

The use of the Probability Tree Diagram to Test the Integrated Model in Building the Management Information Systems

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Received: 12 December 2015 Accepted: 2 January 2016 Published: 15 January 2016

Abstract

This paper aims to implement a new test for the integrated model by using the theory of the probability tree diagram. This test is implemented because it gives more accurate results compared with the previous test that was implemented to test the integrated model by using the simple random sampling (SRS) probability theory. So this paper will provide more accurate results, which will increase the confidence of systems builders in the integrated model.

Index terms— probability tree diagram; simple random sampling; SRS; integrated model; classical approach.

1 Introduction

Mohammad Abu Omar and Khairul Anuar Abdullah have recently developed a new model to improve the use of the classical approach in building the management information systems (MIS's) [1], this model is named as: the integrated model. The importance of the integrated model comes from its mission in overcoming the classical approach drawback which is the additional time and cost consumed while using the classical approach in building the management information systems (MIS's). The integrated model includes a new classification of the management problems, and new sub-approaches that are developed from the life cycle of the classical approach. The integrated model appoints each one of the developed sub-approaches to solve the suitable management problems in order to achieve its mission in saving the time and cost while using the classical approach in building the (MIS's). In the following is the integrated model structure and work [1]: A. The first level: this level includes three main categories of the management problems, which are: -First category management problems.

-Second category management problems.

-Combined management problems. B. The second level: this level includes all types of management problems which are generated and branched from the previous three categories of the management problems in the first level. There are different types of management problems as follows:

-First category management problems generate the following types of management problems: a. First order management problem. b. Second order management problem.

-Second category management problems generate the following types of management problems: a. First level management problem. b. Second level management problem.

-Combined management problems generate the following types of management problems: a. First combined management problem. b. Second combined management problem. c. Third combined management problem. d. Fourth combined management problem.

And thus, the second level includes the eight types of management problems, and each one of them has its own nature and characteristics [1].

C. The third level: According to the characteristics of the management problems, that exist in the second level, the integrated model has developed new subapproaches from the classical approach. These developed sub-approaches have a minimized life cycle compared with current life cycle that is adopted by the classical approach, where each one of these developed sub-approaches is logically appointed to solve the suitable management problems in order to achieve the goal of the integrated model in saving time and cost while using of the classical approach in building the management information systems, as in the following [1]:

a. Second order management problem. b. Second level management problem c. First combined management problem.

Meanwhile, the integrated model maintains the use of the current approach of classical approach to solve the other management problems that are not solved by the previous three developed subapproaches. The current approach of the classical approach is named as: MIS classical approach. Thus, the third level in the integrated model consists of the following [1]:

- Two from MIS approach (1).
- Two from MIS approach (2).
- One from MIS approach (3).
- Three from MIS classical approach.

The following figure shows the levels of the integrated model [1]:

2 Literature Review

The integrated model has been subjected to a test by using the probability theory of the simple random sampling (SRS) [2].

The test has been implemented to examine if the integrated model can achieve its mission and goal in limiting the consumption of additional time and cost through using the classical approach in building the management information systems (MIS's) in order to solve the management problems, the test results have showed that the integrated model can solve 62.5% from the management problems without consuming additional time and cost, while 37.5% of the management problems will be solved without the saving of time and cost [2].

Thus, the test results have recorded the success of the integrated model in its work and mission.

The new work in this paper, aims to implement a new test to the integrated model by using another probability method which is the probability tree diagram. This method is used because it gives more accurate results than the simple random sampling (SRS) probability method results, and this will increase the confident of the efficiency of the integrated model work.

3 III.

4 Methods

This paper uses the probability tree diagram to implement an internal test that measures the probability of each element in each level of the integrated model in order to obtain the probabilities of the final outcomes of the integrated model, which are the following probabilities:

1. The expected probability of using each developed sub-approach: [MIS approach (1), MIS approach

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Volume XVI Issue I Version I Year ()

(2), MIS approach (3)] which will solve the management problems without consuming additional time and cost.

2. The expected probability of using the MIS classical approach that will solve the management problems without saving time and cost. This test is used, because of its property in providing more accurate results in measuring the probabilities, compared with other probability methods such as the simple random sampling probability theory [3], [4], [5].

The probability tree diagram test will be implemented to the integrated model through the following steps and procedures: 1. Define the tree of the integrated model. 2. Apply the simple random sampling probability theory in each branch of the integrated model tree.

3. Define the integrated model probability tree outcome events and find their probabilities. 4. Finding the net probability value for each outcome combined event in the integrated model probability tree.

6 a) The Implementation of Probability Tree Diagram Test

Here, the probability tree diagram test will be implemented to the integrated model through the following test-steps and procedures:

1. Define the tree of the integrated model:

Here, the integrated model is defined as a set of multi-branches, which makes it appropriate for the probability tree diagram test.

