Site Plan Analysis Based on Measured and Unmeasured Criteria for Housing Development According to Investor Assessment

Ni Putu Aryani[1], Hendra Wahyuadi[2], Astrid Kusumowidagdo[1], Karen Fayola,[1] Stephanie Kaori Widodo[1]

[1]Jurusan Arsitektur, Universitas Ciputra, Indonesia
[2] Citraland Tbk., Makasar, Indonesia
Email: niputu.aryani@ciputra.ac.id

Abstrak. *Tingginya laju urbanisasi mendorong pembangunan perumahan untuk memenuhi kebutuhan rumah, khususnya di wilayah perbatasan. Penelitian ini dilakukan untuk memperoleh data kelayakan investasi oleh investor. Tiga rancangan Site Plan yang mempunyai ukuran kavling dan tipe rumah berbeda dianalisa secara bersamaan. Metode kuantitatif dan kualitatif digunakan untuk menganalisis kriteria terukur dan kriteria tidak terukur. Hasil keduanya dinilai oleh investor dengan menggunakan model rasional-intuitif. Penelitian ini menemukan, analisis kriteria terukur menghasilkan Site Plan A mempunyai 60 lot dengan biaya produksi dan harga jual terendah. Sedangkan Site Plan B dan Site Plan C direncanakan sebanyak 37 dan 35 lot dengan biaya produksi dan harga jual lebih tinggi. Oleh karena itu, simulasi kelayakan finansial menghasilkan perbedaan yang signifikan. Hasil analisis kriteria yang tidak terukur menunjukkan bahwa perbedaan nilai kategori setiap Site Plan saling mendominasi. Model rasional-intuitif membagi persentase berdasarkan keuntungan, yaitu 75% terukur dan 25% tidak terukur. Hasil perhitungan menyatakan bahwa Site Plan A lebih layak dilaksanakan secara finansial dan memenuhi perencanaan sebagai bagian dari sebuah kawasan perkotaan. Kesimpulannya, hasil analisis terukur dan tidak terukur mempunyai perbedaan yang signifikan. Namun, dengan evaluasi model keputusan rasional-intuitif yang dilakukan oleh investor, keputusan yang memenuhi kedua jenis analisa tersebut dapat dihasilkan. Oleh karena itu, perhitungan kelayakan finansial bukanlah satu-satunya alat untuk menentukan kelayakan suatu proyek. Kemampuan seorang investor juga menjadi faktor penentu dalam menentukan kelayakan sebuah investasi.*

Keywords: *site plan perumahan, investasi property, kelayakan finansial, analisa kriteria terukur dan tidak terukur, model rasional intuitive.*

Abstract. *The high rate of urbanization has encouraged housing development to meet housing needs, especially in border areas. This research was conducted to obtain investment feasibility data by professionals/investors. Three Site Plan designs that have different lot sizes and house types were analysed simultaneously. Quantitative and qualitative methods were used to analyse the measurable criteria and unmeasured criteria. The results of both were assessed by investors using rational-intuitive decision models. This study finds, the analysis of measurable criteria produces Site Plan A having 60 lots with the lowest production costs and selling prices. Meanwhile, Site Plan B and Site Plan C planned 37 and 35 lots with higher production costs and selling prices. Therefore, the financial feasibility simulation generated a significant difference. The results of the analysis of unmeasured criteria indicated that the different category values of each Site Plan dominated each other. The rational-intuitive model divided the percentage based on profit, which was 75% measurable and 25% unmeasurable. The calculation results stated that Site Plan A was more feasible to implement financially and fulfilled the planning as part of an urban area. In conclusion, the results of measured and unmeasured analyses had significant differences. However, by evaluating rational-intuitive decision models performed by professionals, decisions that meet both types of analysis could be produced. Therefore, the calculation of financial feasibility is not the only tool to determine the feasibility of a project. The ability of an investor is also a determining factor in deciding the feasibility of an investment.*

Keywords: *housing site plan, property investment, financial feasibility, measurable-not-measurable criterion analysis, rational-intuitive models.*

1. Introduction

Research on low-cost housing in Driyorejo states that land prices tend to increase, making it more difficult to have a decent house that people want (Radwa & Megawati, 2023). Meanwhile, in the Government Regulation concerning Housing and Residential Areas in Law Number 1 of 2011, it states that residential housing must support the development of an area and be in accordance with the spatial plan. This is in line with the government's efforts to create affordable housing and is supported by Government Regulation Number 64 of 2016 (Radwa & Megawati, 2023). Regulations are also stated in the Regional Regulation (PERDA) of Gresik Regency Number 12 of 2019 concerning Provision, Delivery and Management of Infrastructure, Facilities and Housing and Settlement Utilities.

It was further explained, the economic conditions in Indonesia in the past 10 years, which tend to be stable, have become a trigger for the development of property investment in Indonesia. In addition, bank interest rates in Indonesia are low and there is a large market demand for housing products. As a result, many investors divert their investment to land/property since every year the value of land increases by 15-20% (Chelindiva & Osesoga, 2020; Sudarsono & Sudiyatno, 2016). This means property is a very profitable investment. This is supported by the stability of the Indonesian economy which grows around 5% which supports the growth of the real sector, including buildings and property industry (Hidayat, 2014).

Property is a lucrative business in the context of making a profit (De Roos, 2004). Therefore, the calculation of profits is one of the main things to consider in deciding whether a project is feasible or not (Santoso, 2013). Planning a housing investment begins with designing a Site Plan which is divided into residential land, environmental roads, green open spaces, and supporting infrastructure. Therefore, in assessing a Site Plan, the analysis must consider the measurable criteria (Ristianti, n.d.) and the unmeasurable criteria (Naafi'aa & Nurini, 2015).

