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| **[Octopus Cards]** |
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# Problem Definition

The problem that this technology is trying to address is the occurrence of transacting costs based on cash and the effect of the inefficiency that it has on students and establishments (long lines, maintaining change in the cashbox for large bills, etc.). Through the use of the octopus cards, the technology simply addresses the issue by introducing a new way of doing payments without the use of cash and the inefficiency that it produces. This makes business transactions much easier from both the students and the businesses’ points of view.

## Scope

The project will implement its solution among the various food stalls and amenities located in the Loyola Schools campus. The food stalls in the LS campus will include those located in the Gonzaga Cafeteria, JSEC, the Bellarmine Hall satellite cafeteria, The Galley in the Rizal Library, and the Deli Club in the MVP Student Center basement. The amenities include photocopying stalls located in the Rizal Library, Kostka Hall, SEC-A, etc. and the printing services found in the Rizal Library and CTC.

## Assumptions

This project assumes the following:

* Ateneo de Manila University (Loyola Schools) as the main proponent
* 8,000 students in the Loyola Schools
* 8 units of photocopying stalls
* 3 printing stations
* 41 food stalls
* Students carrying the costs for the project at a fixed rate
* Establishments carrying the costs for the project at a sales commission

# Market Analysis

## Stakeholders

Primary stakeholders are the students

Secondary stakeholders are the establishments

## Market Characteristics and Trends

The Ateneo de Manila University is a private institution that caters its services to the brightest students in the Philippines. When it comes to the students’ socio-economic segments, the university holds quite a distinction when it comes to its diversity. A tuition fee of 70,000 to 80,000 pesos per semester suggest that students belong to a class range of high C to A. This suggest a purchasing power that is well above the average compared to other universities in the nation.

However, it should also be noted that about 14 to 15 percent of the students are comprised of scholars, thus further strengthening the argument for diversity. Scholars are compensated when it from their tuition to their miscellaneous expenses. Some are partially compensated while some are fully compensated with an additional monthly allowance.

The Ateneo student is also engage in a variety of low-cost transactions within the campus. First of all, cafeterias, food stalls, and bazaars can be expected from different parts of the vicinity. These food establishments are owned by students, independent players, and cooperatives. Food thus can be seen different perspectives. It can be seen as a basic commodity that a student will pay for for regular price to even that of a recreational good as can be seen in student-held eating contests and more. Thus, the number of transactions the average Atenean engages in within his whole 4 to 5 year stay should be numerous. The price of a regular meal varies from 70 to 110 pesos, depending on the stall. Premium meals (e.g. sirloin, steaks) are costly outliers that might be valued higher than the aforementioned range.

The same can be said with the printing and photocopy services of the university. Photocopying is an essential function for fulfilling academic and organizational requirements whether it be for making inputs (readings and resources) or for outputs (passes and graded submission). The same can be said with printing. Although the rise of bootleg copies of resources (e.g. books, articles, etc.) and cloud-sharing of documents’ soft-copies have been on the rise as a costless substitute, photocopying and printing still holds a necessary function in spite of this.

## Revenue Potential

The potential from all these establishments can be valued at about 90,000 pesos per month. The breakdown for the technology project can be seen in the cost-benefit analysis part of the report. The revenue is enough to sustain the project given that students and establishments commit to a minimal contribution.

# Technology

## System

The whole Octopus Card system is powered by its Clearing House Architecture made possible by components such as cards and readers (discussed below), and its mainframe and service providers. The system uses a frame relay network and is powered by a frame service relay provider.

## Universal Reader and Writer Platform

The Octopus Universal Reader and Writer Platforms (URPs) are designed to provide a fast, reliable, cost-effective and convenient payment means for service providers. Different kinds of URP reader/writers have been developed to cater for different operating environments. The URP works by communicating with the RFID chip embedded in an Octopus card, then reading/writing information stored in it.

