

MALABE IOT RESEARCH & DEVELOPMENT [R&D] CENTER

A.M.S. Abesinghe
Undergraduate
Department of Town and Country Planning
University Of Moratuwa



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ABSTRACT

The Module Project Formulation Appraisal and Management which is assigned for the Level III Semester VI is in the synthesis stage. The main objectives of this module is to explain the concept of project appraisal to illustrate the methods and techniques pertaining to project formulation and appraisal and to apply different development appraisal methods and evaluate alternative development proposals. The aim of this assignment is to formulate a project and prepare a feasibility report with the reflections in the real ground situations. Under this project it was proposed to prepare a plan for the establishment a IOT R and D center in Malabe area. At the beginning of the project the location was selected based on the suitability analysis and the project preliminary activities were done including the EIA. Then the basic project design was done with the project objectives rationale and the relationship to the national policies and strategies. Then the project costing and project budgeting was done with the sensitivity analysis. As the next phase the items on implementation arrangement and the project sustainability was done. At last the economic and the financial findings were analyzed, and the report was completed.

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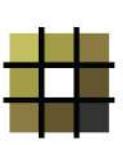
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GENERAL INFORMATION OF THE PROJECT

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01.GENERAL INFORMATION OF THE PROJECT

Sri Lanka was one of prime attractions of the Indian Ocean sailors since the early first millennium BCE. This was due to several reasons and notable among them is Sri Lanka's strategic geographical positioning in this mighty Sea. Sri Lanka was almost in the midpoint of the sea routes which linked the South China Sea in the east with the Red Sea in the west at that time. The Colombo was main, Administrative and capital city after 1500 CE (Somadeva, 2018).The highest population of Sri Lanka is recorded from the Western Province, and that's because of the high population of Colombo Metro Region. Defined Colombo metro region was only metro region in Sri Lanka. Being a commercial Capital have high demand of Transportation and Infrastructure currently and future development.

1. Project Title

Title of this project is the construction of a IOT – Internet Of Things Research and Development Center (R and D) in Malambe area, Colombo metro region of Sri Lanka.



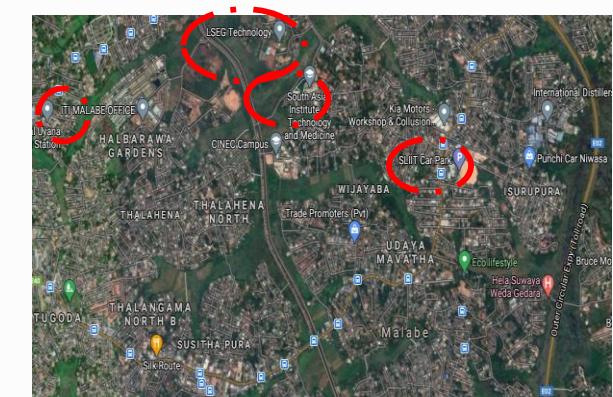
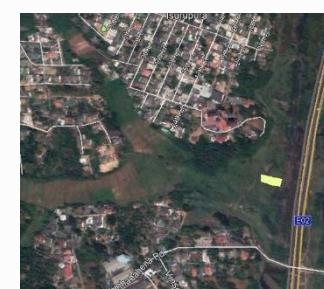
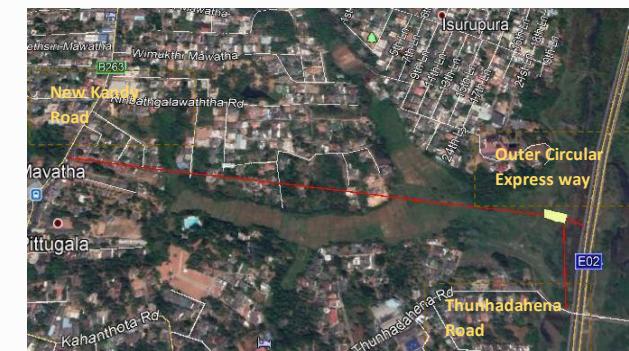
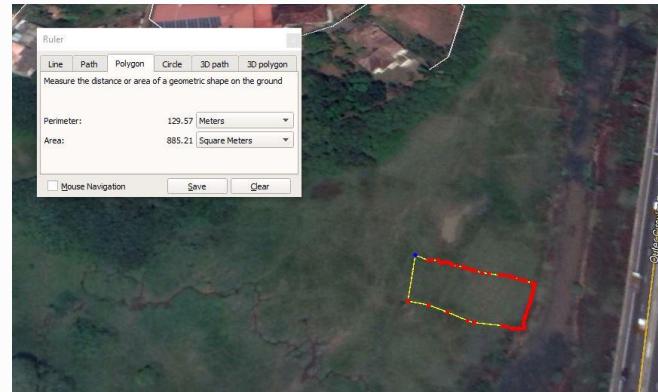
2. Project Sector

This project belongs to the main sector of Communication, Technology and Research Sector and the sub sector of Science and Technology -IOT (Internet of Things)

3. Project Location

It is proposed to establish the IOT research and development center is located in Malabe East, Colombo district of Western Province of Sri Lanka. According to the proposed location this IOT Research and Development center is located near to E2 Outer Circular

Expressway (0.04 KM), near to Thunhadahena Road (0.17 KM) and also this near to New Kandy road (0.96 KM). This land is bare land and nearby environment is consisted with some green field.



4. Land Requirement for the Project

It is hard to build up a building in the center of Colombo. So we have to more place to near the Colombo that has access to every resources. So Battaramulla and Malabe are the ideal places that can recommend. Near LSEG also a recommended place because there are so many IT companies, IT Universities, ICT centers etc. so Malabe is the best required land for the this IOT Rand R center.

Malabe IOT R and D center required land for implement this project. The main considerable reason to select Malabe as the site was the land use of Malabe consists with many Technological centers, universities.

Colombo metro region has high potential to develop the R &D sector and IOT technology with the human capital and also due to the highest concentration of educational institutions and educated people.

Western region megapolis plan identified key development zones under that "Malabe" identified as a science & technology city.

The most suitable place for locate the center was selected by considering the length in between other located R and D centers .35 perch has been allocated for the purpose of implementing process and a land with no human settlements has been chosen to build up the center. The selected project area compromises with high accessibility since it's located near to the road.

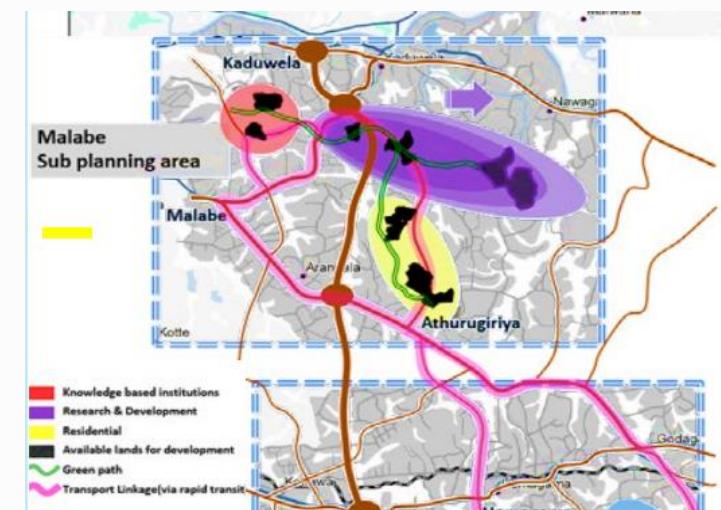


Figure 4.1 Western Megapolis plan

5. Project Preliminary Activities

As this project is on the establishment of the IOT R and D center in the Malabe area it is necessary to do an environment impact assessment so as to identify the impacts towards the environment after the implementation of the project. The environmental variable when developing a project has become a major concern day by day. Without performing a several

analysis regarding to the consequences of a construction can't be bear on the area where it is physically established. Environmental Impact Assessment (EIA) is the most effective method for preventing aggressions towards environment and preserving natural resources in project management.