Furthermore, the analysis of the measured criteria produces figures for Building Border Lines (BBL), Building Coverage Ratio (BCR), Floor-Area Ratio (FAR), and Green Coverage Ratio (GCR). The BBL, BCR, FAR, and GCR figures are used to calculate financial feasibility (Ristianti, n.d.; Thomas, 2006). The results of the financial feasibility analysis are the Internal Rate of Return (IRR), Net Present Value (NPV), Profitability Index (PI), and Return of Investment (ROI). Meanwhile, the analysis of unmeasurable criteria has six categories, namely accessibility, compatibility, view, identity, sense, and livability. These categories are important because the Site Plan must support an urban community development (Naafi'aa & Nurini, 2015).

Moreover, each category has a detailed explanation of the main criteria associated with each category. Investment appraisal that involves analysis of unmeasurable criteria can be performed better by investors (individuals) who have a lot of experience in the field (Sari & Hantono, 2017). Investor experience in managing the property business gives the ability to evaluate a project intuitively. This intuitive thought is rationalized and then translated into numbers. This is done by considering the pros and cons as an investor (Sari et al., 2017) who prioritizes financial/profit returns.

Research on the evaluations made by investors in property investment activities states that there are five models of decision making (https://thebusinessprofessor.com/en_US/management-leadership-organizational-behavior/management-approaches-to-decision-making). Two of them are rational and intuitive decision models (Sauter, 1999; Zacharakis & Meyer, 2000). Both of these models can be used to assess and strengthen a Site Plan planning decision to be applied to a real project. Assessment of unmeasurable criteria can be done by giving ratings that have a range of numbers, for example from 1 to 5; or it can also be used by giving a percentage based on the priority of the interests of a decision.

A Site Plan planning must meet the requirements to be implemented in terms of regulations, benefits (financial), and criteria in supporting an urban community. Therefore, the purposes of this research are: (1) analyse the measurable criteria of Site Plan A, Site Plan B, and Site Plan C; (a) decide the figures of BCR, FAR, and GCR; (b) calculate Projected Net Cash Flows to get IRR, NPV, PI, and ROI values; (2) analyse the unmeasurable criteria according to six categories in numbers; (3) calculation based on investor assessment; (a) percentage of every item in measurable and unmeasurable criteria; (b) total percentage of measurable and unmeasurable criteria.

2. Literature Review

2.1. Residential Development in Gresik area

Driyorejo District is included in Gresik Regency which is located in East Java province and is a district with a growing industrial area (Radwa & Megawati, 2023). Many warehouses and factories are built in Gresik. One of the reasons is because Gresik's position is close to the city of Surabaya, which is the provincial capital of East Java and also a metropolitan city which is the centre of business in East Java. Therefore, the community's demand for housing in Gresik district also increase. This condition has forced people to look for comfortable housing to live in, which can support their lives and are in accordance with their ability to obtain it **(Figure 1.).**

Figure 1. Driyorejo Sub-district (source: author, 2022)

The Regional Government of Gresik City has designed a Regional Spatial Plan (RTRW) which is a space for integration between the government, society, and the sectors that surround people's daily lives. For the city of Gresik, the RTRW has the goal of utilizing space while preserving certain areas that can support the lifestyle of the surrounding community, there is integration between natural and man-made sources, and the welfare of human life. (https://desadriyorejo.gresikkab.go.id/). However, in the RTRW of the Gresik Regency Government, there are no detailed regulations regarding BBL, BCR, FAR, and GCR. Thus, the rules regarding this matter follow the rules of the central government which are adapted to local conditions.

Furthermore, the Ministreal Regulation, Ministry of Public Works and Housing (*Peraturan Menteri PUPR*) RI No. 05/PRT/M/2016 explains the requirements for land use lot must pay attention to the intensity of the development. For this reason, a residential area must be accompanied by integrated service units so that they can get proper social services. Thus, the planning of a site plan should not only be filled with housing units, but there must be facilities to support community life. In fact, some of the housing that has been built around the Driyorejo area do not all meet investment feasibility and urban settlement feasibility (Elrafie et al., 2023; Koçak Güngör et al., 2022). Therefore, in planning a housing Site Plan, an investor is not only guided by the results of financial feasibility calculations. Further

analysis is needed from the point of view of Site Plan planning, especially urban areas so that housing development is more suitable for living.

2.2. Site Plan for Housing Development

Development of an area into a housing environment refers to Ministerial Regulation no. 11/PERMEN/M/2008 that the compatibility provisions for housing and settlement areas include area classification, residential and settlement environmental classification, and area compatibility requirements. The regulation also describes the requirements for the compatibility of infrastructure, facilities and utilities for the area as intended, determined by designing the compatibility of environmental infrastructure and facilities, compatibility of utilities in an integrated manner in accordance with the standards and provisions of applicable laws and regulations, as well as being built with adequate capacity according to needs of housing and residential areas (Supriyadi et al., 2013).

Based on the Regulation of the Minister of Public Housing (*PERMENPERA*) RI No. 38/PRT/M/2015-, the site plan must be an instrument to utilize open space as a means to fulfil the control of housing, other developments, open space, and so on. To make this happen, the site plan must meet several requirements such as a clear delineation or mapping of the land complete with measurements and notations, plans for laying buildings, and limits on their control.

In many investment cases, a feasibility analysis of a site plan is carried out to obtain IRR, NPV, PI, and ROI values (Agusdin & Aidil, 2022). The decision maker for a property business is determined based on the value that has been generated from a financial feasibility analysis. However, some property investment decisions are not only made based on financial feasibility analysis. This is because the results of the financial feasibility analysis are not necessarily valid as a benchmark for implementing a property investment project. In several property investment projects, the wealth of experience that investors have has an important role in making a decision (Sari & Hantono, 2017). Regarding the investor's decisions, the decisions were made based on their intuitive decision making which was rationalized (Fisher & Neubert, 2023; Gani et al., 2020; Wu, 2022).

