

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

Resi Hanawati¹, Dede R Oktini², Santun Bhekti Rahimah³, Rabiatal Adwiyah⁴

^{1,2}Master of Management Study Program, Faculty of Economics and Business, Bandung Islamic University

²orcid: <https://orcid.org/0000-0003-3115-3678>

³Faculty of Medicine, Bandung Islamic University orcid: <https://orcid.org/0000-0002-3943-4653>

⁴Management Study Program, Faculty of Economics and Business, Bandung Islamic University orcid: <https://orcid.org/0009-0009-0330-3035>

ABSTRACT: This study aims to conduct a Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) at the Al Yamin Medical Center Primary Clinic which is reviewed from 6 aspects, namely marketing management, operations, HR, legality/law, environment and finance. Al Yamin Medical Center Clinic currently needs a better positioning strategy in the midst of an increasingly competitive health sector. The type of research is descriptive with a mix of methods. Data was obtained through interviews, observations and documentation. The results of the study indicate that the marketing aspect obtained a very supportive market potential with demand > supply. The operational aspect of the Clinic has a strategic location including the ability to provide buildings and radiology equipment according to standards can be met. The HR aspect based on the number of available HR and according to qualifications in Garut Regency can still be met. The legality/law aspect based on the Ministry of Health regulations stipulates that the Clinic can provide radiology services. The environmental aspect is obtained by the Clinic being able to anticipate radiation hazards by making building structures according to standards. The financial aspect of the results of the PP, NPV and IRR analysis shows good results. Overall, the development of computed radiography x-ray services at the Al Yamin Medical Center Primary Clinic is feasible.

KEYWORDS: Feasibility Study, Clinic, Radiology

I. INTRODUCTION

Primary and advanced health care facilities are required to be able to provide quality health services. The development of the era is increasingly modern, including in medical technology, both in medical examinations and medical support, one of which is radiology examination. Radiology is the foundation of modern health care which has now undergone a transformation in diagnostic progress and has a significant role in handling certain medical conditions experienced by patients. The radiography technology commonly used is not only the X-ray modality, there are other forms such as CT Scan, MRI, USG, Mammogram, Fluoroscopy and nuclear imaging.

X-ray image are chosen as additional supporting examinations at the Al Yamin Medical Center Clinic because they are basic radiology examinations that are suitable for implementation at primary health care, the second supporting examination that is often needed after the laboratory, according to the competence of general practitioners, affordable costs and does not require a large room. In addition, the development of this service is certainly in order to improve the quality of service, minimize the current limitations at the Al Yamin Medical Center Clinic, realize the concept of a clinic that wants to continue to grow and develop by providing more complete health care facilities, as a form of innovation and to get good opportunities that you want to achieve.

A feasibility study is a comprehensive process carried out to evaluate the potential and feasibility of a business or investment project before it is implemented. The feasibility study of radiology services at the Al Yamin Medical Center Clinic is certainly important to analyze in order to be able to create a program or service or business investment by seeing its suitability with existing theories from looking at 6 aspects and to avoid losses considering the investment costs required are not small.

From the calculation of the available market potential with a total population of Bl. Limbangan sub-district of 79,000 people, 11,850 of them are sick people who are estimated to need x-ray radiology services, while until now there is only one health facility in Bl. Limbangan which serves x-ray radiology with a service capacity of 1,975 people per month so that there are 9,875 people who have not been served to undergo x-ray examinations.

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

Based on the background of the problems, this study aims to analyze the Feasibility Study of X-Ray Radiology Services (X-ray Image) with CR (Computed Radiography) Processing Techniques at the Al Yamin Medical Center Primary Clinic, Bl. Limbangan District, Garut Regency, West Java, which is reviewed from 6 aspects, namely marketing management, operations, HR, legality/law, environment and finance.

II. METHODOLOGY

2.1 Research Object and Method

2.1.1 Research Object

The research object in this feasibility study analysis is the Al Yamin Medical Center Primary Clinic which began operating to provide health services on April 19, 2011 with an operational permit with the standard certificate number OSS 81200162802530002. Located in a very strategic location at Plaza Limbangan, Jalan Raya Bandung - Tasikmalaya Number 08, Limbangan Timur Village, Balubur Limbangan District, Garut Regency, West Java.

2.1.2 Research Method

2.1.2.1 Type of Research

In this study, the researcher used a descriptive research type with a quantitative and qualitative approach. So the data obtained is processed and analyzed quantitatively and qualitatively. This quantitative approach is used to analyze financial and marketing aspects. While the qualitative approach is used to describe the results of the analysis of HR, operations, legal, and environmental aspects. Facts or events and existing data, after being analyzed, are further processed based on the theories studied and used as research and discussion materials so that in the end they produce a conclusion that can be used as a basis for providing the best advice.

2.1.2.2 Research Methods

The research method that will be used in this study is also included in the form of a case study. The case study research method is carried out to analyze the indicators of the feasibility study seen from the aspects of the feasibility assessment of operational management, human resource management, aspects and financial management. while to analyze aspects of marketing management, legality/law and the environment using the survey method.

2.1.2.3 Data Collection Techniques

1. Interviews

Interviews will be conducted in this study related to aspects of marketing management, operational management, human resource management, legality/law aspects, aspects of environmental protection and management and financial management. The interview contains questions that will be asked to the owner, employees, users/users or the community, local government, employees/HR and suppliers or vendors.

2. Observation

Observation is a data collection method that is a complex process, a process that is composed of various biological and psychological processes. Two of the most important are the processes of observation and memory. The observation data collection method not only measures the attitudes of respondents, but can also be used to record various phenomena that occur. The objects of observation in this study include:

- Socio-economic conditions of the local community
- Clinic location
- Conditions of the availability of health services that already exist in competitor health facilities
- Clinic accessibility conditions
- Clinic environmental conditions

3. Documentation

Documentation studies are interpreted to obtain data and information in the form of written records/images that are stored related to the problem being studied. The documents analyzed in this study include the profile of competitor clinics, sub-district profiles and the number of residents in the sub-district through BPS and licensing documents.

Table 2.1 Data collection techniques for each aspect

No.	Aspects	Interview	Observation	Documentation	
				Primary data	Secondary data
1.	Marketing	√	√	√	√
2.	Operations	√	√		√
3.	Human resources	√		√	√
4.	Legality/law	√			√

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

5.	Environment	√	√	√	√
6.	Finance	√		√	

2.1.2.4 Research Algorithm

In analyzing this data, the author uses a qualitative quantitative descriptive analysis technique where this technique is used by the author to describe, narrate, depict and explain quantitative data that the author has obtained from the results of data collection methods. By obtaining data related to the business feasibility study seen from the marketing, HR, technical aspects, environmental protection and management aspects, legal aspects and financial aspects, the data obtained will be processed and studied using formulas and steps that will be used in this study. The detailed steps in the research and each discussion in each research step can be seen in the Algorithm Chart in Figure 2.1 as follows.

