Revenue Forecasting Strategy Utilizing the Least Squares Method

Eric Gideon , Ishak Abdullah , Maslin Masrom[*]

Razak Faculty of Technology and Informatics, Universiti Teknologi Malaysia, Malaysia
[*]Corresponding author email: maslin.kl@utm.my

Abstract: Forecasting calculates past or future events and situations, anticipating future development and timing to plan effective actions. Least Squares Method (LSM) is a popular statistical technique that can be used for estimating and forecasting revenues. Subsequently, human capital is essential for corporate success because it helps organizations to run smoothly and profitably. In addition, profitability is related to human capital, with the appropriate education, training, and experience can have a big impact on a company's success. Post-COVID-19 Development Strategy 2030 (PCDS 2030) provides an opportunity for Sarahill Consulting Sdn Bhd (SCSB) to reevaluate its strategic positioning and the new business opportunities offered by PCDS 2030. However, the Board of Directors of SCSB has set a target to generate revenue of at least RM 8 million in 3 years (the year 2025). Using LSM, data suggests that SCSB is not able to meet the revenue target and will need to increase its workforce to meet the target.

Keywords: Forecasting, least squares method, revenue, human capital.

1. Introduction

Sarahill Consulting Sdn Bhd (SCSB), formerly known as Ranhill Bersekutu (Sarawak) Sdn Bhd is an engineering firm with experience in major types of engineering projects. Formerly established as a branch of Ranhill Bersekutu Sdn Bhd in 1992, the firm was restructured to operate as an independent setup with 100% Sarawakian equity, management, and staffing in 1996. SCSB has a staff strength of around 100 employees including 30 engineers and other professionals in various fields of engineering expertise including environmental studies and project management.

The firm specializes in planning, design, project management, and contract administration for a wide variety of projects including:

- Institutional buildings (hospitals, universities, colleges, mosques)

- Commercial high-rises (offices, hotels, condominiums)

- Mix development (townships, commercial high-rises, service apartments, condominiums, hotels)

- Residential development (low-cost and medium-cost housing, apartments, and condominiums)

- Environmental impact assessment studies

- Water supply developments

- Maritime works (marinas, jetties, coastal protection, land reclamation)

- Transportation projects (railways and track, expressways, highways, and airports)

- Drainage and flood mitigation schemes

- Recreational projects (golf resorts, sports complexes, equestrian clubs)

- Power supply systems

- Telecommunications systems

- Sewerage schemes

- Oil and gas facilities (refineries, drilling platforms, bottling plants)

SCSB possesses a wide spectrum of expertise which includes the civil, structural, mechanical, and electrical disciplines together with specialized capabilities in transportation, environmental studies, geotechnics, water resources, oil and gas, energy and power, telecommunications and infrastructure, and project and construction management.

In addition, SCSB has participated in all phases of comprehensive project development, including pre-feasibility/concept studies, feasibility planning, and environmental studies, leading through to detailed design, tendering, contract administration, and project management. Besides that, SCSB utilizes sophisticated computer facilities available today in the execution of all assignments. Computer support facilities, hardware, and various software used allow expedient responses to modifications in design resulting in a cost-effective design.

The firm has a quality audit system to ensure the safety and quality of work produced. In addition, it enjoys the support of local university lecturers and foreign consultants, each an expert in their respective field and engaged based on specific project requirements. Computer facilities are extensively used at Sarahill for engineering analysis, design, draughting, and project management. The extensive use and wide application of Computer Aided Design and Draughting

(CADD) have greatly facilitated the expedient and successful execution of projects undertaken by the firm.

2. Background of the Problem

The launching of the Post COVID-19 Development Strategy 2030 (PCDS 2030) by the Premier of Sarawak, Datuk Patinggi Abang Johari in 2021 marks a significant milestone for Sarawak's economic achievement and aspiration towards a developed state status. Economic growth is expected to be an average of 6% to 8% to double the size of the economy from RM136 billion in 2019 to RM282 billion in 2030. The 6 main target economic sectors of strategic importance are manufacturing, commercial agriculture, tourism, forestry, mining, and social services.

As one of the few local multidisciplinary engineering consultancy practices (ECP) in Sarawak, SCSB intends to capitalize on its staff's strength and experience in expanding its business in the main economic sectors, especially in the manufacturing and mining sectors. ECP strives in delivering quality services with a highly competent and skilled workforce as the main driving force. However, increasing inflationary pressures and high administrative expenses (staff cost), coupled with competitive remuneration by competing ECPs remain a challenge for ECP business.