Therefore, in assessing a Site Plan, two analyses should be carried out simultaneously, namely, analysis of measurable criteria and unmeasurable criteria. Measurable criteria analysis is an evaluation activity based on the figures generated from the Site Plan planning. Meanwhile, the unmeasurable analysis evaluates a design based on six planning categories. From the two analysis assessment systems, it is expected that a Site Plan will not only meet the investment feasibility criteria, but also meet the livability requirements and support (Mylajingga & Mauliani, 2019).

2.3. Investment feasibility parameters: NPV, IRR, PI, and ROI

Property investment, especially for housing complex planning, is designed in accordance with regulations regarding the size of lots and housing units that must be adjusted to government regulations, especially regarding BBL, BCR, FAR, and GCR (Thomas, 2006). Therefore, in one land it is necessary to plan a Site Plan with several alternatives to carry out a financial feasibility analysis. Financial feasibility analysis is carried out in order to obtain a comparison of the value of expenses and profits (Sutrisno, 2009; Widiastuti, 2017). It is further explained that the purpose of the investment calculation is to determine the extent to which the project idea provides financial benefits (Chelindiva & Osesoga, 2020).

It has been mentioned that housing needs and property investment have a mutually supportive relationship. A very detailed calculation needs to be done, because this is related to finance. Thus, prior to the application of an investment activity, a systematic and rational financial analysis is required. The results of the financial analysis are used to make decisions on investment actions (Riskijah, 2014). A study on investment concluded that financial feasibility analysis can be measured from several methods, namely Internal Rate of Return (IRR), Net Present value (NPV), Profitable Index (PI), and Return Of Investment (ROI).

It is further explained that financial calculations in property investment use the inflow and outflow of funds in a certain period in a company. This is called cash in and cash out for expenses

incurred (Chmielewska et al., 2022; Farida & Falikhatun, 2023; Giatman, 2011; Sep, 2023; Tan et al., 2022). Calculations regarding financial feasibility are based on certain formulas. These formulas are:

2.3.1. Internal Rate of Return (IRR)

The Internal Rate of Return (IRR) is a rate of return method that assesses the feasibility of using an extension of the Present Value method. That is, if the NPV position = 0, a certain percentage level will be obtained (IRR-x%). The formula of IRR is:

$$\sum_{t=0}^{n} \frac{(C)t}{(1+i)t} - \sum_{n=0}^{n} \frac{(Co)t}{(1+i)t} = 0$$

Notes: n = The age of the investment return business unit; (C)t = Cash flow in year-t; i = Return flow (rate of return); (Co)t = Cash flow out year-t; and t = Time

The eligibility criteria for the IRR value are:

- IRR is feasible if the value is greater than the percentage of the cost of capital (loan interest), meaning that it is in accordance with the profit value set by the investor;
- IRR is not feasible if the value is less than the profit set by the investor.

2.3.2. Net Present Value (NPV)

Net Present Value (NPV) is the result value of the difference between the amount of cash received and the amount of cash issued. This amount is accumulated in a certain time plan, then the net value is calculated on the basis of present value (Prastiwi & Utomo, 2013). In other words, NPV is a method of calculating net profit in the present time (Giatman, 2011). The formula of NPV is:

$$NPV = \sum_{t=0}^{n} \frac{(C)t}{(1+i)t} - \sum_{t=0}^{n} \frac{(Co)t}{(1+i)t}$$

Notes: n = the age of the investment return business unit; (C)t = cash flow in year-t; I = return flow (rate of return)' (Co)t = cash outflows year-t; and t = time.

The decision criteria to find out whether the investment plan is feasible or not are:

- NPV > 0, profitable investment
- NPV < 0, unfeasible investment (unfeasible)
- NPV = 0, feasible investment (feasible).

2.3.3. Profitability Index (PI)

Profitable Index (PI) is a method that assesses the ratio of the total value of the current cash flow over its economic life and the initial outlay of the project. The formula of PI is:

$$\text{PI} = 1 + \text{NPV/Initial Investment}$$

Notes: NPV = net present value.

The criteria for profitable index are:

- If PI > 1, feasible project
- If PI < 1, unfeasible project

2.3.4. Return of Investment (ROI)

Return of Investment (ROI) is used to measure a company's ability to generate profits from all of its assets (Setiawan & Rosa, 2023; Zhu & Lizieri, 2022). The result of ROI that is high, or the higher it is, the better the condition of the company. The calculation formula used is the result of one investment project compared to the investment costs incurred. The total calculation results are multiplied by the value of 100%, so the results are expressed in percent. If the results of the ROI are negative, then the income generated from the investment cannot cover the total investment costs that have been incurred. The formula of ROI is:

$$ROI = (\text{Total Benefit} - \text{Total Cost}) / (\text{Total Cost}) \times 100\%$$

Notes: Total Benefit = profit amount; Total Cost = amount of investment financing
Criteria of Return of Interest are:

- If ROI>1, feasible project
- If ROI<1, unfeasible project

2.4. Rational-Intuitive Decision Models

Decision making in the context of property is carried out from the consumer or investor side (Del Giudice et al., 2019). Consumers make decisions in determining the house they will buy based on several things, for example the design of the house, location, or the price of the house (Aryani, 2017). However, from an investor's point of view, decision making in the property investment business is made not only from the results of a financial feasibility analysis (Kudryavtsev et al., 2013; Parker, 2014; Sah et al., 2010).

For this reason, besides analysing things that can be measured, investors also carry out an analysis that cannot be measured. In the context of discussing an urban design, what is meant by an analysis of unmeasurable criteria is an analysis related to things that don't discus numerically (Ristanti & Nuha, 2020). There are six categories that can be included in the non-measurable criteria, namely accessibility, compatibility, view, identity, sense, and livability. (Shirvani, 1989). Since unmeasurable criteria cannot be valued by number, another model is needed to define these categories in numbers.

Research on Value Management (VM) conducted in Surabaya states that value management is very useful for reducing the high risk of financing in property development (Sari & Hantono, 2017) and is carried out by investors. However, the VM that has been carried out so far has only been limited to assessing the costs incurred for a project in which VM should be carried out to assess the quality of a Site Plan through an analysis of unmeasurable criteria.