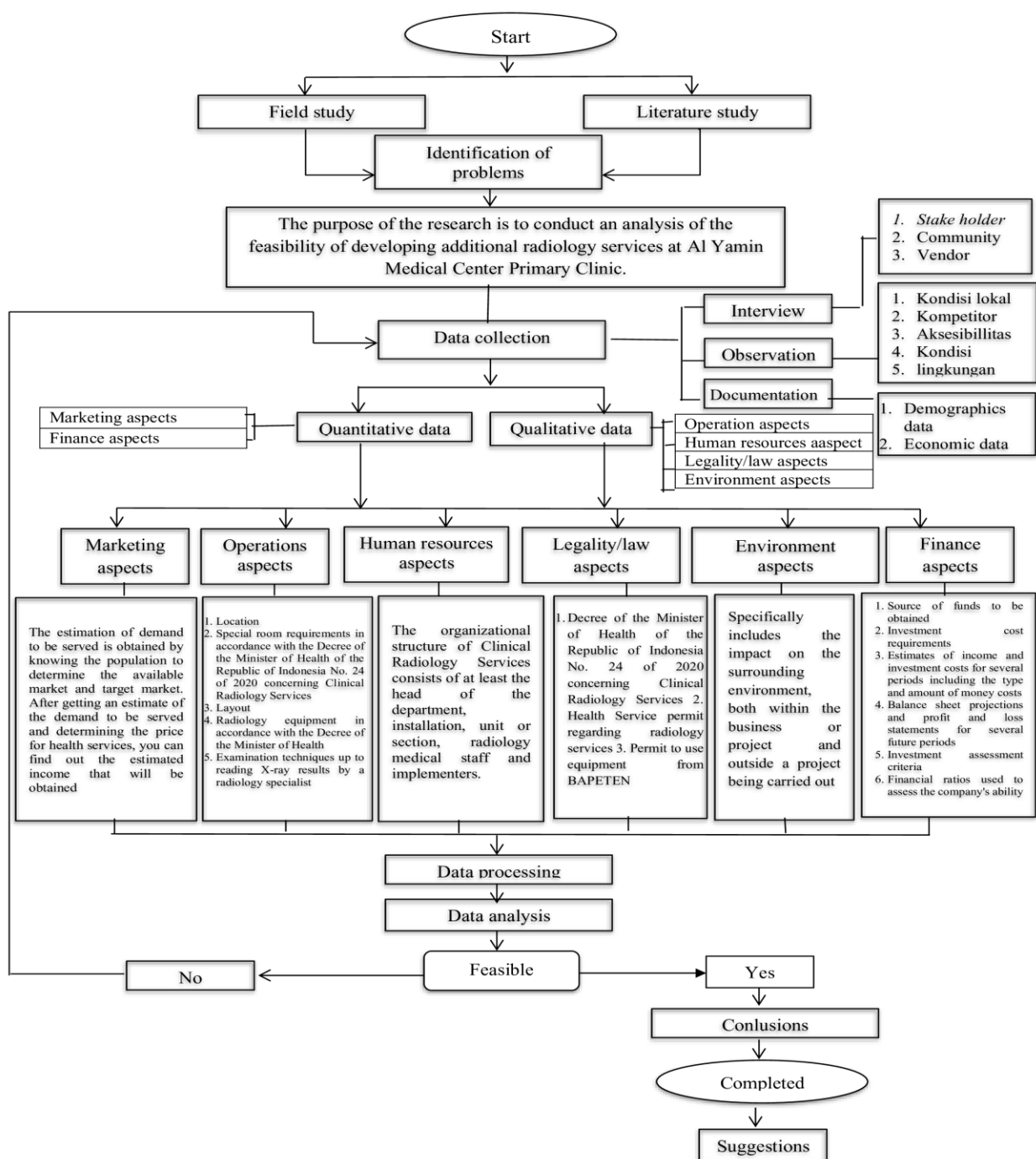


Figure 2.1 Algorithm chart

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

2.2 Data Analysis

Design Based on the research method used, the data analysis of this study uses qualitative and quantitative data analysis. Quantitative data analysis is used to present the feasibility of marketing and financial management aspects while qualitative analysis is used to present the feasibility of marketing management aspects, operations management, HR management aspects, legality/law aspects and environmental aspects. All data obtained from all aspects of management will be processed and analyzed and determined whether the development of computed radiography x-ray services at the Pratama Al Yamin Medical Center Clinic, Balubur Limbangan District, Garut Regency, West Java is feasible and this is expected to be input for the owner of the clinic.

2.1.1 Marketing Management Aspect

According to Sunyoto, (2014:32), marketing is a total system of business activities designed to plan, determine promotional prices and distribute goods that can satisfy desires and achieve target markets and company goals. Calculating the total needs of the target market can be calculated by:

$$\text{Total potential market needs} = (\text{Proportion of target market segments}) \times (\text{use of health services per capita})$$

In developing this radiology service before implementation, it is important to conduct an analysis of the potential market / users of x-ray radiology services (X-ray image) by knowing the difference between supply and demand so that this investment plan is feasible or not.

2.1.2 Operations Management

Aspect Operational management is a management field related to designing, controlling and ensuring that the production / service process runs well. The responsibility of operational management is very large. The operational manager is responsible for overseeing the operational activities of the radiology service facility, this includes the efficiency and ability of the clinic to provide adequate and reliable services. In a feasibility study for developing computed radiography x-ray services (X-ray image) at the Pratama Al Yamin Medical Center Clinic, it is how to express the clinic's needs in the form of numbers so that radiology services in a clinic can later run according to the goals and objectives that have been set. Things that must be analyzed in the operational management aspect are location, radiology equipment, buildings, infrastructure, organization, recording, reporting and documentation, besides that, availability must be ensured to be fulfilled in the process of implementing the development of X-ray radiology services at the Pratama Al Yamin Medical Center Clinic. By conducting interviews with the clinic owner/manager, it will be known about the land requirements needed, clinic improvement costs, clinic construction costs, general equipment costs, medical equipment costs, marketing costs, IT system costs, initial operational costs and other additional costs.

2.1.3 Human Resource Management Aspects

The HR management aspect is analyzed using qualitative analysis. This aspect is analyzed by adjusting the HR needs for radiology services in accordance with the provisions of the Minister of Health of the Republic of Indonesia Number 24 of 2020. Based on the legislation above, the first thing that must be done is to determine the operational hours of the service so that the number of human resource needs appears so that clinic services can run effectively. After that, the availability of the required HR is seen so that it can be determined what steps will be taken if the availability of the required HR is limited.

2.1.4 Legality Aspects

The legal legality aspect is analyzed using qualitative analysis with secondary data collection, namely documents in the form of legal requirements regarding licensing and technical requirements for x-ray radiology services (X-ray image) at the Al Yamin Medical Center Primary Clinic. Next, identification is carried out regarding the requirements that have been met and have not been met. The requirements as referred to include the legality of whether or not the Clinic can provide x-ray radiology services, location, building, infrastructure, human resources and equipment. The legal aspect of the law in the form of licensing for clinical radiology services must complete various requirements including:

1. Identity of the permit applicant
2. Legal entity deed
3. Taxpayer Identification Number
4. Health service permit
5. Location of use of the x-ray machine
6. Specifications of the x-ray machine unit and/or x-ray tube test certificate
7. Softcopy of previous permit
8. Floor plan of the room and its surroundings

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

9. Radiation safety verification report: function test, radiation exposure measurement, softcopy of previous permit, x-ray machine suitability test
10. Personnel diploma
11. Radiation protection officer practice permit
12. Results of radiation worker health monitoring
13. Evidence of request for individual dose monitoring services or results of individual dose monitoring evaluation
14. Radiation protection and safety program
15. BAPETEN / nuclear energy regulatory permit

2.1.5 Environmental Protection and Management Aspects

The Environmental Protection and Management Aspects are analyzed using qualitative analysis with primary and secondary data collection. Primary data was conducted by conducting interviews with the Environmental Service to obtain expert opinions on the feasibility of developing computed radiography x-ray services (X-ray image) at the Al Yamin Medical Center Pratama Clinic in terms of environmental protection and management in the form of Environmental Approval. Secondary data was conducted by reviewing the requirements for the Clinic Environmental Approval based on Government Regulation Number 22 of 2021 concerning the Implementation of Environmental Protection and Management, Regulation of the Minister of Environment and Forestry No. P.38/MENLHK/SETJEN/KUM.1/7/2019 concerning Types of Business Plans and/or Activities that must have an Environmental Impact Analysis, Regulation of the Minister of Health Number 3 of 2020 concerning Classification and Licensing of Clinics and Regulation of the Minister of Health Number 7 of 2019 concerning Hospital Environmental Health.

2.1.6 Financial Management Aspects

Financial management aspects are analyzed using quantitative analysis based on secondary data. The aspects of financial management analyzed in this feasibility study include:

a. Investment Plan and Funding Sources

In analyzing the investment plan, the financing needs for opening a radiology clinic service must be calculated along with the operational costs of the Clinic within a certain period. Meanwhile, the source of funds is analyzed using qualitative analysis based on primary data obtained from interviews with clinic owners regarding the sources of funds obtained for opening radiology services. That way it can be known whether the source of funds comes from individuals, doctors' associations, government budgets, associations with entrepreneurs or bank associations.

b. Income and Cost Projections

In projecting income, it is necessary to analyze which activities can be sources of income. This income projection can come from medical activities such as outpatient care, inpatient care, medical support and actions, while the source from general activities can be from cafeterias, nursing homes, parking, rent and so on. Meanwhile, in projecting costs, it can be determined by calculating direct costs, namely medical activities plus indirect costs such as human resources, clinic maintenance and administration.

c. Cash Flow Projections

Cash flow analysis projections are carried out using primary and secondary data. The analysis includes:

1. Initial cash flow is a cash flow related to expenditures for investment activities such as purchasing land, buildings, preliminary costs and so on. Initial cash flow can be said to be cash outflow.
2. Operational cash flow is a cash flow related to project operations such as sales, general and administrative costs. Therefore, operational cash flow is cash inflow and cash outflow.
3. Terminal cash flow is cash flow related to the residual value of the project (residual value) such as remaining working capital, residual value of the project, namely the sale of project equipment.

d. Financial Analysis

To assess the feasibility of an investment, a financial analysis is needed by calculating:

1. NPV
2. Payback period and
3. Internal Rate of Return (IRR) / BEP

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

Table 2.2 Variable operational

No.	VARIABLE	DIMENSIONS	INDICATOR	SIZE	FEASIBILITY CRITERIA
1.	Marketing	Market potensial	The difference between demand and supply	Ratio	• Demand>supply = feasible • Demand<supply = not feasible
2.	Operation	Strategic location	Easy accessibility within a coverage area of 5-10 km.	Traveling time	• ≤30 minutes = feasible • >30 minutes = not feasible
		Space/building requirements	Availability of land of at least 10 m (l) x 7 m (w) x 2.8m (h) and space to move facilitates the process flow.	Land area	Minimum land available is 10 m (l) x 7 m (w) x 2.8m (h) = feasible Land <10m (l) x 7m (w) x 2,8m (h) = not feasible
		Availability of radiology equipment	Suppliers of mobile x-ray and CR equipment are readily available	Is there any/not	• Available = feasible • Not available = not feasible
		(Technical service) Passed BAPETEN test	Conducting suitability tests on equipment and use of radiation sources	Yes/No	• Yes = feasible • No = not feasible
3.	Human resources	1 radiologist	Availability of quantity and suitability of qualifications	Number of people and experience	• More quantity than required and experienced = feasible • Quantity less than required = not feasible
		2 radiographers			
		1 radiation protection officer			
4.	Legality/law	Government regulations/provisions	Can the clinic provide x-ray radiology services?	Conformity with statutory regulations	• In accordance with statutory regulations = feasible • Contrary to statutory regulations = not feasible
5.	Environment	Anticipate the dangers of radiation	Availability of lead raw materials for the manufacture of radiology rooms	Is there any/not	• Lead available = feasible • Not available = not feasible
6.	Finance	Payback periode (PP)	Time to return on investment	Year	• PP<projected age = feasible • PP>projected age = not feasible
		Net present value (NPV)	Net present value	Rupiah	• NPV positive = feasible • NPV negative = not feasible
		Internal rate of return (IRR)	Rate of return	%	IRR> cost of capital (interest rate) = feasible IRR< cost of capital (interest rate) = not feasible

Source: Decree of the Minister of Health of the Republic of Indonesia. Number 24 of 2020 concerning Standards of Clinical Radiology Services, Regulation of the Minister of Health Number 14 of 2021 concerning Standards of Business Activities and Products in the Implementation of Risk-Based Business Licensing in the Health Sector, Beni. 2018. Business Feasibility Study. Pustaka Setia Bandung.