The Legal framework for EIA process in Sri Lanka has been laid down in the National Environment Act (NEA) in 1988.

- EIA process is mandated only for large scale development projects or projects which are located in environmental sensitive areas. Those types of projects which require EIA have been prescribed in the Gazette (Gazette No.772/22 of 24.06.1993).

Therefore, the EIA process that needed to be carried out in this area is as follows. EIA process includes 6 major steps.

Steps		Time allowed for the PAA (Project Approving Agencies)
01	Screening (Determining whether an EIA is required for a project)	7 days
02	Scoping (Determining the scope of the EIA study and issuing of Terms of Reference)	40 days for EIA
03	Preparation of the EIA report	No time limit has been given since the project proponent is responsible for this.
04	Review of the EIA report The review involves both public and technical review	
	a) Public review (applicable only for EIAs) The project proponent needs to respond to the public comments received	30 working days
	(b) Technical review	50 days for EIA
05	EIA Decision Granting approval with terms and conditions or rejection with reasons.	
06	Post approval monitoring	

Table 15.1 EIA Process Steps

- The EIA process concern about the protection of the environment and the impacts which can be occurred due to the establishment of R&D Centre in the selected project location. Since the center is not an industry which emits pollutant to the environment, the project won't be a threat to the space.
- Any existing constructions or human settlement won't be removed or demolished when the R&D project laugh and also Resettlement processes may not occur for the buildup process.



BASIC PROJECT DESIGN AND FRAMEWORK

- 1. Project Objectives.**
- 2. Rationale of Project**
- 3. Relationship of the Project to National Policies and Strategies**

02. PROJECT DESIGN AND FRAMEWORK

6. Project Objectives

Our project is to Implement a Research and Development center for IOT in Malabe. Our main objectives for this implementation are as follows.

- O1. Doing Top level research activities parallel to other developed countries.
- O2. Finding solutions to the local industry level problems.
- O3. providing opportunities to the students who are interested in IOT sector to get knowledge and experience with the current technologies.

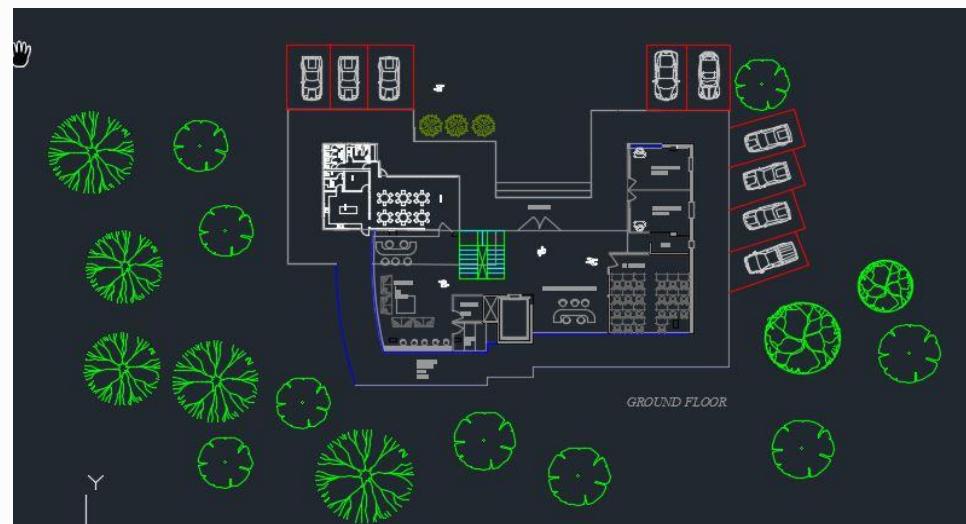
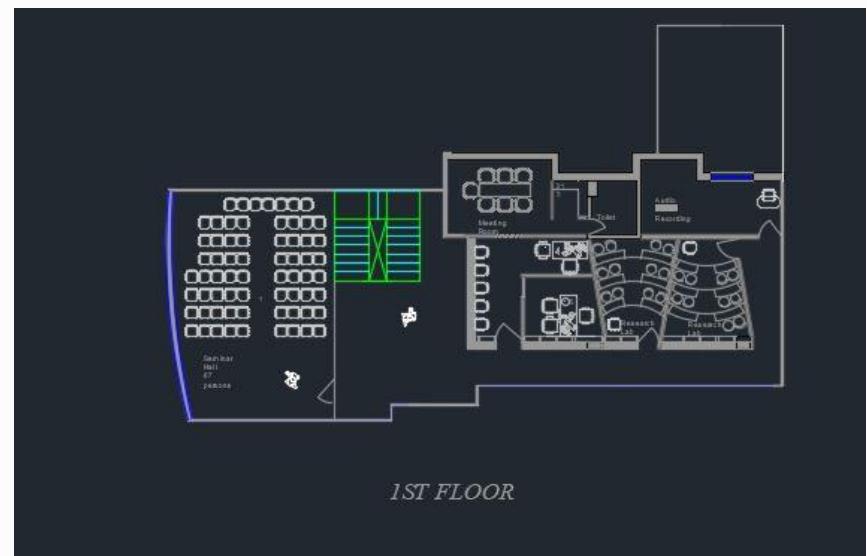
Action project –

- Construction of Malabe IOT Research and Development Center.