With this backdrop, the company wishes to analyze future revenue streams and trends for its strategic positioning, moving forward in preparation for the new business opportunities offered by PCDS 2030. The Board of Directors of SCSB has set a target to generate revenue of at least RM 8 million in 3 years with the current workforce and if need be, to determine the additional workforce required to achieve this target.

3. Literature Review

3.1 Forecasting Technique using Least Squares Method

Forecasting calculates past or future events and situations, anticipating future development and timing to plan effective actions [1]. Least Squares Method (LSM) is a popular statistical technique. It is simple to add into distributions and minimizes the sum of squared deviations. Due to its use of widely used estimators, mathematical tractability, and well-researched tools and algorithms like derivatives, eigen decomposition, and singular value decomposition, LSM is a well-liked statistical technique. It is simple to add into distributions and minimizes the sum of squared deviations [2].

Periodic series, also known as time series, are collections of observations of variables, events, or both that are made periodically, meticulously recorded in the order that they occur, and then aggregated as statistical data [1]. LSM is an effective data fitting method for estimating and forecasting revenues, with both manual calculations and Excel Solver methods yielding similar results, reducing residual squared sum.

3.2 Relationship between Revenue and Human Capital in Service Industry

The ability of the leadership to sustain productivity and optimize profitability is crucial for an organization to survive. Profitability depends on the efficient use of internal resources and skills, as well as firm-specific factors that influence profitability [3]. Profitability is often related to productivity and productivity requires a high level of human capital, and firm value is determined by the increase and volatility of output. Benefits only become apparent when a company expands, making smaller companies unavailable for utilizing human capital [4].

Human capital is essential for corporate success because it helps organizations run smoothly and profitably. Finding people with the appropriate education, training, and experience can have a big impact on a company's success [5]. For successful services, human capital, which includes skill, credentials, experience, and personality, is essential, making human labor a fundamental product [6].

4. Methodology

Referring to the problem statement, the Board of Directors of Sarahill Consulting Sdn Bhd (SCSB) would like to position themselves to generate revenue of at least RM 8 million in 3 years (the year 2025). To achieve this, the management needs to decide whether to increase the current workforce or not as they are concerned that the current workforce is not able to cope with the firm accepting new projects.

Firstly, the financial report from the last 12 years was obtained for SCSB, spanning between 2011 and 2022. In general, the more datasets obtained, the more accurate the forecasting will be [1]. Next, the revenues in the past 12 years were evaluated against administrative expenses (payroll, etc.) which will provide insights into whether they are directly proportional or not. Subsequently, a projection of future performance is forecasted using Least Squares Method which extrapolates revenue trends for SCSB in the next three years.

Based on the projected revenues in the next three years, the management of SCSB will have a better understanding of whether they can meet the target set by the Board of Directors, or whether the management will need to consider expanding the current workforce to meet the target.

5. Results and Discussions

Revenue and Administration Expenses of Sarahill Consulting Sdn Bhd (SCSB) are obtained from their annual report for the past 12 years and are illustrated in Table 1 below. Additionally, a graph is plotted based on Table 1 and is illustrated in Figure 1.

Based on Figure 1, revenue for SCSB is directly proportional to Administration Expenses. This means that profitability (revenue) is related to human capital in the case of SCSB, which agrees with the findings suggested by Sisodia et al. (2021).

Subsequently, should SCSB follow the same trend as the past twelve (12) years, it should be adapting to the same trend

Table 1. 12 years' Revenue and Administration Expenses for Sarahill Consulting Sdn Bhd

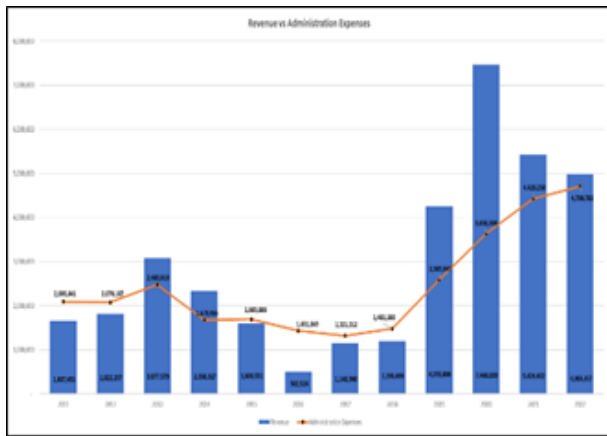| Year	Revenue	Adminstration Expenses
2011	RM 1667451	RM 2095041
2012	RM 1822297	RM 2079187
2013	RM 3077579	RM 2480910
2014	RM 2338317	RM 1679465
2015	RM 1600551	RM 1695886
2016	RM 502524	RM 1431849
2017	RM 1148960	RM 1321012
2018	RM 1196499	RM 1481380
2019	RM 4255806	RM 2585947
2020	RM 7468839	RM 3636369
2021	RM 5424402	RM 4428258
2022	RM 4983357	RM 4709783