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

III. RESULTS

3.1 Marketing management aspects

3.1.1 Demographic Conditions

The study of the demographic condition aspect is intended to obtain an overview of the population density and population growth rate of the Al Yamin Medical Center Clinic area located in Balubur Limbangan District, Garut Regency with an area of 73.59 km² and the distance of this District is around 31.5 km from the capital of Garut Regency to the north. Balubur Limbangan District consists of 14 villages, namely Cigagade, Cijolang, Ciwangi, Dunguswiru, Galihpakuwon, Pangeureunan, West Limbangan, Central Limbangan, East Limbangan, Neglasari, Pasirwaru, Simpen Kidul, Simpen Kaler and Surabaya. The coverage area (catchment area) of the target market for x-ray radiology services (X-ray image) of Al Yamin Medical Center Clinic is the sub-districts that are within a radius of ± 10 km from the location of Al Yamin Medical Center Clinic, there are 7 sub-districts including 6 sub-districts in Garut Regency, namely Selaawi Sub-district, Cibatub Sub-district, Kersamanah Sub-district, Malangbong Sub-district, Cibiuk Sub-district, Leuwigoong Sub-district and 1 Cibugel Sub-district which is included in Sumedang Regency. In the coverage area there is 1 competitor clinic, namely PRODITA, which is approximately 100 meters from Al Yamin Medical Center Clinic which provides special laboratory and X-ray radiology services.

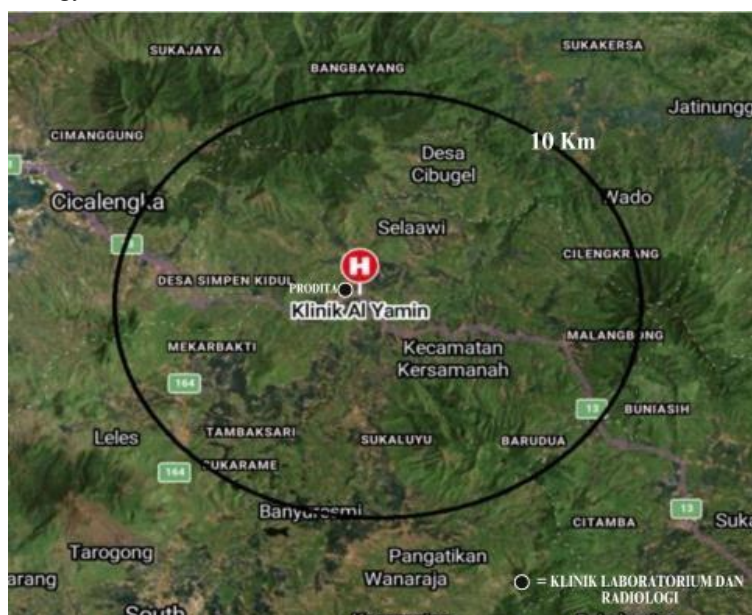


Figure 3.1 Coverage area of Al Yamin Medical Center Clinic
Source: Google maps

3.1.2 Socio-Economic Conditions

The majority of the population in the Garut area is included in the lower middle class, so the target market of the Al Yamin Medical Center Clinic is families with household expenditures of <2 million – 6 million.

Table 3.1 Average per capita expenditure per month by commodity group and expenditure group (rupiah) 2023

Commodity Group		Expenditure Group			Total Expenditure
		Bottom 40 Percent	Middle 40 Percent	Top 20 Percent	
(1)	(2)	(3)	(4)	(5)	(6)
	Grains	2,71	1,88	2,48	1,50
	Tubers	6,42	5,04	7,70	4,10
	Fish/Shrimp/Squid/Shellfish	6,68	4,38	6,53	4,00
	Meat	5,59	4,01	5,80	3,37
	Eggs and Milk	5,86	4,74	15,84	7,61
	Vegetables	3,43	2,72	4,47	2,87
	Nuts	3,94	3,28	4,77	2,70
	Fruits	5,15	4,01	6,65	4,32
	Oil and Coconut	3,17	2,79	3,49	2,48

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

Beverage Ingredients	4,77	4,15	4,87	3,05
Spices	4,51	2,78	4,32	3,02
Other Food Ingredients	4,88	4,91	6,41	3,83
Prepared Food and Beverages	3,27	3,41	4,32	3,02
Cigarettes and Tobacco	6,68	4,79	5,96	3,95
Total Food	1,53	1,47	2,95	2,24
Housing and Household Facilities	2,73	2,32	6,79	4,41
Miscellaneous Goods and Services	4,01	4,17	16,21	10,28
Clothing, Footwear, and Headgear	3,72	3,73	7,58	4,92
Durable Goods	16,57	13,61	28,84	26,14
Taxes, Levies, and Insurance	5,76	4,60	7,78	4,33
Party and Ceremony/Feast Needs	45,23	26,29	21,73	19,19
Non-Food Total	2,20	1,96	9,14	6,31
Average Expenditure of Garut Regency	1,31	1,21	5,32	3,59

Source: Central Statistics Agency, National Socio-Economic Survey (Susenas) March 2023

3.1.3 Health Profile

The use of X-rays can be used to examine almost the entire human body from head to toe, but the organ that is most often examined is the thorax / chest cavity to determine the condition of the lungs and heart. The use of X-rays is also usually used to support the diagnosis of both infectious and non-infectious diseases. Currently, the number of cases of infectious and non-infectious diseases is almost the same. ARI is still the main cause of morbidity and mortality of infectious diseases in the world. The mortality rate for ARI reaches 4.25 million each year in the world. Based on data from the World Health Organization (WHO) in 2019, lower respiratory tract infections reduced life expectancy by 2.09 years in sufferers. (WHO, 2019). Likewise, based on the health profile of Garut Regency from the data of the 10 highest diseases in primary level facilities, respiratory tract problems are included in the 10 largest diagnoses, so based on this, radiological examination of X-rays is needed to support a more precise diagnosis.

3.1.4 Competitor Scope

In the coverage area, there is 1 competitor which is a Laboratory and Radiology X-ray Clinic, namely PRODITA, which is quite close to the Al Yamin Medical Center Clinic, which is around 100 meters. PRODITA is the main competitor and the only one that can be a threat to take the X-ray radiology service market at the Al Yamin Medical Center Clinic and it is possible that in the next 10 years these competitors can increase where currently the Limbangan Regional Hospital is also being built. In the process of this competition scope, an analysis of the strengths and weaknesses of PRODITA can be made as follows.

Table 3.2 Competitor strength and weakness analysis

Clinic Name	Address	Analysis	
PRODITA	East Limbangan Street, Cisereuh No. 15A East Limbangan Village, Limbangan District, Garut Regency	Strength	Weakness
		Has a radiology specialist - Strategic location - Has been operating for about 5 years - The clinic's brand and nameplate are clearly visible from the main road - Establishes referral cooperation with other health facilities such as Community Health Centers, Clinics and Independent Doctors' Practices - The only Laboratory and Radiology Clinic in the North Garut area.	Operational hours are still limited - Does not have a large parking area - Digital marketing has not developed

Source: Data processed 2024

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

3.1.5 Potential Market

To find out the potential market for a radiology service, a projection must be calculated between the amount of supply (availability) of X-ray radiology facilities and the amount of demand (request) for X-ray radiology examinations in the next 10 years. Based on the benchmark referring to data on the use of X-ray radiology in several hospitals, the percentage of use is around 15% of the total outpatient care, so the Clinic estimates that its usage rate follows 15%. Al Yamin Medical Center Clinic is targeting an initial market share of 5% of the potential number of radiology examinations that have not been served.

Table 3.3 Projection of the potential number of residents who will use x-ray radiology services at the Al Yamin Medical Center Clinic

Year	Projected population in coverage area (thousands)	Probability for x-ray radiology examination 15% (A) thousand	Proportion of radiology service capacity at competitors 10% (B) thousand	Number of potential radiology examinations that have not been served (A-B) thousand
2022	475,36	71,204	7,124	64,08
2023	480,11	72,016	7,201	64,81
2024	484,99	72,748	7,274	65,47
2025	489,9	73,485	7,348	66,137
2026	494,89	74,233	7,423	66,81
2027	499,9	74,985	7,498	67,487
2028	505,02	75,753	7,575	68,178
2029	510,17	76,525	7,652	68,873
2030	515,4	77,31	7,731	69,579
2031	520,67	78,100	7,810	70,29
2032	526,04	78,906	7,890	71,016

Source: Data processed 2024

Table 3.3 shows the number of potential markets that will use x-ray radiology services at the Al Yamin Medical Center Clinic considering that the number of patients who have not been served tends to increase every year and of course will be an opportunity for the Al Yamin Medical Center Clinic to take market share.

3.1.6 Marketing Strategy (Marketing Mix, STP and CVP)

There are two basic principles in marketing strategy, namely retaining existing customers and generating new customers. If a health facility cannot retain old customers, then it needs to generate more new customers all the time. It won't take long for the health facility to 'run out' of new customers. The way to maintain it is by meeting or exceeding customer expectations. (Muhardi et al, 2023). An aggressive marketing strategy is needed to reach new customers, as well as various channels to bring in patients, both online and offline (omnichannel). The form of marketing mix that will be developed is based on the concept of the "7P" marketing mix as follows:

A. Product

Among the various products in health care services, the products to be developed at Al Yamin Medical Center Clinic include diagnostic support services, namely radiology x-ray photos. The products and services to be developed must be quality-oriented, namely the quality of medical and nursing care, quality care, and periodic and continuous quality control.

