CHAPTER II
LITERATURE REVIEW

2.1   Introduction

Literature reviews are surveys of scholarly publications on a particular subject. A literature review enables the researcher to identify relevant theories, methods, and gaps in research that are existing by providing a broad overview of current knowledge. An effective literature review analyses, synthesises, and critically evaluates the state of knowledge on the particular subject. Literature reviews are important because they demonstrate the researcher's knowledge of the topic. Moreover, they provide a framework for developing a research methodology.

2.2   Review of Current Situations

The economy is often used as a reference indicator of economic success in a region. These indicators include the problems of inflation and unemployment as well as improving social welfare. One of the factors that influence economic growth is the number and quality of the population and labor force. From year to year, population growth has relatively increased, which will also affect the growth of the workforce. The growth of the labor force has increased from year to year. The contribution of the economically active population in the production process and economic growth is enormous. Among the scholars around the world who define economically active population, Nor and Said(2014) give the definition provided by the United Nations regarding economically active population as the people who are ready to render services or supply labour for producing goods and services that have economic values.

The studies of Borjas (2014) and Ehrenberg and Smith (2009) explain that all the people who are aged over 16 years are regarded as labor force whether they are employed or unemployed. However, the rate of participation points to the fraction of population who are actively engaged themselves in the workforce. Meanwhile, in China, the study of Liu (2012) reveals that the participation rate in

the labour force is defined as the proportion of the population who participate actively in the labor force divided by the total population. In Malaysia, the Department of Statistics defined the labor force as those who are within the age limit of 15–64 years, regardless of their occupational status, while the proportion of LFPR is the number of people divided by the number of people from 15 to 64 years (Tin, Ismail, & Othman, 2011).

A more significant number of workers will increase the level of production. A large number of workers can mean an increase in the number of productive workers. Labor input through skills, knowledge, and discipline is an important element in economic growth. A country or region, even though it is able to buy various sophisticated equipment but cannot employ a skilled and trained labor force, will not be able to utilize these capital goods effectively.With an increasing number of available workers, it means you can increase the number of productive workers through skilled workers so that production will increase, which means that it will also increase the Gross Regional Domestic Product. In other words, the number of workers has a positive relationship with economic growth.

An essential contribution of this study is the analysis of the long-term impact of the existing workforce in Malaysia. In addition, it can be a reference for the Malaysian government to increase the attractiveness of FDI (Foreign Direct Investment) information, manage foreign debt, and increase the workforce. These three variables are expected to drive economic growth.

2.3   Review of Related Literature

2.3.1   Labour Force

The labor force is the portion of the population that is able and willing to work. The meaning of being able is to be able physically and mentally, and legally able and not to lose the freedom to choose and do work and are willing to actively or passively do and look for work (Sumarsono, 2004). According to (Soemitro Djojohadikusumo), the labor force is the share of the population that has a job or is looking for opportunities to do productive work. It can also be called human

resources. The size of the workforce depends on the composition of the population. The population increase, especially in the working age group, will also produce a large workforce. It is hoped that this large workforce will be able to spur increased economic activity, which will ultimately improve people's welfare. In reality, a large population does not always have a positive impact on the welfare.

2.3.2   Prediction

Prediction is a process of systematically estimating something that is most likely to happen in the future based on past and present information owned so that the error (the difference between something that happened and the estimated result) can be minimized (Setyowanto, 2014). Prediction is a process for estimating future needs, including needs in terms of quantity, quality, time, and location required to meet the demand for goods or services. (Nasution and Prasetyawan, 2008). Prediction is an objective calculation and uses past data to determine something in the future (Sumayang, 2003). Prediction or forecasting defines the art and science of predicting future events (Render & Heizer, 2007). Meanwhile, according to Taylor, forecasting predicts what will happen in the future. Thus prediction is a calculation process using previous data for future needs.