The following figures show the branches of the integrated model tree:

-Branch (1): it is obtained from the first level of the integrated model structure as it is shown in the figure (1). Branch -The Sample Space (?): It is the set of all possible outcomes of the experiment [2].

-The Event:

The event (E) is a set of outcomes of an experiment (a subset of the sample space) to which a probability is assigned [2], [3].

-The Probability Theory:

The simple random sampling (SRS) probability method defines the probability of an event E $[P(E)]$, as the number of outcomes favorable to the event, divided by the total number of outcomes [2], [4], [3]:

In the (SRS) probability theory, each element in the sample space (?) has an equal probability of selection [2]. Now, the (SRS) probability method will implement an experiment in each branch of the integrated model tree, is as follows: a. Branch (1) Experiment:

This experiment is implemented by the (SRS) probability method, as in the following:

-The sample space (?) in the experiment includes three elements, as follows:

-The events in the experiment are:

E1: {First Category Management Problems}.

E2 :{Second Category Management Problems}.

E3: {Combined Management Problems}.

Additionally, there is one element from each event.

Now, the probability theory of the (SRS) method will be applied to each event in the experiment, as in the following: b. Branch (2) Experiment:

This experiment is implemented by the (SRS) probability method, as in the following:

-The sample space (?) in the experiment includes two elements, is as follows:

-The events in the experiment are: E1: {First Order Management Problems}.

E2 :{ Second Order Management Problems}. And there is one element from each event. Now, the probability theory of the (SRS) method will be applied to each event in the experiment, as in the following:c. Branch (3) Experiment:

This experiment is implemented by the (SRS) probability method, as in the following:

-The sample space (?) in the experiment includes two elements, is as follows:

-The events in the experiment are: E1: {First Level Management Problems}. E2 :{ Second Level Management Problems}. And there is one element from each event. Now, the probability theory of the (SRS) method will be applied to each event in the experiment, as in the following:Branch (4) Experiment:

This experiment is implemented by the (SRS) probability method, as in the following:

-The sample space (?) in the experiment includes four elements, is as follows:

() And there is one element from each event. Now, the probability theory of the (SRS) method will be applied to each event in the experiment, as in the following:Number

3. Define the integrated model probability tree outcome events and find their probabilities:

In the probability tree diagrams, the tree outcomes are combined events [3], [4], [??5].In the case of the integrated model probability tree, and as it is shown in figure (1), the outcomes are also combined events that are resulted from the branches: (2), (3), and (??) of the integrated model tree, is as follows:

a. The outcome events of branch (2): there are two outcome events of branch (2), as follows:

-The first outcome event is: MIS new approach (1), It is a combined event that is generated from the two events which are: first category management problems event, and first order management problems event. It appears as output of the line of branch (1.a) -(2.a).

-The second outcome event is: MIS classical approach, It is a combined event that is generated from the two events which are: first category management problems event, and second order management problems event. It appears as output of the line of branch (1.a) -(2.b).

7 Figure (6) :

The outcomes of branch(2) in the integrated model tree

To find the probability of each outcome combined event in the probability tree diagram, the probability tree diagram method uses the intersection probability formula between the events that generate the outcome combined event. Now, this method will be applied to find the probability of branch (2) outcome combined events in the integrated model probability tree, is as follows [3], [4], [5]:

And because that all of the events: first category management problems, first order management problems, and second order management problems are independent events, so the intersection process between these independent events will be converted to a multiply process [3], [4] So, the probability of (MIS new approach (1)) will be calculated as follows:

And the probability of (MIS classical approach) will be calculated as follows:

The following figure clarifies the finding of probability of the outcome combined events of branch (2) which are: MIS new approach (1) event, and MIS classical approach event: -The second outcome event is: MIS classical approach, It is a combined event that is generated from the two events which are: second category management problems event, and second level management problems event. It appears as output of the line of branch (1.b) -(3.b).

8 Figure (8) : The outcomes of branch(3) in the integrated model tree

To find the probability of each outcome combined event in the probability tree diagram, the probability tree diagram method uses the intersection probability formula between the events that are generated the outcome

combined event. Now, this method will be applied to find the probability of branch (3) outcome combined events in the integrated model probability tree, is as follows [3], [4], [5]:

And because that all of the events: second category management problems, first level management problems, and second level management problems are independent events, so the intersection process between these independent events will be converted to a multiply process [3], [4],[5], is as follows:

Now, and from the results of branch (1) and branch (3) experiments, the following values can be obtained: So, the probability of (MIS new approach (1)) will be calculated as follows: And the probability of (MIS classical approach) will be calculated as follows:

9)) P MIS New A pproach

? = = 1 1 1 3 2 6 () P MIS Classical A pproach ? = = (21 1 1 3 2 6 ((2

The following figure clarifies the finding of probability of the outcome combined events of branch (3) which are: MIS new approach (2) event, and MIS classical approach: c. The outcome events of branch (??): there are four outcome events of branch (4), is as follows:

-The first outcome event is: MIS new approach (3). It is a combined event that is generated from the two events which are: combined management problems event, and first combined management problems event. It appears as output of the line of branch (1.c) -(4.a).

