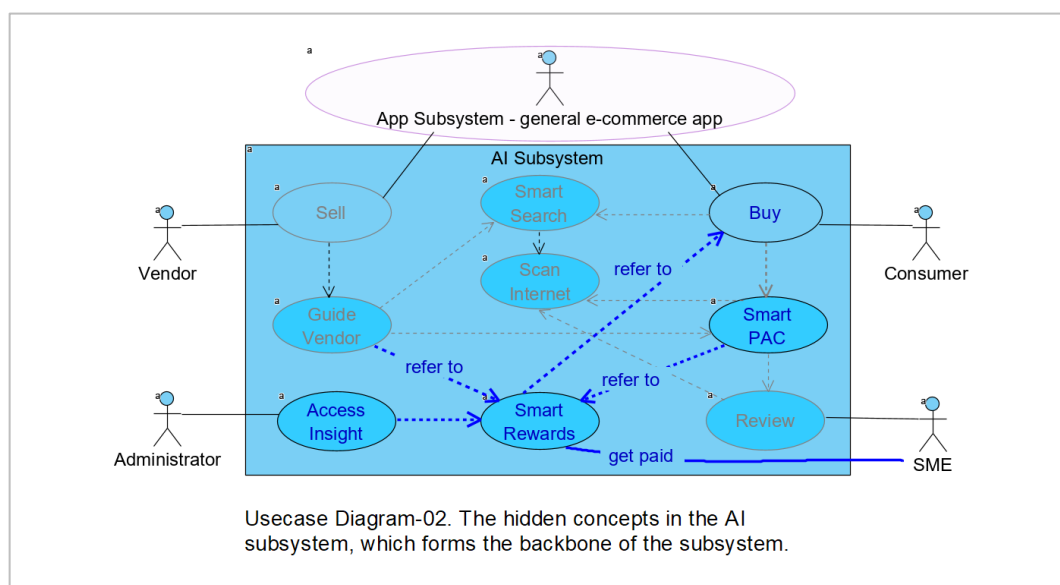
- Smart PAC is a derived use-case that assesses and compares products.
- The use-case should intelligently provide a best Assessment & Comparison between products, which differentiate the Platform from competition.
- All product data and review, for currently listed products, available on the Platform and major websites should take effect in the service.
- Product data and reviews newly posted on the Platform and major websites should be effective to relating actors *in hours* within post.
- The use-case should learn Consumer's assessment needs, like *what categories of product were/are accessed in what aspect/opinion terms, what aspect/opinion can represent how much Value for Money, what people are interested in what aspects, what is the current fashion, etc.*
- The use-case should refer to Smart Rewards use-case to get guidance for its behavioral parameters, deciding on the Assessment & Comparison service provided to Consumer. See Appendix-2 and Appendix-6 for more about Rewards & Retention.
- The use-case is based on Scan Internet and Review use-cases, and is used by [Buy, U.2] and [Guide Vendor, U.7] use-cases.

See Appendix-2 and Appendix-1 for the role Smart PAC use-case plays in boosting the retention rate of the Platform, and for technical discussion.

Note: The quality of opinion analysis is critical in PAC (Product Assessment and Comparison). The mainstream of opinion analysis is aspect/opinion extraction. See Appendix-1 for technical discussion.

## U.7. Guide Vendor

- Guide Vendor is a derived use-case that provide a guidance to Vendor.
- The use-case should provide *a basic, conventional dashboard of sales performance of the Platform* to Vendor.
- The use-case should also provide intelligent guidance to Vendor in what product (specifications, performance, and quality) at what price had how much influence on their sales, what of them is/will be competitive, how effective their promotion is, etc.
- The use-case should refer to Smart Rewards use-case to get guidance for its behavioral parameters. See Appendix-2 and Appendix-6 for Rewards & Retention.
- The use-case is based on [Smart Search, U.5] and [Smart PAC, U.6] use-cases to support [Sell, U.1] use-case.



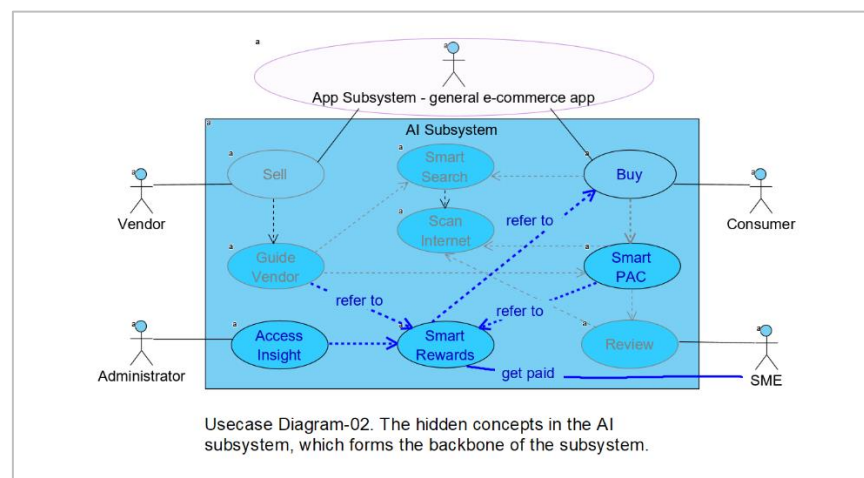
## U.8. Smart Rewards

- Smart Rewards is a derived use-case that controls the rewards of Vendor, Consumer, and SME to maximize the long-term rate of retention. See Appendix-2 and Appendix-6 for more about the Rewards & Retention.
- The use-case should provide passive guidance to [Smart PAC, U.6] and [Guide Vendor, U.7] use-cases to indirectly control the rewards of Vendor and Consumer for a best retention rate.

- The use-case refers to [Buy, U.2] use-case to collect records of historical interactions among Vendor, products, Consumer, assessments, and comparisons, and find the dynamics in an intelligent way.
- The use-case should learn what is the best balance to keep maximum retention rates. The balance will decide how much rewards will be assigned to what actors. Although rewards for different actors have different expressions, the use-case should learn the best balance of rewards allotment between actors.
- It will decide the performance of SME, and adjust their rewards for the whole retention rate of the system.
- Smart Rewards will be initiated by the Project, be featured by the Platform, and differentiate it from competition, although it is invisible from outside.