1. Prediction Type

    According to Render and Heizer (2004), the types of forecasting can be divided into several types. Judging from planning operations in the future, forecasting is divided into three types, namely:

    a. Economic forecasts explain the business cycle by predicting inflation rates, availability of money, funds needed to build housing and other planning indicators.

    b. Technology predictions pay attention to the level of technological progress that can launch exciting new products, which require new plants and equipment.

c. Demand predictions are projections of demand for a company's products or services.

2. Prediction Step

A good prediction is a forecast that is carried out by following the steps or procedures for good preparation. According to Gaspersz (2005), there are nine steps that must be considered to ensure the effectiveness and efficiency of the prediction system, namely:

a. Determine the purpose of the prediction

b. Selecting the independent demand items to be predicted

c. Determine the time horizon of the prediction (short, medium or long-term)

d. Choose prediction models

e. Obtain the data needed to make predictions

f. Predictive model validation

g. Make predictions

h. Implementation of predicted results

i. Monitor the reliability of prediction results

2.3.3 Analysis

Analysis is a thinking activity to break down a whole into components so that the signs of the components can be identified, their relationship to one another, and their respective functions in a unified whole (Komaruddin, 2001, p. 53). Analysis is the breakdown or decomposition of a unit into minor units. (Azwar, 2019). Analysis is the "reading" of the text, which places signs that place those signs in dynamic interactions, and the messages conveyed (Robert, 1991). Analysis is an activity to look for patterns or ways of thinking related to systematic testing of something to determine parts, relationships between parts, and their relationship to the whole (Sugiono, 2015, p. 335). Analysis is an attempt to break down a problem into parts. So, the arrangement is straightforward, and then the meaning can be understood, or the situation of the case can be understood (Satori and Komariyah, 2014, p. 200). From the opinion above, it can be

Politeknik Negeri Sriwijaya

concluded that analysis is an activity of thinking to look for patterns to break down the problem into its components so that its meaning can be understood.

2.3.4 Particle Swarm Optimization

Particle swarm optimization (PSO) is an evolutionary computation technique motivated by the simulation of social behavior. PSO was developed by Kennedy and Eberhart (Kennedy and Eberhart 1995; Eberhart, Simpson, and Dobbins 1996).

Figure 2.1 A Flock of Birds Looking for Food

PSO simulates the behavior of a flock of birds, as shown in Figure 2.1. Such as the following scenario: there is a group of birds randomly looking for food in an area where there is only one piece of food in the searched area. All birds have no idea how far away the food is. So the best strategy for finding food is to follow the bird closest to the food. PSO adopts these scenarios and applies them to solve optimization problems. PSO is not just an optimization tool but also a tool that describes the interactions of living things and their environment.

In PSO, every single solution referred to as a "bird" in our search for space is called a "particle" (or individual). Each "flying" particle follows the current optimum particles. The particle stores traces of its position in the problem space. In this PSO algorithm, the search for a solution is carried out by a population consisting of several particles. The population is generated randomly with the smallest and largest value limits. Each particle represents a position or

solution to the problem at hand. Each particle searches for the optimal solution by traversing the search space. This is done using each particle, adjusting to the best position of the particle (local best) and to the best particle position from the entire herd (global best) while crossing the search space. Thus, sharing experience or information occurs within the particle itself and between a particle and the best particles from the entire swarm while finding a solution. After that, a search process is carried out to find the best position for each particle in a certain number of iterations until a relative position is obtained.

Since 1995, Particle Swarm Optimization (PSO) metaheuristic proposed by Eberhart and Kenedy has been widely used (Rosa et al., 2021). Inspired by nature, it was the flocking and swarm behavior of birds and also insects. The advantages of PSO over others intelligent optimization approaches include easier to execute, fewer settings to change, and greater memory capacity (Garlapati et al., 2010). During the optimization, the process of PSO occurs when the members of the population are flown according to their flying experience or other members experiences. PSO has a population called swarms, and potential solution called particles, where these particles move through the search domain which is modified (velocity and position) at each iteration of the algorithm in search of optimal solutions.