There are five models that can be used as an approach in the context of making a decision in project planning (Gani et al., 2020; Hanafi, 2018). Decision making can be done by using one model or combining them. The rational decision model analysis logically and consistently with a full desire to maximize value, quality in order to achieve a goal (Susanto, 2016). Meanwhile, intuitive analysis based on feelings, experiences, and accumulative judgments (Sauter, 1999). Thus, if these two models are combined, then an appraisal is not only based on things that are logical, but also considers feelings, experiences that have been done a lot (Hanafi, 2018).

3. Research Method

3.1. Research Material-Data Collection Method

The research object is a land area of 8300m2 which is located in the Citraland, Driyorejo area, Gresik. There are three types: Site Plan A, Site Plan B, and Site Plan C **(Figure 2.)** which have different lot arrangement designs, types of houses, and number of houses. Site Plan A has a total of 60 lots, Site Plan B has 37 lots, and Site Plan C has 35 lots.

Primary data regarding the land was obtained from the developer and the Regional Government to then be developed with a different design. Primary data included land location, land conditions, and surrounding environmental data obtained from the local regional government. Furthermore, secondary data was obtained from the results of property class assignments, literature, journals, and the Driyorejo area website regarding some important information about the Driyorejo environment.

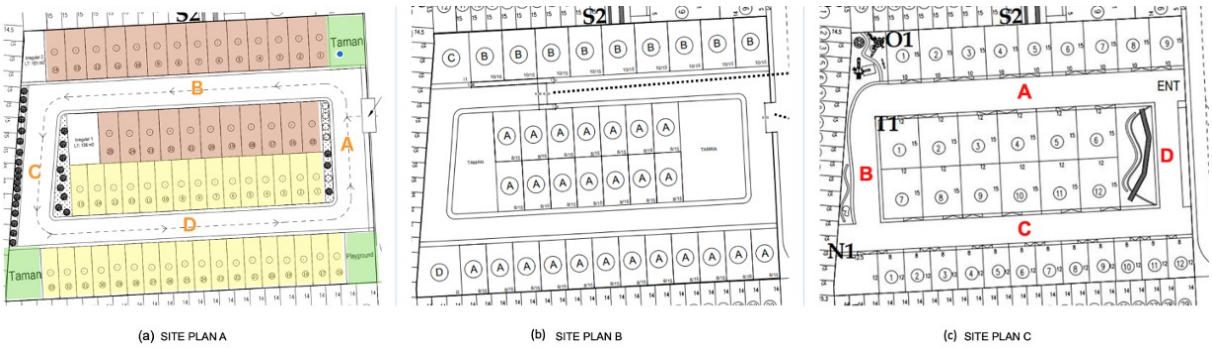

Figure 2. Research material, (a) Site Plan A, (b) Site Plan B, and (c) Site Plan C (source: author, 2022)

3.2. Data Analysis Method

This research was conducted using a descriptive analysis method that combines quantitative and qualitative analysis (Jalinus & Risfendra, 2020; Ramdhan, 2021). The process of analysing research data was carried out separately, to then be summarized in a conclusion. Measurable criterion analysis was carried out based on a descriptive quantitative method which performed calculations based on border lines, lot size, house area and green area. The data was elaborated to calculate the value of the unit price in order to obtain valid data for calculating IRR, NPV, PI and ROI.

Furthermore, the unmeasurable analysis was carried out based on descriptive qualitative (Yuliani, 2018) using six categories, namely accessibility, compatibility, sense, identity, view, and livability, By using rational-intuitive value management, investors analyse the Site Plan based on a logical and consistent assessment that includes feelings, judgments, and experiences (**Figure 3.**).

The stages of analysis can be explained as follows:

A. Analysis of unmeasurable criteria was based on six categories using value management, rational-intuitive decision models in the form of numbers from 1 to 5. A value of 1 is used for a very poor assessment and a value of 5 is given for a very good assessment.
B. The results of the measured criterion analysis values were given different percentages, IRR = 50%, NPV = 30%, PI and ROI each 10%. In addition, the results of the analysis of unmeasurable criteria in the second category were multiplied by 25% and in the first, third, fourth, fifth, and sixth category were multiplied by 15%.
C. The calculation results of the measurable criteria analysis were taken as much as 75% (financial) and the non-measurable criteria analysis was taken as much as 25%. The percentage was determined by property investment priorities that focus on profit.

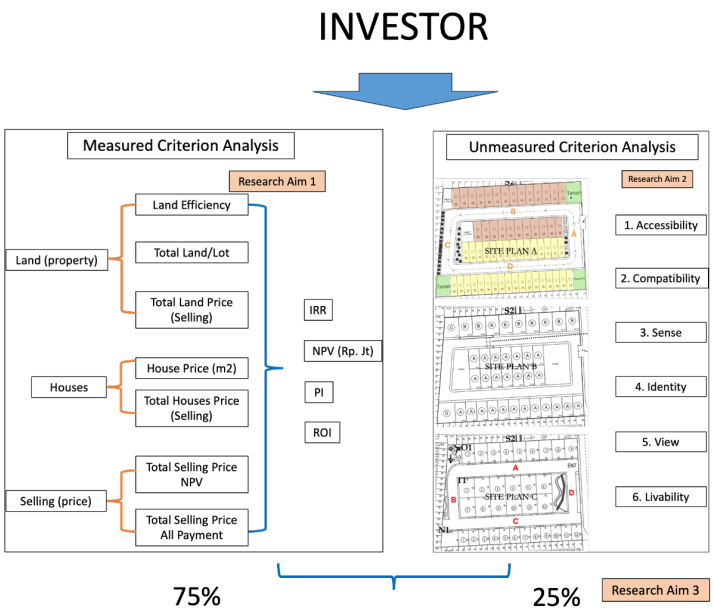

Figure 3. Data analysis and research aim (source: author, 2023)

4. Result and Discussion

4.1. Measurable Criteria Analysis of Site Plan A, Site Plan B, and Site Plan C

4.1.1. BCR, FAR, GCR, number of houses

Based on the designs of the three Site Plans, Site Plan A has the largest number of units with the smallest lot sizes compared to Site Plans B and C. Meanwhile, Site Plan C has the largest lot sizes and the least number of lots. Each Site Plan has different land efficiency, but the maximum efficiency used is 70% of the total land area. Site Plan A has the highest land efficiency, while Site Plan B has the lowest land efficiency.