Figure 1. Twelve (12) years of revenue and Administration Expenses for Sarahill Consulting Sdn Bhd

in the upcoming three (3) years. This allows us to project the estimated revenue of SCSB in 2025 using Least Squares Method utilizing Microsoft Excel Solver. The year 2011 is defined as year 1 and the year 2025 (next 3 years) will be year 15. The following is the estimated revenue for SCSB in three (3) years, 2025.

Table 2. 12 years' Revenue of Sarahill Consulting Sdn Bhd

Year	Revenue	Remarks
1	RM 1667451	2011
2	RM 1822297	2012
3	RM 3077579	2013
4	RM 2338317	2014
5	RM 1600551	2015
6	RM 502524	2016
7	RM 1148960	2017
8	RM 1196499	2018
9	RM 4255806	2019
10	RM 7468839	2020
11	RM 5424402	2021
12	RM 4983357	2022

Projection of Estimated Revenue using Microsoft Excel Solver (Least Squares Method)

$m = 379910.69$

$b = 487795.71$

Month	Actual Revenue	Estimated Revenue	Error	Error^2
1	RM 1667451.00	RM 867706.40	799744.6	6.39591E+11
2	RM 1822297.00	RM 1247617.09	574679.9	3.30257E+11
3	RM 3077579.00	RM 1627527.77	1450051	2.10265E+12
4	RM 2338317.00	RM 2007438.46	330878.5	1.09481E+11
5	RM 1600551.00	RM 2387349.14	-786798	6.19051E+11
6	RM 502524.00	RM 2767259.83	-2264736	5.12903E+12
7	RM 1148960.00	RM 3147170.51	-1998211	3.99285E+12
8	RM 1196499.00	RM 3527081.20	-2330582	5.43161E+12
9	RM 4255806.00	RM 3906991.88	348814.1	1.21671E+11
10	RM 7468839.00	RM 4286902.57	3181936	1.01247E+13
11	RM 5424402.00	RM 4666813.26	757588.7	5.73941E+11
12	RM 4983357.00	RM 5046723.94	-63366.9	4015369185

Error Sum of Squares (ESS)= 2.91789E+13

Revenue,

$y = mx + b = 379910.69x + 487795.71$

In year 15,

$x = 15$

$y = RM6186456.00$

Based on the formulation above, SCSB is estimated to have a revenue of approximately RM 6.19 million based on the current workforce. This figure is approximately RM 1.8 million lesser than what was targeted by the Board of Directors for the year 2025.

In this case, the management of SCSB should immediately plan on getting new hires to train and allow the new hires to understand the culture of SCSB, and subsequently work towards meeting the target set by their Board of Directors which is to generate revenue of at least RM 8 million in the year 2025.

6. Conclusion

In conclusion, revenue for Sarahill Consulting Sdn Bhd (SCSB) is directly proportional to Administration Expenses which suggests that profitability (revenue) is related to human capital in the past 12 years trend for SCSB. By adopting the Least Squares Method (LSM) approach), the estimated to have revenue of approximately RM 6.19 million based on the current workforce and is approximately RM 1.8 million lesser than what was targeted by the Board of Directors for the year 2025. This suggests that the management of SCSB will need to plan on getting new hires to meet the target RM 8 million target.

References

[1] A. Wijaya and S. O. Kunang, "Implementation of the least square method in the forecasting system prices of stop materials in the traditional market unit of palembang city," *Budapest International Research and Critics Institute-Journal (BIRCI-Journal)*, vol. 5, no. 3, pp. 22 030–22 042, 2022.

[2] H. Abdi *et al.*, "The method of least squares," *Encyclopedia of measurement and statistics*, vol. 1, pp. 530–532, 2007.

[3] N. Eleyae, "The relationship between human capital, productivity, and profitability," Ph.D. dissertation, Walden University, 2021.

[4] G. Sisodia, N. Jadiyappa, and A. Joseph, "The relationship between human capital and firm value: Evidence from indian firms," *Cogent Economics & Finance*, vol. 9, no. 1, p. 1954317, 2021.

[5] D. Lamotte, "Human capital–a driving force for business growth," *ILO Office*, 2012.

[6] E. Skapska and J. Samul, "Human capital indicators in service industries: from workforce profile to output measures," *European Scientific Journal*, vol. 11, no. 10, pp. 292–301, 2015.