Smart Rewards use-case will be instrumental in creating/maintaining a sustainable eco-system of vendors, consumers, SMEs, and sponsor.

As this is a key area where the Platform will create unique value, and because it does not pertain to SME only, we study it in detail in Appendices.



## U.9. Access Insight

- Access Insight use-case is the interaction between Administrator and the AI subsystem.
- The use-case allows Administrator to gain insight into the market platform, through a comprehensive dashboard.
- The use-case also allows Administrator to exert influence on the state of the market platform by regulating [Smart Rewards, U.8] use-case.

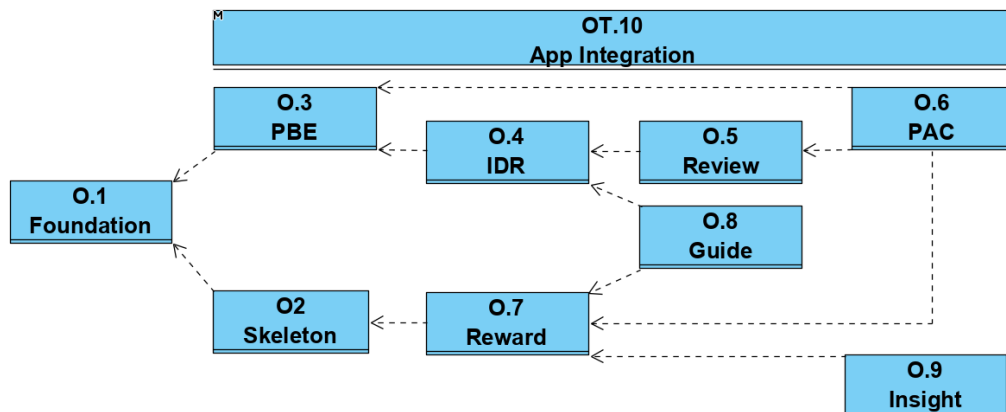


## 8. Objectives

This section aims to define the objectives that the Project will achieve.

The objectives described below will be the objectives themselves as well as common notions shared by the Sponsor and the Team in communication. The objectives will guide breaking down the project into tasks.

Hereinafter and throughout the project, objectives will be indexed as “O.X”, where X is the number attached to the object’s description. An example is “O.3”. Objectives can also be indexed as [Name, O.X] for the readability purpose. An example is [PBE, O.3].



Class Diagram-01. Project objectives and their dependencies.

Depending on the context, an objective may be interpreted as the objective itself or the software package/program module that the objective is directly responsible to produce.

An object number does not necessarily represent the order in which the objective will be achieved.

### O.1. Foundation

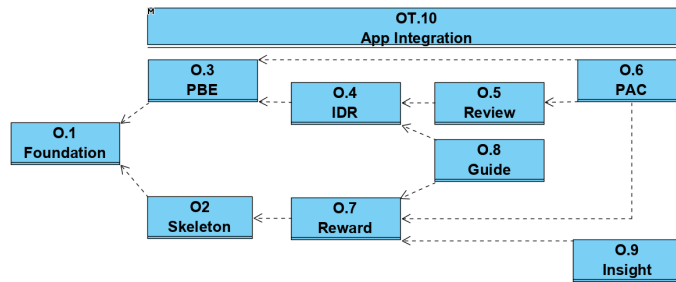
- A general multi-vendor e-commerce platform will be developed, without its AI extension.
- The specifications established by pioneering apps can be further refined for competitiveness.

## O.2. Skeleton

- A minimal version of the SMEP Platform will be operational on top of Foundation [Foundation, O.1]
- The Skeleton will implement [Sell, U.1] and [Buy, U.2] use-cases, which will be initially limited to the functionality of the Foundation.

See [Foundation, O.1] for the Foundation, and [Integration, O.10] for App Integration.

See [Sell, U.1] and [Buy, U.2] use-cases for their requirements.



Class Diagram-01. Project objectives and their dependencies.

- [Skeleton, O.2] directly depends on [Foundation, O.1].
- The Skeleton is a starting version of the SMEP Platform that has all, but no more functionality than, those that the Foundation can perform. It will, initially, be a simple wrapper of the Foundation and relay its functionality directly to and from conventional actors.
- The Skeleton will serve as the baseline for the Platform. The following modules will be added/integrated to the Skeleton on an incremental basis:
  - PBE: Product Baseline Engine
  - IDR: Image Detection & Recognition
  - PAC: Product Assessment & Comparison
  - RR: Rewards & Retention

See Use-Case View for concepts, Management section for the development process we will follow, and the following objectives for more about the modules.

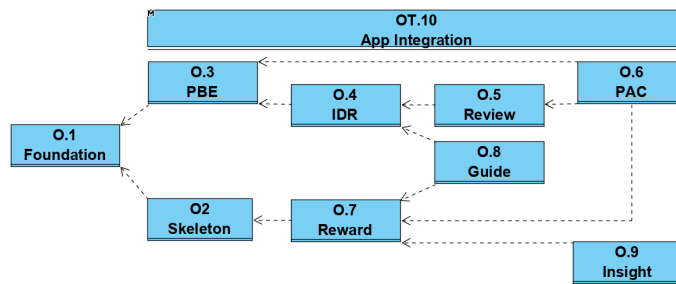
## O.3. PBE: Product Baseline Engine

[Scan Internet, U.4] use-case will be fully implemented.

Product Baseline Engine (PBE) module will be developed to support the use-case in the background. Most popular selling products will be recognized, classified, saved, updated, removed, and served to external modules by the PBE module.

See [Scan Internet, U.4] use-case for its requirements.

- Third party tools may be used to reduce development cost and timeframe.



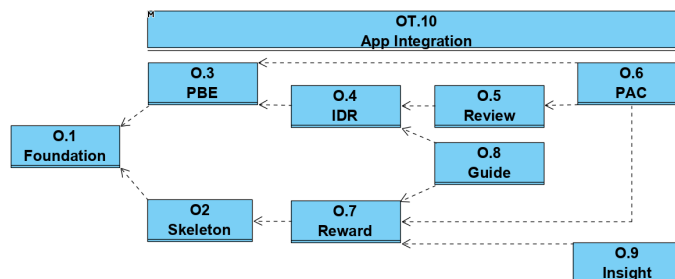
Class Diagram-01. Project objectives and their dependencies.