-The second outcome event is: MIS new approach (1). It is a combined event that is generated from the two events which are: combined management problems event, and second combined management problems event. It appears as output of the line of branch (1.c) -(4.b).

-The third outcome event is: MIS new approach (2), It is a combined event that is generated from the two events which are: combined management problems event, and third combined management problems event. It appears as output of the line of branch (1.c) -(4.c).

-The fourth outcome event is: MIS classical approach, It is a combined event that is generated from the two events which are: combined management problems event, and fourth combined management problems event. It appears as output of the line of branch (1.c) -(4.d).

Figure (10) : The outcomes of branch(??) in the integrated model tree To find the probability of each outcome combined event in the probability tree diagram, the probability tree diagram method uses the intersection probability formula between the events that generate the outcome combined event. Now, this method will be applied to find the probability of branch (4) outcome combined events in the integrated model probability tree, is as follows [3], [4],[5]:

And because that all of the events: combined management problems, first combined management problems, second combined management problems, third combined management problems, and fourth1 1 1 3 2 6 () P MIS Classical A pproach ? = = ((3)) (Pr) (Pr)

P MIS New ApproachP Combined Management oblems P First Combined Management oblems = ? ((2)) (Pr) (Pr)

P MIS New Approach P Combined Management oblems P Third Combined Management oblems combined management problems are independent independent events will be converted to a multiply process [3], [4], ??5], is as follows:= ? ((1)) (Pr) (Pr

Now, and from the results of branch (1) and branch (??) experiments, the following values can be obtained: So, the probability of (MIS new approach (3)) will be calculated as follows:

And the probability of (MIS new approach (1)) will be calculated as follows:

And the probability of (MIS new approach (2)) will be calculated as follows:

And the probability of (MIS classical approach) will be calculated as follows:

The following figure clarifies the finding of probability of the outcome combined events of branch (4) which are: MIS new approach (3) event, MIS new approach (1) event, MIS new approach (2) event, and MIS classical approach: Thus, the following table (1) shows the summary of probability values for the outcome combined events of the integrated model probability tree: ((3)) P MIS New A pproach ? = = 1 1 1 3 4 12 ((1)) P MIS New A pproach ? = = 1 1 1 3 4 12 ((2)) P MIS New A pproach ? = = 1 1 1 3 412() P MIS Classical A pproach ? = = -

The MIS new approach (3) event: has the following probability: (1/12), so: -The MIS classical approach event: has the following probabilities: (1/6, 1/6, 1/12), so: And, if all these probability values of all outcome events are added, the result should be (1), as in the following: IV.(1((2

10 Results and Discussion

The probability tree diagram test gives the following probability results as in the following table (2): And, as it is mentioned in the theory of the integrated model through the introduction, the use of the developed new approaches (1, 2, and 3) will help the integrated model to build the management information systems (MIS's) without consuming additional time and cost, while the use of the MIS classical approach will consume additional time and cost in building the (MIS's) [7], [8], [1]. Now the research will determine the probability value of building the (MIS's) without consuming additional time and cost, which is (the probability of the success of the integrated model work), this probability can be found as follows:

And also, the probability value of building the (MIS's) without saving additional time and cost, which is (the probability of the fail of the integrated model work), this probability is the probability of using the MIS classical approach which is as follows:

Thus, the research will present the final decision whether the integrated model success in its mission or fail, as in the following: Firstly: the integrated model can build the management information system (MIS's) by using classical approach to solve the management problems without consuming additional time and cost, with the probability of: (0.5833), this probability value is a likely result according to the probability scale, as in the following [9],[5] : Secondly: the integrated model can build the management information system (MIS's) by using classical approach to solve the management problems, without saving additional time and cost, with the probability of: (0.416), this probability value is an unlikely result according to the probability scale, as it is shown in figure (12).

So, the previous results indicate the success of the integrated model in its work, with probability of: (58%).

11 Conclusion

The integrated model is a recently developed model that is designed to reduce the drawback of the classical approach which is the consumption of additional time and cost while building the management information systems (MIS's) to solve the management problems.

The work of the integrated model has been recently tested by using the simple random sampling probability theory, and the test results have confirmed the success of the integrated model in its work.

