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Financial Feasibility Analysis of the Investment for Management of Maha Chakri Sirindhorn Natural History Museum at Walailak University[†]

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Abstract

This study analyzes the financial feasibility of investing in the management of Maha Chakri Sirindhorn Natural History Museum at Walailak University. It uses a 10-year discounted cash flow model and compares the results with investment decision criteria. The study categorizes museum investment costs into 4 items: (1) Personal wages, (2) Administrative fees, (3) Costs of media and equipment, and (4) Utilities expenditures. The income can be classified into 4 distinct categories: (1) Income from entrance ticket fees, (2) Income from souvenir and restaurant space rental fees, (3) Income from conference room service fees, and (4) Income from library membership fees. Based on an analysis of the financial feasibility of investing in management, assuming an average daily visitor count of 800, it was determined that the investment could be more worthwhile. This is particularly true considering the maintenance costs and equipment replacement expense over 3 years, resulting in a net present value (NPV) of −149,712 Bath. In the assumption, assuming an average daily visitor count of 1,000, found that the investment is worthwhile. The museum returned its investment in the second year, with a net present value (NPV) of 157,962 Bath. Based on the assumption of an average daily visitor count of 1,200, the study concluded that the investment is worthwhile, with a payback period of 1 year and a net present value (NPV) of 157,962 Bath. The sensitivity analysis found that the volatility of management returns is influenced by 2 key factors: The volume of visitors and the price of museum tickets.

Keywords: Financial feasibility, Investment for management, Natural History Museum

Introduction

The Plant Genetic Consercation Project (PGCP) was established in 1993 in the Royal Chitralada Palace in Dusit, Bangkok, Thailand, under the initiative of Her Royal Highness Princess Maha Chakri Sirindhorn. The primary goal of PGCP was to develop the essential human and genetic resources necessary for the preservation and advancement of plant and their development to the benefit of the nation's agriculture and business sectors. The eight activities undertaken by the PGCP were: (1) Protecting plant genetics; (2) Investigating and gathering plant genetics; (3) Planting and preservating plant genetics; (4) Conserving and utilizing plant genetics; (5) Establishing germplasm database center; (6) Devising plans for plant variety development; and (8) Implementing special activities to support plant genetic conservation (Plant Genetic Conservation Project, 2023).

In 2014, Walailak University took part in the Plant Genetic Conservation Project, which was initiated by Her Royal Highness Princess Maha Chakri Sirindhorn. It executed the design and construction endeavor for the MAHA CHAKRI SIRINDHORN Natural History Museum at Walailak University. The project aims to achieve 3 objectives: Firstly, to generate knowledge, understanding, and facilitate the learning process through media exhibitions and educational experiences for the public; secondly, to raise awareness about the conservation of resources and cultural heritage of the country; and thirdly, to provide a platform for people to access information about the country's physical, biological, cultural, and local wisdom resources. The museum's target demographics encompass students, citizens, and tourists. During the project's initial

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phase, the museum prioritizes investment in the design, construction, landscaping enhancement, procurement of materials, development of media and multimedia, and organization of exhibitions. The museum has not conducted a comprehensive analysis to identify models and guidelines for investment in management. This is a challenge for Walailak University in terms of efficiently and sustainably operating the museum, as well as mitigating potential risks stemming from market failures (Cowen, 1988; Tassey, 1997).

This study analyzes the financial feasibility of the investment for management of Maha Chakri Sirindhorn Natural History Museum at Walailak University. It assesses the profitability in the investment of Walailak University. This study aims to provide valuable insights that will inform policy suggestions about Walailak University's potential investment in museum management. This financial feasibility study utilizes up-to-date financial data for the year 2023 obtained from credible sources. The data includes museum management costs provided by experienced engineers and architects, projected museum income based on researchers' forecasts, and project-related activities derived from field visits, data synthesis, assumptions, and diverse financial variables. This study is limited in its scope since it does not encompass the indirect economic, social, and environmental advantages associated with investing in museum management.

