Coleman managerial report

Business, Management

R. C/ Coleman distribute a variety offoodproducts that are sold through grocery store and supermarket outlets. The company receives orders directly from the individual outlets, with a typical order requesting the delivery of several cases of anywhere from 20 to 50 different products. Under the company's current warehouse operation, warehouse clerks dispatch order-picking personnel to fill each order and have the goods moved to the warehouse shipping area.

Because of the high labour costs and relatively low productivity of hand order-picking, management has decided to automate the warehouse operation by installing a computer-controlled order-picking system, along with a conveyor system for moving goods from storage to the warehouse shipping area. R. C. Coleman's director for material management has been named the project manager in charge of the automated warehouse system. After consulting with members of the engineering staff and warehouse management personnel, the director compiled a list of activities associated with the project.

The optimistic, most probable and pessimistic times (on weeks) have also been provided for each activity.

Managerial Report

Develop a report that present the activity schedule and expected project completion time for the warehouse expansion project. Include a project network in the report. In addition, take into consideration the following issues: R. C. Coleman's top management established a required 40-week completion time for the project. Can this completion time be achieved?

Include probability information in your discussion. What recommendations do you have if the 40-week completion time is required?

Suppose that management requests that activity times be shored to provide an 80 percent chance of meeting the 40-week completion time. If the variance in the project completion time is the same as you found in part (1), how much should he expected project completion time be shortened to achieve the goal of an 80 percent chance of completion within 40 weeks? Using of expected activity times as the normal times and the following crashing information, determine the activity crashing decisions and revised activity schedule for the warehouse expansion project.

QUESTIONS MANAGERIAL REPORTS

Introduction

This report is the analysis study of R. C. Coleman Company; a company on distribution business with varieties of food products that are sold through grocery store and supermarket outlets.

The company receives orders directly from the individual outlets, with a typical orders requesting the delivery of several cases of anywhere from 20 to 50 different products. Present company’s current warehouse operation, the practise which has been utilized manually by warehouse clerks. The dispatch order-picking personnel are to fill each order and have the goods moved to the warehouse shipping area. Manual operation has been rationale as high labour cost and low productivity on the distribution system. Management has decided to change into automate the warehouse operation with the objective to improve on the operations and utput efficiency. R. C.

Coleman’s top management has established requirement of 40-weeks completion time for the project of installation of computer-controlled order-picking system, this come along with conveyor system for moving goods from storage to the warehouse shipping area. The management also has drawn up others requirement and completion percentage at any particular time. The establishment of the report will be base objectively to analyse and examine all possibilities on the predetermine activities on the project network and completion time for the warehouse distribution upgrading project of R. Coleman Company. Hence, the result from this report is vital Page 4 information required to the company’s top management team to make effective decision for this project meeting with business objective and goal. 2. Methodology Upon appointed as Project Manager, Mr R. C. Coleman is responsible for planning, scheduling and controlling the project that consist of numerous separate jobs or task performed by a variety department and individual. The project team need to establish the project network and making the analysis based on the Quantitative Approaches to Decision Making processes.

In order to draw up project network, the team need information on the project activities involved and time required. As this project is rather new and they had never attempted before by the team, Mr Coleman have to establish the time by estimation. The activities are following the concept of probability distribution whereby they have to determine by estimating each activities time at a range of possible value. After a meeting with his project team, he has established a list of activities associated with the project as per below;

The incorporation of uncertainty activity with estimating time above is defined as; i. ii. Optimistic time (a) = the minimum activity time if everything progresses ideally. Most Probable time (m) = condition. iii. Pessimistic time (b) = the maximum activity time if significant delays are encountered Below table is the result for the uncertain activities time achieved.

To ensure that the project is progressing as planned, Mr Coleman is advised to utilize and incorporate the analysis with the concept of probability distribution; Project Scheduling with Uncertain Activity Times. Such situation, the understanding and utilization of Program Evaluation and Review Technique (PERT) and Program of Critical Path Method (CPM) has proven to be extremely valuable.