The velocity and position are represented in Equations 2.1 and 2.2.

$$\vec{V}_i = (V_{i1}, V_{i2}, ..., V_{iD}) \text{ for } i = 1, 2, ..., N \tag{2.1}$$

$$\vec{X}_i = (X_{i1}, X_{i2}, ..., X_{iD}) \text{ for } i = 1, 2, ..., N \tag{2.2}$$

The next velocity and position of i-the particle are updated using Equations 2.3 and 2.4.

$$V_i^{t+1} = \underbrace{w^t \cdot v_i^t}_{\substack{\text{current} \\ \text{motion}}} + \underbrace{c_1 \times r_1 \times (P_{best} - X_i^t)}_{\substack{\text{particle memory} \\ \text{influence}}} + \underbrace{c_2 \cdot r_2 \times (G_{best} - X_i^t)}_{\text{swarm influence}} \tag{2.3}$$

$$X_i^{t+1} = X_i^t + V_i^{t+1} \tag{2.4}$$

where w^t is the inertia weight, t is the generation of algorithm, V_i^{t+1} is the position and velocity of the next iteration, v_i^t is the current particle velocity, X_i^{t+1} is the position of the next iteration, X_i^t is the current velocity position, c_1 is the cognitive constant, c_2 is the constant of social acceleration, r_1 and r_2 are random variable in the range between 0 and 1, P_{best} is the best position giving the best fitness value of the particle and G_{best} is the best position of the best particle among all particles in the population. Figure 2.2 shows a flowchart of the PSO algorithm method.
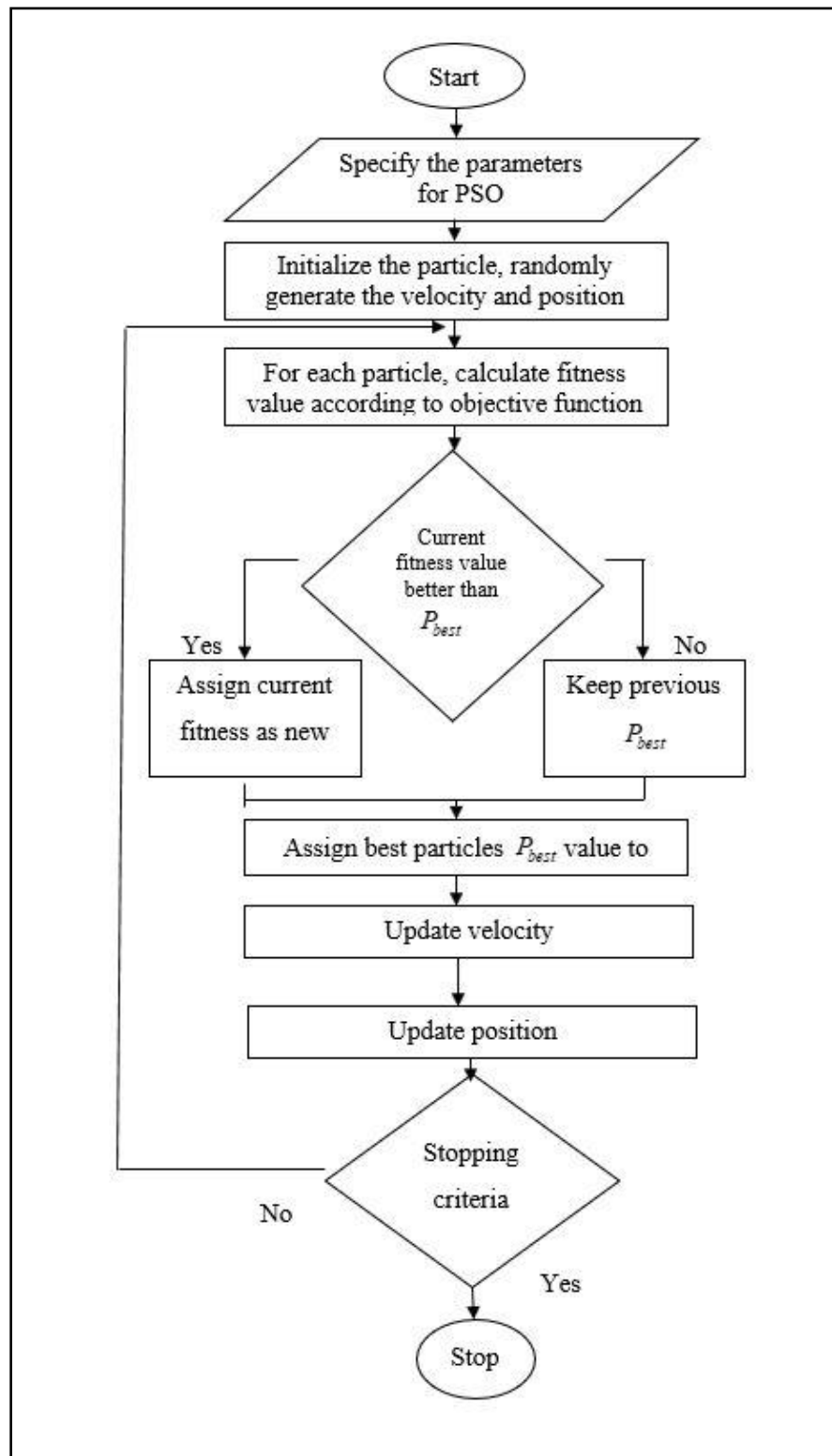
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Figure 2.2 A Flowchart for Particle Swarm Optimization