Literature review

The literature review is divided into 2 sections. The initial section comprises a review of the Maha Chakri Sirindhorn Natural History Museum at Walailak University, while the subsequent section entails a literature review focused on the analysis of financial feasibility.

The Maha Chakri Sirindhorn Natural History Museum at Walailak University

The coordination center of the Plant Genetic Conservation Project under the royal initiative of Her Royal Highness Princess Maha Chakri Sirindhoen at Walailak University (2022) present the main content of Maha Chakri Sirindhorn Natural History Museum at Walailak University which is "follow in the princess's footsteps from the top of the mountain to under the sea". The museum's architecture features and elegant pattern resembling the number 8, serving as a visual representation of the journey of natural resources from Khao Luang Mountain in Nakhon Si Thammarat to the surrounding plain, coastal areas, and the Gulf of Thailand. The museum exhibition employs the concept of 3 resource derived from the Plant Genetic Conservation Project framework, initiated by Her Royal Highness Princess Maha Chakri Sirindhoen at Walailak University. These resources include physical, biological, and cultural resources.

The museum's display is categorized into 6 distinct groups: The exhibition at Khao Luang Mountain showcases the physical resources of the mountain, including animals, birds, mushrooms, fungi, and microorganisms. It also highlights the tribal way of life and folk culture, such as the Sakai, Moken, and Thai Song Dam tribe. Additionally, there is an exhibition on the management of the Pak Phanang River Basin, which focuses on the Royal Initiative Projects on water resources management initiated by King Rama IX. The exhibition also explores shipbuilding wisdom and the movement of sea waves, as well as the abundance of the gulf of Thailand through aquarium displays. Lastly, there is an exhibition dedicated to the royal duties of Her Royal Highness Princes Maha Chakri Sirindhorn in the conservation of natural resources.

The museum is situated within the premises of Walailak University, in the province of Nakhon Si Thammarat, Thailand. The project budget amounts to 350,000,000 Bath, with 250,000,000 Bath allocated for museum construction and 100,000,000 Bath designated for displays. The museum is a two-story edifice spanning an area of 12,500 square meters. The building's entrance features a periodic approach area, which serves to clearly indicate to visitors that they are entering a space dedicated to the study of natural history. The building features an interior courtyard that provides an open space for the arrangement of greenery, complementing the museum's content. There is a spacious ground floor area designated for hosting special exhibitions. The outside form mirrors the distinctiveness of southern architecture and seamlessly integrates with the surrounding botanical park region. There are several attributes of civilization that enable those with disabilities and promote energy conservation.

Financial feasibility analysis

A financial feasibility analysis is a methodical assessment of the financial sustainability of a proposed project, investment, or commercial endeavor. It entails conducting a comprehensive analysis of the project's financial components to ascertain its viability. The financial feasibility analysis consists of 3 components, as outlined by (Gitman & Zutter, 2015; Ross et al., 2003; Brighan & Houston, 2009); cost estimating involves the calculation of the overall expenses related to the project, encompassing both the original investment and the continuous operational costs. This encompasses expenses related to equipment, workforce, materials, rental fees, utilities, and other necessary resources. Additionally, it involves evaluating the projected revenue and income that the project will create. Furthermore, it entails doing a profitability analysis to calculate financial metrics that will assess the possible profitability of the project. According to the literature review conducted by (Link & Scott, 2005), the utilization of Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PB) is a common practice for assessing the worth of significant projects. These methods are applicable for evaluating projects with diverse revenue sources.

Reviewing research literature in financial feasibility analysis

Researchers conducted a literature analysis on project evaluation, specifically focusing on the use of financial techniques such as Net Present Value (NPV) and International Rate of Return (IRR) to assess investment projects.