Characteristics

* A universal reader/writer platform supports ISO/IEC 14443 Type A & B and Sony FeliCa card reader.
* Capable of integrating with existing Octopus devices.
* Capable of integrating with various payment solutions such as parking systems and vending machines.
* Supports LED display, sound and voice messaging to provide a user-friendly payment environment.
* Supports multiple SAM card slots for security and key management.
* Runs on embedded Linux Operating System.

## Cards

The Octopus Cards that are used in Hong Kong were originally manufactured by Sony. These cards are the ones used to replace the need to bring cash all the time. These cards have the capacity to be used for daily living. For example, these cards can be used for public transportation may it be bus or train. They also have the capacity to be used in stores whenever the stores have the system that may allow the transaction.

These cards also have these qualities:

* Transactions are as fast as 0.3 seconds
* More stable and reliable due to the non-contact transactions
* Environmentally friendly materials were used
* Easily reloadable

## 

## Add-Value Machines

Top ups would only be done through prepaid, unlike the original design for banks to serve as service providers. We see this as likelihood given the project’s small scale as well as the security issues attached to it.

# Risks

|  |  |  |
| --- | --- | --- |
| **Possible Risks** | **Probable Impact** | **Possibility** |
| Loss of card | Low | High |
| URP malfunction | High | Medium |
| Server Downtime | High | Low |
| Electricity Blackout | High | Low |
| Broken card | Low | Low |
| Loading stations malfunction | Medium | Low |

# Implementation Plan

## Development

The development will take up at least 8 months. The costs and requirements will be seen in the Cost Benefit Analysis part of the paper. During the development, the analysis of the required system will be done. Data Flow Diagrams, Entity-Relationship Diagrams and others will also be constructed during this phase to help the development of the system. The project team will also create their plans and schedules like Gantt Charts in order for them to be organized in their efforts of putting up the said system.

## Implementation

The probable implementation of the cards will be during the summer break of the students, so that operations can start as early as the first semester of the school year. This phase will include the walkthrough and training of the users or the stall owners. There will also be an allotted time for observation, so that if there are any bugs or errors, the team can quickly modify it.

## Maintenance and Support

The maintenance and support will depend on the agreement of the project team and the stakeholders. Most of the time, the project team’s contract for the maintenance and support only last for three months. After which, if ever there will be errors or malfunctions, there will be added fees already. But within the said three month period, all repairs and modifications will be free of charge as long as the changes are part of the agreed upon scope of the system.

# Project Roles & Resources

## Project Roles

### Project Manager

The project manager is the one who oversees the whole project. He is the one who has direct contact with the suppliers and some of the stakeholders. He ensures that his project team is working on the right things at the right time. He creates the schedule and other important documents that are needed during the project creation and maintenance phases. He sees to it that the work of his project team follows the schedule agreed upon by the stakeholders and them.

### Systems Analyst

The systems analyst is the one in charge of looking at the data flow of the current and proposed system. He is the one who thinks of possible ways of improving the current system. After getting information from the client and stakeholders, he makes the lives of the developers easier due to transforming data to useful bits of information that may be necessary for the development of the system.

### Developer

The developer will configure the system that has already been made. He can either look at codes previously done or do it based on how he sees the information given to him by the Systems Analyst. He can also opt to do it from scratch. He can program and code the whole thing if it will be easier for him to do so. The developer is in charge of making things happen in this project. Without the developer, the system will not be possible.

### Tester

The tester will be the one to create test cases. He will ensure the quality of the system through the testing of the cards, URP and the system. He will look into possible errors that may occur, so that when the system is implemented, there will be little to no problems. There are different types of testing. There is the User Acceptance test, Stress test, Alpha and Beta test. The tests that will be done will be chosen accordingly.

## Resources

The resources that are required for the project will be a computer or two for development and other documents. Also the system will also require the cards and the URP to be coded and synced with the program that will be developed. The cards and other hardware will be bought from designated suppliers like Sony.

Note: Sony was the supplier of the Octopus Cards used in Hong Kong.

# Cost-Benefit Analysis

## Cost

1. Server (SPARC T4-1B Server Module– P30,000)

This will serve as the Octopus Clearing House System. As the Ateneo is smaller compared to Hong Kong in scope, so will a smaller server serve its purpose.