B. Price

The determination of rates is based on history with annual or biennial increases, based on the inflation rate, based on unit cost calculations, plus the specified profit margin. In addition, it also takes into account the rates of competing Clinics. The planned rates to be set are IDR 145,000 thousand for general patients and IDR 40,000 for BPJS patients.

C. Place

The X-ray radiology service at Al Yamin Medical Center Clinic will be distributed to Clinics, Health Centers, individual practicing doctors in the coverage area and run a cooperation system by providing a percentage of incentives from each external referral. In addition, in the Limbangan area there is an industrial area in the form of factories with a very large number of employees around three thousand in 1 factory so that the distribution of this x-ray service will also encourage the MCU program for the factory employees.

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

D. Promotion

The form of special promotion for this x-ray radiology service is planned to be implemented, namely providing special prices at the beginning of the opening around the first month, installing banners in the front area of the Clinic with large and attractive sizes that Al Yamin Medical Center Clinic already has x-ray radiology services, with digital marketing through social media that Al Yamin Medical Center Clinic already has and including direct marketing.

E. People

This form of promotion is how every HR must be able to provide excellent service, of course it has been instilled and become a habit, including later to radiology officers who must be able to apply the values set by the Clinic in how to provide services.

F. Process

Responsive service is part of the Clinic's values so that it will also be implemented including in the x-ray radiology service later, the Clinic will set a fast waiting time such as supported by expert results of less than one hour must be implemented according to the set target.

G. Physical evidence

The physical appearance that Al Yamin Clinic currently has has changed a lot where in 2023 the Clinic will renovate to make the appearance more attractive, comfortable and safe. Paying attention to the latest aesthetics so that it can be a separate attraction including in the creation of a radiology room, especially the waiting room which of course will be made as comfortable as possible. Customer value proposition (CVP) or the value that will be promised in this X-ray radiology service is the advantage that will be offered in the form of a short waiting time supported by expert results of less than 1 hour, the benefits obtained in terms of the quality of the X-ray results.

1. Residents in North Garut and surrounding areas
2. All ages and all genders
3. BPJS Health participants and general patients
4. Residents with lower middle incomes

3.2 Operations management aspects

3.2.1 Location

The Al Yamin Medical Center Clinic is located on the edge of the National road and is very strategic so that it is easily accessible to 7 surrounding sub-districts and is the main access for people from Regencies/Cities in the eastern region of West Java to the provincial capital. Al Yamin Medical Center Clinic has 2 floors with a ground floor area of 223.3 m² and the 1st floor with an area of 260.4 m². With land ownership rights based on the Village Head's Certificate No. 400.05.2003/DS/I/2010 dated 20-01-2010, land ownership certificate No. 1474 dated 19-05-2009 and certified as functionally feasible.

3.2.2 Layout

The layout of health service facilities at Al Yamin Medical Center Clinic is expected to provide a perception of high-tech technology, clean, careful procedures and comfortable. The facilities and infrastructure available will affect customer perceptions of the quality of a service. In Figure 3.2 - 3.3 it can be seen in the layout of Al Yamin Medical Center Clinic that the location of the radiology area is on the ground floor of the rear area of the Clinic which is planned to build an additional room for the radiology area on the land area in the rear area of the Clinic which is still sufficient to meet the minimum standard land area according to regulations. This location also facilitates radiology services that will receive referral patients from doctors outside the Al Yamin Medical Center Clinic.

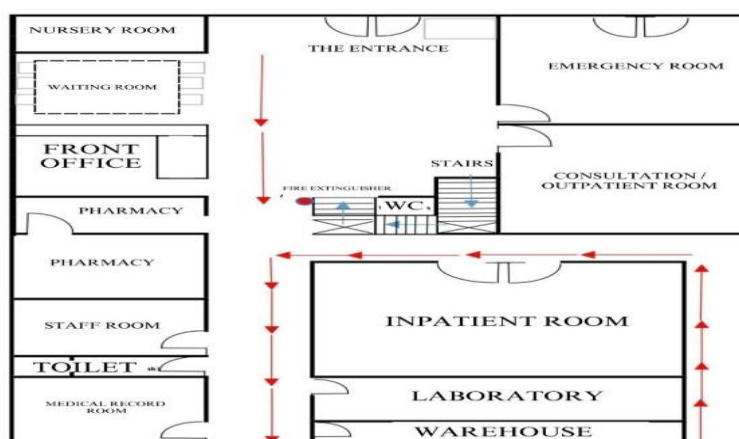


Figure 3.2 Layout of the Al Yamin Medical Center Clinic, ground floor, front area

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

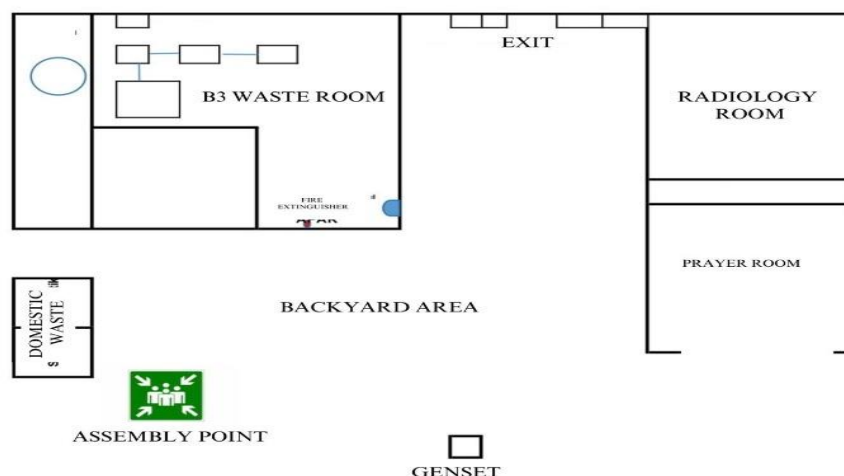


Figure 3.3 Layout of the Al Yamin Medical Center Clinic, ground floor, rear area

3.2.3 Need for buildings, infrastructure and radiology equipment

The provision of buildings, infrastructure and equipment for Clinical Radiology refers to the Regulation of the Minister of Health of the Republic of Indonesia Number 24 of 2020 concerning Clinical Radiology Services. Buildings and infrastructure for Clinical Radiology Services must meet radiation safety in accordance with the provisions of laws and regulations. Buildings and infrastructure for Clinical Radiology Services as referred to must be easily accessible from the emergency room, outpatient room and/or other service rooms that require Clinical Radiology Services. The Clinical Radiology Service Building consists of at least an administration room, waiting room, examination room, radiography and imaging processing room and reading and consultation room. The infrastructure that must be available in Clinical Radiology includes an air conditioning system, lighting system, sanitation system in the form of dirty water, clean water and drainage water, electrical system, medical gas system, fire protection system, evacuation facilities and waste processing system.

Table 3.4 Primary Clinical Radiology Service Equipment

EQUIPMENT	COMPLETENESS	AMOUNT (MINIMUM)
Mobile radiography (mobile x-ray)	Analog or digital Has 2 tube handle levers for free movement Wheeled with or without battery UPS with capacity according to needs	1 unit
Radiation equipment protective	Lead apron, thickness min. 0.25 mm Pb Thyroid protector Pb min. 0.25 mm Pb Gonad protector Pb 0.5 mm Pb	According to the needs
Radiation equipment protection	Surveimeter Film badge/TLD	As needed 1/worker
Emergency kit	Equipment and drugs for CPR according to anesthesia standards	According to the needs
Viewing box	Double atau single box	According to the needs
Generator set power supply	Size and utility as needed	According to the needs

Source: Decree of the Minister of Health of the Republic of Indonesia Number 24 of 2020.

3.2.4 Service process

The radiology service that will be held at the Al Yamin Medical Center Clinic for the initial stage will operate every Monday - Sunday including every red date with service hours from 08.00 to 21.00 which will be divided into 2 work shifts, namely morning from 08.00 to 14.00 and afternoon from 14.00 to 21.00 in addition to internal referrals, the radiology service will also accept external

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

referrals. Hopefully, this X-ray radiology service can operate 24 hours. For the flow of this X-ray radiology examination service, it must be based on a request letter/introduction from the doctor, then the patient carries out the registration and payment administration, then the X-ray examination is carried out and the results can be waited for. The clinic targets a waiting time of less than 1 hour.

3.3 Human resource management aspects

The X-ray radiology service that will be held at the Al Yamin Medical Center Clinic is an organization that needs to be managed professionally. The selection of doctors and other medical personnel also contributes to the Critical of Success Factor (CSF) of a clinic. In addition From qualified management, HR is an investment for an organization. The right and careful human resources so that patients and service providers get what they expect. HR procurement in clinical radiology refers to the minimum HR standards in the regulation of the Minister of Health of the Republic of Indonesia Number 24 of 2020 concerning Clinical Radiology Services.

Table 3.5 Primary clinical radiology services based on the human resources that must be available

Type of HR	Condition	Amount (Minimum)
Radiology specialist or other doctor with additional authority granted by the Radiology College Clinic	Have a practice license Certificate from the Indonesian College of Clinical Radiology, for doctors other than radiology specialists	1 person
Radiographer	D III Engineering Radiodiagnostics has practice license	1 person/tool
Radiation Protection Officer	Have a practice license	1 person
Administrative staff	Senior high school	1 person

3.3 Legality/legal aspect

The purpose of the legal aspect is to assess the validity, perfection and authenticity of the documents owned. Research on the validity of documents can be carried out in accordance with the institution that issued and authorized the relevant document. This research is very important considering that before the business is run, all procedures related to this or various requirements must first be met.