The PERT/CPM system will furnish to project manager on the information of project planning, scheduling and the progress of the project so that he able to coordinate and monitoring the project and be complete as expected by the management. Discussion Analysis When the top management of R. C. Coleman has decided to modernize and expand the current warehouse and its distribution system, there is certain project requirement and goal has been drawn up to the project manager and the team to find out the feasibility to achieve target goal on the completion timing and possible percentage.

Hence, the analysis will be representing on each part of the management requirement. There is two parts as per below: Apart from to find out the project completion time, the project Manager; R. C. Coleman has to find out the possibility that this expansion project could be complete within 40 weeks. Upon finding the result, he needs to come out on recommendation to

supporting the result. Various parts below is to solving as per PERT/CPM steps procedures; PART 1 (a) Project Network Flow and Variance

The identified activities and links from the table one (1) above require illustration in form of work flow chart using CPM /PERT technique to analysis further in determining critical activities and critical path for the project. Figure three (3) below is the project network depicting the activities and linkage of immediate predecessors on each individual activity from start until complete. Figure 3: R. C. Coleman Project Network. Part 1 (b) Expected Project Time, Project Network and Completion Time.

To illustrate the project network with PERT/CPM procedures and finding the completion time, the three (3) estimate time above should be calculate and convert to expected time. Expected time (t) can be finding with the formula; Expected Time (t) = (a+4m+b) / 6 Upon finding the result on expected time, we could analysis to determine ‘ start’ and ‘ finish’ time for each activities from starting the project until completion. At the end of the flow we could establish that on the total time required to complete the project based on calculation of expected time. Below is the determine project network work flow and estimated completion time in weeks.

From the project network work flow at figure four (4) above, we have noted that the R. C. Coleman warehouse expansion project and conveyor system distribution upgrading will be completed at 43 weeks. Page 9 The team also needs to determine the slack associated with each activity. The term ‘ Slack’ is the length of time of an activity can be delayed without increasing the project completion time.

The amount of slack of an activity is computed as follows; Slack = LS – ES = LF – EF Conversely, the activities which appear having zero slack is the critical activity whereby delaying in this process or steps could post an effect to total project schedule completion timing. As ruled, with uncertainty activity times, the team must aware that the differences between those three estimation time (Optimistic, most probable and pessimistic) could give great effect on the value of the variance. The term ‘ variance’ is indication on the dispersion or variation in the activities time value. The value of variance could calculate with this formula; 2 = 2 Having greater value between tis value among the activities could give great reflect a high degree of uncertainty in the activity time. For easy to overview on the whole project, we have summarize the information into table manners as on Table five (5) below; Table 5: Project network summary information and critical path.

Hence, we recommend that the top management consider shortening activities time by adding more resources into it and by applying ‘ crashing’ technique on the appropriate activities. PART 2 Considering that the project could complete with 80 per cent at 40th Week with a variance reference is maintained same as on part (I), Mr. Coleman need to find out on the possibility time to be shortened to achieve of 80 per cent chances of completion of project is within 40 weeks. In part one (1) of the analysis, we have found that the probability to complete the project within 40 weeks is only at 10 per cent.

At this part, we need further analysis on the probability that the project will be meeting the 40-week completion time is at 80 per cent and a Normal Distribution Table with a mean of zero and a standard deviation of 1 is

referred with the variance (z) is 2. 38; Based on the formula; Z = Page 13 Let say, P (T ? 40 weeks) = 0. 5 + Zn = 80% or 0. 8 0. 8 = 0. 5 + Zn Zn = 0. 8 – 0. 5 = 0. 3000 Using the new mean value or Zn = 0. 3000 and we will enter the table for normal distribution to find the closest value ‘ z’. So, the closest value for Zn = 0. 300 is 0. 2995 where the closest normal probability distribution z at E (Tn) is equal to 0. 4. If the variance (z) is maintained at 2. 38, then in the project completion time is; Z = z = (T- E (Tn)) / 2. 38 = 0. 84 (T - E (Tn)) = 0. 84 x 2. 38 (40- E (Tn)) = 1. 9992 or 2. 0 E (Tn) = 40 – 2. 0 = 38 weeks. We have determine from the above calculation shows that the project completion time is shortened to 38 weeks in order to achieve the goal of an 80% chances in order to complete within 40 weeks. Figure 8 below showing the probability of the project to provide an 80 per cent probability chances of meeting 40-week of completion project time. Figure 8: Standard Normal Distribution Curve with Percentage Target Weeks.