2. Workstation – (P20,000)

A computer workstation will also be needed for the server.

3. Octopus Card (Year 1 - 8,000 units on first year to cover all and 2,000 units in succeeding years for covering only freshman and transferees)

Each student will have an octopus card with him or her. The cost will be included in the tuition fee. It will be charged at P300 per student.

4. Add value-machines (4 units x P100,000 per unit) – 400,000

Just like ATM machines, add-value machines (for top up) will be strategically displaced. One unit of add-value machine for each of the following buildings: Xavier, Rizal Library, LS Bookstore, and JSEC.

5. Reader/Writer (75 units x P10,500 per unit)

Each retail establishment will need a Universal Reader/Writer(URP) in order for cashless transactions to be enabled. The retail establishments are divided into three categories: photocopy stalls(8 units), printing(3 units), and food stalls(41 units).

6. Data requirements will be based on Frame Relay Service quoted by service providers such as PLDT Brains or PLDT Accasia.

## Benefit

Economically, the benefit of this project would be the ease of payment and the gradual decrease in transaction cost which would increase the revenue of establishments integrated in the Octopus system. Therefore, the revenues could be derived from these establishments through a sales commission of 0.3% in each establishment. In the case that establishments choose to increase prices due to the implementation of the sales commission, it should be minimal given the very low rate and the increase shouldn’t make demand for the goods accessible through the octopus card very price elastic.

## Return on Investment

The payback period is estimated to be about 3.86. Hence, the cost of the project should be recovered at the fourth year given if estimates for costs and benefits stay the same.