#### O.4. IDR: Image Detection and Recognition

- [Smart Search, U.5] use-case will be fully implemented.
- Image Detection and Recognition (IDR) module will be developed, integrated with [Skeleton, O.2] and [PBE, O.3], and operational to support Smart Search use-case in the background. See [Smart Search, U.5] use-case for its requirements.
- [IDR, O.4] directly depends on [PBE, O.3].
- Yolo v3 algorithm will be customized and implemented for image detection and recognition. Yolo v3 is expected to add responsiveness in the user experience on their mobiles, which may have lower computational resource.

#### O.5. Review: Product Review

- [Review, U.3] use-case will be fully implemented.
- Review module will be developed, integrated to [Skeleton, O.2], and operational to support Review use-case in the background. See [Review, U.3] use-case for its requirements.
- [Review, O.5] directly depends on [IDR, O.4].



Class Diagram-01. Project objectives and their dependencies.

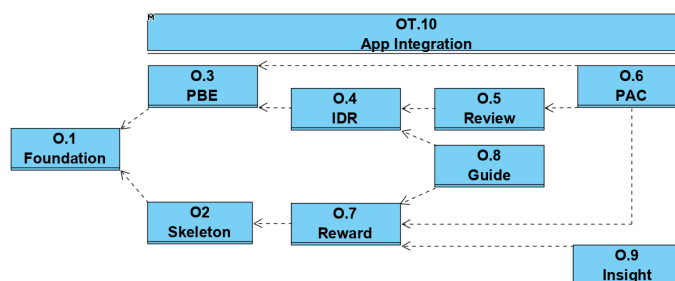
#### O.6. PAC: Product Assessment & Comparison

- [Smart PAC, U.6] use-case will be fully implemented.

- Product Assessment & Comparison (PAC) module will be developed, integrated to [Skeleton, Obejctive.2], and operational to support Smart PAC use-case in the background. See [Smart PAC, U.6] use-case for its requirements.
- [PAC, O.6] directly depends on [PBE, O.3].
- [PAC, O.6] directly depends on [Review, O.5].
- [PAC, O.6] directly depends on [Reward, O.7].
- Buy use-case will be using the services provided by [PAC, O.6]
- Automatic, intelligent PAC module will be developed by using NLP and Deep Learning techniques. See Appendix-1 for detail.

## O.7. Rewards: Rewards & Retention

- [Smart Rewards, U.8] use-case will be fully implemented.
- Rewards & Retention (Reward) module will be developed, integrated to [Skeleton, O.2], and operational to support Smart PAC and Guide Vendor use-cases in the background. See [Smart Rewards, U.8] use-case for its requirements.
- [Reward, O.7] directly depends on [Skeleton, O.2].
- [PAC, O.6] will be using the services provided by [Reward, O.7].
- Intelligent control algorithm will be developed for the feedback backbone, see Appendix-2 for the feedback backbone, by using Deep Learning techniques.



Class Diagram-01: Project objectives and their dependencies.

## O.8. Guide: Guide Vendor

- [Guide Vendor, U.7] use-case will be fully implemented, integrated to [Skeleton, O.2], and operational. See [Guide Vendor, U.7] use-case for its requirements.
- [Guide, O.8] directly depends on [IDR, O.4]
- [Guide, O.8] directly depends on [Reward, O.7]
- Vendor will be guided, through Sell use-case, with the competitors' product, the Platform's Smart Product Assessment & Comparison, which is also provided to Consumer when they choose products, and the Platform's smart recommendation on products, price, and promotion.

## O.9. Insight: Access Insight

- [Access Insight, U.9] use-case will be fully implemented, integrated to [Skeleton, O.2], and operational. See [Access Insight, U.9] use-case for its requirements.
- [Insight, O.9] directly depends on [Reward, O.7]
- Sponsor will be able to dashboard the Platform, as well as regulate Rewards & Retention use-case, which belongs to [Reward, O.7]. See Appendix-2 for Rewards & Retention.

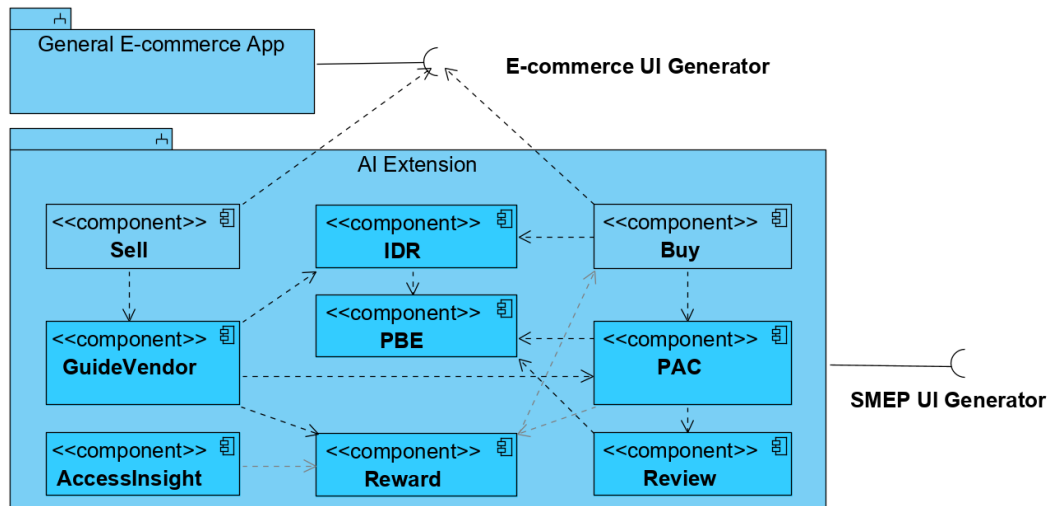
## O.10. Integration

- [Skelton, O.2] will be accommodate modules, and enhanced by using the modules on an ongoing basis throughout the Project.
- [Guide, O.8] will be integrated to [Skeleton, O.2].
- [PBE, O.3], [IDR, O.4], [Review, O.5], [PAC, O.6], [Reward, O.7], [Guide, O.8], and [Insight, O.9] will be integrated to [Skeleton, O.2].
- Buy use-case, implemented by [Skeleton, O.2] objective, will be enhanced based on services provided by [IDR, O.4] objective.
- Buy use-case will also be enhanced based on services provided by [PAC, O.6] objective.
- Sell use-case, implemented by [Skeleton, O.2] objective, will be enhanced based on services provided by [Guide, O.8] objective.
- Buy Products use-case, implemented by [Skeleton, O.2], will be enhanced to provide services as required by [Reward, O.7] objective.