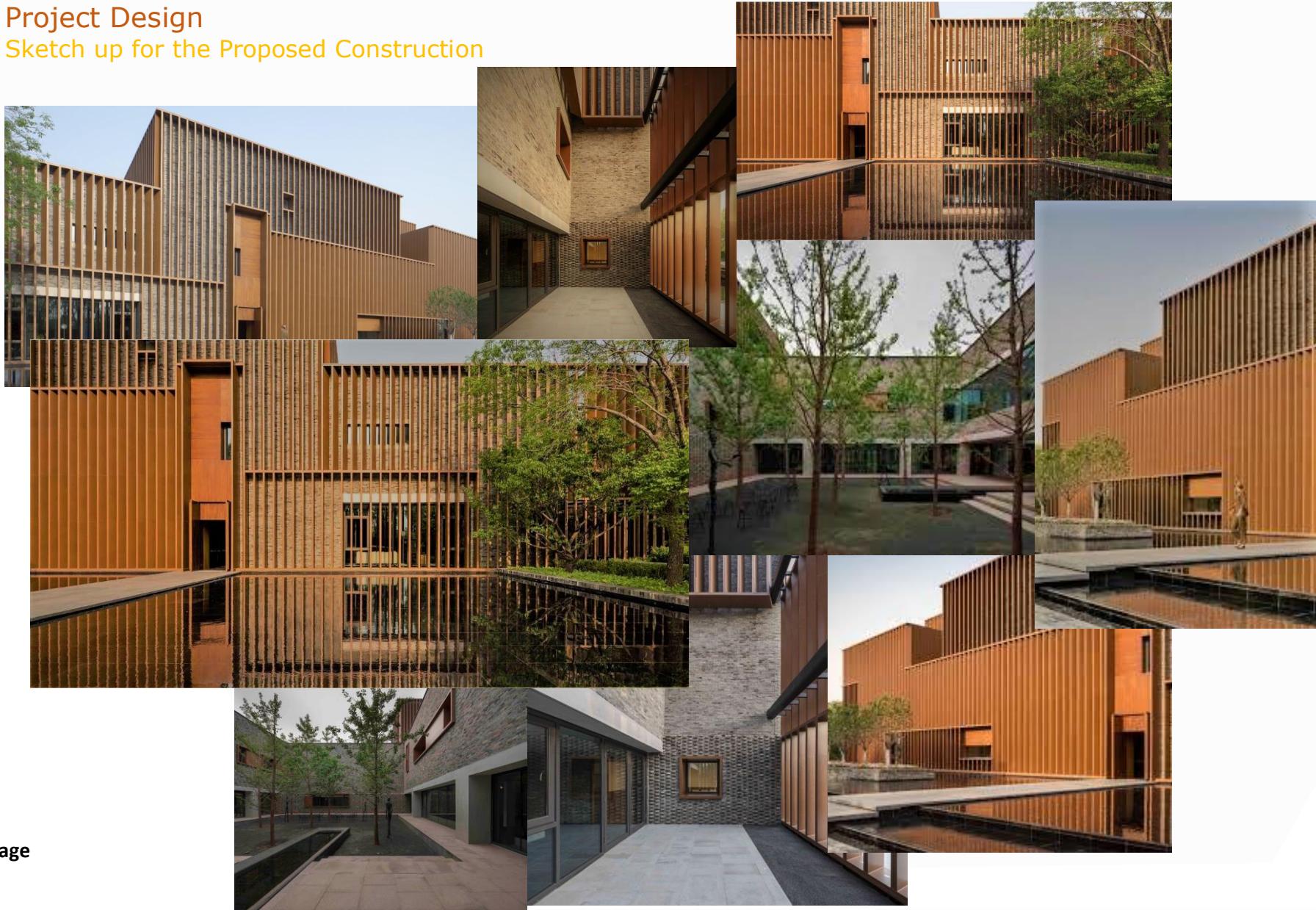
Project Design

AutoCAD plan for the Proposed Construction



Project Design

Sketch up for the Proposed Construction



7. Rationale of Project

Rationale of the project addresses the question of "Why implementing project is absolutely necessary to implement the project". Under the rationale of the project, we should do the need assessment or problem analysis related to the project for identifying the needs and problems in the existing condition of the project area and surrounding community. In here, we have done the problem analysis by analyzing and describing the needs and problems related to this implementing IOT research and development center in Malabe area in Colombo district.

According to my view, with considering the regional base resources, there is not a rationale for building the IOT research and development center in particular area of the Malabe As a rationale of this selected project, we have explained the "why the current IOT researches and developments and related infrastructures are insufficient, how the new proposed project of IOT research and development center is going to address these insufficiencies and why the IOT research and development center would be a wise use of this particular space".

7.1 Specific Problems and Needs to be address by the Project

This is a large scale IOT R and D project and it will take more benefits to the area. Therefore, it is identified some points to elaborate reasons for this project. Under this

- What is the problem, need or the existing gap/ deficiency?
- What are the root-cause, underline causes and immediate causes that contribute for the problem or the need that the project intends to address?
- How does this wholesale fishery market project contribute to fulfil the existing gap in the sector?
- Mode of intervention of this project to address the gap?
- Other alternative modes of interventions, if any

project following things are help to understand why this project proposed

Under this proposed project of IOT research and development center, we have addressed specific problems and needs related to project by answering the assessment questions with specific explanations for each questions in regular way like this.

7.2 What is the problem, need or the existing gap / deficiency?

According to the using primary and secondary data that we collected the issues in the Colombo metro region. Mainly we identify the in Colombo area have not well functioning IOT R and D center. The main root cause is in identify in the region as follows,

- Agriculture sector facing problems in producing good quality goods.
- Local industries depend heavily on the human resources
- Less job opportunities for research engineers in sri lanka
- School and university students lack the latest technological knowledge and experience.

7.3 What are the root-cause, underline causes and immediate causes that contribute for the problem or the need that the project intends to address?

“Roots - cause analysis” is one of the best tools for getting to the root of the problem. And also, there is purpose to improve project performance and continuous improvement tools can be used in the selected project. In here, as an analysis, I have used a method based on the “Ishikawa or Fishbone diagram”.