2.3.5 Bat Algoritm

The standard bat algorithm was developed by Xin-She Yang in 2010 [30], [29]. The main characteristics in the BA are based on the echolocation behavior of microbats. In general, bats imitate the behavior of bats in searching for food and can distinguish types of insects even in total shadow (Yang, 2010). Bats can do echolocation, with ability, The bat can know the location of their prey, obstacles, and predatory animals. As BA uses frequency tuning, it is in fact the fifirst algorithm of its kind in the context of optimization and computational intelligence.

The Bat Algorithm can provide accuracy using Naive Bayes as its evaluator, which is quite promising at 98.29% compared to the Exhaustive Search and Genetic Search methods, which yield 82.97% and 82.55%, respectively (Pallavi, 2013). The Bat Algorithm will be used as a feature selector for assist the predictive process of analyzing workforce data with the hope of resulting optimal accuracy.

In 2010, Yang (2013) developed the Bat algorithm (BA), which was inspired by bat echolocation behavior. Bats are interesting animals, with the bat being the only mammal with wings and the unique skill of echolocation. Microbats utilize echolocation, a kind of sonar, to identify objects, avoid obstacles, detect prey, and target prey via reflected sound. Some bats have evolved a highly sophisticated sense of hearing depending on the species. Bats emit a high sound frequency to neighborhood and hear the echo that bounces back to them. From these echoes, bats can determine the size, distance, and texture of the objects. The initial population is generated at random using the lower and upper boundaries of the dimension, as well as the number of bats, N .

$$x_{ij} = x_{\min j} + (x_{\max j} - x_{\min j}) \cdot \beta \qquad (2.5)$$

where $i = 1,2,...,n$, $j = 1,2,...n$, β is a random vector [0,1], $x_{\max j}$ and $x_{\min j}$ represent upper and lower boundaries, respectively.

Initially, frequency of bat algorithm is set random value for each solution in range of f_{min} and f_{max}. Then new solution x_i^t and velocity v_i^t are updated using the following equations;

$$f_i = f_{min} + (f_{max} - f_{min}) \cdot \beta \qquad (2.6)$$

$$v_i^t = v_i^{t-1} + (x_i^t - x^*)f_i \qquad (2.7)$$

$$x_i^t = x_i^{t-1} + v_i^t \qquad (2.8)$$

where β is randomly generated [0,1], x^* represents global best solution and t is number of iterations. Once a solution for the local search has been chosen from among the best solutions, a new solution is produced locally using random walk.

$$x_{new} = x_{old} + \varepsilon A^t \qquad (2.9)$$

where $\varepsilon \in [-1,1]$ is a uniform random number, while A^t is the average loudness of all bats. Loudness A_i and the rate r_i of pulse emission have to update as the iterations proceed. The loudness of a bat decreases as it approaches its prey, while pulse emission increases.