## 9. High-level Architecture

### - Baseline component diagram

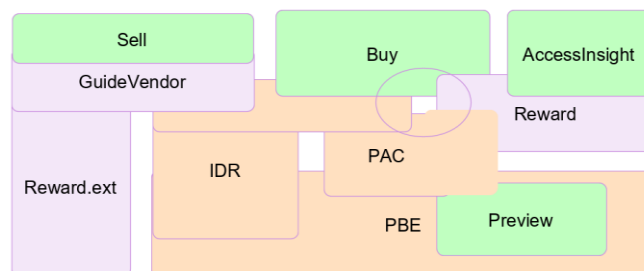
Together with the high-level use-case diagram, the development of the AI subsystem will begin with the following high-level component diagram, which resembles the high-level use-case diagram.



Component Diagram-01. High-level components.  
Its resemblance with Usecase Diagram-01 enables OOP approach in from requirements through management to programming.

- The closed loop of dependency [Buy -> PAC -> Rewards -> Buy] will be taken care of to *stabilize* the system from its possible spontaneous resonance.
- Special technical care will be taken of for Reward module. See [Rewards, O.7] and Appendix-2.

The baseline component diagram can have a different view, as follows:



Component Diagram-02. A hierarchical view of Component Diagram-01. A module atop of another depends on the latter.

**Green:** used by actors, **Pink:** middle, **Wheat:** basic.

The chart is complicated by the closed loop of dependency.  
See the circular mark and Reward.ext

## 10. Management

The management disciplines and processes we choose for the project are described below.

- The management of the project will be guided by the following viewpoints:
  - o The part of general e-commerce app will be considered basic, regarding the certainty of its successful development and the little value it can create directly today.
  - o The core that creates most value on top of the basics is the AI subsystem. We will be aware that it will accordingly pose most risks and take most cost.
  
- Personnel management
  - o We will recruit project members from within us, who have long been working as a team and are working at the same physical space. We will not outsource to other freelancers.
  - o We will keep the retention rate at maximum throughout the project.
  - o Project Manager will be responsible for the overall management. Project Manager will also take the role of AI leader.
  - o App leader will be responsible for web app and mobile app, which relate to the general e-commerce app as a whole and to the AI subsystem partially.
  - o AI leader will be responsible for AI techniques in the AI subsystem.
  - o App leader and AI leader report to Project Manager and are entitled to recruit members; manage resources including budget, processes; outsource to external firms; and report to Project Manager for their responsible areas.
  
- Communication and reporting
  - o Project Manager will be the principal representative of the project on overall management before the Sponsor.
  - o If the Sponsor wants elaboration on App and AI, the respective leaders will have direct communication with the Sponsor.
  
- Development processes

The Unified Software Development Process will be followed by and large. We will not distort the reality of development by blindly forcing waterfall model of project management. The two decades of experience we have in Unified Process will help.

  - o We will not over-separate between development phases, and allow rather smooth transition and overlap between them. This will relieve engineers from having to be subject to management ease and bureaucracy, and let them concentrate on their work as is. Instead, Project Manager and team leaders will bear more burden to coordinate between the Sponsor and engineers.

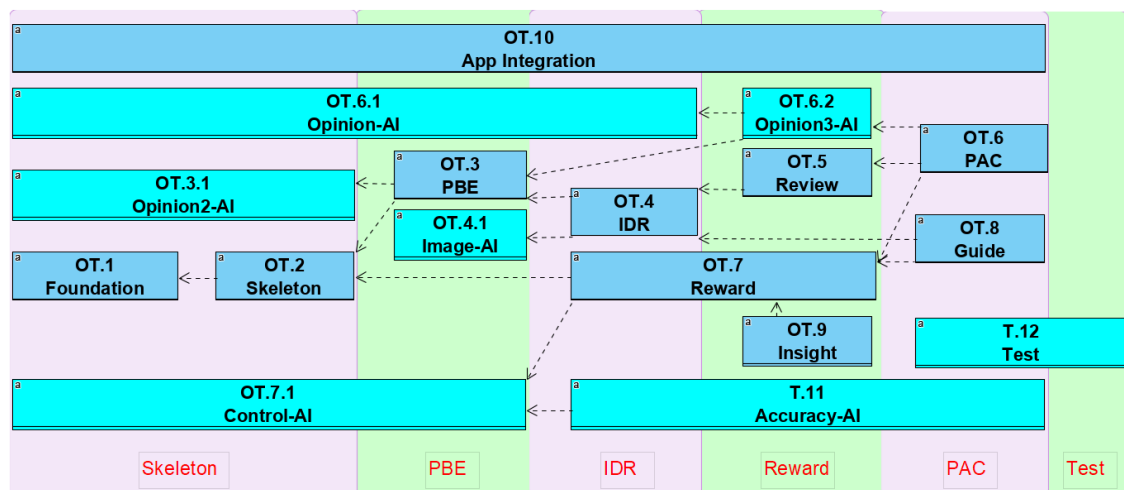
- We will build a general e-commerce app first as the skeleton of the platform, and add functionalities to it on an iterative and incremental basis. The platform will grow from the skeleton step by step incorporating new modules that are also under incremental construction, rather than suddenly integrate from components that are developed separately and completely. This will help both remove risks at earlier stage and adapt to learning curves.
- The management, as well as the software engineering, will follow Object Oriented Programming discipline.

As much as possible, the concepts used in management, development processes, and programming will follow those identified in the requirements. The rather intuitive and medium size nature of the project, along with the Sponsor's clear alignment of concepts, will enable this.

Accordingly, tasks/resource allotments, project reviews, and reports will be in terms of functionalities, rather than standard names of sub-processes.

## - High-level tasks

It is an OOP approach to maintain a direct mapping between Project tasks and objectives, as we will for the Project. A Project objective [PAC, O.6], for example, will generated its corresponding task [PAC, OT.6], as seen in the following figure.