3.4 Environmental aspects

The operational activities of Al Yamin Medical Center Clinic will certainly have an impact, both positive and negative. The environmental impact that can be caused by x-ray radiology services is the danger of radiation which is a radioactive substance. Therefore, it is necessary to have management to reduce this impact, namely by the suitability of the x-ray radiology building / room which must meet the standards as previously described.

3.5 Financial aspects

3.5.1 Investment Costs

The first step in financial analysis is to estimate the amount of investment costs required for computed radiography x-ray services at Al Yamin Medical Center Clinic. In general, the investment costs required are building, X-ray radiology equipment, licensing and first year operating costs. The first year's operational costs consist of salaries, contingencies and maintenance of the x-ray equipment. The total investment value required is as follows:

Table 3.6 Investment needs for x-ray radiology services

No.	component	Amount (Rupiah)
1.	Building	50.000.000
2.	Equipment (Mobile x-ray and CR) including BAPETEN permit	550.000.000
3.	First year operating costs (salaries and contingencies)	150.000.000
TOTAL		750.000.000

3.5.2 Funding Source Plan

The important thing that is actually considered in this aspect inance/finance is related to capital is how the business will be funded either with own capital, foreign capital, or a combination of both, will be able to achieve economic benefits. For the development of x-ray radiology services at the Al Yamin Medical Center Clinic, the assumption of own capital funding sources is used, so that there are no interest costs calculated in the cash flow analysis later.

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

3.5.3 Projection of Income and Cost

Needs Briefly, it can be defined, costs are money that must be spent during the business process. By following standard accounting practices, the costs for this clinic are divided into 2 (two) types, namely: variable costs and fixed costs. The amount of variable costs varies according to the number of sales (services) while fixed costs do not depend on the number of sales. To calculate this variable cost we use the ratio assumption. The estimated cost incurred by the clinic in providing services is around 60%, this ratio includes medical services and BHP (consumables) issued. The amount of variable costs is calculated by multiplying the cost ratio by the income obtained. The results obtained from this calculation can be seen in the table below.

Table 3.7 Calculation of variable costs incurred by the clinic

Year	Income (Rupiah)	Operational/variable cost estimation	Variable / Operational costs (Rupiah)
1	312.795.000	60%	187.677.000
2	328.433.400		197.060.040
3	517.282.200		310.369.320
4	674.419.500		404.651.700
5	760.402.800		456.241.680
6	998.023.500		598.814.100
7	1.257.507.800		754.504.680
8	1.540.444.500		924.266.700
9	1.848.520.800		1.100.112.480
10	2.547.477.000		1.528.586.200

Source: Data processed 2024

In addition to variable costs, other costs that must be taken into account are fixed costs. To calculate fixed costs, we need to recognize what types of costs may occur. After identifying the various costs that may occur in each section, it is also necessary to determine how to calculate them by considering the factors that most influence these costs. In calculating fixed costs, an estimate of the economic life of fixed assets and the depreciation method is carried out. The depreciation method uses the straight-line method.

Table 3.8 Estimated economic life of fixed assets star border

No	FIXED ASSETS	ECONOMIC AGE
1.	Building	25 years
2.	X-Ray Equipment	10 years

Based on the layout of the planning of the Al Yamin Medical Center X-ray radiology service, an additional room will be built for the radiology room which has an economic life of around 25 years, while the economic life of the X-ray radiology equipment is 10 years. This will greatly affect the calculation of the estimated fixed.

Table 3.9 Depreciation and Amortization

NO	ASSET	ACQUISITION	ECONOMIC AGE	CURRENT YEAR									
				1	2	3	4	5	6	7	8	9	10
1.	Building	50.000.000	25	Rp.2.000.000	Rp.2.000.000	Rp.2.000.000	Rp.2.000.000	Rp.2.000.000	Rp.2.000.000	Rp.2.000.000	Rp.2.000.000	Rp.2.000.000	Rp.2.000.000
2.	X-Ray equipment	550.000.000	10	Rp.55.000.000	Rp.55.000.000	Rp.55.000.000	Rp.55.000.000	Rp.55.000.000	Rp.55.000.000	Rp.55.000.000	Rp.55.000.000	Rp.55.000.000	Rp.55.000.000
Total		600.000.000	35	Rp.57.000.000	Rp.57.000.000	Rp.57.000.000	Rp.57.000.000	Rp.57.000.000	Rp.57.000.000	Rp.57.000.000	Rp.57.000.000	Rp.57.000.000	Rp.57.000.000

Source: Data processed 2024

Funds invested in x-ray radiology services at Al Yamin Medical Center Clinic for fixed assets consist of land, buildings and x-ray radiology equipment. These fixed assets contribute to the operation of radiology services for more than one year so that depreciation

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

is carried out except for land. The depreciation method and the length of economic life are used as is commonly used in hospitals, namely the straight-line method and the economic life for buildings is 25 years, medical and non-medical equipment is 10 years.

1. Profit or loss projection up to 10 years Profit/loss projection of x-ray radiology services for 10 years as follows:

Table 3.10 Profit/Loss Projection and Net Cash Flow up to 10 Years

		YEAR TO-										
NO	Description	0	1	2	3	4	5	6	7	8	9	10
1	Income:											
2	Equity	0	0	0	0	0	0	0	0	0	0	0
3	Investment Loans	0	0	0	0	0	0	0	0	0	0	0
4	Operational and Non-Operational Income)	0	Rp.312.795.000	Rp.328.433.400	Rp.517.282.200	Rp.674.419.500	Rp.760.402.800	Rp.998.023.500	Rp.1.257.507.800	Rp.1.540.444.500	Rp.2.183.557.500	Rp.2.547.477.000
5	Total Income (2+3+4)	0	Rp.312.795.000	Rp.328.433.400	Rp.517.282.200	Rp.674.419.500	Rp.760.402.800	Rp.998.023.500	Rp.1.257.507.800	Rp.1.540.444.500	Rp.2.183.557.500	Rp.2.547.477.000
6	EXPENSES :											
7	Investment Costs	0	0	0	0	0	0	0	0	0	0	0
8	Operational Costs	0	Rp.187.677.000	Rp.187.677.000	Rp.310.369.320	Rp.404.651.700	Rp.456.241.680	Rp.598.814.100	Rp.754.504.680	Rp.924.266.700	Rp.1.100.112.480	Rp.1.528.586.200
9	Loan Repayment	0	0	0	0	0	0	0	0	0	0	0
10	Total Expenses (7+8+9)	0	Rp.187.677.000	Rp.187.677.000	Rp.310.369.320	Rp.404.651.700	Rp.456.241.680	Rp.598.814.100	Rp.754.504.680	Rp.924.266.700	Rp.1.100.112.480	Rp.1.528.586.200
11	Depreciation and Amortization	0	Rp.57.000.000	Rp.57.000.000	Rp.57.000.000	Rp.57.000.000	Rp.57.000.000	Rp.57.000.000	Rp.57.000.000	Rp.57.000.000	Rp.57.000.000	Rp.57.000.000
12	EBIT (5-10)	0	Rp.125.118.000	Rp.141.000.000	Rp.206.912.880	Rp.269.767.800	Rp.304.161.120	Rp.399.209.400	Rp.473.003.120	Rp.616.177.800	Rp.1.083.445.020	Rp.1.018.890.800
13	Interest on Loan	0	0	0	0	0	0	0	0	0	0	0
14	EBT (12-13)	0	Rp.125.118.000	Rp.141.000.000	Rp.206.912.880	Rp.269.767.800	Rp.304.161.120	Rp.399.209.400	Rp.473.003.120	Rp.616.177.800	Rp.1.083.445.020	Rp.1.018.890.800
15	Taxes (25% of EBT)	0	Rp.31.279.500	Rp.35.250.000	Rp.51.728.220	Rp.67.441.950	Rp.76.040.280	Rp.99.802.350	Rp.118.250.780	Rp.154.044.450	Rp.270.861.255	Rp.254.722.700

Source: Data processed 2024

Table 4.17 shows that the Net Cash Flow Projection for the Al Yamin Medical Center Clinic's x-ray radiology service is positive, this is mainly because the source of funds for developing this x-ray radiology service comes from its own capital so that there is no obligation to repay loans and pay interest on loans.

4. Cash flow projections up to 10 years

In calculating net cash flow, the income statement approach is used with the assumption that all income is received in cash (cash inflow) and all operational costs are paid in cash (cash outflow) except for depreciation and amortization. Because it uses the income statement approach, Net Cash Flow is income after interest and taxes (EAT). Because our source of funds is 100 percent from investment, Net Cash Flow is the same as the EAT value.