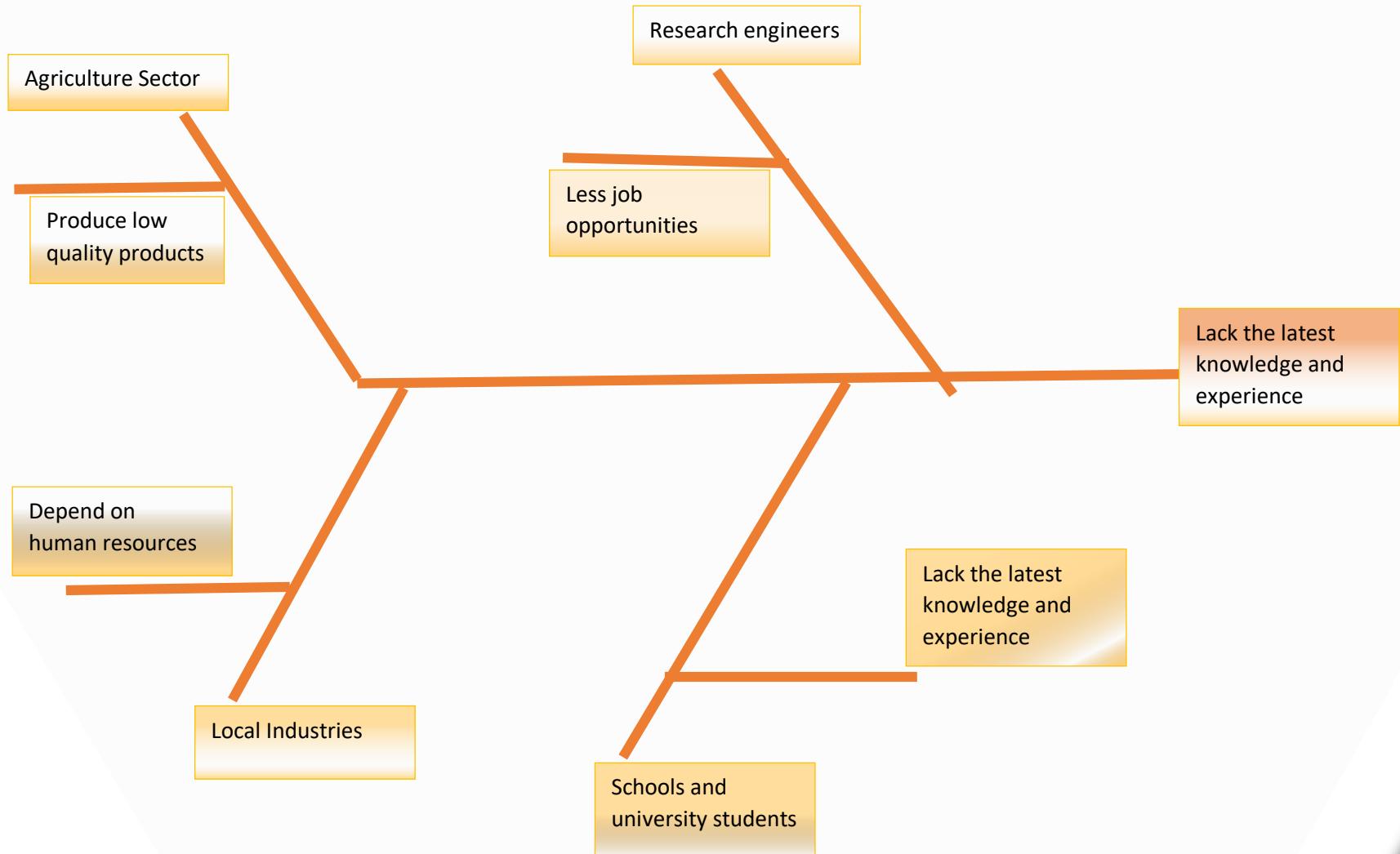


Figure 7.3 Root Cause Analysis

7.4 How does this project contribute to fulfill the existing gap in the sector?

Under this session, we should include data related to the "how this project contributes to address the identified above gaps or problems". Actually, the main problem was a not well functioning IOT R and D center in Malabe in Colombo district. By doing the Fishbone diagram, we could identify the main courses to effect the main problem. Therefore, we have clear understanding related to existing problem and relevant causes to it.

There is an aim for introducing new technologies related to Agricultural sector and university and school students to gives new technological knowledge processing in

Malabe area by implementing this IOT research and development Centre. In addition to that, we can use resources as existing ict institutions within the region like Malabe LSEG center. As well as, through this research and development Centre, it is going to introduce new techniques for innovations, of the production processing with knowledgeable experts in the Centre. Every grower has chances to get resources and improve their production capacities. Finally, IOT research and development Centre will be a good opportunity for improving productivity and quality of Sri Lankan IOT technology as most preferred R and D center in the world day by day.

7.5 Mode of intervention of this addressing gap?

There is an aim for Introducing smart agriculture for selected areas, Introducing IOT for industry automation, Hiring Engineers with proper knowledge

and experience, and offering courses for the students interested in IOT in Malabe area by implementing this IOT research and development center.

7.6 Target Beneficiaries

In every project have target beneficiaries. Beneficiaries can be defined as “an individual, group or any entity that is focus of receiving the benefits arising out of a project”. According to my view, if a successful project, it should be provided beneficiaries from bottom level to top level of all groups in people in the society. Actually, it should be included “both direct and indirect recipients and goods and services produced by the program”. In here, the direct recipients are Colombo region community is the main beneficiaries of this IOT R and D center. As indirect beneficiaries are the surrounding area's

community people and entire country, this modern technologies and new innovations contributed agencies at different stages of the project and new employees and officers involve in the IOT research and development Centre.

And also our research engineers like expertise are mainly befits that and students also the lucky beneficiaries of this IOT R and D center.

8. Relationship of the project to National Policies and Strategies

According to Western region Megapolis plan identified key development zones under that “Malabe” identified as a science & technology city.

Current government political manifesto focused a technology-based society they mentioned that in their policies. “Technology Based Society (policy 7)” and in their policy framework they always mentioned the advantage of the technology and how they used technology for the development of the country.

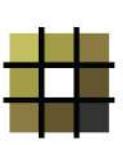
Tech city project 2018 identified 4 main zones that focusing technological advancement within different sectors. “The emerging global scenarios also indicate that the ongoing technological advances (frequently noted as the products of ‘Fourth Technological Revolution’) such as the Big Data, Internet of Things, Block Chain Technology, Robotics and Automated Industries, Virtual Spaces, E-commerce, Agile Governance, Automated Mobility, etc, will have an

unprecedented impact upon the lifestyles of the people, and in-turn on the physical developments and an unprecedented impact upon the lifestyles of the people, and in-turn on the physical developments and the overall spatial structure all over the word in near future, not exempting Sri Lanka." (Development M. o., 2018)

"The fast-evolving technology, increasingly shred information and ever modernizing means of communication necessitates Sri Lanka to act fast and choose the most appropriate, economical and effective strategies to improve its physical environment and the infrastructure." (Development M. o., 2018)

As mentioned above national physical plan also mentioned about the technology. Other than that national physical plan proposed fiber optic network for the country. That is also mainly centralized to the CMR. Existing situation also the telecommunication and fiber optic technology are very high in CMR. So, we can prove that we have a greater potential for developing the IOT technologies within our region. other than that port city development also another important investment which is currently used the high technology for the development. Most of the policy actions of current government as I mentioned above wish to use this technological innovation for the development of the country. Currently the potential of developing such advanced technologies is facilitated by the CMR. So, obviously the advantage is come toward the CMR.

Homagama development plan proposed University, Research, and Development institutes development zone.
Ex: Processed food and beverage sector need the R & D investment for capturing the global market.



PROJECT RESULTS AND RISK FRAMEWORK

- 1. Coordination with Stakeholders and Partners for Implementation of the Project Items on Project Results and Risk Framework**
- 2. Project Impacts, Outcomes and Outputs/ Result Framework of the Project/ Performance Framework of the Project**
- 3. Aligning the Project Objective/s with the Relevant Sustainable Development Goal/s (SDGs)**
- 4. Potential Negative Impact on Socio Economic Activities and Environment by the Project**

9.COORDINATION WITH STAKEHOLDERS AND PARTNERS FOR IMPLEMENTATION OF THE PROJECT

In every project, there are relevant stakeholders and partners for implementation of the project with including relevant ministries, provincial councils and other agencies. The main aim of this coordination with

stakeholders and partners is to ensure maximization of effectiveness and efficiency of project implementation while minimizing unnecessary wastage.

In this proposed project for the IOT R&D center we have many stakeholders.

1. Research Engineers and Research scientists
2. Local industry owners
3. Students interested in IOT
4. E-Waste recycling centers
5. Electronic component suppliers
6. Ministry of Skills Development, Vocational Education, Research & Innovation

These stakeholders are engaged in or getting benefited by the R&D center we're planning to implement



0.2 Project outcomes

Outcome refers to the changes or effects of the outputs produced by a project. The aim of this project outcome is, to address core problem, provide meaningful changes and benefits.

Problem	Intervention	(preliminary) Outcome
Agriculture sector facing problems in producing good quality goods.	Introducing smart agriculture for selected areas.	Quality products in agriculture sector.
Local industries depend heavily on the human resources	Introducing IoT for industry automation	Increase the accuracy and reliability of local industry outputs
Less job opportunities for research engineers in sri lanka	Hiring Engineers with proper knowledge and experience	Increased job opportunities for research engineers
School and university students lack the latest technological knowledge and experience	Offering courses for the students interested in IoT	People with latest IOT Knowledge

Table 210.21 Project Outcome

0.3 Project outputs

Project outputs are the goods and services delivered to the target group by the project Planned. The outputs directly influence the achievement of expected outcomes.

Quality products in agriculture sector.

1. Best quality goods
2. Lesser chemicals used in production process
3. Pre identifying environmental changes and adaptation.

Increase the accuracy and reliability of local industry outputs

1. Increase the quality and production time.
2. Reducing the cost of human resources
3. Pre identifying of machine breakdowns.