Class Diagram-03. Project tasks, their dependencies, stages, and milestones.

Blue block represents a task directly inherited from the Project objective of the same number.

Cyan block represents a delegated child task introduced to run its parent task partially in parallel with their preceding tasks.

The background columns represent states and milestones with their names at the bottom.

While the Project objectives can be, or be derived directly from, the high-level tasks, we find that some important, riskier, and time-taking tasks will have to wait until its preceding tasks are finished. For example, the task [PAC, OT.6] would have to wait for its preceding tasks [Review,



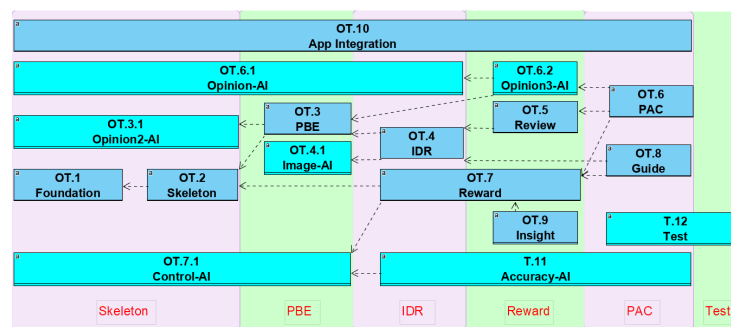
OT5], [IDR, OT.4], and [PBE, OT.3] to be finished completely, while we need to, and can, work on the underlying AI techniques included to the task in parallel with the preceding tasks.

To work around this, we let the tasks spawn its child tasks, delegate part of its work that need to be done earlier to the child tasks, and put the child tasks in parallel with the preceding tasks. See the tasks in cyan in the figure.

Child tasks are still considered a high-level task. The tasks that may be spawn under high-level task is a subtask.

Depending on the context, a task may be interpreted as either the task itself or the software package/program module that the task is directly responsible to produce.

The numbers don't necessarily represent the order in which the task will be worked on.



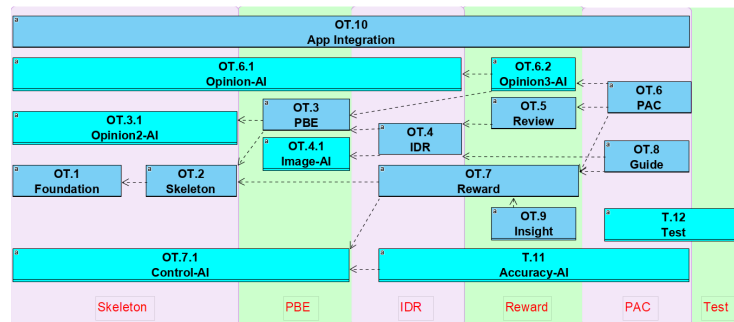
Class Diagram-03. Project tasks, their dependencies, stages, and milestones.  
 Blue block represents a task directly inherited from the Project objective of the same number.  
 Cyan block represents a delegated child task introduced to run its parent task partially in parallel with their preceding tasks.  
 The background columns represent states and milestones with their names at the bottom.

Tasks derived from use-case and objectives will produce a corresponding module that will realize and implement the use-case.

Newly adopted child tasks are described below:

- [Opinion-AI, OT.6.1], a child task of [PAC, OT.6]
  - Output: A Deep Learning model for extracting aspects/opinions in each category of product.
  - Fine opinion analysis techniques that we possess will be further refined and customized. See Appendix-1, Appendix-3, and Appendix-4 for more about the opinion analysis technique.
  - People will be hired to label aspects and opinions in sentences in each category of product, in order to collect a Deep Learning training data.
  - The technique of inter-category opinion-extraction knowledge transfer will be applied to reduce the cost of labeling.
  - We are considering Unsupervised Learning techniques to use for the Project later.

- [Opinion3-AI, OT.6.2], a child task of [PAC, OT.6]
  - Output: Testing code.
  - The modules [Opinion-AI, OT.6.1] and [PBE, OT.3] will be coordinated.

