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EXPECTED VALUE METHOD OF INFORMATION AND LOST OPPORTUNITIES AS A DECISION-MAKING TOOL

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Abstract

The Expected Value of Information and Opportunity Cost methods have become increasingly popular tools in strategic decision-making. In the context of decision-making, comprehensive information is crucial. If the information is incomplete or based on assumptions, decision-makers will struggle to make precise and clear decisions. Therefore, the concept of probability or likelihood needs to be applied to align with future consequences. Decision-making involves challenging aspects, such as responses to competitors and inflation indices that can affect various aspects within an organization. One form of decision-making involves conditions of risk that must be prepared for. In this scenario, two main criteria exist: Expected Value and Opportunity Loss, providing consistent results. This implies that the application of both methods has been utilized to make the best decisions and can enhance the decision-making process in various contexts. In the analysis of the expected value of information, we explore how the collection of additional information can influence the final decision. On the other hand, in the concept of opportunity cost, we measure the cost of alternative decisions not taken. The integration of these two methods offers a comprehensive and holistic perspective on the decision-making process.

Keywords: *Expected pay off, Opportunity loss, Decision making*

Introduction

In today's digital age, smart decision-making is the key to success. There is so much information available on the internet that we must have an effective method to filter and use the information. One method that is becoming increasingly popular is the Expected Value of Information and Lost Opportunities Method. Decision-making is an integral part of every aspect of life, especially in the context of business and management. In an effort to improve the quality of decisions, decision makers often seek more sophisticated and effective methods. In this regard, the Expected Value of Information and Lost Opportunity Methods offer an innovative approach. Therefore, by understanding and applying these two methods, organisations can minimise uncertainty and maximise the outcome of strategic decisions.

Research Method

This research utilised both qualitative and quantitative approaches (Creswell, 2017) to explore the potential application of the Expected Value of Information and Missed

Opportunities methods in various decision scenarios. Data were collected through a combination of interviews with business/industry practitioners, case studies, and historical data analysis as a secondary data source (Sugiyono, 2017). This research also involves mathematical modelling to calculate the expected value of information and lost opportunities in specific decision-making situations.

Result and Discussion

Definition

Decision-making is the result of a continuous process of communication and participation of the whole organisation (Kadarsah, 1998: 13). Decision making is a task that must be carried out by a manager to reach a conclusion, this is in line with the opinion that decision making must focus on the main problem of choosing certain alternatives to an activity (Cooke, 1991: 4).

A decision can be seen as an act of correction for the implementation of activities that deviate from the original plan. This needs to be done if after the decision is taken and implemented, it turns out that there is a deviation that can cause great losses if it is maintained, so there should be a new decision that can improve the old decision (Ibid, 2003: 1).

In decision making, information is needed, if the information is incomplete or the data is only an estimate, then the decision maker will make a decision in a state of uncertainty and to measure this uncertainty, the concept of probability value must be used (Mulyono, 1998: 1).

The first stage in the decision approach requires the identification of all decision alternatives. For decisions under risk conditions, we also need to identify each condition that may occur along with the probability value that shows the chance of each condition occurring. From these two factors, an output will be produced which is the result of the selection of each alternative for a certain condition, which we can arrange in a matrix of outputs / results commonly referred to as conditional value because it is the result of alternative selection that depends on the fairest conditions (Op.cit, 1998: 21).

According to Hastie, R., & Dawes, R. M. (2001) and Sunardi, S. (2018) it can be concluded that there are steps in the Expected Value Method of Information and Lost Opportunities:

1. Identification of Required Information.

   The first step in applying this method is to identify relevant and necessary information for decision making. This can include data, facts, and current trends that can affect the outcome of the decision.

2. Expected Value Assessment

Once the information has been identified, the next step is to assess the expected value of each possible option. This involves an in-depth analysis of the potential positive outcomes of each scenario.

3. Evaluation of Lost Opportunities

Next, the method entails evaluating the lost opportunities or potential losses that may occur if a decision is not taken. This provides an additional dimension to the decision-making process.

4. Decision Making

Based on the expected value assessment and lost opportunity evaluation, the final step is wise decision-making. By considering both aspects, this method provides a solid basis for making an informed and balanced decision.