Increased job opportunities for research engineers

1. Job satisfaction
2. Preventing engineers from seeking foreign job opportunities.

People with latest IOT Knowledge

1. Improvement of IT sector in all industries.
2. Increase the awareness in people about new technologies.

0.4 Planned Activities in Achieving Outputs

With the help of ministry of agriculture and the major industry owners, we can implement latest IOT technology in these two sectors. And the latest developed technologies will also put to test and then implement for the industrial use to enhance the outputs.

11. Aligning the Project Objectives with the Relevant Sustainable Development Goals



Sustainable Development Goals to be achieved by the objectives of The Project-

- Quality Education
- Decent work and economic growth
- Industry innovation and Infrastructure
- Affordable and clean energy

Decent work and economic growth and Industry, innovation and infrastructure are sustainable development goals which are describe about promote sustained, inclusive and sustainable economic growth,

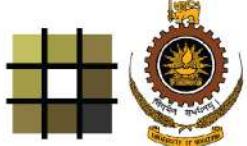
full and productive employment and decent work for all. Achieve economic productivity through technological upgrading and innovation including through a focus on IOT. And using Solar power system is achieved the affordable and clean energy sustainable goal.

12.Potential Negative Impact on Socio Economic Activities and Environment by the Project

IOT R and D project implementation potential for make negative impact on socio economic activities and environment. Every project has kind of negative impacts. But it has to plan to reduce it. This projects have not larger scale negative effect but some small effect sis happened. Project planned activities also have Potential Negative Socio-Economic & Environmental Impacts-

- Completely change their life style with this project activity.

to use to mitigate that negative impacts of this project. IOT research and development work depend on electronic components but we sell this e-waste to e-waste collecting center.so, that we facilitate the solution for this impacts also.



PROJECT COSTING, BUDGET, AND FINANCING

- 1. Project Budget**
- 2. Financing Plan**

PROJECT COSTING, BUDGETING AND FINANCING

13. Project Budget-

This is IOT R and D project and this is medium scale. Therefore, it need to calculate cost for whole the project and other things. Therefore, it is need to know about bill of quantity for this project implementation process. It means total estimated cost for the project or budget financing of the project. In that it is used cost estimation method to find to total project cost. In that it is used budget cost from the person who expert in that section

and also it is used same project to get to know about time duration cost and cost items like that things. But in this project it is taken final result of cost estimation from the report of BOQ. But in that it is very difficult to take all of the calculations. Therefore, it is taken very important part for the project. The total project budget is desirable to be presented to all the key stakeholders and obtain their buy-in and approval.

The total estimated project cost is Rs. 134,874,931.00 and annual project income is Rs. 317,600,000 as detailed in this tables.

Project Cost	Rs. (Million)
Land Acquisition	17500000
Preliminaries & General items	2,850,000
Procurement	39000

Cost for construction	35,458,931.00
Professional fees	2,000,000
Cost of finance	77,000,000
Total	134,847,931.00

Table: 13.1 Project Budget

14. Financing Plan

14.1. Method of Financing

This project will be financed by Ministry of Skills Development, Vocational Education, Research & Innovation and ADB. Loan amount is Rs. 60,000,000 that is taken by ADB and rest Rs. 10,000,000 will be paid by government grant of Ministry of Skills Development, Vocational Education, Research & Innovation. The maintenance cost will be adding from third year of the project. The cost for maintenance will be around Rs. 24,500,000 and that will be contributed by local authority of Malabe area.

The loan amount of 60,000,000.00 will be paid back within a 3 year from the revenue of Malabe IOT R and D center.

14.2. Revenue Forecast

Annually this project could able of generate Rs 79,400,400 as revenue.

Revenue generate from IOT R & D center	Rs. (Million)
Annual funds for 1 research center	35,000,000
No of research center	4
Total Annual Funds	140,000,000
Revenue generate from E-Waste	2,000,000
Total Income	142,000,000
Production cost	40,000,000
Salaries	25,000,000
Total expenditure	65,000,000
Net income	77,000,000

Revenue generate from E-LIBRARY	Rs. (Million)
E-LIBRARY	0.2
Course free from 1 student	20,000
Batch size	50
No. of Batches	2
Total income from ICT courses	2,000,000
Total income	2,200,000

Revenue generate from canteen	Rs. (Million)
Annual income	200,000

Total revenue	79,400,000
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14.3. Project Operation and Maintenance Costs after Completion

Project operation and maintenance are handed over to the local authority after the construction period. The annual maintenance cost is Rs. 24.5 million as detailed in under tables.(BOQ)

Types of maintenance	Rs. (Million)
Other facility maintenance	5
Building maintenance	2
Machine maintenance	5
Office management	2
Water & Electricity	2.5
Human maintenance	8
Total Cost	24.5

14.3. BOQ for IOT R and D Center

<u>BILLS OF QUANTITIES</u>					
<u>PROJECT : PROPOSED RESEARCH FACILITY</u>					
ITEM NO	DESCRIPTION	UNIT	QTY	UNIT RATE (Rs)	AMOUNT(Rs)
A	PRELIMNARIES				
A-1	Allow for insurances	item			800,000.00
A-2	Allow for construction management staff	item			1,500,000.00
A-3	Allow for temporary accommodation	item			550,000.00
	Sub total carried to summary				2,850,000.00
D	EARTH WORK & EXCAVATION				
D-1	Clearing site vegetation and removal of debris away from the site	m ²	450.0	200.00	90,000.00
D-2	Removal of 150mm depth top soil for preservation and stack for future use	m ²	450.0	50.00	22,500.00
D-3	Excavation in common earth in column foundation keep for reuse up to 1.0 m depth	m ³	32.5	250.00	8,125.00
D-4	Excavation in common earth in wall foundations and keep for reuse up to 1.0-2.0 m depth	m ³	17.6	260.00	4,576.00
D-5	Termite treatment application	m ²	384.5	600.00	230,700.00

14.3. BOQ for IOT R and D Center

D-6	Filling to excavation with available materials at site up to 1.0 depth	m^3	28.0	400.00	11,200.00
D-7	Burrow gravel and refill in hardcore in 150mm layers well rammed with a roller	m^3	20.0	650.00	13,000.00
	Sub total carried to summary				380,101.00
F1	CONCRETE WORKS				
F1-1	75mm screed concrete in grade 15 in kerb wall,wall and column foundations	m^2	46.0	20,000.00	920,000.00
F1-2	1200x1200x900mm column bases in grade 25 concrete (R/f measured seperately)	m^3	65.0	38,000.00	2,470,000.00
F1-3	columns in grade 25 concrete up to ground floor level (R/f measured seperately)	m^3	1.1	40,000.00	44,000.00
F1-4	375x375mm columns in grade 25 concrete from ground floor level level to roof level (R/f measured separately)	m^3	20.8	42,000.00	871,500.00
F1-5	225x300mm plinth beams in grade 25 concrete (R/f measured seperately)	m^3	3.9	38,000.00	148,200.00
F1-6	225x325mm slab beams in grade 25 concrete first and second floors (R/f measured seperately)	m^3	4.3	43,000.00	184,900.00
F1-7	225x225mm lintel in grade 25 concrete (R/f measured seperately)	m^3	9.2	37,000.00	340,400.00
F1-8	112.5x225mm lintel in grade 25 concrete (R/f measured seperately)	m^3	5.2	36,000.00	187,200.00