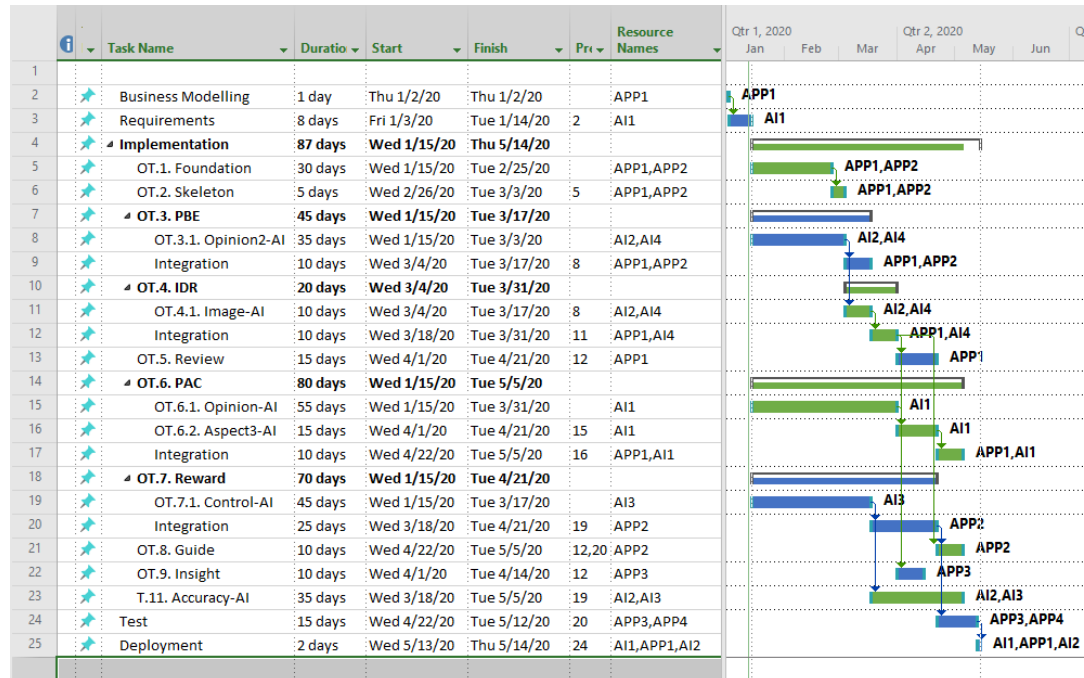
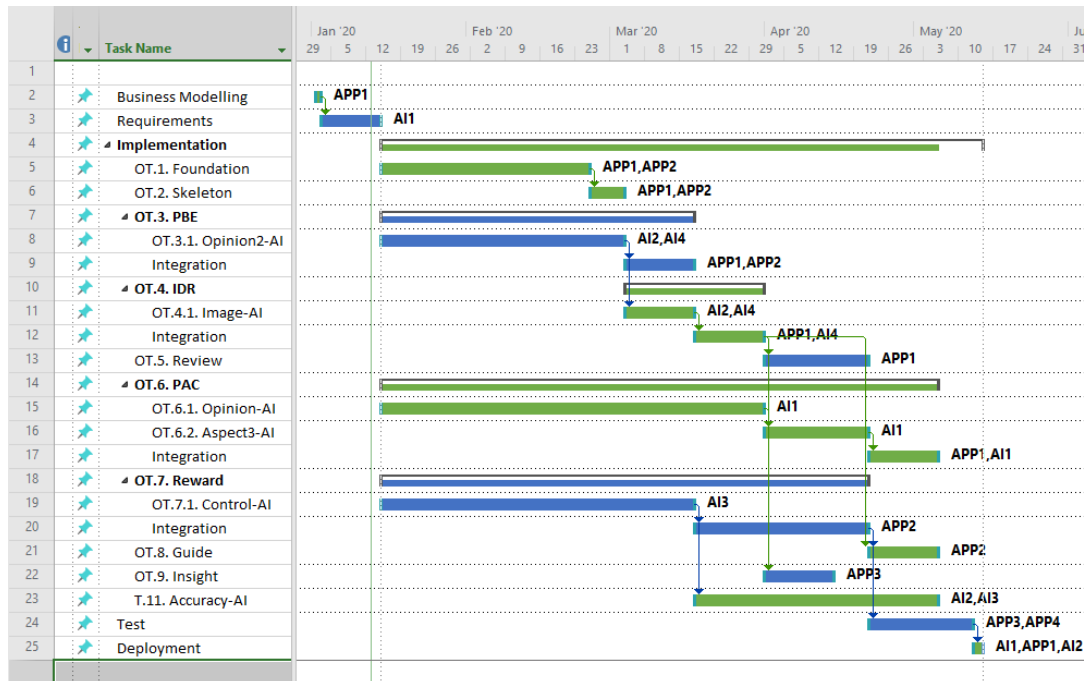


Class Diagram-03. Project tasks, their dependencies, stages, and milestones.  
Blue block represents a task directly inherited from the Project objective of the same number.  
Cyan block represents a delegated child task introduced to run its parent task partially in parallel with their preceding tasks.  
The background columns represent states and milestones with their names at the bottom.

- [Opinion2-AI, OT.3.1], a child task of [PBE, OT.3]
  - Output: A Deep Learning model for classifying texts related to product data.
  - Text classification technique will be refined and customized for the Project.
  - Feed from data sources, like the major social networks, will be check to classify proper categories the text belongs to, before pre-processed and stored for later use, by the module developed by this task.
- [Image-AI, OT.4.1], a child task of [PAC, OT.4]
  - Output: A Deep Learning model for Image Detection and Recognition on mobiles.
  - Yolo v3 Image Detection and Recognition technique, or the latest version, will be customized for the Project.
  - Picture images related to product categories will be connected to (fine) train a Yolo 3 model.
- [Control-AI, OT.7.1], a child task of [Reward, OT.7]
  - Output: A Machine Learning model for maximizing the retention rate of the Platform.
  - A hybrid technique of Deep Learning and Reinforcement Learning will be developed to intelligently learn and control the Feedback Backbone. See Appendix-2 and Appendix-6 for more.
- [Accuracy-AI, T.11], a child task of [PAC, OT.7]
  - Output: Ongoing accuracy improvement to keep up with emerging state-of-the-art AI techniques and performance.

## - Schedule

The project can be scheduled in terms of the high-level tasks that are identified in the above section. Note the chart below does not necessarily call for water-fall model of management.

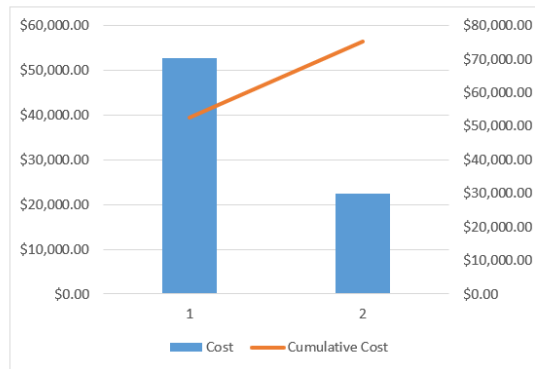


The resource allotment reflects mainly the Team's current skills, experience, and resources retained, which are steadily improving over time.

## - Cost (Engineers)

### CASH FLOW

Actual Cost	Baseline Cost	Remaining Cost	Cost Variance
\$0.00	\$0.00	\$75,184.00	\$75,184.00



The chart shows the project's cumulative cost and the cost per quarter.  
To see the costs for a different time period, select the Edit option from the Field List.

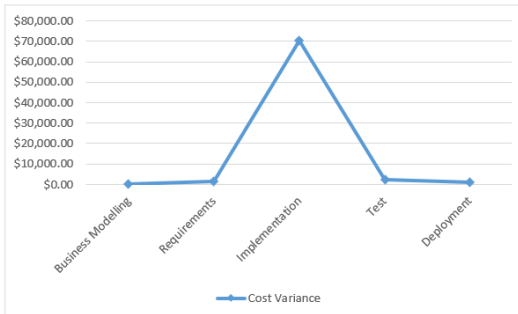
The table below shows cost information for all top-level tasks.  
To see cost stats for all tasks, set the Outline Level in the Field List.