In this study, Yunardi and Rahadi (2023) explore the feasibility and potential revitalization of underutilized commercial buildings in Bandung, focusing specifically on the case of the XYZ Hotel. The study utilizes SWOT analysis and a comprehensive feasibility study to determine the potential of these buildings. The research seeks to assess the current condition of XYZ Hotel, compare its facilities with competitors, identify alternative functions for the establishment, and evaluate the feasibility of its revitalization. The findings indicate that XYZ Hotel needs to be more utilized and faces challenges regarding outdated infrastructure, a lack of modern amenities, and subpar room conditions. Experts recommend a significant overhaul of the hotel's facilities, incorporating modern technologies and amenities to meet the expectations of contemporary travelers. The financial analysis demonstrates a positive Net Present Value (NPV) of IDR 47,701,605,549, an International Rate of Return (IRR) of 16.61 %, a Profitability Index of 1.90 times, and a payback period of 8 years. The result confirms the financial feasibility of the restoration project.

In their 2020 study, Limonov, Nesena, and Semenov examine the utilization of cost-benefit analysis to assess the effectiveness of cultural heritage conservation initiatives in historical towns in Russia. This study focuses on the challenges of providing a rationale for investing in projects that attempt to preserve Russian cultural heritage. The case study considered in the article is the project "Preservation and Development of Small Historic Towns and Settlement". The project's economic net present value was evaluated during its preparation. The findings of the evaluation were employed to substantiate the viability of allocating public funds to support the project. Based on the calculations, the project is justified at the federal level from a societal standpoint. This is because it has a positive economic net present value and an internal economic rate of return that surpasses the social discount rate.

Research methodology

The methods for analyzing the financial feasibility of the investment for the management of the Maha Chakri Sirindhorn Natural History Museum at Walailak University are as follows:

1) Studying the document on investment project proposals for the management of the Maha Chakri Sirindhorn Natural History Museum at Walailak University.

2) Gathering pertinent and consistent financial data for the Maha Chakri Sirindhorn Natural History Museum project at Walailak University to ascertain assumptions in the financial feasibility analysis. This includes assumptions regarding operating costs, time periods, income, and overall financial aspects.

3) Using the principal model of discounted cash flow over a period of 10 years and calculate financial indicators such as Net Present Value (NPV), the rate of return (IRR), and payback period (PB) to analyze and compare each project.

Models and tools for financial analysis

Investment projects typically involve long-term commitments, spanning multiple years of operation. Costs and benefits emerge in both the present and the future. Therefore, it is necessary to assign a monetary value to both the costs and benefits. The worth of the future is determined by discounting it to its present value. This study utilizes the ideas of cost and benefit analysis. The present value or discounted cash flow model is utilized for a 10-year investment duration, considering factors like investment costs, operating costs, income, and financial returns while discounting future cash flows. Factors such as the asset's usable life, scrap value, inflation rate, and other relevant variables. Subsequently, to ascertain the investment project with the highest value, the subsequent tools will be considered.

Net Present Value, NPV

The net present value (NPV) represents the total economic benefit of an investment during its duration. It can quantify the disparity between the advantages and expenses associated with the investment undertaking during its duration. The net benefit in each scenario will be discounted using the discount rate to decrease the value of the net benefit that will occur in the future to its current value. The present value can be calculated using the following formula.

$$NPV = \sum_{t=1}^{n} \frac{B_t - C_t}{(1+r)^t}$$

where NPV represents the net present value, t denotes the period of the investment project, n signifies the number of years or lifespan of the investment project, B_t represents the project benefit in year t, C_t represents the project cost in year t, and r represents the discount rate.

A project is considered worthwhile if it has a positive net present value. In circumstances where many investment projects are being considered, the present value of the benefits expected from the investment exceeds the present value of the expenditures incurred.

Internal Rate of Return, IRR

The internal rate of return (IRR) of a project is the discount rate at which the net present value (NPV) of the project becomes zero. The internal rate of return (IRR) represents the mean yearly rate of return that investors may expect to get on their investment throughout the duration of the project. A project deemed worthy of investment must yield a return on investment that above the opportunity cost of the loan, as shown by the interest rate (r) or IRR > r.

Payback Period, PB

The payback period calculate is a tool utilized to determine the timeframe in which a project will pay back its initial investment. The project will benefit from rapid return on investment, resulting in improved liquidity and reduced risk. The payback period of project determined by the number of years it takes for the cumulative net cash flow to become positive or reach the break-even point, starting from the beginning of operation. The investment decision is determined by comparing the calculated payback period with the acceptable period. The acceptable period may vary depending on the project's requirement to return the principal. A project becomes more appealing as its payback period decreases.