## Tables and Figures

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | | **Cost(Monthly)** | |  | |  | | |
|  | Development | | | Production | |  | |  | | |
| Server | Php2,500.00 | | |  | |  | |  | | |
| Workstation | Php1,666.67 | | |  | |  | |  | | |
| Octopus Card | Php200,000.00 | | |  | |  | |  | | |
| AV Machines | Php33,333.33 | | |  | |  | |  | | |
| Reader/Writer | Php45,500.00 | | |  | |  | |  | | |
| Personnel |  | | | Php13,500.00 | |  | |  | | |
| Project Team | Php62,500.00 | | |  | |  | |  | | |
| Frame Relay | Php141.67 | | | Php3,000.00 | |  | |  | | |
| Maintenance Cost |  | | | Php4,841.67 | |  | |  | | |
|  |  | | |  | |  | |  | | |
|  |  | | |  | |  | |  | | |
|  |  | | | **Benefit(Monthly)** | | | |  | | |
| **Photocopy stalls** |  | | |  | | **Printing** | |  | | |
| Rizal (2nd floor) | 1 | | |  | | Rizal | | 1 | | |
| Rizal (3rd floor) | 1 | | |  | | Old Rizal | | 1 | | |
| Sec A | 1 | | |  | | CTC | | 1 | | |
| Sec B | 1 | | |  | | *Total units* | | 3 | | |
| SOM | 1 | | |  | |  | |  | | |
| ISO | 1 | | |  | | **Food stalls** | |  | | |
| Kostka | 1 | | |  | | Gonzaga | | 25 | | |
| Old Rizal | 1 | | |  | | JSEC | | 15 | | |
| *Total units* | 8 | | |  | | Bellarmine | | 1 | | |
|  |  | | |  | | *Total units* | | 41 | | |
| **Students** |  | | |  | |  | |  | | |
| *Total* | 8000 | | |  | |  | |  | | |
|  |  | | |  | |  | |  | | |
| **Category** | **Total units per category** | | | **Estimated Sales** | | **Commision Rate** | | **Octopus Revenue per month** | | |
|  |  | | |  | |  | |  | | |
| Photocopy stalls | 8 | | | PHP 1,248,000.00 | | 0.3% | | Php3,744.00 | | |
| Printing | 3 | | | PHP 390,000.00 | | 0.3% | | Php1,170.00 | | |
| Food stalls | 41 | | | PHP 27,716,000.00 | | 0.3% | | Php83,148.00 | | |
| Total Benefit (Monthly) | | | |  | |  | | **Php88,062.00** | | |
|  |  | | |  | |  | |  | | |
|  |  | | |  | |  | |  | | |
|  |  | | |  | |  | |  | | |
| Development Period | | | | 8 | |  | |  | | |
| Interest rate |  | | | 0.08 | |  | |  | | |
| Projected Changes(Annual) | | | |  | |  | |  | | |
| Production Cost |  | | | 0.04 | |  | |  | | |
| Production Benefit | | | | 0.06 | |  | |  | | |
|  | | | |  | |  | |  | | |
| Projected Costs | |  |  | |  | |  | |  |  | |
|  | | Year 0 | Year 1 | | Year 2 | | Year 3 | | Year 4 | Year 5 | |
| Server | | 20000.00 | 0.00 | | 0.00 | | 0.00 | | 0.00 | 0.00 | |
| Workstation | | 13333.33 | 0.00 | | 0.00 | | 0.00 | | 0.00 | 0.00 | |
| Octopus Card | | 1600000.00 | 0.00 | | 0.00 | | 0.00 | | 0.00 | 0.00 | |
| AV Machines | | 266666.67 | 0.00 | | 0.00 | | 0.00 | | 0.00 | 0.00 | |
| Reader/Writer | | 364000.00 | 0.00 | | 0.00 | | 0.00 | | 0.00 | 0.00 | |
| Personnel | | 0.00 | 178200.00 | | 203860.80 | | 233216.76 | | 266799.97 | 305219.16 | |
| Project Team | | 500000.00 | 0.00 | | 0.00 | | 0.00 | | 0.00 | 0.00 | |
| Frame Relay | | 1133.33 | 36000.00 | | 37440.00 | | 38937.60 | | 40495.10 | 42114.91 | |
| Maintenance Cost | | 0.00 | Php58,100.00 | | 60424 | | 62840.96 | | 65354.5984 | 67968.78234 | |
|  | |  |  | |  | |  | |  |  | |
| Annual Costs | | 2765133.33 | 272300.00 | | 301724.80 | | 334995.32 | | 372649.67 | 415302.85 | |
| NPV of Annual Costs | | 2765133.33 | 252129.63 | | 258680.38 | | 265930.08 | | 273908.63 | 282648.14 | |
| NPV of Cumulative Costs | | 2765133.33 | 3017262.96 | | 3275943.35 | | 3541873.43 | | 3815782.06 | 4098430.21 | |
|  | |  |  | |  | |  | |  |  | |
|  | |  |  | |  | |  | |  |  | |
| Projected Benefits | |  |  | |  | |  | |  |  | |
|  | | Year 0 | Year 1 | | Year 2 | | Year 3 | | Year 4 | Year 5 | |
| Annual Gross | | 0 | 1056744.00 | | 1120148.64 | | 1187357.56 | | 1258599.01 | 1334114.95 | |
| NPV of Annual Gross | | 0 | 978466.67 | | 960346.91 | | 942562.71 | | 925107.85 | 907976.22 | |
| NPV of Cumulative Gross | | 0 | 978466.67 | | 1938813.58 | | 2881376.29 | | 3806484.14 | 4714460.36 | |
|  |  | |  | |  | |  |  | |
|  | |  |  | |  | |  | |  |  | |
| Annual Net | | (2765133.33) | 784444.00 | | 818423.84 | | 852362.24 | | 885949.34 | 918812.10 | |
| NPV of Annual Net | | (2560308.64) | 672534.29 | | 649691.23 | | 676632.63 | | 651199.21 | 625328.08 | |
| NPV of Cumulative Net | | (2560308.64) | (1887774.35) | | (1238083.12) | | (561450.49) | | 89748.73 | 715076.80 | |
|  | |  |  | |  | |  | |  |  | |
| Payback Period | | 3.86217931 |  | |  | |  | |  | 2.212390525 | |