Table 3.11 Cash Flow In for up to 10 years

NO	DESCRIPTION	YEAR TO-									
		1	2	3	4	5	6	7	8	9	10
1	Operating and Non-Operating Income	Rp.312.795.000	Rp328.433.400	Rp.517.282.200	Rp.674.419.500	Rp.760.402.800	Rp.998.023.500	Rp.1.257.507.800	Rp.1.540.444.500	Rp.2.183.557.500	Rp.2.547.477.000
	Total Cash Flow In	Rp.312.795.000	Rp.328.433.400	Rp.517.282.200	Rp.674.419.500	Rp.760.402.800	Rp.998.023.500	Rp.1.257.507.800	Rp.1.540.444.500	Rp.2.183.557.500	Rp.2.547.477.000

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

Table 3.12 Cash Flow Out up to 10 years

NO	DESCRIPTION	YEAR TO-									
		1	2	3	4	5	6	7	8	9	10
1	Operating costs	Rp.187.677.000	Rp.197.060.040	Rp.310.369.320	Rp.404.651.700	Rp.456.241.680	Rp.598.814.100	Rp.754.504.680	Rp.924.266.700	Rp.1.100.112.480	Rp.1.528.586.200
2	Tax (25% of EBT)	Rp.31.279.500	Rp.35.250.000	Rp.51.728.220	Rp.67.441.950	Rp.76.040.280	Rp.99.802.350	Rp.118.250.780	Rp.154.044.450	Rp.270.861.255	Rp.254.722.700
Total Cash Flow Out		Rp.218.956.500	Rp.232.310.040	Rp.362.067.540	Rp.472.093.650	Rp.532.281.960	Rp.698.616.450	Rp.872.755.460	Rp.1.078.311.150	Rp.1.370.973.705	Rp.1.783.308.900

Source: Data processed 2024

Table 3.13 Net Cash Flow up to 10 years

Year to	Cash Flow In (Rp)	Cash Flow Out (Rp)	Net Cash Flow (Rp)
1	312.795.000	218.956.500	93.838.500
2	328.433.400	232.310.040	96.123.360
3	517.282.200	362.067.540	155.214.660
4	674.419.500	472.093.650	202.325.850
5	760.402.800	532.281.960	228.120.840
6	998.023.500	698.616.450	299.407.050
7	1.257.507.800	872.755.460	384.752.340
8	1.540.444.500	1.078.311.150	462.133.350
9	2.183.557.500	1.370.973.705	812.583.795
10	2.547.477.000	1.783.308.900	764.138.100
Total	11.120.343.200	8.093.769.005	3.498.634.845
Average/year	1.010.940.291	809.376.900	349.863.485

Source: Data processed 2024

3.5.4 Financial Analysis (PP, NPV, IRR)

1. Payback Period To find out the return on investment or the length of time needed by the Clinic to return the initial investment, the Payback Period technique is used. The following is a table of payback period calculations.

Table 3.14 Payback Period Analysis

Initial Investment	Rp.750.000.000
Year 1	Rp.93.838.500
Remainder	Rp.656.161.500
Year 2	Rp.96.123.360
Reminder	Rp.560.038.140
Year 3	Rp.155.214.660
Reminder	Rp.404.823.480
Year 4	Rp.202.325.850
Reminder	Rp.202.497.630
Average Net Cash Flow/year	Rp.349.863.485
(Last remaining/average Net Cash Flow) x 12 months	7 months
PP =	4 yeras 7 months

The investment capital in the development of x-ray radiology services at the Al Yamin Medical Center Clinic of Rp 750,000,000 will be returned within 4 years and 7 months. The investment period is 10 years, so the feasibility of the investment reviewed from the recovery period is FEASIBLE because 4 years and 7 months have been returned or faster than the investment period (10 years).

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

2. Net Present Value

The net present value technique or known as NPV relies on the discounted net cash flow technique. If the results of the analysis produce a positive NPV, then the investment plan for developing this Clinic's services is declared feasible to implement. To calculate the present value, a certain discount rate is used. The discount rate is obtained from the amount of risk-free interest and clinic risk. At the time of writing the report, the Bank Indonesia (BI) interest rate was 6%. This is the BI interest rate as a risk-free interest rate. Investing in this clinic is certainly riskier than saving in a bank. Given the risks in this business, the discount rate calculated in this study is 3 times the BI rate, which is 18%. The use of the discount rate is to calculate the amount of the FCFF discount factor each year. The discount factor is calculated using the following equation: Equation 1 - Discount factor

$$DF = \frac{1}{(1+DR)^t}$$

Description :

DF = discount factor

DR = discount rate

t = time period

Table 3.15 NPV Analysis

Year	Cash flow (Rp)	PVIF 16% 10 yeras	Present value (Rp)
1	2	3	4 (2x3)
1	93.838.500	0,862	80.888.878
2	96.123.360	0,743	71.419.634
3	155.214.660	0,640	99.337.382
4	202.325.850	0,552	111.683.869
5	228.120.840	0,476	108.585.519
6	299.407.050	0,410	122.756.890
7	384.752.340	0,353	135.817.576
8	462.133.350	0,305	140.950.671
9	812.583.795	0,262	212.896.954
10	764.138.100	0,226	172.695.210
Present value cash flow			1.257.032.583
Initial investment			750.000.000
NPV			507.032.583

Source: Data processed 2024

Based on the results of the NPV analysis, a positive NPV of IDR 507,032,583 was obtained, so the investment in developing x-ray radiology services at the Al Yamin Medical Center Clinic with an investment plan of IDR 750,000,000, an interest rate of 16% per year for a period of 10 years is feasible to implement.

3. Internal Rate of Return

A technique for ranking or feasibility of investment proposals using the rate of return on investment which is calculated by finding the discount rate that equates the present value of cash inflows with the initial investment is called the Internal Rate of Return or IRR. If the results of the analysis using the IRR technique are greater than the cost of capital or the profit sharing rate which in this study is set at 16%, then the investment in x-ray radiology services at the Al Yamin Medical Center Clinic is feasible to implement. The following is a table of calculations for the Internal Rate of Return.

Table 3.16 IRR Analysis

Total cash flow 10 yeras	Rp. 3.498.634.845
Average cash flow per year	Rp. 349.863.485
Initial investment	Rp. 750.000.000
Average rate of return (Initial investment / average annual cash flow)	2,143

Source: Data processed 2024

From the mathematical table of PVIFA, with an investment period of 10 years and a PVIFA value approaching 2.143, it is obtained:
The PVIFA value, with n = 10 is 2.168 for k = 45%
The PVIFA value, with n = 10 is 2.124 for k = 46%

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

Table 3.17 Present Value of An Annuity of Rp 1,-

Periode	45 %	46 %
1	0,689	0,684
2	1,165	1,154
3	1,493	1,475
4	1,719	1,695
5	1,875	1,846
6	1,983	1,949
7	2,057	2,02
8	2,108	2,068
9	2,144	2,102
10	2,168	2,124
PVIF	$1/(1+45\%)^{10} = 0,024$	$1/(1+46\%)^{10} = 0,023$

Source: Data processed 2024

So the PVIF value of 2.143 is between 45% and 46%, which is 0.024 and 0.023. Then $(0.024/0.023) \times 1\% = 0.01\%$ So IRR = 16% minus 0.01% is 45.99%. The results of the IRR calculation above show that the investment in developing x-ray radiology services at the Al Yamin Medical Center Clinic with an investment plan of IDR 750,000,000, - with an interest rate of 16% per year for a period of 10 years produces an IRR of 45.99%. Based on this analysis, it can be said that the rate of return is very good, so the investment is feasible to implement, because the IRR is greater than the cost of capital (IRR > Cost of Capital).

IV. DISCUSSION AND CONCLUSSION

4.1 Discussion

Based on the formulation of the problem in this study and the description or analysis of each aspect of the feasibility that has been described previously, the following conclusions are given for the assessment of each aspect:

1. Marketing management aspect

With the coverage area that is already owned by the Al Yamin Medical Center Clinic based on medical record data and observations of Clinic visitors, the Al Yamin Medical Center Clinic has a very wide coverage area within a radius of 10 km, namely 7 sub-districts that have become the Al Yamin Medical Center Clinic market so far. This will certainly make it easier in the midst of 1 competitor, but with the name of the Al Yamin Medical Center Clinic which has been built previously and already has its own patients / internal referrals will use radiology services, so it will not be as difficult as when starting / pioneering a business from scratch. Likewise, the hopes of patients at the Al Yamin Medical Center Clinic who gave a positive response and expected x-ray radiology services to be held so that patients do not need to be referred out and finished in one place in their treatment process. Based on the results of the FGD with the management of the Al Yamin Medical Center Clinic, this x-ray radiology supporting examination in everyday life, many patients come for treatment and need this examination, especially for doctors who will certainly be helped in establishing a diagnosis and therapy. Diseases related to the respiratory tract and heart problems are among the diseases complained about by patients. In addition, patients with a history of trauma often come to the Clinic which opens 24-hour service and need an x-ray examination. The implementation of this x-ray radiology service is also to make it easier for patients to obtain supporting examinations without having to be referred to other areas which will later require more time and costs considering the capacity of radiology examinations in the North Garut area which is still limited.

Coverage area with a population of 1/5 or 20% of the total population in Garut Regency, an average population growth rate of 1.2%, a percentage of productive population of almost 90%, a slightly larger number of females than males and a population growth rate that continues to increase every year to reach 526,000 people in 2032, in addition, Limbangan District is included in the North Garut area where the North Garut area is part of the regional expansion plan in Garut Regency which will later become a separate Regency, namely North Garut Regency. Although currently there are competitors and it is predicted that in the future new competitors will emerge, the assumption is that the Al Yamin Medical Center Clinic can take at least 5% of the total population who will use x-ray radiology services at the Al Yamin Medical Center Clinic. In addition, the existing potential market shows over demand with limited supply by looking at the current population and in the projection for the next 10 years including in the previous study (Bima 2023) there is a strong and significant relationship between the population density indicator around Immanuel Hospital and the trend of increasing GRDP in the population coverage of Immanuel Hospital towards the market aspect, so that it becomes an important indicator determining the feasibility of the market aspect and there is a strong and significant relationship between the indicator of the statement of physical evidence of service towards the marketing aspect, so that it becomes an important indicator determining

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

the feasibility of the marketing aspect so that based on the analysis above, the Development of Computed Radiography X-Ray Services at the Al Yamin Medical Center Primary Clinic is FEASIBLE to be implemented.