Financial assumption

1) The annual interest rate for the loan is 6.5 %. The researchers calculated the minimum loan interest rate imposed by commercial banks on their high-quality customers (Bank of Thailand, 2023).

2) The project period is set for 10 years.

3) The discount rate is established at 8 %. The discount rate is determined by adding the yield of the maximum 50-year government bond, which is 2.92 %, to the risk factors estimated by experts, ranging from 5 to 6 % (ThaiBMA, 2023).

Results

The management costs of Maha Chakri Sirindhorn Natural History Museum at Walailak University

The management costs of Maha Chakri Sirindhorn Natural History Museum at Walailak University, over a ten-year project duration, can be categorized into 4 components: (1) Personal wages, (2) Administrative fee, (3) Costs of media and equipment, and (4) Utilities expenditures. The Estimated costs of museum management are as follows:

Table 1 The management cost of Maha Chakri Sirindhorn Natural History Museum at Walailak University.

Year	Costs of management in museum				Total
	Wage	Administrative fee	Media and equipment	Utility	
2024	2,552,558	436,000	345,000	9,669,206	13,002,764
2025	2,642,058	347,000	195,000	9,669,206	12,853,264
2026	2,735,139	720,050	195,000	9,669,206	13,319,395
2027	2,831,942	436,000	195,000	9,669,206	13,132,148
2028	2,932,618	1,277,685	195,000	9,669,206	14,074,509
2029	3,037,321	720,050	195,000	9,669,206	13,621,577
2030	3,146,211	1,799,656	195,000	9,669,206	14,810,073
2031	3,259,458	347,000	195,000	9,669,206	13,470,664
2032	3,377,234	720,050	195,000	9,669,206	13,961,490
2033	3,499,722	1,366,685	195,000	9,669,206	14,730,613
Total	30,014,261	8,170,176	2,100,000	96,692,060	136,976,497

Table 1 Illustrates a rising trend in the museum's management costs from 2024 to 2033. The project will commence in 2024, with a total expenditure of 13,002,764 Bath allocated for museum management. In 2033, the project's final worth amounts to 14,730,613 Bath. The most significant expense in museum management is the utility expenditures, encompassing electricity and water, accounting for 74.36 %. This is followed by personal wages at 19.63 %, museum administrative costs at 3.35 %, and the cost of media and equipment at 2.65 %.

The income of Maha Chakri Sirindhorn Natural History Museum at Walailak University

The income of Maha Chakri Sirindhorn Natural History Museum at Walailak University can be classified into 4 categories: (1) Income from entrance ticket fees, (2) Income from souvenir and restaurant space rental fees, (3) Income from conference room service fees, and (4) Income from library membership fees. This study categorizes income assumptions into 3 categories based on the number of visitors: Model 1 predicts an average of 800 daily visitors, assuming the museum can only accommodate the minimum number of visitors. Model 2 predicts an average of 1,000 daily visitors, assuming the museum can accommodate a moderate number of visitors. Model 3 predicts an average of 1,200 daily visitors, assuming the museum can accommodate a high number of visitors. The ticket price come from the study of willingness to pay of museum visitors.

Table 2 The income of Maha Chakri Sirindhorn Natural History Museum at Walailak University, predicts an average of 800 daily visitors.