Land efficiency results in a different number of lot. Site Plan A has 60 lots, Site Plan B is planned for 37 lots, while Site Plan C is used for 35 lots. This means that Site Plan A requires 4,962m2 to be used for 60 lots, Site Plan B requires 4,560m2 for 37 lots, and Site Plan C requires 4,974m2 for 35 lots out of a total land area of 8,300m2. **(Table 1.).**

Table 1. Lot Type, House Area , BCR, FAR, GCR, and Total Lot

Site Plan	Lot Type	House area (m^2)	BCR (%)	FAR	GCR (%)	Total (Lot)
A	5 X 15 (75)	60	40	2	25	33
	6 X 15 (90)	87	47	2	25	25
	Irregular 1	-	-	-	-	1
	Irregular 2	-	-	-	-	1
B	8 X 15 (120)	175	70	2	10	26
	10 X 15 (150)	200	70	2	10	9
	Irregular 1	200	-	-	-	1

	Irregular 2	200	-	-	-	1
C	8 X 12 (96)	127	57	1.6	20	12
	10 X 15 (150)	174	55	1.5	21	10
	12 X 15 (180)	206	56	1.6	25	12
	Irregular 1	-	-	-	-	1

The calculation of financial feasibility is based on the amount of expenditure and income that takes into account: investment period, source of capital, and loan interest rates. However, in the calculations, loan interest rates were not used. This was done so that the calculation of financial feasibility could be simpler. Another factor to consider is the cost of construction, which rises every year and the amount of payments from buyers used to build a house. Thus, the three Site Plans have different costs and house selling prices according to the type of lot, building area, house cost, and house selling price. **(Table 2).**

Table 2. Lot Type, House Area, House Construction Cost, Total Price

Site Plan	Lot Type	House Area (m^2)	House Const. Cost (Rp)	Total Price (Rp)
A	5 X 15 (75)	60	270.000.000	930.000.000
	6 X 15 (90)	87	392.000.000	1.217.000.000
	Irregular 1	-	-	1.190.000.000
	Irregular 2	-	-	884.000.000
B	8 X 15 (120)	175	788.000.000	2.056.000.000
	10 X 15 (150)	200	900.000.000	2.400.000.000
	Irregular 1	200	900.000.000	2.795.000.000
	Irregular 2	200	-	1.523.000.000
C	8 X 12 (96)	127	572.000.000	1.529.000.000
	10 X 15 (150)	174	783.000.000	2.225.000.000
	12 X 15 (180)	206	927.000.000	2.651.000.000
	Irregular 1	-	-	1.418.000.000

4.1.2. Projection Analysis of Net Cash Flows (IRR, NPV, PI, and ROI)

Based on the calculation of the type and number of lots, total operational costs, construction costs and selling prices of houses, as well as the value of total operational costs, after operational surplus and capital, the results of IRR, NPV, PI and ROI could be obtained from the three Site Plans. Site Plan A has the highest IRR value compared to the two Site Plans. Meanwhile, Site Plan C has the highest NPV, PI, and ROI values compared to Site Plans A and B **(Table 3.)**. Thus, it can be concluded the calculation of financial feasibility has not yet had maximum results in determining the most profitable Site Plan.

Table 3. Analysis of Net Cash Flows Projection

Site Plan	Total Lot	Total Ops. Cost	Constr. Cost	Surplus After Ops.	IRR (%)	NPV (Rp Jt)	PI	ROI (%)	NOTE
A	60	-6.274	-19.445	37.849	65,5	6.078	1,21	132,7	2 yrs
					6,55	6,08	6,39	6,55	
B	37	-7.503	-27.706	41.676	40,8	7.447	1,26	146,2	3 yrs
					4,08	7,45	7,84	9,23	
C	35	-7.417	-26.171	42.366	43,4	7.955	1,28	148,6	3 yrs
					4,34	7,96	8,37	9,72	

4.2. Unmeasurable criterion analysis

The unmeasurable criteria analysis has six categories, namely accessibility, compatibility, view, identity, sense, and livability. Site plan A has a main entrance width of 10 meters which is located right across the road of the residential area. There are 60 lots that have 2 types of housing units with the sizes of 5m x 15m and 6m x 15m with a 2-storey building design. Since the house is 5 meters wide, the environment in Site Plan A is denser. The width of the roads in the neighbourhood is 9 meters and 7.9 meters.

Site Plan B has a main entrance that is 6 meters wide, an environmental road 6.5 meters wide, with a total garden area (green area) of 9.2% of the total land area (8,300m^2). Site Plan B has a total of 37 lots with lot sizes of 8 meters x 15 meters, 10 meters x 15 meters and each has 2 floors. The size of the land and housing units being wider, the environment looks looser. Planning Site Plan B only has a garden that is placed in the front and back of the area. The area of lots and housing units is still possible to develop if additional space is needed in the future.

Unlike Site Plans A and B, Site Plan C has an 8 meter wide of main entrance with a 7.5-meter-wide neighbourhood road. There are two types of lot, namely 10m x 15m and 12m x 15m which are arranged parallel. In the planning there are 35 units; each unit has 2 floors. Due to the larger size of the house, there are many gardens in the more spacious neighbourhood (39% of the total area).