Expected Value of Information

A decision selection that can be done easily and logically is to try to produce the maximum amount of expected profit, using the Expected pay off (EP) method. The Expected pay off (EP) of an alternative is defined as the sum of all possible pay offs, with each one attached. In general, the Expected pay off (EP0 of an alternative can be informed as follows (Ibid, 1998: 302):

$$EP\ (Ti) = \sum_{j=1}^{n} a_{ij} . p_j$$

In this example, a children's game maker must choose one of three designs, let's call it design A, B, C. The profit from the sale (payoff value) depends on the demand, which is increasing, stable, and decreasing, with probability 0.20; 0.70; 0.10, respectively.

If he chooses design A, it turns out that demand is increasing steadily and decreasing, the amount of profit is Rp 650,000, - Rp 400,000 and Rp 25,000, if he chooses design B, it turns out that demand is increasing steadily and decreasing, the amount of profit is Rp 740,000, Rp 440,000, and – Rp 10,000, - if he chooses design C, it turns out that demand is increasing steadily and decreasing, the amount of profit is Rp 750,000, - Rp 400,000 (= loss), - Rp 125,000 (loss). Using the criterion of the largest expected value of payoff (maximum), which design will be chosen?

Table 1. Decision Making Technique

Request / Design	Increased (0,20)	Stable (0,70)	Decrease (0,10)
Design A	650.000	400.000	250.000
Design B	740.000	440.000	- 10.000
Design C	750.000	- 400.000	-125.000

Source : Decision Making Technique (Ibid, 1998:305)

EP (D.A) = 650.000(0,20) = 400.000 (0,70) + 25000 (0,10) = 412.000

EP (D.B) = 740.000 (0,20 = 440.000 (0,70) + -10.000 (0,10) = 455.000

EP (D.C) = 750.000 (0,20) = (400.000)(0,70) + (-125.000)(0,10) = 417.500

Since the NHP (D.B) is largest, design B should be chosen, on the average, it is expected to achieve a profit of IDR 455,000. much greater than designs A and C.

Indifference probability

Returning to the example above, we copy the following decision making table again:

Table 2. Payoff table or decision table (smu = currency unit)

Action	Growth Rate	
	Increase (0.30)	Decrease (0,70)
Deposting	1000 smu	250 smu
Buying Share	600 smu	400 smu

Source : Decision Making Technique (ibid, 1998:305)

Based on the criteria of the largest expected payoff value, we should choose alternative A, which is depositing money with an expected payoff value of 475 smu. In this example we know that the probabilities are 0.40 and 0.70 for an increasing and decreasing economic growth rate respectively.

Now the question is what is the probability that the economic growth rate increases or that the payoff value is the same for alternative one (depositing) or alternative two (buying stocks). Such probabilities are called in difference probabilities.

For example PA = probability of alternative A PB = probability of alternative B PB = 1-PB because PA + PB = 1

Table 3. Probability Alternative

Action / Event	K1 PA	K2 (1-PA)
T1	1000	250
T2	600	400

EP (T1) = 1000 (PA) + 250 (1-PA) = 1000 PA + 250 – 250 PA

EP (T2) = 600 (PA) + 400 (1-PA) = 600PA + 400 – 400 PA

750 PA + 250 – 200 PA + 400

550 PA = 150 PA = 3/11 = 0,27

PB = 1 – 0,27 = 0,73

So in the probability that the economic growth rate increases by 0.27 or 27% and decreases by 0.73 or 73, it makes no difference whether we choose alternative (action) T1 or T2 because the expected value of payoff is the same for both. However, if PA>0.27 the city will choose T1 (depositing) and if PA<0.27 we will choose T2 (buying shares).

As we know the expected value of payoff is a very important decision criterion in the presence of risk. It should be explained here that the expected value of payoff is the average value not the actual individual payoff value as the value of the decision outcome. In the above example EP(T1) =475 smu, is only an average value because the decision outcome can reach 1000 smu if the economic growth rate increases with probability 0.30 or only 250 smu if it decreases with probability 0.30.

If the decision problem is repetitive in nature. the same problem will occur repeatedly in the long run. therefore we try to maximise the long-term pay off. The expected value of payoff is a valid criterion for decisions in the presence of risk (Ibid. 1998: 3070.

Lost Opportunity Value

In practice, the question always arises as to whether there is any benefit in buying information to improve decisions. A resource in the form of manpower and costs in the form of money and equipment, is needed to obtain information through random sample research and hypothesis testing on matters that we consider necessary, especially those concerning important decisions. In the following, we will discuss the value of information and for this we need the concept of opportunity loss, which is the same as opportunity cost (Ibid, 1998: 307).