2. Operational management aspect

From the operational aspect, Al Yamin Medical Center Clinic is located in a very strategic location including the national road so that service accessibility will be easily accessible to the community within the coverage area radius and can be reached in <30 minutes, which of course will be a separate opportunity. The equipment of x-ray equipment that prioritizes sophisticated tools is expected to be one of the points of strength of x-ray radiology services at the Al Yamin Medical Center Clinic and the building that will be used as a radiology service is built separately on empty land in the Clinic area with a land area capacity that is still fulfilled following the standard regulations that have been determined in the laws and regulations related to the area of land and buildings that will be built later, in addition to the availability of mobile x-ray and CR radiology equipment, the Clinic has also obtained several prospective suppliers who can be options for procuring these tools and strategic locations and the availability of facilities and infrastructure are absolute requirements for the feasibility of this operational aspect as in previous research (Anita, 2022) based on the analysis it can be concluded that Hospital X is a type C hospital that has a strategic location and large land for the development of hemodialysis services as a provision for its feasibility so that the operational aspect of the Development of Computed Radiography X-Ray Services at the Al Yamin Medical Center Primary Clinic is WORTHY to be implemented.

3. Human resource aspect

Based on the minimum standard of Clinical radiology services that do not require too many human resources, namely one radiology specialist, looking at the data on the number of radiology specialists in Garut Regency, it is still sufficient based on data from the Garut Regency Health Office, there are 6 radiology specialists with 9 health facilities that provide radiology services consisting of 8 hospitals and 1 clinic with a ratio of 1 radiology specialist having a maximum of 3 places of practice, so it is still possible to present it. This radiology specialist does not need to always be present at the Clinic because the photo-taking process is carried out by a radiology radiographer and the results of the expertise can be consulted online. Likewise with other human resources, seeing the location of the Clinic which is in the North Garut area on the edge of the National road so that there are still many other health workers available, this is because of the ease of transportation both from the East Priangan area and from the provincial capital so that it has the potential to support radiology service activities so that it can be ascertained that the Clinic will be able to present these human resources and the suitability of human resources as needed in line with research (Bima, 2023) that there is a strong and significant relationship between the indicators of suitability of the structure and description of the organization implementing MRI scanner services to the human resource aspect, so that it becomes an important indicator determining the feasibility of the human resource aspect therefore the Development of Computed Radiography X-Ray Services at the Al Yamin Medical Center Primary Clinic based on the analysis of human resource management aspects is FEASIBLE to be implemented.

4. Legal aspects

In the legal aspect, x-ray radiology services at the Al Yamin Medical Center Clinic only require BAPETEN permission by following the completeness of the required documents and currently the Clinic itself has official and complete licensing documents. The BAPETEN permit will be obtained or facilitated by the x-ray radiology equipment vendor where the purchase of the x-ray radiology device includes the licensing process with no additional costs including feasibility and suitability tests so that it will facilitate the Clinic. However, the most important thing to consider is the legality of the Clinic, whether it can provide radiology services based on statutory regulations, both in the Regulation of the Minister of Health Number 14 of 2021 concerning Standards for Business Activities and Products in the Implementation of Risk-Based Business Licensing in the Health Sector and the Decree of the Minister of Health of the Republic of Indonesia Number 24 of 2020 concerning Standards for Clinical Radiology Services, which states that the Clinic can provide radiology services and in previous research related to the feasibility study of MRI services in hospitals, it was stated that essential requirements such as hospital permits, radiology installations and the equipment used have been met to become feasibility standards, such as Hospital Operational Permits, Hospital Owner Legal Entities, Feasibility Tests for Radiology Equipment Functions, Suitability and Calibration Tests, Building Approvals, Service Testing/Calibration. Based on the analysis of the legal aspects, the Development of Computed Radiography X-Ray Services at the Al Yamin Medical Center Primary Clinic is FEASIBLE to be implemented.

5. Environmental aspects

In x-ray radiology services with CR processing techniques, there is no environmental impact such as producing solid or liquid waste, what needs to be considered is the radioactive/radiation hazards that arise from radiological x-rays, this is anticipated by making a radiology room that must follow minimum standards and this will be followed by the Clinic because before starting the service, a room feasibility test must be carried out by BAPETEN / nuclear energy regulatory. The minimum room standard that must be met is the use of lead and the Clinic has ensured the availability of the lead raw materials. The Al Yamin Medical Center Clinic separately

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

also has SPPL, UPL and UKL recommendations. In another study, it was stated based on the results of health examinations of radiology officers at Dr. M. M. Dunda Hospital in 2020-2022, it was concluded that radiation exposure affected hemoglobin, leukocyte, SGPT, and SGOT levels, meaning that adverse health impacts need to be anticipated both in the management of Occupational Health and Safety of officers and the surrounding environment. So from the analysis of environmental aspects, the Development of Computed Radiography X-Ray Services at the Al Yamin Medical Center Primary Clinic is WORTHY to be implemented.

6. Financial management aspects

The aspects used in this financial parameter are Payback Period (PP), Net Present Value (NPV) and Internal Rate of Return (IRR). Investment capital in x-ray radiology services at the Al Yamin Medical Center Clinic will be returned within 4 years and 7 months (four years and seven months) with an investment period of x-ray radiology services for 10 years, so the feasibility of the investment reviewed from the recovery period is Feasible. With the results of the Net Present Value (NPV) analysis, a positive Net Present Value (NPV) of Rp 507,032,583 was obtained. So that overall the x-ray radiology service plan at the Al Yamin Medical Center Clinic can be declared feasible to implement. The results of the IRR calculation show that the investment in x-ray radiology services with an investment plan of Rp. 750,000,000, - with a profit sharing of 16% per year for a period of 10 years produces an IRR of 45.99% which shows that the IRR is greater than the cost of capital. Based on the financial aspects that have been studied using several conventional methods, namely by analyzing 3 financial aspects of PP, NPV, IRR, the financial analysis is the standard reference for financial feasibility in every feasibility study such as the results obtained in the hospital feasibility study research based on the projection of the number of visits, accompanied by projected income/profit/loss data for 10 years. Investment Value IDR 16,072,563,000. The results of the financial analysis show that PP if it does not partner with BPJS Kesehatan is 5 years 7 months, if it partners with BPJS / Social Security Administrator Kesehatan it is faster, namely 4 years 5 months. The results of the NPV calculation are positive in both conditions. So that the investment in the Development of Computed Radiography X-Ray Services at the Al Yamin Medical Center Primary Clinic is FEASIBLE to be implemented.

Table 4.1 Recapitulation of the results of the feasibility study analysis for the development of computed radiography x-ray services at the Al Yamin Medical Center Clinic.

No.	VARIABLE	DIMENSIONS	INDICATOR	ANALYSIS RESULTS	ELIGIBILITY CRITERIA
	Marketing	Market potential	The difference between demand and supply	Demand>supply	Demand>supply= feasible
	Operation	Strategic location	Easy accessibility within a coverage area of 5-10 km.	Travel time ≤30 minutes	≤30 minutes = feasible
		Space/building requirements	The availability of land of at least 10 m (p) x 7 m (l) x 2.8 m (t) and space to move facilitates the process flow.	Available	Minimum land available is 10 m (p) x 7 m (l) x 2.8m (t) = feasible
		Availability of radiology equipment	Suppliers of mobile x-ray and CR equipment are readily available	Available	Available = feasible
		(Technical service) Passed BAPETEN test	Conducting suitability tests on equipment and use of radiation sources	Yes	Yes = feasible
	HR	1 radiology specialist	Availability of quantity and suitability of qualifications	Number of people and experience available	More quantity than required and experienced = feasible
		2 radiographer			
		1 radiation protection officer			
	Legality/law	Government regulations/provisions	Can the clinic provide x-ray radiology services?	In accordance with statutory regulations	In accordance with statutory regulations = feasible
	Environment	Anticipate the dangers of radiation	Availability of lead raw materials for the manufacture of radiology rooms	Available	Lead available = available
	Finance	Payback periode (PP)	Time to return on investment	4 yeras 7 month	PP<projected age = available

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

	Net present value (NPV)	Net present value	Rp. 507.032.583	NPV positive = feasible
	Internal Rate of Return (IRR)	Rate of return	45,99%	IRR > cost of capital (interest rate) = feasible

4.2 Conclusions

After conducting a feasibility analysis in the Development of Computed Radiography X-Ray Services (X-Ray Photos) at the Al Yamin Medical Center Primary Clinic, Balubur Limbangan District, Garut Regency, West Java, which was reviewed from 6 aspects, it can be concluded:

1. Reviewed from the marketing aspect, the results of the FEASIBLE analysis were obtained, this is based on market potential that shows demand > supply and is supported by a good marketing strategy.
2. Reviewed from the operational aspect, the results of the FEASIBLE analysis were obtained, this is based on a very strategic location including the Clinic's ability to provide buildings and radiology equipment according to standards that can be met.
3. Reviewed from the HR aspect, the results of the FEASIBLE analysis were obtained, this is based on the number of available HR and according to qualifications in Garut Regency, which can still be met to be presented at the Al Yamin Medical Center Clinic in providing x-ray radiology services.
4. Reviewed from the legality/legal aspect, the results of the FEASIBLE analysis were obtained, this is based on the regulations of the Ministry of Health which stipulate that the Clinic can provide radiology services.
5. Reviewed from the environmental aspect, the results of the analysis are FEASIBLE, this is based on the Clinic's ability to anticipate radiation hazards that result from radiology services by creating a building structure that meets standards.
6. Reviewed from the financial aspect, the results of the analysis are FEASIBLE, this is based on the calculation of PP, NPV and IRR which show good results.