Name	Remaining Cost	Actual Cost	Cost	ACWP	BCWP	BCWS
Business Modelling	\$80.00	\$0.00	\$80.00	\$0.00	\$0.00	\$0.00
Requirements	\$1,536.00	\$0.00	\$1,536.00	\$0.00	\$0.00	\$0.00
Implementation	\$70,240.00	\$0.00	\$70,240.00	\$0.00	\$0.00	\$0.00
Test	\$2,400.00	\$0.00	\$2,400.00	\$0.00	\$0.00	\$0.00
Deployment	\$928.00	\$0.00	\$928.00	\$0.00	\$0.00	\$0.00

## COST OVERRUNS

### TASK COST VARIANCE

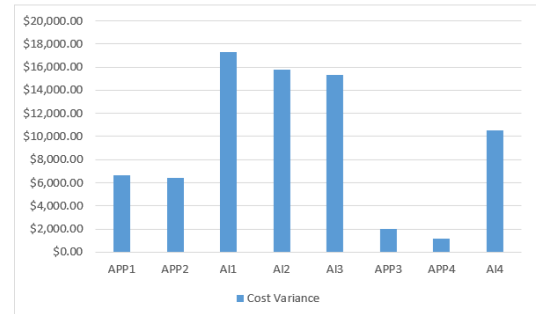
Cost variance for all top-level tasks in the project.



Name	% Complete	Cost	Baseline Cost	Cost Variance
Business Modelling	0%	\$80.00	\$0.00	\$80.00
Requirements	0%	\$1,536.00	\$0.00	\$1,536.00
Implementation	0%	\$70,240.00	\$0.00	\$70,240.00
Test	0%	\$2,400.00	\$0.00	\$2,400.00
Deployment	0%	\$928.00	\$0.00	\$928.00

### RESOURCE COST VARIANCE

Cost variance for all the work resources.

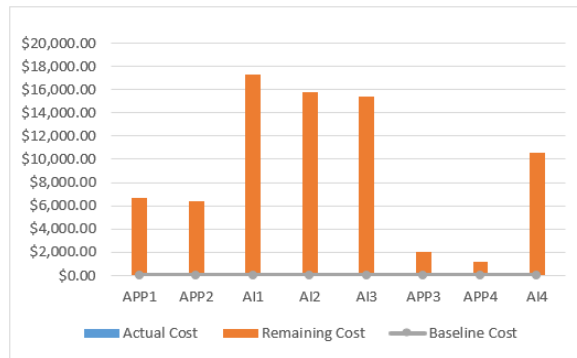


Name	Cost	Baseline Cost	Cost Variance
APP1	\$6,640.00	\$0.00	\$6,640.00
APP2	\$6,400.00	\$0.00	\$6,400.00
AI1	\$17,280.00	\$0.00	\$17,280.00
AI2	\$15,744.00	\$0.00	\$15,744.00
AI3	\$15,360.00	\$0.00	\$15,360.00
APP3	\$2,000.00	\$0.00	\$2,000.00
APP4	\$1,200.00	\$0.00	\$1,200.00
AI4	\$10,560.00	\$0.00	\$10,560.00

# RESOURCE COST OVERVIEW

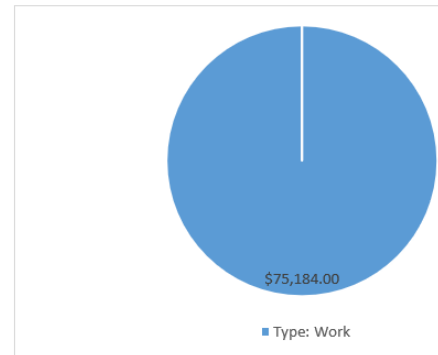
## COST STATUS

Cost status for work resources.



## COST DISTRIBUTION

How costs are spread out amongst different resource types.



## COST DETAILS

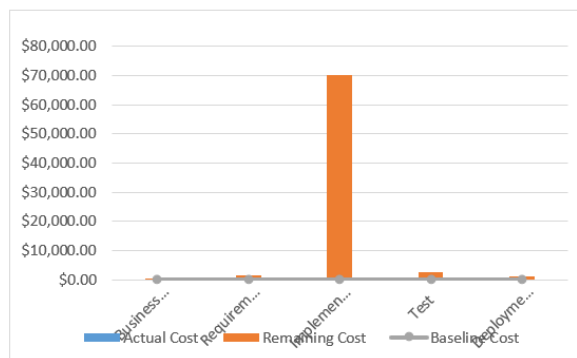
Cost details for all work resources.

Name	Actual Work	Actual Cost	Standard Rate
APP1	0 hrs	\$0.00	\$10.00/hr
APP2	0 hrs	\$0.00	\$10.00/hr
AI1	0 hrs	\$0.00	\$24.00/hr
AI2	0 hrs	\$0.00	\$24.00/hr
AI3	0 hrs	\$0.00	\$24.00/hr
APP3	0 hrs	\$0.00	\$10.00/hr
APP4	0 hrs	\$0.00	\$10.00/hr
AI4	0 hrs	\$0.00	\$24.00/hr

# TASK COST OVERVIEW

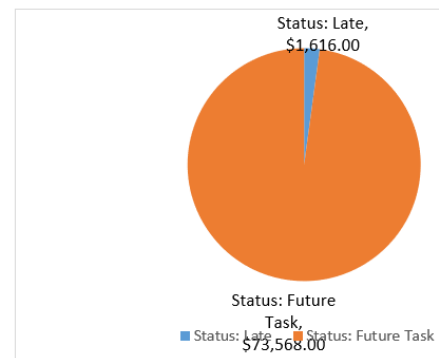
## COST STATUS

Cost status for top-level tasks.



## COST DISTRIBUTION

How costs are spread out amongst tasks based on their status.



## COST DETAILS

Cost details for all top-level tasks.

Name	Fixed Cost	Actual Cost	Remaining Cost	Cost	Baseline Cost	Cost Variance
Business Modelling	\$0.00	\$0.00	\$80.00	\$80.00	\$0.00	\$80.00
Requirements	\$0.00	\$0.00	\$1,536.00	\$1,536.00	\$0.00	\$1,536.00
Implementation	\$0.00	\$0.00	\$70,240.00	\$70,240.00	\$0.00	\$70,240.00
Test	\$0.00	\$0.00	\$2,400.00	\$2,400.00	\$0.00	\$2,400.00
Deployment	\$0.00	\$0.00	\$928.00	\$928.00	\$0.00	\$928.00

## - Budget

Engineers will be working on a full-time basis, retained throughout the Project, and not outsourced/offshored, in order to ensure quality work, except for special graphic UI design.