This paper uses the probability tree diagram test to implement another new test of the integrated model work; this test is implemented because it gives show that the integrated model can solve more than 58% of the management problems without consuming additional time and cost, while less than 42% of the management problems will be solved without the saving of time and cost. (1) (2)¹



Figure 1: Figure (1):

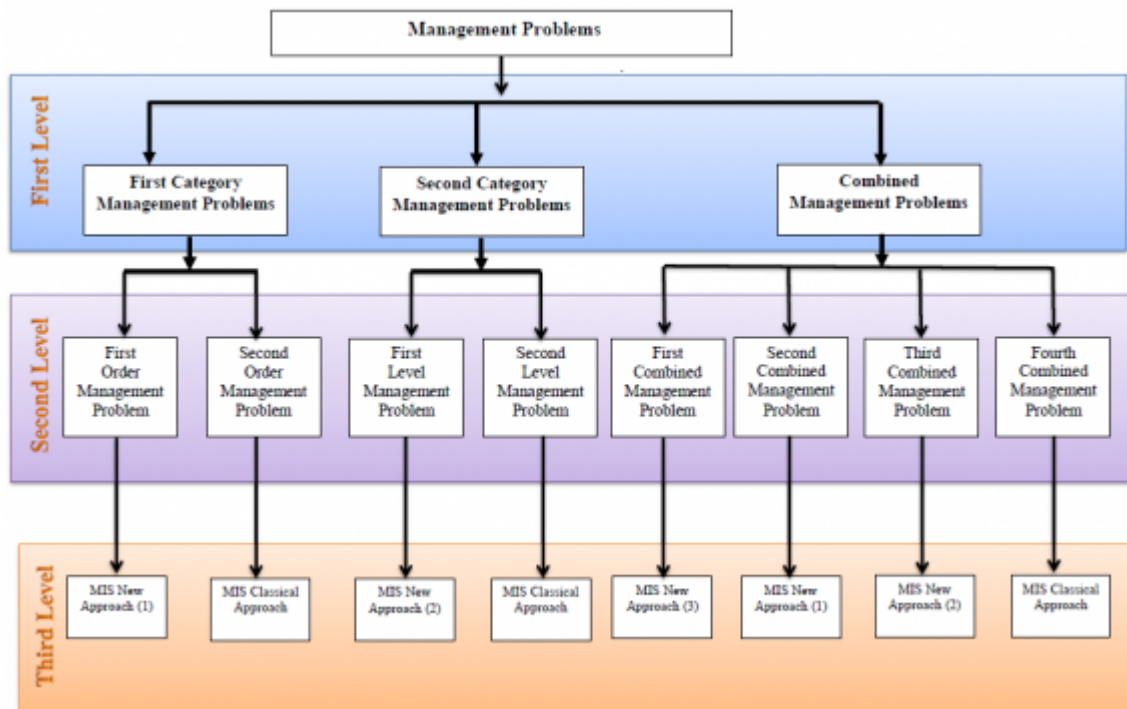
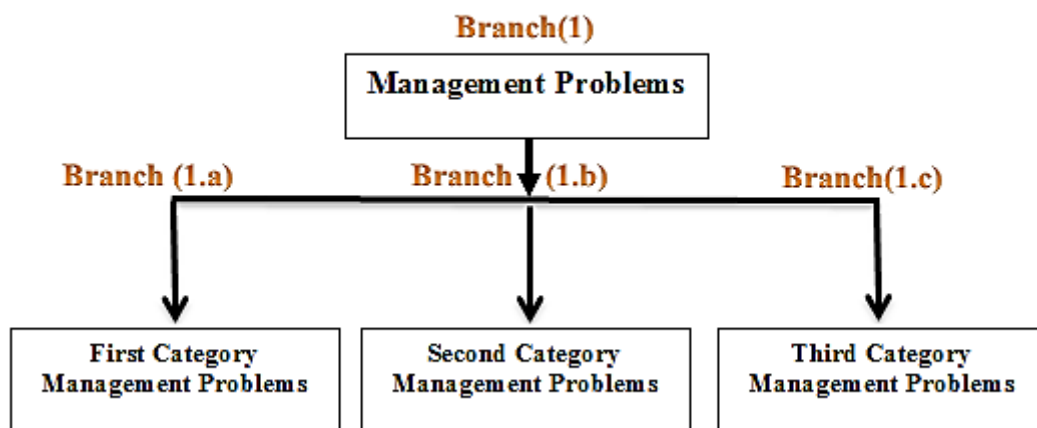


Figure 2:



3

Figure 3: Figure (3)