14.3.BOQ for IOT R and D Center

F1-9	125mm thick floor slab for first, second floors in grade 25 concrete(R/f measured separately)	m ³	80.2	37,500.00	3,007,500.00
F1-10	75mm thick ground floor slab in grade 25 concrete(R/f measured separately)	m ³	29.2	37,500.00	1,095,000.00
F1-11	75mm thick floor slab for parking area in grade 25 concrete(R/f measured separately) rate shell included all necessary finishes	m ³	37.5	37,500.00	1,406,250.00
	Subtotal carried to summary				10,674,950.00
F3	REINFORCEMENT				
F3-1	Cutting,bending,hoisting and placing of high yield reinforcement 10mm to 16mm diameter	t	22.5	175,000.00	3,937,500.00
F3-2	Cutting,bending,hoisting and placing of mild steel reinforcement 6mm diameter	t	1.5	150,000.00	225,000.00
	Sub total carried to summary				4,162,500.00
F2	FORM WORK FOR CONCRETE				
F2-1	Making placing and fixing of 16mm plywood form work to columns with joists and supports	m ²	137.0	500.00	68,500.00

14.3. BOQ for IOT R and D Center

F2-2	Making placing and fixing of 16mm plywood form work to plinth beam with joists and supports	m	119.0	110.00	13,090.00
F2-3	Making placing and fixing of 16mm plywood form work to lintels with joists and supports	m ²	246.0	450.00	110,700.00
F2-4	Making placing and fixing of 16mm plywood form work to floor slab with joists and supports	m ²	980.0	900.00	882,000.00
F2-5	Making placing and fixing of 16mm plywood form work to slab beam with joists and supports	m ²	740.0	750.00	555,000.00
F2-6	Making placing and fixing of 16mm plywood form work to sub structure works(footings, beams, walls)	m ²	370.0	650.00	240,500.00
	Sub total carried to summary				1,869,790.00
G1	RANDOM RUBBLE MASONRY WORK				
G1-1	150-225 mm size random rubble masonry in wall foundation width 450mm	m ²	53.0	8,500.00	450,500.00
G1-2	150-225 mm size random rubble masonry in 300 mm kerb wall foundation	m ²	3.6	7,500.00	27,000.00
	Sub total carried to summary				477,500.00
G2	BRICK WORK				
G2-1	225mm brick work in 1:5 mixture in super structure	m ²	108.0	8,500.00	918,000.00
G2-2	112.5mm brick work in 1:5 mixture in super structure	m ²	8.8	5,000.00	44,000.00

14.3. BOQ for IOT R and D Center

G2-1	225mm brick work in 1:5 mixture in super structure	m ²	108.0	8,500.00	918,000.00
	Sub total carried to summary				1,880,000.00
G3	BLOCK WORK				
G3-1	225mm block work in 1:5 mixture in super structure	m ²	1195.0	920.00	1,099,400.00
	Sub total carried to summary				1,099,400.00
H	WATER PROOFING				
H-1	20mm thick rendering in 1:2 mortar mixture and applied with 2 coats of bitumen in damp proofing course vertical	m	654.0	120.00	78,480.00
H-2	20mm thick rendering in 1:2 mortar mixture and applied with 2 coats of bitumen in damp proofing course horizontal	m ²	248.0	600.00	148,800.00
H-3	1000 guage poliurathene as damp proofing membrane under floor	m ²	400.0	250.00	100,000.00
	Sub total carried to summary				327,280.00
J	DOORS AND WINDOWS				
J2-1	Supplying and fixing door , size 900x2100mm Aluminium framed single sash cladding door rate shell including all fittings.	nr	25.0	45,000.00	1,125,000.00

14.3. BOQ for IOT R and D Center

J2-2	Supplying and fixing door , size 750x2100mm Aluminium framed single sash cladding door rate shell including all fittings.	nr	6.0	30,000.00	180,000.00
J2-3	Supplying and fixing window , size 900x1200mm, Aluminium framed glazed sliding window with top louver panel	nr	4.0	25,000.00	100,000.00
J2-4	Supplying and fixing window, size 900x1200mm, Aluminium framed glazed top hung window with top louver pane	nr	9.0	15,000.00	135,000.00
	Sub total carried to summary				1,540,000.00
T	WALL FINISHES				
T-1	16mm thick plaster in 1:1:5 mixture finish smooth in internal surfaces	m ²	3165.0	550.00	1,740,750.00
T-2	16mm thick plaster in 1:1:5 mixture finish semi rough in external wall surfaces	m ²	1246.0	750.00	934,500.00
	Sub total carried to summary				2,675,250.00
T2	FLOOR FINISHES				
T2-1	Floor finishes with 16mm thick rendering in 1:5 mixture and ceramic tiles	m ²	1200.0	3,000.00	3,600,000.00
T2-2	Floor finishes -skirting with 16mm thick rendering in 1:5 mixture and ceramic tiles	m	850.0	125.00	106,250.00
	Sub total carried to summary				3,706,250.00
U	GLAZING				
U-1	4mm plain Glass for windows	m ²	220.0	600.00	132,000.00
	Sub total carried to summary				132,000.00
V	ROOF COVERING & ROOF PLUMBING				
V-1	Allow for All roof covering works including roof structure, covering, welding,plumbing, water proofing and fine finishing.	pro. sum			2,500,000.00
	Sub total carried to summary				2,500,000.00

14.3. BOQ for IOT R and D Center

W	ELECTRICAL INSTALLATION				
W-1	Allow for electrical installation	pro. sum			850,000.00
	Sub total carried to summary				850,000.00
X	PAINTING				
X-1	Prepare and apply 2 coats of wall filler and 2coats of emulsion paint for internal wall surfaces	m ²	3165.0	400.00	1,266,000.00
X-2	Prepare and apply 2 coats of wall filler and 2coats of weather coat paint for external wall surfaces	m ²	1246.0	450.00	560,700.00
X-3	Prepare and apply 2 coats of water based paint for doors and windows	m ²	160.0	600.00	96,000.00
	Sub total carried to summary				1,922,700.00
Y	SANITARY INSTALLATION				
Y-1	Supplying, Furnishing & installing ceramic squatting pan	nr	9	35,000.00	315,000.00
Y-2	Supply and fix wash basin	nr	4	30,000.00	120,000.00
Y-3	Supply and fix 12mm basin tap	nr	4	2,000.00	8,000.00
Y-4	Supply and fix 12mm angle valves	nr	8	750.00	6,000.00
Y-5	Supply and fix 12mm shower head	nr	9	4,000.00	36,000.00
Y-6	Supply and fix 12mm shower mixture	nr	9	6,000.00	54,000.00
Y-7	Supply and fix 12mm bib cock	nr	9	1,500.00	13,500.00
	Sub total carried to summary				552,500.00

14.3. BOQ for IOT R and D Center

Z	PLUMBING ,SEWAGE AND WASTE WATER DISPOSAL SYSTEMS				
Z-1	Allow for supply and installation of all plumbing ,sewage and waste water disposal systems including fitting, handling and finishing and back filling	pro. sum			450,000.00
	Sub total carried to summary				450,000.00