$$A_i^{t+1} = \alpha A_i^t \qquad (2.10)$$

$$r_i^{t+1} = r_i^0[1 - \exp(-\gamma t)] \qquad (2.11)$$

where r_i^0 is the initial emission rate, α and γ are constant. Normally, each bat has different values of loudness [1,2] and pulse emission rate [0,1], and this can be achieved by randomization. The pulse rate can be calculated as a range between 0 and 1, with 0 indicating no emission and 1 indicating that the bat is emitting at its utmost. These bats' loudness and pulse emission rate will be updated whenever they have reached the optimal solution or new solutions have been improved. Until the termination requirements are satisfied, these bats will continue to fly. The procedure of BA algorithm is depicted as a flowchart in Figure 2.3.
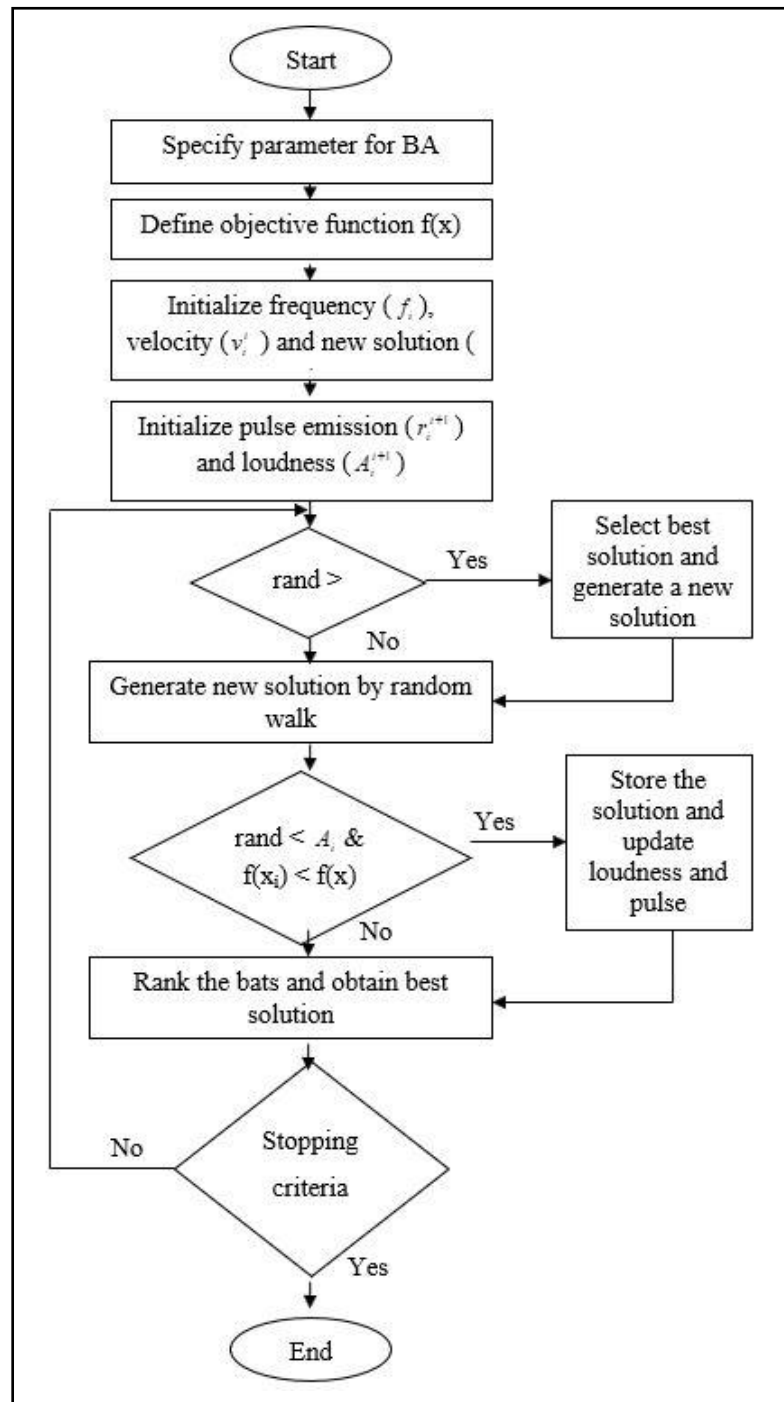
Figure 2.3 A Flowchart for Bat Algorithm