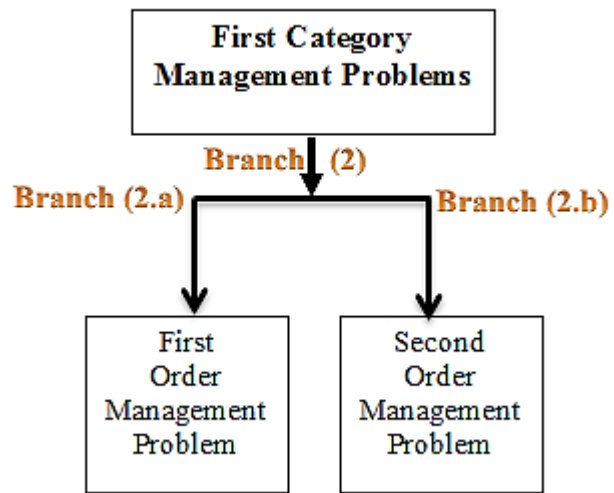


Figure 4: Figure (5

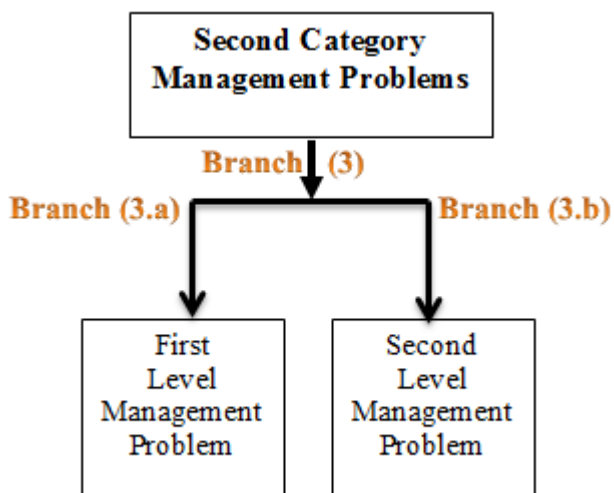


Figure 5: Figure (7):

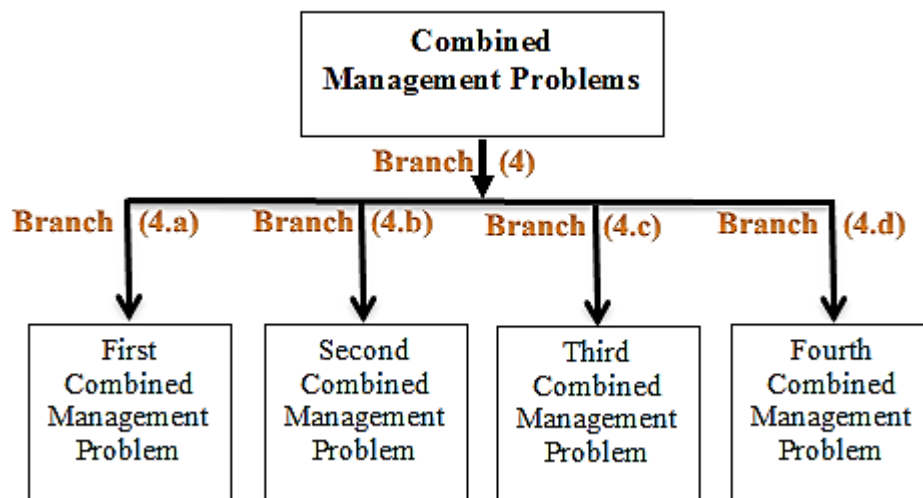
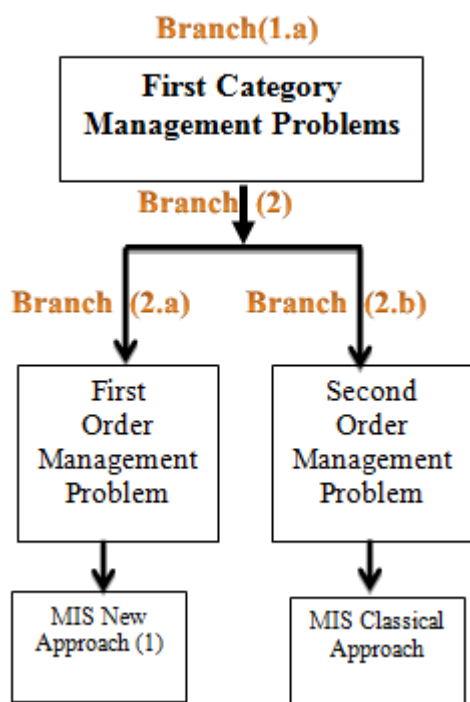
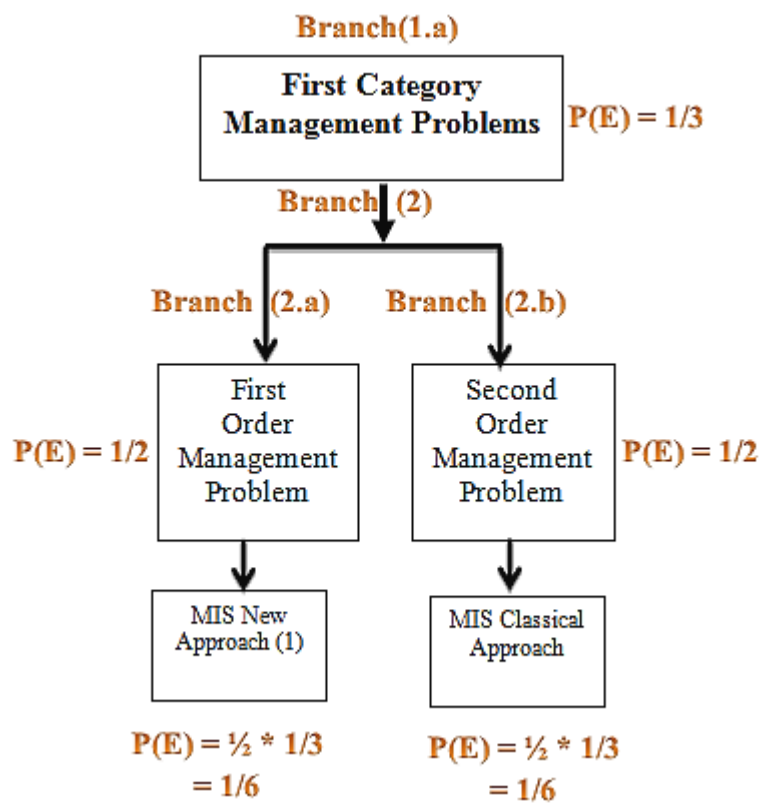