Suppose we see each possible outcome as a difference between the action we take or the alternative we choose and an action with a better outcome. For example, choosing action 1 (=t1), the profit obtained is only 10 million, but if the action chosen is the second action (= t2) the profit reaches 15 million. If you choose t1, you will lose the opportunity to get a higher profit of Rp 15 - 10 million = 5 million. However, if you choose t2, you will not lose the opportunity because what is lost is Rp 1-5 million = Rp 0 million.

So in this case it can be defined the opportunity loss value for an outcome is the amount of payoff lost due to not choosing an alternative or action with the largest payoff for uncertain events that actually occur.

An example of a drink peddler who stands in front of SMP Negeri 7 Bogor City selling types of drinks, can choose one of 4 types, namely coca cola, ice tape sticky rice, squeezed oranges, ice cendol. The sales results of each type of drink are highly dependent on the weather conditions, namely good weather with a probability of 0.60 and bad weather with a probability of 0.40.

If selling coca cola, good weather results in sales of 1,200 smu and if the weather is bad, sales of 150 smu.

If selling glutinous ice tape, good weather results in sales of 800 smu and if bad weather sales of 400 smu.

If selling ice orange juice, good weather results in sales of 400 smu and if the weather is bad, sales of 800 smu.

If selling ice cendol, good weather results in sales of 500 smu and if bad weather sales of 500 smu.

Table 4. Payoff table

Event / alternative	Good Weather (0,60)	Bad Weather (0,40)
Coca cola (t1)	1.200	150
Glutinous ice tape (t2)	800	400
Squeezed oranges (t3)	400	800
Ice cendol (t4)	500	500

Here there is an opportunity loss. If in case of good weather the senate sells oranges squeezed to reach 400 smu, whereas if selling coca cola sales reach 1200 smu, this is the best alternative, when the weather is good so lose the opportunity to earn (1200- 400) smu = 800 smu.

If selling ice cendol, the sales result is 500 smu, losing the opportunity to earn (1200 - 500) = 700 smu.

If the weather is bad, the best alternative is to sell squeezed oranges. If it is decided to sell coca cola, it will lose the opportunity of (800 -150) smu = 650 smu, while if you sell es cendol, you will lose the opportunity of (800 - 500) smu = 300 smu. Thus we obtain the following table of opportunity loss (Ibid, 1998: 311):

Table 5. Opportunity loss table

Event / alternative	Good Weather (0,60)	Bad Weather (0,40)
Coca cola (t1)	0	650
Glutinous ice tape (t2)	400	400
Squeezed oranges (t3)	800	0
Ice cendol (t4)	700	300

The results of the calculation of expected loss (=EL) for each alternative are as follows:
EL (t1) = 0 (0.60) + 650 (0.40) = 260 smu

EL (t2) = 400 (0.60) + 400 (0.40) = 400 smu

EL (t3) = 800 (0.60) + 0 (0.40) = 480 smu

EL (t4) = 700 (0.60) + 300 (0.40) = 540 smu

It turns out that EL (t1) is the smallest, so alternative (t1) is chosen, meaning that the senate decided to sell coca cola.

If we use the largest expected pay off as a criterion for choosing, then we must calculate the expected payoff for all alternatives and we choose the alternative with the largest expected.

EL (t1) = 1200 (0.60) + 150 (0.40) = 780

EL (t2) = 800 (0.60) + 400 (0.40) = 640

EL (t3) = 400 (0.60) + 400 (0.40) = 400 smu

EL (t4) = 500 (0.60) + 500 (0.40) = 500 smu

It turns out that EL (t1) is the largest so alternative (t1) is chosen, meaning that the senate decides to sell coca cola, either using the largest expected payoff criterion or the smallest expected loss. The decision taken remains the same, namely the senate selling coca cola (Ibid, 1998: 312).

Conclusion

Satisfaction taken by a person is influenced by his view of the situation at hand. Everyone can make decisions that will always relate to possible conditions in the future. This is due to the consequences of a decision that will be experienced in the future. This decision-making condition involves various aspects that cannot be known and are difficult to predict, such as the reaction of certain competitors who move quickly or the level of inflation that can affect the finances of an organisation. Managers in making decisions will be faced with at least three decision-making conditions, namely decision conditions in certainty, risky decision conditions and uncertainty decision making.

The Expected Value of Information and Lost Opportunity methods present a very effective tool to support the decision-making process. By combining expected value of information and lost opportunities, this method helps in making better, more accurate, and more informed decisions.

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