Each category in the non-measurable criteria is assessed based on the Site Plan planning. The evaluation was carried out based on the number of lot, the area of the house, the percentage of open green area, and the width of the road. Assessment was carried out on a scale of 1 to 5, where 1 indicates the worst weight, while 5 is the best quality. The description of the unmeasurable categories and their ratings in numbers can be seen in (**Table 4.)**

Based on the analysis results in table 4, the Site Plan A design has the highest value in terms of compatibility factors regarding location, density, scale and mass form. Meanwhile, the Site Plan C design received the highest score by reflecting an environment aimed at the upper middle economic class. Site Plan B design has the same average value for the accessibility, compatibility, view and sense factors. The analysis results also show that the three Site Plan designs have the lowest scores for each different factor. This means that the Site Plan A design lacks livability value. The Site Plan B design does not have an environmental identity because the green area is only found on the front and back of the cluster area. Meanwhile, the Site Plan C design received the lowest score for compatibility due to the lot size being too large, hence the number of units produced was only 35 units.

Table 4. Accessibility, Compatibility, View, Identity, Sense, and Livability

Site Plan	Accessibility	Compatibility	View	Identity	Sense	Livability
	Facilities and infrastructure, site location, circulation arrangements within the site	**Appropriateness of location, density, scale, and shape of the mass of the building**	**view and pattern, color, texture, height, and size**	**certain object which is characteristic**	**The taste that is created becomes a cultural symbol**	**opportunity to thrive in the environment**
A	one-way circulation, main entrance width 10m, main road 7.9m-9m, 25% green area	small lot size, 60 units, 2 storey building, minimalist style	composition of the house is denser because of the lots' width of 5m	dense environment, green area at each end of the cluster	environment created for middle to lower income households	lot is small, social community supports social development
	4	5	4	4	4	2
B	one-way circulation, main entrance width 6m, main road width 6.5m, 9.2% green area	medium lot size, 37 units, 2 storey building, minimalist style	medium house composition, parallel lot arrangement, single loaded	environment, green area only in front and back part of cluster	environment for the middle class	lot is bigger, possible to be extended
	4	4	4	2	4	3
C	one-way circulation, main entrance of 8m, main road of 7.5m, 35% green area	large lot size, 35 units, 2 storey building, minimalist style	wider house composition, lots of gardens, single loaded parallel arrangement	Main entrance in the corner, more green area, environment is more spacious	environment for the upper middle class	possible to expand the house
	4	2	4	4	5	4

4.3. Calculation based on investor's assessment

4.3.1. Percentage of every item in measurable and unmeasurable criterion

Value management can be done to provide a numerical assessment of a property project. Assessment using value management is not only done in order to reduce construction costs. It means value management can also be done to assess and estimate the value of a property project with numbers. In order to make a decision, value management can be supported by rational-intuitive models. That means rational and intuitive decision making is usually done by professionals or practitioners who have years of experience in the property investment.

In the analysis of measurable criteria that produce IRR, NPV, PI, and ROI with consideration of profit-focused business assessment priorities, the IRR and NPV values have the largest percentages, namely 50% and 30%. This is also because the IRR and NPV values are the main assessments in the financial feasibility of a property project. Meanwhile, in the PI and ROI values, each has the same percentage, namely 10%. Therefore, the total of the whole percentage is 100%. From the calculation that multiplies the IRR, NPV, PI, and ROI values, the result is that the Site Plan A value has the highest score, namely 4.79 (**Table 5.**).

Table 5. Result of Measured Criterion for IRR, NPV, PI, dan ROI

		VALUE			TOTAL		
	SITE PLAN	***A***	***B***	***C***	***A***	***B***	***C***
50%	**IRR**	6,55	4,08	4,34	2,46	1,53	1,63
30%	**NPV**	6,08	7,45	7,96	1,37	1,68	1,79
10%	**PI**	6,39	7,84	8,37	0,48	0,59	0,63
10%	**ROI**	6,55	9,23	9,72	0,49	0,69	0,73
100%				SUB TOTAL 1	4,79	4,49	4,77

The six categories in the analysis of unmeasurable criteria have the largest proportion of ratings in the conformity category -25%, because a Site Plan must meet the suitability of the lot area, the suitability of the size of the building, the selling price, and the length of time the project will run until the units are sold out. Meanwhile, the other five categories have the same rating weight, which is equal to 15% and the total percentage of the six categories is 100%. The result of the non-measurable criterion assessment is that suitability has the highest value, namely 3.95 **(Table 6.)**.

Table 6. Result of Unmeasured Criterion

		VALUE			TOTAL		
	SITE PLAN	***A***	***B***	***C***	***A***	***B***	***C***
15%	**Accessibility**	4	4	4	0,60	0,60	0,60
25%	**Compatibility**	5	4	2	1,25	1,00	0,50
15%	**View**	4	4	4	0,60	0,60	0,60
15%	**Identity**	4	2	4	0,60	0,30	0,60
15%	**Sense**	4	4	5	0,60	0,60	0,75
15%	**Livability**	2	3	4	0,30	0,45	0,30
100%				SUB TOTAL 2	3,95	3,55	3,35

4.3.2. Total percentage of measurable and unmeasurable

The results of the assessment of the analysis of measurable criteria and non-measurable criteria are presented according to the role of each analysis. Because finance is the main thing to consider in the property business, the measurable criteria analysis results have a portion of 75%. Thus, the results of the measurable criterion analysis value was 3.6 while the results of the analysis of unmeasurable criteria have a portion of 25%, resulting in a value of 2.19. From the results of the two calculations, the total assessment of the analysis of measurable criteria and non-measurable criteria resulted in a score of 5.79 for Site Plan A. This means that the planning design of Site Plan A is more profitable and supports the development of an urban community (**Table 7.**).