Figure 6: G



9

Figure 7: Figure (9):



11

Figure 8: Figure (11):

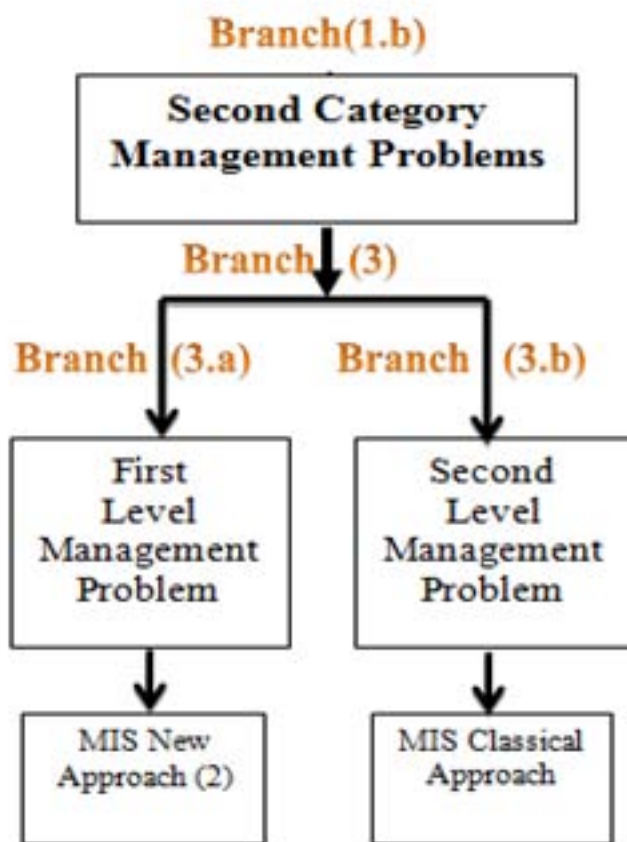