Page 14 STANDARD NORMAL DISTRIBUTION CURVE AREAS When (T) = 40 z = (40 -38) / 2. 38 z = 0. 84 ? = 2. 38 PLAN COMPLETION TIME @ 80% EXPECTED COMPLETION TIME 38 z= 0 40 z = -1. 26 TIME (T) WEEKS 5. Conclusion Upon the completion on the calculation and analysis for both part; (1) and (2), Mr. R. C. Coleman; the appointed Project Manager on the upgrading the premises to automated warehouse system may advise to top management of the Company that on both part the result obtained on the requirement stipulated by the Management seems doubtful and is difficult to achieve.

In order to pursue the objective goal, top management is advised to consider and approve to Mr. R. C. Coleman to exercise shortening activity times at

part (1). This shortening in other words is known as ‘ crushing’ technique. Those activities time may require additional resources, either man power or financial in order to complete or meeting the percentage goal which has vision by the top management. Page 15 6. Reference An Introduction to ManagementScience; Quantitative Approaches to Decision Making. 13th Edition, Anderson, Sweeney, Williams & Martin.

The incorporation of uncertainty activity with estimating time above is defined as; i. Optimistic time (a) = the minimum activity time if everything progresses ideally.

Most Probable time (m) = the most probable activity time under normal condition. iii. Pessimistic time (b) = the maximum activity time if significant delays are encountered Expected time (t) can be finding with the formula; Expected Time (t) = (a+4m+b) / 6 1. For activity time A, the time average is; (t) = (a+4m+b) / 6 (t) = (4+6(4) +8) / 6 (t) = 6 2. For activity time B, the time average is; (t) = (a+4m+b) / 6 (t) = (6+8(4) +16) / 6 (t) = 9 3. For activity time C, the time average is; (t) = (a+4m+b) / 6 (t) = (2+4(4) +6) / 6 (t) = 4 4. For activity time D, the time average is; (t) = (a+4m+b) / 6 (t) = (8+10(4) +24) / 6 (t) = 12 5.

For activity time E, the time average is ; (t) = (a+4m+b) / 6 (t) = (7+10(4) +13) / 6 (t) = 10 6. For activity time F, the time average is; (t) = (a+4m+b) / 6 (t) = (4+6(4) +8) / 6 (t) = 6 Page 18 7. For activity time G, the time average is; (t) = (a+4m+b) / 6 (t) = (4+6(4) +20) / 6 (t) = 8 8. For activity time H, the time average is; (t) = (a+4m+b) / 6 (t) = (4+6(4) +8) / 6 (t) = 6 9. For activity time I, the time average is; (t) = (a+4m+b) / 6 (t) = (4+6(4)

+14) / 6 (t) = 7 10. For activity time J, the time average is; (t) = (a+4m+b) / 6 (t) = (3+4(4) +5) / 6 (t) = 4 11.