GRAND SUMMARY					
ITEM NO	DESCRIPTION				AMOUNT (Rs)
A	PRELIMNARIES				2,850,000.00
D	EARTH WORK & EXCAVATION				380,101.00
F1	CONCRETE WORKS				10,674,950.00
F3	REINFORCEMENTS				4,162,500.00
F2	FORM WORK				240,500.00
G1	RANDOM RUBBLE MASONRY WORK				477,500.00
G2	BRICK WORK				918,000.00
G3	BLOCK WORK				1,099,400.00
H	WATER PROOFING				327,280.00
J	DOORS AND WINDOWS				1,540,000.00
T	WALL FINISHES				2,675,250.00
T2	FLOOR FINISHES				3,706,250.00
U	GLAZING				132,000.00
V	ROOF COVERING & ROOF PLUMBING				2,500,000.00
W	ELECTRICAL INSTALLATION				850,000.00
X	PAINTING				1,922,700.00
Y	SANITARY INSTALLATION				552,500.00
Z	PLUMBING ,SEWAGE AND WASTE WATER DISPOSAL SYSTEMS				450,000.00
	TOTAL				35,458,931.00

14.4 Financial Plan

Project Cost	Financial Statement							Total
	0	1	2	3	4	5	6	
Land Acquisition	17500000							17500000
Preliminaries & General items	2,850,000							2850000
Procurement	39000							39000
Cost for construction	17,729,465.50	10,637,679.30	7,091,786.20					35458931
Professional fees	2,000,000							2000000
Maintaince cost				24,500,000	24,500,000	24,500,000	24,500,000	98000000
Cost of finance	0	25,840,000	25,840,000	25,840,000				77,520,000
Total cost	40118465.5	36477679.3	32931786.2	50,340,000	24,500,000	24,500,000	24,500,000	233367931
	-40118465.5	-13087679.3	-9191786.2					

Revenue of project								
Revenue generate from IOT R & D center				77,000,000	77,000,000	77,000,000	77,000,000	308000000
Revenue generate from E-LIBRARY				2200000	2200000	2200000	2200000	8800000
Revenue generate from canteen				200,000	200,000	200,000	200,000	800000
Total revenue	0	0	0	79,400,000	79,400,000	79,400,000	79,400,000	317600000
Net cash flow	-40,118,466	-13,087,679	-9,191,786	29,060,000	54,900,000	54,900,000	54,900,000	131362069
Cumulative NCF	-40,118,466	-53,206,145	-62,397,931	-33,337,931	21,562,069	76,462,069	131,362,069	40325734.7
Discounting factor	1	0.8771	0.7694	0.6749	0.592	0.5193	0.4555	
14%	-40,118,466	-11480420.44	-7072781.01	19614672.26	32505207	28513339.7	25011701.47	46973253.68
Cumulative discounted net flo	-40,118,466	-51,598,886	-58,671,667	-39,056,995	-6,551,787	21,961,552	46,973,254	-127062994.6
npv 14%	-40,118,466	-11479203.51	-7072160.302	19612594	32500800	28509570	25006950	46960084.68
Cumulative net cash flow	-40118465.5	-51597669.01	-58669829.32	-39057235.3	-6556435	21953134.7	46960084.68	-127086415.1
IRR	16%							
Net cash flow	-40,118,466	-13,087,679	-9,191,786	29,060,000	54,900,000	54,900,000	54,900,000	131362069
Pay back period		3.607248288		3 years and 8 month				

14.4 Financial Plan

- Since the IOT Research and Development work heavily depend working with electronic components there will be lot of E-Waste (Electronic waste) to be disposed. There are E-waste collecting centers located in sri lanka which buys these electronic components. So Instead of disposing these with regular waste, We intend to sell these Electronic waste to earn some revenue.
- This method will help to prevent Environmental problems raising by improper disposal of Electronic waste also. we also implementing a solar grid on the roof of the building. the cost of it is also added to the construction cost. We're planning to reduce the electricity cost using this solar grid. And we're also using this Solar powered electricity usage as an example in using renewable energy for industry level applications. Since our objectives are also aligned to build a better future, this concept also will be a good example.
- other than Solar Power Grid, we are using Eco-Bricks to build the building as materials. We're hoping to Build a eco-friendlier premise using these eco-bricks and also hoping to reduce the production cost. and also the high standard ventilation system will always keep the fresh air inside the building and this will be beneficial for human health.
- Since we're considering the Green concepts in the development and maintaining process, the social and environmental impacts will minimize. also we're covering the outside area with trees and plants to align with the green concept.

14.5 Loan Amount

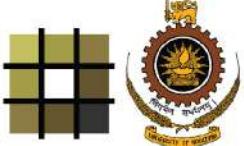
The loan amount of 60,000,000 will be paid back within a 3 year 8 month from the revenue of Malabe IOT R and D center. And instalment is Rs.25.84 million. But to get a stable situation of the project four years have been taken. From the seventh year onwards the revenue will be divided into certain sector like increment of employee, research purpose etc. and use in efficient manner.

Loan amount Rs.60 Million @14%				
Years	Capital Balance (Rs. Million)	Installment	Interest (14%)	Deduction of Capital
	60	25.84		
Y1	60	25.84	8.4	17.44
Y2	42.56	25.84	5.9584	19.8816
Y3	22.6784	25.84	3.174976	22.665024

$$\text{Installment} = 60/(1-(1/(1+0.14)^3)/0.14) \quad 25.84$$

18. Resettlement Activities

In this project we are not going to acquire any bare land area. For the development acquire 35 perch land which is a abundant marshy land in existing condition. For the land acquisition compensate the private land owners.



IMPLEMENTATION ARRANGEMENT AND PROJECT SUSTAINABILITY

- 1. Implementation Arrangements**
- 2. Arrangements for Sustainability, Operation and Maintenance after completion**

PROJECT IMPLEMENTATION ARRANGEMENTS AND SUSTAINABILITY

15. Implementation Arrangements

This section explains about the responsibilities in implementation of IOT research and Development in Malabe.

In this project the main responsibilities are led by the Ministry of Skills Development, Vocational Education, Research & Innovation. Under this authority all the management process will be done.

Organization	Management of project implementation roles and responsibilities
Executing Agency (EA), the Ministry of Skills Development, Vocational Education, Research & Innovation	Responsible for overall implementation
Project Steering Committee	Facilitate inter-ministerial coordination and provide overall policy guidance
PMU (project Management Unit)	Coordinate project implement action activities <ol style="list-style-type: none"> 1. Planning 2. Procurement and contract management 3. Financial management 4. Monitoring and evaluation 5. Reporting
Project coordination committee	Provide guidance to project implementing unit
Project Implementation unit	Implementing the project
ADB	Funding the project

Table 1Implementation Arrangement

15.1 Implementation Schedule

Under these organizations project process is going on 1st of January in 2019 to in 2021. According to this time periods main implementation stages of this Development of Research and Development center is as follows (Annex 4). Once the project completed it will be maintaining by the relevant local authority.

16. Arrangements for Sustainability, Operation and Maintenance after completion

Under this phase explains about after completion of the project, the sustainability of the project, operations and the maintenance process.

16.1 Sustainability of the project

Early 1987 balancing the three aspects as environmental, economic, and social features of the system called sustainable. "Balancing these three aspects of sustainability is what John Ellington advocated as a "triple bottom line" that adds the responsibilities of social justice and environmental quality to profit." According to that definition here explains about the "Sustainability" under those three categories after the implementation of this project.

16.2 Social Sustainability

"Engage the community in the entire life cycle of the project"

before developments done, there are some meetings to be hold with the public community for introducing the development and analysis of the drawbacks and the gray areas of the project. And also the areas which have to improve in the project.