Table 7. Summary of Calculation

Summary of Calculation				
Analysis	**%**	**Site Plan A**	**Site Plan B**	**Site Plan C**
Measured Criterion (Sub-Total 1)	75	4,79	4,49	4,77
		3,60	3,36	3,58
Unmeasured Criterion (Sub-Total 2)	25	8,74	8,04	8,12
		2,19	2,01	2,03
Total	100	5,79	5,37	5,61

Analysis of measurable and unmeasurable criteria is used in order to evaluate a planned Site Plan in an urban environment in order to produce the most feasible design to be realized. Analysis of unmeasurable criteria assessed by investors using a combination of two decision models, rational and intuitive, yields quite significant values. In this case, the experience of investors in pursuing real estate or property investment is very influential. Thus, even though the results of calculating the financial feasibility value are high, experienced investors do not necessarily make decisions to implement them.

In the context of the feasibility analysis of a Site Plan design by an investor, this research can be further developed to obtain a valid value. Investors' experience can be a variable that has several parameters so that it can be known the results of the analysis if the investor is still inexperienced in his (their) work. Subsequent research can also be developed by combining a decision model that gives an assessment based on a Likert scale. The research will certainly require several investors with varying length of experience criteria.

5. Conclusion

The need for middle and lower housing is increasing along with the increasing amount of urbanization in border areas. Therefore, property investment has a high value, supported by bank interest rates in Indonesia and macro-economic stability.

Based on the analysis of measurable criteria based on the type of lots, the number of lots, and the selling price of the house, Site Plan A has the highest IRR value but the lowest NPV, PI, and ROI values. Whereupon, Site Plan C has the highest NPV, PI, and ROI compared to the other two Site Plans.

The results of the analysis of unmeasurable criteria using qualitative which were changed into value management generate Site Plan A having the highest score in the suitability category. Meanwhile, Site Plan C has the highest score in the sense category.

The results of the two assessments were recalculated using value management with rational-intuitive decision models analysis and resulted in an assessment that Site Plan A planning is more profitable financially, in terms of lot planning and sales, and supports the development of an urban community.

In conclusion, the results of measured and unmeasurable analysis have significant differences. However, by evaluating rational-intuitive decision models, a decision that is financially beneficial for planning and urban areas can be produced. Therefore, calculating the financial feasibility of a project is not the only tool to determine the feasibility of a project to be implemented. An experienced investor can assess through rational-intuitive decision models in making decisions to invest.

Referensi

Agusdin, R. P., & Aidil, N. N. (2022). Feasibility Analysis of Information Technology Investment Using Cost Benefit Analysis Method. *Telematika: Jurnal Informatika Dan Teknologi Informasi*, *19*(2), 245–258.

Aryani, N. P. T. K. J. (2017). The Factors Affecting the Home Buying Decisions Related to House Physical Characteristics in a Middle-Up Estate in Surabaya, Indonesia. *Ars-Taiwan*, *15*, 1–16.

Chelindiva, F., & Osesoga, M. S. (2020). Profit management analysis of property and real estate companies. *Riset Akuntansi Keuangan*, *5*(2), 132–146.

Chmielewska, A., Ciski, M., & Renigier-Biłozor, M. (2022). Residential real estate investors' motives under pandemic conditions. *Cities*, *128*, 103801.

De Roos, D. (2004). *Real Estate Riches: How to Become Rich Using Your Banker's Money*. John Wiley & Sons.

Del Giudice, V., De Paola, P., Francesca, T., Nijkamp, P. J., & Shapira, A. (2019). Real estate investment choices and decision support systems. *Sustainability*, *11*(11), 3110.

Elrafie, N. S. S., Hassan, G. F., El Fayoumi, M. A., & Ismail, A. (2023). Investigating the perceived psychological stress in relevance to urban spaces' different perceived personalities. *Ain Shams Engineering Journal*, *14*(6), 102116.

Farida, I., & Falikhatun, F. (2023). Budgeting Gamesmanship in Real Estate and Construction: A Study of Msme's. *Jurnal Kajian Akuntansi*, *7*(1), 1–15.

Fisher, G., & Neubert, E. (2023). Evaluating ventures fast and slow: Sensemaking, intuition, and deliberation in entrepreneurial resource provision decisions. *Entrepreneurship Theory and Practice*, *47*(4), 1298–1326.

Gani, A. N., Rofi'i, M., & Maksum, I. (2020). Efek sistem pemrosesan informasi rasional dan intuitif pada pengambilan keputusan kewirausahaan: sebuah tinjauan literatur. *Jurnal Ekonomi Modernisasi*, *15*(03), 149–161.

Giatman, M. (2011). *Ekonomi teknik*.

Hanafi, I. (2018). Gaya pengambilan keputusan kepala sekolah Dasar ditinjau Rasional dan Intuitif. *Jurnal Review Pendidikan Dan Pengajaran (JRPP)*, *1*(1), 76–82.

Hidayat, R. W. (2014). Peluang dan tantangan investasi properti di Indonesia. *Jurnal Akuntansi UNESA*, *2*(2), 1–18.

Jalinus, N., & Risfendra, R. (2020). Analisis kemampuan pedagogi guru smk yang sedang mengambil pendidikan profesi guru dengan metode deskriptif kuantitatif dan metode kualitatif. *INVOTEK: Jurnal Inovasi Vokasional Dan Teknologi*, *20*(1), 37–44.

Koçak Güngör, M., Bostancı, B., Yılmaz Bakır, N., & Doğan, U. (2022). Investigation of Urban Design Approaches in Renewal Areas with Hybrid Decision Model. *Sustainability*, *14*(17), 10543.

Kudryavtsev, A., Cohen, G., & Hon-Snir, S. (2013). "Rational'or'Intuitive": Are behavioral biases correlated across stock market investors? *Contemporary Economics*, *7*(2), 31–53.

Mylajingga, N., & Mauliani, L. (2019). KAJIAN ELEMEN PERANCANGAN KOTA HAMID SHIRVANI. *PURWARUPA Jurnal Arsitektur*, *3*(2), 123–130.