Based on the analysis of the six aspects above, it can be concluded that the Development of Computed Radiography X-Ray Services at the Al Yamin Medical Center Primary Clinic can be said to be FEASIBLE to be implemented, thus the investment can be continued because it is very profitable financially.

4.2.1 Recommendations

The management and owner of the Clinic can immediately realize the plan to develop computed radiography x-ray services at the Al Yamin Medical Center Primary Clinic. The next job is to implement the marketing strategies needed so that the return on investment goes according to plan or even faster than expected. To achieve this goal, of course, reliable and experienced management is needed in the marketing area. Further researchers are expected to be able to further refine if they are going to conduct similar research with this mix method, especially in its quantitative form to be more specific in data analysis to find its correlation so that the data produced can be more valid and academics / authors of this research can maximize the insights obtained because of course the author will get many benefits for the future through this writing including input from experts, especially related to how good strategies are in business or service development as seen from 6 aspects that must be considered, namely by implementing in the implementation / managing health services that are being run or in planning - planning for the development of other services so that the planning and implementation can run effectively and efficiently.

REFERENCE

- 1) Abd. Karman. 2022. Business Feasibility Study. Nawa Litera Publishing ISBN: 978- 623-8059-15-7. East Java
- 2) Alexander N., & Sudjatno. 2018. Environmental Analysis as a Basis for Strategy Formulation at Dr. Saiful Anwar Hospital, Malang City. FEB Student Scientific Journal, 6(2): 1-14.
- 3) Annita, Winnie, Ummy. 2022. Feasibility Analysis of Hemodialysis Unit Development at Hospital X in Surabaya. e-ISSN: 2715-6419
- 4) Beni. 2018. Business Feasibility Study. Pustaka Setia Bandung
- 5) Deby et al. 2021. Business Feasibility Study 2021. Widina Bhakti Persada Publisher Bandung
- 6) Decree of the Minister of Health of the Republic of Indonesia. Number 24 of 2020 concerning Clinical Radiology Service Standards.
- 7) Desi. 2018. Business Ethics in Islamic Perspective. Muhammadiyah Bima Islamic Institute (IAI)
- 8) Diah. Firman. 2017. Analysis of Radiology Equipment Investment at PKU x Muhammadiyah Yogyakarta Hospital Unit 2. Proceedings of the National Conference of the National Seminar on Hospital Management (SNMMR). Yogyakarta
- 9) Djuhatmoko, Nawan and Purwanto, Wahyu and Tjahjono, Achmad (2019) Analysis of Investment in Procurement of Radiotherapy Equipment (Linear Accelerator) with the Net Present Value, Payback Period and Internal Rate of Return

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

- Methods at Dr. Sardjito Central General Hospital Yogyakarta. Accessed from 171103472 NAWAN DJUHATMOKO 1-3.pdf (stiewww.ac.id) On December 26, 2022.
- 10) Eka, FA. 2022. Strategic Management at PKU Muhammadiyah Gubug Grobogan Hospital. Muhammadiyah University of Surabaya.
 - 11) Eyal, Marcia. 2019. Medical Imaging: From Roentgen to the Digital Revolution, and Beyond. Rambam Maimonides Medical Journal
 - 12) Fadli Agus Triansyah. Dyah Ayu Suryaningrum. M. Trihudiyatmanto. 2023. Business Feasibility Study. Majalengka. CV. Edupedia Publisher.
 - 13) Ghulam Ahmad. (2024). Radiology Revolution: Emerging Technologies and Diagnostic Advancements. Department of Applied Social Sciences, University of Health Science.
 - 14) Guidelines for Preparing a Feasibility Study for a Hospital. Directorate of Supporting Medical Services and Health Facilities, Directorate of Health Efforts, Ministry of Health of the Republic of Indonesia in 2012.
 - 15) Guidelines for Licensing Services for Diagnostic and Interventional Radiology X-Ray Machines. Guidebook 2019. Sub-Directorate of Health Facility Licensing, Directorate of Radiation Facilities and Radioactive Substances Licensing, Nuclear Energy Regulatory Agency.
 - 16) Hadi Nurvan, Arum Kesuma Wardani, Nur Endah Palupi. 2023. Characteristics of Patient Examination at the Radiology Installation of Ananda Babelan Hospital, Bekasi, August 2021–July 2022. e-ISSN 2716-0254
 - 17) Herlinda. Musdalifah. Sumarsono. 2022. Reject Factors of Radiographic Film Using Computed Radiography at Bhayangkara Hospital, Makassar. Lontara Journal of Health Science and Technology.
 - 18) Hidayah, N. 2018. Strategic Management Textbook. LP3M Universitas Muhammadiyah Yogyakarta: Yogyakarta.
 - 19) Imtiyaz Ansari. Mohd Arfat. Maajid Mohi. 2022. Conventional Radiography- Comparison with Computed Radiography (CR). Department of Radiology, Uttar Pradesh University of Medical Sciences, Saifai-India-206130
 - 20) Kotler, Philip and Kevin Lane Keller. (2009). Marketing Management, 13th Edition, Jakarta: Elangga.
 - 21) Kurniawan AW, Puspitaningtyas Z. (2016). Quantitative Research Methods. Pandiva Book. Yogyakarta. Report of the Central Statistics Agency of Garut Regency 2023. Report of the Central Statistics Agency of Sumedang Regency 2023.
 - 22) Law Number 32 of 2009 concerning Environmental Protection and Management
 - 23) Law of the Republic of Indonesia Number 17 of 2023 concerning Health
 - 24) M. Hamim Sultoni. 2020. Business Feasibility Study. Madura. IAIN Madura Press. ISBN : 978-623-92464-6-4
 - 25) Maram Mahmoud A Monshia. Josiah Poona. Vera Chung. (2020). Deep learning in generating radiology reports: A survey. School of Computer Science, University of Sydney, Sydney, Australia, Department of Information Technology, Taif University, Taif, Saudi Arabia.
 - 26) Maya. 2021. Feasibility Study Analysis of Dental Aesthetic Services at My Dental Clinic in Bandung, West Java. Bandung Islamic University.
 - 27) Medicine and Health Sciences. Department of Radiological Science and Medical Imaging, College of Applied Medical Science, Majmaah University, Majmaah, Saudi Arabia. Department of Radiotherapy and Nuclear Medicine, College of Medical Radiological Science, Sudan University of Science and Technology, Khartoum, Sudan
 - 28) Muhardi et al. 2020. Strategic Management: Strategic Business Plan of Hospital. PT Refika Aditama: Bandung.
 - 29) Muhardi. Albert. Ira. 2022. Hospital Leadership. Bandung. Refika Aditama Muhardi, Albert H, Wilma H.D, Johannes K.H. 2023. Hospitla Strategic Marketing, Bandung. Refika Aditama
 - 30) Ni Putu Sartika Sukma Putri. 2021. Use of Conventional and Digital Radiography Techniques in Endodontic Treatment. Faculty of Dentistry, Hasanuddin University, Makassar.
 - 31) Nolista. 2022. FEASIBILITY STUDY OF CHANGING RSKIA ANNISA BANJARMASIN INTO A PUBLIC HOSPITAL IN THE ERA of the COVID-19 PANDEMIC. Universitas Gadjah Mada, 2022 | Downloaded from <http://etd.repository.ugm.ac.id/>
 - 32) Regulation of the Minister of Health Number 14 of 2021 concerning Standards for Business Activities and Products in the Implementation of Risk-Based Business Licensing in the Health Sector
 - 33) Regulation of the Government of the Republic of Indonesia Number 28 of 2024 concerning Implementing Regulations of Law Number 17 of 2023 concerning Health
 - 34) Regulation of the Government of the Republic of Indonesia Number 22 of 2021 concerning Implementation of Environmental Protection and Management
 - 35) Regulation of the Minister of Health of the Republic of Indonesia. Number 9 of 2014 concerning Clinics.
 - 36) Resonance Imaging (MRI) Procurement (A Case Study at Immanuel Hospital in Bandung City). Universitas Pasundan.
 - 37) Septiana, Yunus. 2024. Hematology Profile and Dose Monitoring of Radiology Staff at Dr. M. M. Dunda Regional Hospital in 2020-2022. e-ISSN: 2987- 811X MARAS: Multidisciplinary Research Journal

Feasibility Study Analysis of Computed Radiography X-Ray Service Development (X-Ray Image) At the Al Yamin Medical Center Primary Clinic.

- 38) Setia Negara, Bima and Suryana, Popo and Hindarsah, Ida (2023) Feasibility Study of Magnetic
- 39) Sudrajat SD., Muhandi, & Hendrata A. 2022. Analysis of Business Strategy Plan for Maternal and Child Hospitals (Case Study of Bunda Aisyah Hospital in Tasikmalaya). Journal of Social and Technology: 2(8): 670-68.
- 40) Sugiyono. (2017). Business Research Methods. CV Alfabeta. Bandung. Troy Segal. 2019. Operation Management in Healthcare.
- 41) Wahidmurni. (2017). Presentation of Quantitative Research Methods. UIN Maulana Malik Ibrahim Malang.
- 42) Website: <https://my.clevelandclinic.org/health/diagnostics/21818-x-ray> Wiwik. 2019. Business Feasibility Analysis. Umisda Press. Sidoarjo Yousif Mohamed Y. Abdallah. 2019. History of Medical Imaging. Archives of



There is an Open Access article, distributed under the term of the Creative Commons Attribution – Non Commercial 4.0 International (CC BY-NC 4.0) (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits remixing, adapting and building upon the work for non-commercial use, provided the original work is properly cited.