2.4   Review of Related Products

2.4.1   Related to Research Title

Based on the title raised by the researcher, there is some previous research literature.

<div align="center">Tabel 2.1 Related to Research Title</div>

No	Title	Author	Conclusion
1.	Labour Force Participation and Nature of Employment Among Women in Selangor, Malaysia	Rulia Akhtar , Muhammad Mehedi Masud, and Md Sohel Rana	The comparison between the female and male workforce. Nevertheless, the participation of women is not spontaneous like that of their male counterparts—the current study endeavors to determine the influencing factors that women usually consider while participating in economic activities. Governments could consider giving women vocational training to improve their skills, which will help them cope with the labor market requirements. The government should also create adequate job opportunities with a friendly environment where females will feel free to join and take pride in working with their male counterparts.

2.	The Effect of Economic Growth and Labor Force Growth on Unemployment Rates in the City of Surabaya	Moch Heru Anggoro	Telling about the factors that affect economic growth is the number and quality of the population and labor force. This study determines the effect of economic growth and the growth of the labor force on the unemployment rate in the city of Surabaya. The research uses using a quantitative approach to causal research. The samples are economic growth, labor force growth, and Surabaya's unemployment rate from 2004 - 2013. Analysis of the data used in this research is multiple linear regression analysis.
3.	Particle swarm optimization An overview	Riccardo Poli, James Kennedy , Tim Blackwell	Explain about the meaning of Particle swarm optimization (PSO) by looking at the new version of PSO, developing new applications, and publish theoretical about the effect of various parameters and aspects of the algorithm

| 4. | Bat algorithm: Recent advances | Iztok Fister jr, Xin-She Yang, Iztok Fister, Simon Fong | Describes the bat algorithm, a brief review of the latest developments, some of the new variants and issues highlighted in the journal. There is also an example of combining the bat algorithm with a traditional algorithm, such as the gradient-based method, of seeing if it improves performance even further |

Table 2.1 tells about some of the previous research literature related to the title of this research. Starting from the title, author, and conclusion of the literature.

2.4.2   Statistics Indonesia *(Badan Pusat Statistik)*

Figure 2.4 Website Statistics Indonesia

The Central Bureau of Statistics is an Indonesian Non-ministerial Government Agency that is directly responsible to the President of the Republic of Indonesia. one of the roles that BPS must carry out is to provide data needs for the government and the community. This data is obtained from self-conducted censuses or surveys as essential statistical data and departments or other government agencies as sectoral or secondary statistical data. One of the concrete

steps in carrying out this role is to widely disseminate statistical data through the media to all data users.Figure 2.2 tell about Website Statistics Indonesia. The website https://www.bps.go.id/ is divided into four sections, namely:

1. The home page is the beginning of the BPS Website. this page contains essential information presented concisely, such as Latest Information, BPS App, Press Conference Schedule, Did You Know, Graphics, and Links. Provincial website, several banners, and leading publications.

2. The BPS App is a feature on the BPS website which contains several links to the BPS website application web page. The BPS App can be accessed directly on the BPS website home page.

3. The home page also displays statistical indicator data in graphical form. This indicator data includes the Arrival of International Tourists, Import Value, Inflation, and Export Value.

4. The Provincial BPS Website Link is on the homepage's right side. If the user selects a particular province, for example, Aceh Province, the page will switch to the BPS Aceh province website, which contains all the data on the BPS Aceh Province website. Users can determine which province BPS website they are visiting by looking at the header title of the websitevisited or viewed the website address being visited.