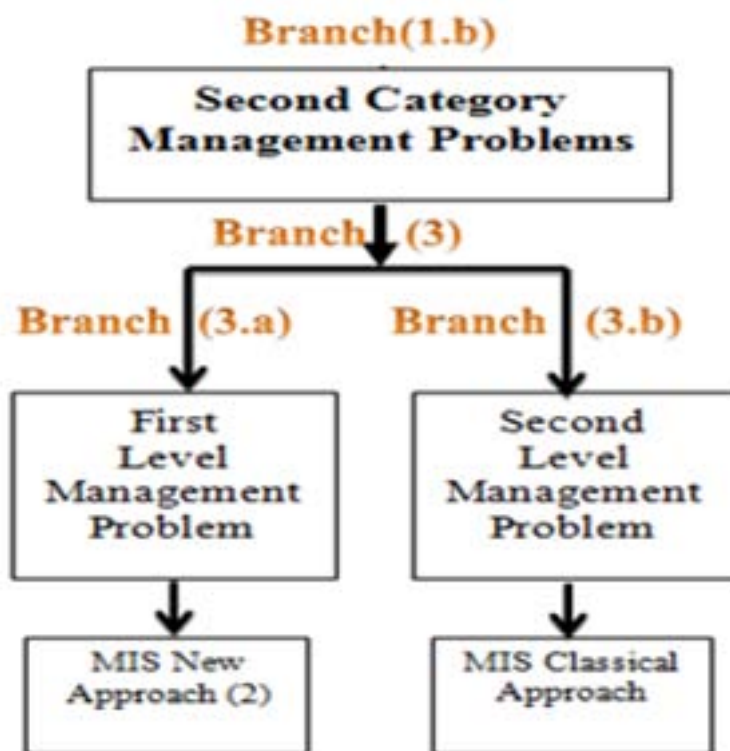
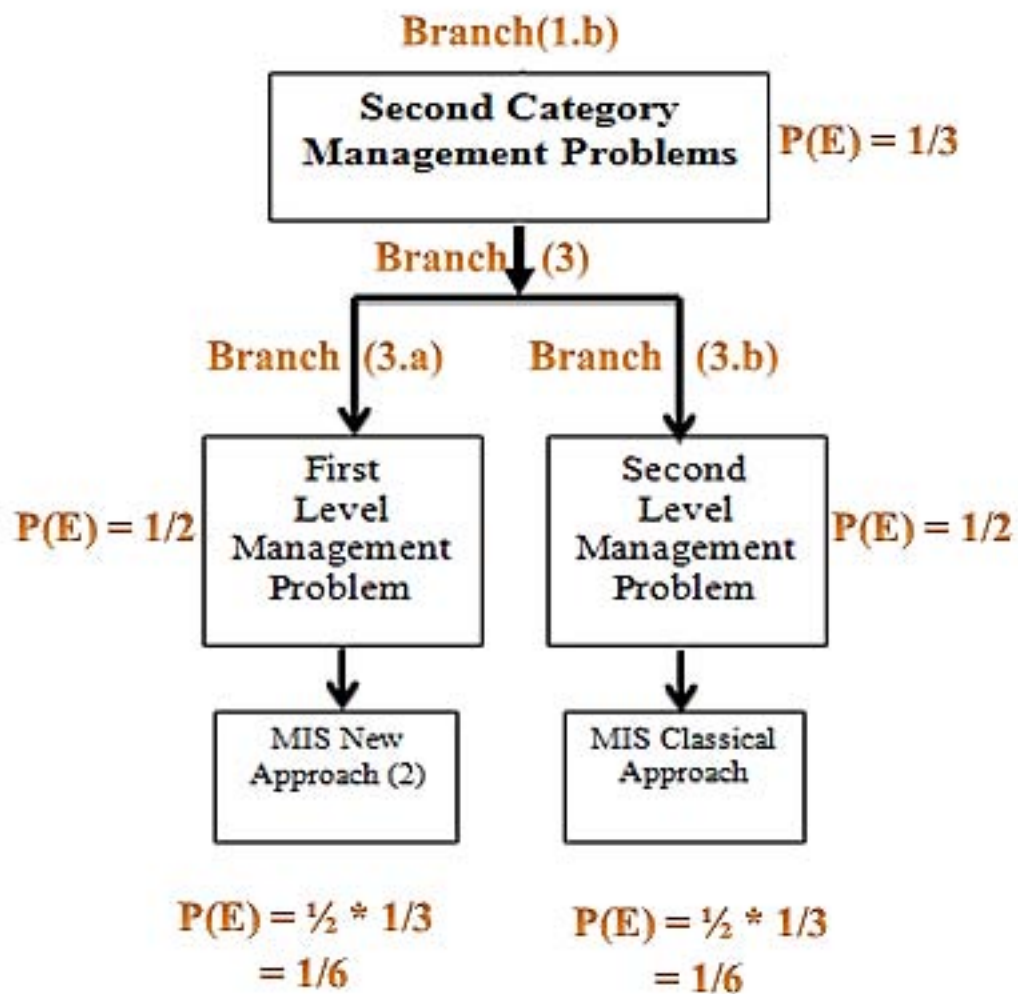


Figure 9:



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Figure 10: (3 /) 2016 G



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Figure 11: Figure (12

13

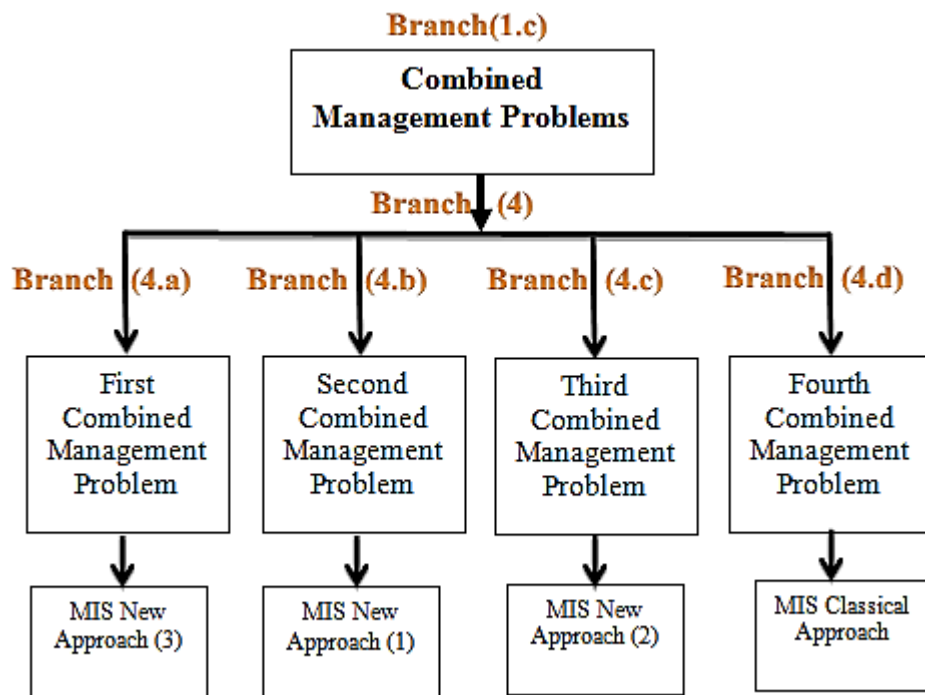


Figure 12: Figure (13

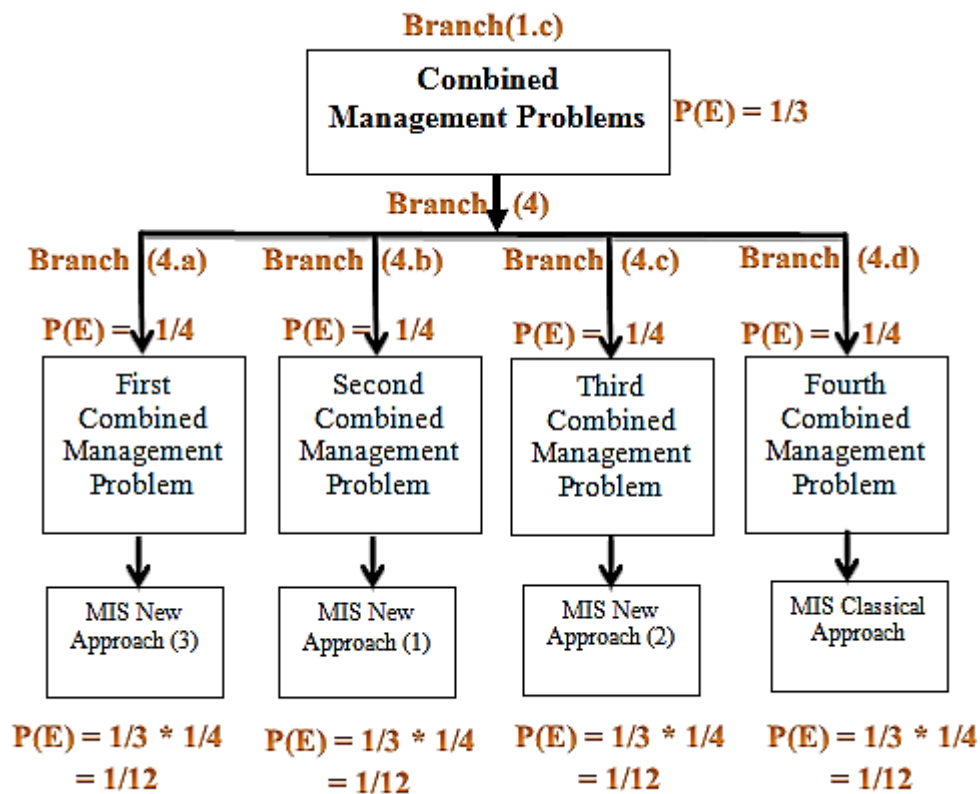


Figure 13:

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The Outcome Combined Event of the Integrated Model Tree	The Net probability value
MIS new approach (1)	0.25
MIS new approach (2)	0.25
MIS new approach (3)	0.0833
MIS classical approach	0.416

Figure 15: Table (2

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