Hourly rates for App engineers and AI engineers are \$10.00 and \$24.00, respectively, on a basis of 40 hours per week. Work performed outside standard working-hours, which is usually dozens of hours a week, will not be charged for.

Outsourcing expense is added in order to get a labeled dataset that will be used to train AI models. The dataset will be a property of the Sponsor if negotiated that. The Sponsor can choose to provide a dataset of the same size/quality on their own if their procurement is more efficient.

Smaller miscellaneous outsourcing will be at our expense.

Costs By Task													
	Task Name	Duration	Start	Finish	Resource Names	Weeks	APP Heads	AI Heads	Total (\$)	APP WM	APP Total(\$)	AI WM	AI Total(\$)
1	Business Modelling	1 day	Thu 1/2/20	Thu 1/2/20	APP1				0.00	0.0	0.00	0.0	0.00
2	Requirements	8 days	Fri 1/3/20	Tue 1/14/20	AI1	1		1	960.00	0.0	0.00	1.0	960.00
	<b>Implementation</b>	<b>87 days</b>	<b>Wed 1/15/20</b>	<b>Thu 5/14/20</b>									
3	OT.1. Foundation	30 days	Wed 1/15/20	Tue 2/25/20	APP1,APP2	6	2		4,800.00	12.0	4,800.00	0.0	0.00
4	OT.2. Skeleton	5 days	Wed 2/26/20	Tue 3/3/20	APP1,APP2	1	2		800.00	2.0	800.00		0.00
	<b>OT.3. PBE</b>	<b>45 days</b>	<b>Wed 1/15/20</b>	<b>Tue 3/17/20</b>									
5	OT.3.1. Opinion2-AI	35 days	Wed 1/15/20	Tue 3/3/20	AI2, AI4	7		2	13,440.00	0.0	0.00	14.0	13,440.00
6	Integration	10 days	Wed 3/4/20	Tue 3/17/20	APP1,APP2	2	2		1,600.00	4.0	1,600.00	0.0	0.00
	<b>OT.4. IDR</b>	<b>20 days</b>	<b>Wed 3/4/20</b>	<b>Tue 3/31/20</b>									
7	OT.4.1. Image-AI	10 days	Wed 3/4/20	Tue 3/17/20	AI2, AI4	2		2	3,840.00	0.0	0.00	4.0	3,840.00
8	Integration	10 days	Wed 3/18/20	Tue 3/31/20	APP1, AI4	2	1	1	2,720.00	2.0	800.00	2.0	1,920.00
9	OT.5. Review	15 days	Wed 4/1/20	Tue 4/21/20	APP1	3	1		1,200.00	3.0	1,200.00	0.0	0.00
	<b>OT.6. PAC</b>	<b>80 days</b>	<b>Wed 1/15/20</b>	<b>Tue 5/5/20</b>									
10	OT.6.1. Opinion-AI	55 days	Wed 1/15/20	Tue 3/31/20	AI1	11		1	10,560.00	0.0	0.00	11.0	10,560.00
11	OT.6.2. Aspect3-AI	15 days	Wed 4/1/20	Tue 4/21/20	AI1	3		1	2,880.00	0.0	0.00	3.0	2,880.00
12	Integration	10 days	Wed 4/22/20	Tue 5/5/20	APP1,AI1	2	1	1	2,720.00	2.0	800.00	2.0	1,920.00
	<b>OT.7. Reward</b>	<b>70 days</b>	<b>Wed 1/15/20</b>	<b>Tue 4/21/20</b>									
13	OT.7.1. Control-AI	45 days	Wed 1/15/20	Tue 3/17/20	AI3	9		1	8,640.00	0.0	0.00	9.0	8,640.00
14	Integration	25 days	Wed 3/18/20	Tue 4/21/20	APP2	5	1		2,000.00	5.0	2,000.00	0.0	0.00
15	OT.8. Guide	10 days	Wed 4/22/20	Tue 5/5/20	APP2	2	1		800.00	2.0	800.00	0.0	0.00
16	OT.9. Insight	10 days	Wed 4/1/20	Tue 4/14/20	APP3	2	1		800.00	2.0	800.00	0.0	0.00
17	T.11. Accuracy-AI	35 days	Wed 3/18/20	Tue 5/5/20	AI2,AI3	7		2	13,440.00	0.0	0.00	14.0	13,440.00
18	Test	15 days	Wed 4/22/20	Tue 5/12/20	APP3,APP4	3	2		2,400.00	6.0	2,400.00	0.0	0.00
19	Deployment	2 days	Wed 5/13/20	Thu 5/14/20	AI1,APP1,AI2	0.4	1	2	928.00	0.4	160.00	0.8	768.00
<b>Total</b>									<b>74,528.00</b>	<b>40.4</b>	<b>16,160.00</b>	<b>60.8</b>	<b>58,368.00</b>
Outsourcing Cost													
	Task Name	Unit Cost(\$)	Units						Total(\$)				
20	Opinion Labeling for Training Sentences	0.04	30,000	Sentences					1,200.00				
21	Webpage Design												
<b>Total</b>									<b>1,200.00</b>				
<b>Project Budget Sum Total</b>									<b>75,728.00</b>				

### Key Stakeholders

Sponsor	
Project manager	

### Approval Signatures

\_\_\_\_\_

the Sponsor

\_\_\_\_\_

Project Manager

## 11. Appendices

### Appendix-1 Product Assessment & Comparison (PAC), Opportunities

See the Appendix part of the proposal

### Appendix-2 Rewards & Retention - strategy

See the Appendix part of the proposal

### Appendix-3 Opinion Analysis in general

See the Appendix part of the proposal

### Appendix-4 Opinion Analysis techniques demonstrated

See the Appendix part of the proposal

### Appendix-5 Image Detection/Recognition (IDR) techniques

See the Appendix part of the proposal

### Appendix-6 Reinforcement Learning techniques

See the Appendix part of the proposal

### Appendix-7 Market Research

See the Appendix part of the proposal

### Appendix-8 Marketing Strategy

See the Appendix part of the proposal