Naafi'aa, I., & Nurini, N. (2015). Arahan Perancangan Ruang Publik dengan Pendekatan Konsep Riverfront di Sungai Tuntang Kabupaten Demak. *Teknik PWK (Perencanaan Wilayah Kota)*, *4*(3), 373–388.

Parker, D. (2014). Property investment decision making by Australian REITs. *Journal of Property Investment & Finance*, *32*(5), 456–473.

Prastiwi, A., & Utomo, C. (2013). Analisa Investasi Perumahan Green Semanggi Mangrove Surabaya. *Jurnal Teknik ITS*, *2*(2), D191–D196.

Radwa, N. D., & Megawati, S. (2023). Implementasi Kebijakan Program Rumah Bersubsidi Bagi Masyarakat Berpenghasilan Rendah (MBR) di Kecamatan Driyorejo Kabupaten Gresik. *Publika*, 1489–1502.

Ramdhan, M. (2021). *Metode penelitian*. Cipta Media Nusantara.

Riskijah, S. S. (2014). Optimalisasi cashflow menggunakan metode penjadwalan est dan pengaturan sumberdaya pada proyek bangunan gedung. *PROKONS Jur. Tek. Sipil*, *8*(1), 55.

Ristanti, N. S., & Nuha, A. S. (2020). KONSEP PERANCANGAN" AGRO-INDUSTRIAL RURAL TOURISM" DI DESA TLINGSING KECAMATAN CAWAS KABUPATEN KLATEN. *Jurnal Pasopati: Pengabdian Masyarakat Dan Inovasi Pengembangan Teknologi*, *2*(2).

Ristianti, N. S. (n.d.). *Buku Ajar Perancangan Kota 1: Analisis Kriteria Terukur*.

Sah, V., Gallimore, P., & Sherwood Clements, J. (2010). Experience and real estate investment decision-making: a process-tracing investigation. *Journal of Property Research*, *27*(3), 207–219.

Santoso, B. (2013). *Berinvestasi pada properti*. Elex Media Komputindo.

Sari, Y., & Hantono, D. (2017). Pemahaman Pengaplikasian Value Management oleh Pengembang Real Estat di Surabaya. *Seminar Nasional Sains Dan Teknologi (SEMNASTEK)*, AR-002.

Sari, Y., Hantono, D., & Susilowati, E. (2017). *Value Management di Pengembangan Real Estat Surabaya Berdasarkan Persepsi Praktisi Pengembang Real Estat*. Arsitektur UMJ Press.

Sauter, V. L. (1999). Intuitive decision-making. *Communications of the ACM*, *42*(6), 109–115.

Sep, I. (2023). *Steering on feasibility in the context of urban area development: A case study research that explores how public and private actors in collaborative governance steer on feasibility in the context of urban area development*.

Setiawan, C. A., & Rosa, T. (2023). The Analysis of The Effect of Return of Investment (ROI) on Stock Price and Financial Performance of a Company. *Journal of Accounting, Management, Economics, and Business (ANALYSIS)*, *1*(1), 20–29.

Shirvani, H. (1989). *A New Theory of Urban Design*. JSTOR.

Subagyo, A. (2007). *Studi kelayakan*. Elex Media Komputindo.

Sudarsono, B., & Sudiyatno, B. (2016). Faktor-faktor yang mempengaruhi return saham pada perusahaan property dan real estate yang terdaftar pada bursa efek indonesia tahun 2009 s/d 2014. *Jurnal Bisnis Dan Ekonomi*, *23*(1).

Suhendra, I. (n.d.). Implementasi Peraturan Pemerintah Nomor 64 Tahun 2016 Tentang Pembangunan Perumahan Bagi Masyarakat Berpenghasilan Rendah di Kota Tasikmalaya. *Jurnal Syntax Transformation*, *1*(6), 270–277.

Supriyadi, S., Qomariyah, S., & Muttaqin, A. Y. (2013). Perencanaan Site Plan Dan Studi Kelayakan Investasi Pada Perumahan Pondok Permata Hijau Desa Wirun Kecamatan Mojolaban. *Matriks Teknik Sipil*, *1*(2).

Susanto, R. (2016). Hubungan Pengambilan Keputusan Rasional Dengan Akuntabilitas Kepemimpinan Kepala Sekolah. *Jakarta: Eduscience*.

Sutrisno, H. (2009). Manajemen keuangan teori, konsep dan aplikasi. *Yogyakarta: Ekonosia*.

Tan, C., Yu, M., Wang, J., Geng, S., Niu, D., & Tan, Z. (2022). Feasibility study on the construction of multi-energy complementary systems in rural areas—Eastern, central, and western parts of China are taken as examples. *Energy*, *249*, 123571.

Thomas, R. (2006). *Environmental design: an introduction for architects and engineers*. Taylor & Francis.

Widiastuti, K. A. (2017). Evaluasi Investasi Properti pada Perumahan Bumi Kanjuruhan (Studi pada PT. Kharisma Karangploso). *Manajemen Bisnis*, *7*(2).

Wu, H. (2022). Intuition in investment decision-making across cultures. *Journal of Behavioral Finance*, *23*(1), 106–122.

Yuliani, W. (2018). Metode penelitian deskriptif kualitatif dalam perspektif bimbingan dan konseling. *Quanta*, *2*(2), 83–91.

Zacharakis, A. L., & Meyer, G. D. (2000). The potential of actuarial decision models: can they improve the venture capital investment decision? *Journal of Business Venturing*, *15*(4), 323–346.

Zhu, B., & Lizieri, C. (2022). Local beta: Has local real estate market risk been priced in REIT returns? *The Journal of Real Estate Finance and Economics*, 1–37.

Website:

The Business Professor (2023, July 14th; 13:36). https://thebusinessprofessor.com/en_US/management-leadership-organizational-behavior/management-approaches-to-decision-making.

Desa Driyorejo (2023, July 3rd; 09:17) https://desadriyorejo.gresikkab.go.id/

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