For activity time K, the time average is; (t) = (a+4m+b) / 6 (t) = (2+4(4) +6) / 6 (t) = 4 With uncertainty time, we need to find the variance in order to describe the dispersion or variation in the activity time values. The variance of the activity time is given by the formula; ? 2 = 2 1. The variance for activity A is; ? 2A = 2 = (8-4/6)2 = (2/3)2 = 0. 44 2. The variance for activity B is; Page 19 ? 2B = 2 = (16-6/6)2 = (10/6)2 = 2. 78 3. The variance for activity C is; ? 2C = 2 = (6-2/6)2 = (2/3)2 = 0. 44 4. The variance for activity D is; ? 2D = 2 = (24-8/6)2 = (16/6)2 = 7. 11 5. The variance for activity E is; ? E = 2 = (13-7/6)2 = (6/6)2 = 1 6. The variance for activity F is; ? 2F = 2 = (8-4/6)2 = (2/3)2 = 0. 44 7. The variance for activity G is; ? 2G = ? 2H = 2 = (20-4/6)2 = (16/6)2 = 7. 11 = (8-4/6)2 = (2/3)2 = 0. 44 8. The variance for activity H is; 2 9. The variance for activity I is; ? 2I = 2 = (14-4/6)2 = (10/6)2 = 2. 78 10. The variance for activity J is; ? 2J = 2 = (5-3/6)2 = (1/3)2 = 0. 11 11. The variance for activity K is; ? 2K = 2 = (6-2/6)2 = (2/3)2 = 0. 44 Hence, the table below is the summary from the calculation of expected time and the variance of each activity; EXPECTED TIME AND VARIANCE FOR THE R. C. COLEMAN COMPANY PROJECT ACTIVITES Activity Expected time (week) A 6 0. 44 Variance Page 20 B C D E F G H I J K 9 4 12 10 6 8 6 7 4 4 2. 78 0. 44 7. 11 1 0. 44 7. 11 0. 44 2. 78 0. 11 0. 44 Activity Expected Time 6 9 4 12 10 6 8 6 7 4 4 Variance Earliest Start (ES) 0 0 9 13 13 23 13 29 29 35 39 Latest Start (LS) 3 0 9 17 13 23 21 29 32 35 39 Earliest Finish (EF) 6 9 13 25 23 29 21 35 36 39 43 Latest Finish (LF) 9 9 13 29 23 29 29 35 39 39 43 Slack LS –

ES 3 0 0 4 0 0 8 0 3 0 0 Critical path A B C D E F G H I J K 0. 44 2. 78 0. 44 7. 11 1 0. 44 7. 11 0. 44 2. 78 0. 11 0. 44

From the table above we could note that the activity schedule for the warehouse expansion project which shows zero slack is the critical path for the project; B – C – E – F – H – J – K. From the critical path shown, the expected time of the project is E (t) = tB + tC + tE + tF + tH + tJ + tK = 9 + 4 + 10 + 6 + 6 + 4 + 4 = 43 WEEKS Page 21 Project network flow and completion time E 13 23 10 13 23 A 6 0 3 6 9 C 4 B 9 0 0 9 9 9 9 13 13 G 8 13 21 21 29 F 6 23 23 29 29 START H 6 29 29 35 35 I 7 29 36 32 39 K 4 39 39 43 43 FINISH (43 WEEKS) D 13 25 12 17 29 J 4 35 39 35 39

Hence, the variance in the project completion time is the sum of the variance on the critical path activities, which is ? 2 = ? B + ? C + ? E + ? F + ? H + ? J + ? K = 2. 78 + 0. 44 + 1. 0 + 0. 44 + 0. 44 + 0. 11 + 0. 44 = 5. 65 ? = = 2. 38 Z = = Since the management allotted 40 week to complete the project, the probability distribution Z = = -1. 26 Page 22 Using the table for standard distribution had shown that the value area of 1. 26 is 0. 3962. So the probability of the project will be complete at 40 weeks is P (40 weeks) = 0. 5 -0. 3962 = 0. 1038 ? 10. 38 % Standard Normal Distribution Curve

STANDARD NORMAL DISTRIBUTION CURVE AREAS ? = 2. 38 EXPECTED COMPLETION TIME (T) 43 TIME (T) WEEKS Standard Normal Distribution Curve with Target Weeks Page 23 STANDARD NORMAL DISTRIBUTION CURVE AREAS When (T) = 40 z = (40 -43) / 2. 38 z = - 1. 26 ? = 2. 38 EXPECTED COMPLETION TIME 40 z = -1. 26 43 z= 0 TIME (T) WEEKS Standard Normal Distribution Curve with Percentage Target Weeks. STANDARD NORMAL DISTRIBUTION CURVE AREAS When (T) = 40 z = (40 -38) / 2. 38 z = 0. 84 ? =

2. 38 PLAN COMPLETION TIME @ 80% EXPECTED COMPLETION TIME 38 z= 0

40 z = -1. 26 TIME (T) WEEKS END OF REPORT Page 24