Year	Income of museum (800 visitors per day)				Total
	Ticket fee	Souvenir and restaurant space rental fee	Conference room service fees	Library membership fees	
2024	7,345,067	420,000	2,392,000	250,000	10,407,067
2025	7,804,133	420,000	2,392,000	275,000	10,891,133
2026	8,263,200	420,000	2,392,000	302,500	11,377,700
2027	8,722,267	420,000	2,392,000	332,750	11,867,017
2028	9,181,333	420,000	2,392,000	366,025	12,359,358
2029	9,181,333	420,000	2,392,000	402,628	12,395,961
2030	9,181,333	420,000	2,392,000	442,890	12,436,223
2031	9,181,333	420,000	2,392,000	487,179	12,480,512
2032	9,181,333	420,000	2,392,000	535,897	12,529,230
2033	9,181,333	420,000	2,392,000	589,487	12,582,820
Total	87,222,665	4,200,000	23,920,000	3,984,356	119,327,021

Table 2 Illustrates a rising trend in the income of Maha Chakri Sirindhorn Natural History Museum at Walailak University. According to model 1, there is a predicted average 800 daily visitors from 2024 to 2033. The project commenced in 2024 with an income of 10,407,067 bath, by the completion of the project in 2033, income had increased to 12,582,820 baths. In 2024, the income from ticket fee accounted for 65.83 % of the income, amounting to 7,348,067 baths while other sources contributed 34.17 %, totaling 3,812,000 bath.

Table 3 The income of Maha Chakri Sirindhorn Natural History Museum at Walailak University, predicts an average of 1,000 daily visitors.

Year	Income of museum (1,000 visitors per day)				Total
	Ticket fee	Souvenir and restaurant space rental fee	Conference room service fees	Library membership fees	
2024	9,181,333	420,000	2,392,000	250,000	12,243,333
2025	9,755,167	420,000	2,392,000	275,000	12,842,167
2026	10,329,000	420,000	2,392,000	302,500	13,443,500
2027	10,902,833	420,000	2,392,000	332,750	14,047,583
2028	11,476,667	420,000	2,392,000	366,025	14,654,692
2029	11,476,667	420,000	2,392,000	402,628	14,691,295
2030	11,476,667	420,000	2,392,000	442,890	14,731,557
2031	11,476,667	420,000	2,392,000	487,179	14,775,846
2032	11,476,667	420,000	2,392,000	535,897	14,824,564
2033	11,476,667	420,000	2,392,000	589,487	14,878,154
Total	109,028,335	4,200,000	23,920,000	3,984,356	141,132,691

Table 3 Illustrates an upward trend in the income of Maha Chakri Sirindhorn Natural History Museum at Walailak University. According to model 2, there is a predicted average 1,000 daily visitors from 2024

to 2033. The project began in 2024 with an income of 12,243,333 bath, by the project's completion in 2033, the income had risen to 14,878,154 baths. In 2024, the ticket fee constituted 70.66 % of the entire income, amounting to 9,181,333 baths while other sources contributed 29.34 %, totaling 3,812,000 bath.

Table 4 The income of Maha Chakri Sirindhorn Natural History Museum at Walailak University, predicts an average of 1,200 daily visitors.

Year	Income of museum (1,200 visitors per day)				Total
	Ticket fee	Souvenir and restaurant space rental fee	Conference room service fees	Library membership fees	
2024	11,017,600	420,000	2,392,000	250,000	14,079,600
2025	11,706,200	420,000	2,392,000	275,000	14,793,200
2026	12,394,800	420,000	2,392,000	302,500	15,509,300
2027	13,083,400	420,000	2,392,000	332,750	16,228,150
2028	13,772,000	420,000	2,392,000	366,025	16,950,025
2029	13,772,000	420,000	2,392,000	402,628	16,986,628
2030	13,772,000	420,000	2,392,000	442,890	17,026,890
2031	13,772,000	420,000	2,392,000	487,179	17,071,179
2032	13,772,000	420,000	2,392,000	535,897	17,119,897
2033	13,772,000	420,000	2,392,000	589,487	17,173,487
Total	130,834,000	4,200,000	23,920,000	3,984,356	162,938,356

Table 4 Illustrates a rising trend in the income of Maha Chakri Sirindhorn Natural History Museum at Walailak University. According to model 1, there is a predicted average 1,200 daily visitors from 2024 to 2033. The project commenced in 2024 with an income of 14,079,600 bath, by the completion of the project in 2033, income had increased to 17,173,487 baths. In 2024, the income from ticket fee accounted for 74.29 % of the income, amounting to 11,017,600 baths while other sources contributed 25.17 %, totaling 3,812,000 bath.