After completion of the project, we can expect the engagement of the community to be higher. New technologies in the IOT sector will encourage the community to participate in active manner. The project provides some training opportunities for the people who are willing to work in the IOT sector also. Through this training activity the community engagement of the project will be increased and it will raise the social sustainability position up to good level.

Provide infrastructure facilities

- Through this project development, the infrastructure facilities of the area will be increased Such as High speed communication lines, the internet facilities and etc. The project will directly facilitate to this area.

Job Opportunities

- There will be many research engineer positions and research scientist positions available. This will help to prevent the young researchers seeking for foreign research opportunities. Along with that many positions will available for management sector, marketing sector and financial sector. Also many maintenance vacancies will open for the villagers who living nearby.

16.3 Economic Sustainability

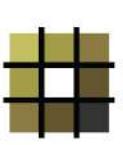
Through this project directly provide job opportunities to the local students, resident , famers and the public community. Through the job opportunities the economy of those communities will increase. 19 Therefore the economy of the society will be increased and poverty level will be reducing. Because in existing condition the IOT in the market decide the whole economy those people.

Productivity of the electrical device production will be increased through increasing the efficiency of manufacturing, transportation, storing, harvesting of the production. Because through this development the researchers will be conduct the researches on covering those areas. Will introduce new technological improved equipment to increase the efficiency of the harvesting, and increase the productivity of the tea by genetic changes. For instance the research will be conducted on the innovative production and new methods though increase the efficiency of storing and transporting methods. Those developments will increase the sustainable economic development under the development goal as "Responsible consumption and production".

Time Line of the Project

			Year 0		Year 01 - 2021				Year 02 - 2022			
No	Activity	Time from commencement (M)	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	
1	Community meetings	1										
2	Land Acquisition	1										
	Completion of draft project	1										
3	Development plan											
4	Preliminary planning clearance	2-4										
	a). Preliminary clearance for the project activity	2										
	b). Environmental clearance for the selected site	2-3										
	c). Preliminary clearance for sourcing of raw materials	2-4										
5	Development permit	5										
6	Budget Allocation	6-7										
	a). Advance Contracting Action	6-9										
	b). Establish project Implementation arrangement	6-9										
	c). Financial Approval	6-9										
	d). Loan signing	6-9										
	e). Government Legal opinion provided	6-9										
	f). Government budget inclusion	6-9										
	g). Loan effectiveness	6-9										

7	Project design with utilities	8-12												
8	Procurement Activities	9-12												
	a).Finance	9-12												
	b). Construction	9-12												
	c). Laboratory equipment	9-12												
9	Site clearance	13-15												
10	Provide Infrastructure	13-15												
11	Constructing the project	16-25												
12	Installation of Laboratory equipment	25-26												
13	Certificate of conformity	26-27												
14	Monitoring and evaluation	26-27												



ECONOMIC AND FINANCIAL APPRAISAL

17. Findings of the Economic and Financial Analysis

ECONOMIC AND FINANCIAL APPRAISAL

17. Findings of the Economic and Financial Analysis

Providing result of economic and financial analysis (appraisal) of the proposed project is another important information that need to be provided in the project proposal. Those exploration results may include with the worksheets used for the analysis as the attachment to the project proposal. Commonly, to undertake economic

- Cost-Benefit Analysis (CBA) Methods –
 1. Economic Internal Rate of Return (EIRR)
 2. Economic Net Present Value (ENPV)
 3. Cost-Benefit Ratio (c/b)
- Financial Analysis Methods
 1. Financial Internal Rate of Return (FIRR)
 2. Financial Net Present Value (FNPV)
 3. Payback method
- Cash Flow statement

Even though, among the various analytical methods which have mentioned above, EIRR, ENPV or C/B, which are the three most generally-used methods of CBA, are often considered to be the most preferred methods of project appraisal as they can examine the net contribution of the project to the economy and to

and financial appraisal of the proposed project, the main component is considering proponents which is having the characteristics of the proposed project and select appropriate and feasible analytical tool(s) among the methods listed in we have concerned certain analytical parts, which are;

society. This method is easy for infrastructure sector development projects. At the same time, it is not that much of easy while doing calculation related with social sector projects but in here, we are going to make a Whole sale fishery market it will come under infrastructure sector, also this project is little bit in small

and medium scale. So, we could fund the information related with those techniques.

In the case of projects with quantifiable financial return, various financial analysis methods such as FIRR, FNPV and Payback methods might be alternatively used. For other projects mostly with intangible benefits, the proponent may present the analytical results based on

FIRR – Financial Internal Rate of Return

As above, the method of IRR applied in the financial analysis is called Financial Internal Rate of Return (FIRR). According to the Fishery whole sale markets project the IRR value is 20% which will be more feasible

FNPV – Financial Net Present Value

The FNPV refers to the net present value of the discounted net benefits i.e. capital investment and operation and maintenance and estimated value of

multiple criteria using the combination of available numerical and qualitative data. This analysis should indicate to what extent the proposed project would bring benefits in economic terms to the national economy and society over costs.

to implement due to the IRR rate is higher than 14%. The higher a project's internal rate of return, the project is more desirable it to undertake the project

benefits generated from the operations are matched and discounted at the rate of cost of capital. Calculating ENPV is,

Total Inflow	0	0	0	79,400,000	79,400,000	79,400,000	79,400,000
Total Outflow	40118466	36477679	32931786	50340000	24500000	24500000	24500000
Net flow	40118466	13087679	-9191789	29060000	54900000	54900000	54900000
NPV @14%	40118466	-1479204	-5.9E+07	-39056995	-6551787	2196155	46973254

Payback Period

The Payback period refers to the duration that takes to recover the capital investment from the net estimated financial returns. In this whole sale market project, it will

take loan as 60million from Asian Development Bank therefore within project period it is good to pay loan with their interest rate. This project payback period is 3 years four months and 8 months.

Cost-Effectiveness Analysis

Cost-effectiveness analysis (CEA) is a form of economic analysis that compares the relative costs and outcomes (effects) of different courses of action. Cost-

effectiveness analysis is distinct from cost-benefit analysis.

Cost of finance which have been paid is 14% and the IRR is 16% compare to the cost of return, the IRR is good. Therefore, the project is viable to implement. According to the commercial rate of 14% this project is feasible with Rs 57429843.6 with the 16% of rate of return. Once the revenue is increased by 10% then the IRR is increased by 16% and that is good increment.

For more clarification if we find the profitability index/ benefit cost ratio (PI),

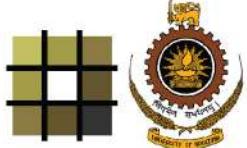
$$\text{PI} = \text{PV of cash inflow} / \text{PV of cash outflow}$$

$$= 3117600000 / 233367931$$

$$= 1.3609$$

$$= 1.3$$

If the PI is > than 1 the project will be accepted. So this project will be profitable one.



PROJECT CONTACT DETAILS

1. IOT Research and Development Center

PROJECT CONTACT DETAILS

IOT R and D Center Project Information

The project of the items on project contact details for Electronic component suppliers, Ministry of Skills Development, Vocational Education, Research & Innovation Research ,Engineers and Research scientists. If anyone wants to get additional details or clarification about this Ministry of Skills Development, Vocational Education, Research & Innovation Research, above institutions are officially support to them. Public can be getting an idea about the content included in the project proposal.