Costs and benefits analysis of the Investment for Management of Maha Chakri Sirindhorn Natural History Museum at Walailak University

The costs and benefits analysis of the investment for management of Maha Chakri Sirindhorn Natural History Museum at Walailak University, categorized based on visitors' estimates, is as follows:

Table 5 Costs and benefits analysis of the Investment for Management of Maha Chakri Sirindhorn Natural History Museum at Walailak University.

Year	Profit (Loss)		
	800 Visitor per day	1,000 Visitors pre day	1,200 Visitors per day
2024	(1,845,697)	(9,431)	1,826,835.60
2025	(1,212,131)	738,901	2,689,935.28
2026	(1,191,695)	874,104	2,939,904.95
2027	(515,131)	1,665,434	3,846,001.40
2028	(965,150)	1,330,182	3,625,515.71
2029	(475,616)	1,819,717	4,115,050.50

Year	Profit (Loss)		
	800 Visitor per day	**1,000 Visitors pre day**	**1,200 Visitors per day**
2030	(1,623,850)	671,483	2,966,816.42
2031	(240,151)	2,055,181	4,350,514.99
2032	(682,260)	1,613,073	3,908,406.60
2033	(1,397,792)	897,540	3,192,873.96

Table 5 Illustrates the cost-benefit analysis of natural history museum management. The model 1, which assumes an average of 800 daily visitors, incurs losses over the ten-year lifespan of the project. These losses are expected to increase in the years that necessitate maintenance and replacement of equipment based on its useful life. The net present value (NPV) of Model 1 is −149,712. This indicates that the investment in the project, which has a lifespan of 10 years, is not justified given the daily visitor count of 800.

Based on the cost-benefit analysis of managing a natural history museum, it has been determined that model 2, which assumes an average of 1,000 visitors per day, is a worthwhile investment. The project has a payback period starting from the second year. In its inaugural year, the initiative incurred a deficit of 9,431 Bath. The second model's Net Present Value (NPV) was 4,160 Bath. This indicates that an investment in the project would be worthwhile if there were 1,000 daily visits over the project's lifetime. Model 3, which assumes an average of 1,200 visitors per day, is also worthwhile investment starting from the first year. The Net Present Value (NPV) equals 157,962 Bath.

Conclusion and discussion

The financial feasibility analysis of investing in the management of Maha Chakri Sirindhorn Natural History Museum at Walailak University uses the discounted cash flow model for a duration of 10 years. It calculates financial indicators such as Net Present Value (NPV), the rate of return (IRR), and payback period (PB) to analyze and compare each project. The study categorizes museum investment costs into 4 items: (1) Personal wages, (2) Administrative fees, (3) Costs of media and equipment, and (4) Utilities expenditures. The income can be classified into 4 distinct categories: (1) Income from entrance ticket fees, (2) Income from souvenir and restaurant space rental fees, (3) Income from conference room service fees, and (4) Income from library membership fees.

Based on an analysis of the financial feasibility of investing in management, assuming an average daily visitor count of 800, it was determined that the investment does not worthwhile. This is particularly true considering the maintenance costs and equipment replacement expense over 3 years, resulting in a net present value (NPV) of −149,712 Bath. In the assumption, assuming an average daily visitor count of 1,000, found that the investment is worthwhile. The museum returned its investment in the second year, with a net present value (NPV) of 157,962 Bath. Based on the assumption of an average daily visitor count of 1,200, the study concluded that the investment is worthwhile, with a payback period of 1 year and a net present value (NPV) of 157,962 Bath.

Managing the museum to be worthwhile in the case of setting entry prices at 20 Bath for children, 30 Bath for students and youth, and 50 Bath for tourists requires a total of 1,000 - 1,200 daily visitors in order to achieve sustainability. Walailak University should be a support budget to reduce risk management in the event of a loss and create additional income from other channels to support the loss with direct returns to the museum. The sensitivity analysis found that the volatility of management returns is influenced by 2 key factors: The volume of visitors and the price of museum tickets.

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