Coaching basketball and variance analysis

Ronald Guymon
Georgia State University

Ryan Blunck
Georgia State University

ABSTRACT

The Kansas Jayhawks are on the brink of losing to the University of Northern Iowa Panthers in one of the NCAA's biggest upsets. Students are asked to put themselves in the shoes of the Kansas Jayhawks' coach in the last minutes of the game during the Jayhawks' last timeout. As the Jayhawks' coach you have to decide what is most important- accuracy or field goal attempts. You have twenty seconds to stress to your team one of these two inputs. What should you tell your team? This case investigates how to quantify the impact of field goal accuracy and field goal attempts on the results of a basketball game and then transfers this understanding to a simple manufacturing setting. Upon completion of this case managerial accounting students will have a basic understanding of the underlying principles of variance analysis and interpretation.

Keywords: managerial accounting, variance analysis, standard costing

Note: This is a fictitious case developed for educational use. All statements, names, numbers, dates, etc. used herein were created for the purposes of this case and should not be construed as factual.

INTRODUCTION

Many basketball fans love the college basketball playoffs (i.e., March Madness). Since it is a single elimination tournament the stakes for every game are very high. It can be hard to predict how teams will perform. For instance, in the first round of the tournament, there is historically a 25% chance that a lower-seeded team will beat a higher-seeded team (Lipscomb and Fallica 2012).[1] In 2010, during the second round of the six-round tournament, number nine seed University of Northern Iowa (UNI) beat the number one seed Kansas 69-67.[2, 3]

Put yourself in the position of the Kansas coach during a 60 second time out with only a minute left of the game. Your team is losing. You don't have much time to talk to your players, so you will have to focus your comments on one or two things. For instance, you may want to tell your team to focus on the accuracy of their field goal attempts, or you may want to tell your team to focus on attempting more shots. Or, you may want to encourage your team to get the ball to a particular player so that he can shoot a long-range shot, or who will be likely to make foul shots. You may also want to use this timeout to put certain players on the bench and other players on the court.

For simplicity, focus on field goals made and the two key inputs that influence the number of field goals made: attempts and accuracy. To help you decide what would be the best use of your time, first evaluate how many field goals Kansas made up to the last minute during the game relative to a benchmark, summarized in the last column of Table 1 (Appendix). A reasonable benchmark is their performance during the rest of their games that season, summarized in the fourth column of Table 1. During the rest of the season Kansas, on average, made 26.37 field goals. With only one minute left in their final game (potentially) Kansas had made 21 field goals. While it appears that Kansas is performing below expectations, the number of minutes actually played is not the same as the average number of minutes played during the rest of the season.

Because the number of minutes actually played is different than the average number of minutes played, the comparison in Table 1 is hard to interpret. For example, Kansas player Brady Morningstar, who on average makes 1.11 field goals per game, plays an average of 21.4 minutes. With only one minute left in the game against UNI Brady Morningstar had made zero field goals; however, he had only played eight minutes. Thus it is hard to say if Brady Morningstar is performing below expectations because we have not controlled for the number of minutes played. To make the comparison more meaningful, a new benchmark that is based on the same number of minutes that were actually played is created in the middle columns of Table 2 (Appendix). The flexible season averages control for minutes played by taking the average field goals made per minute played, and multiplying it by the actual number of minutes played during the final game. For example, on average Brady Morningstar makes .052 field goals per minute (1.11 field goals made divided by 21.4 minutes). Thus, during the eight minutes that he actually played in the last game against UNI, one would expect Brady Morningstar to make 0.42 field goals (.052 field goals per minute times eight minutes). A similar calculation is performed for each of the other players. With the exception of Kansas center, Cole Aldrich, and forward,

[1] As expected the likelihood of an upset is greatest for the games that have a smaller gap in their seeds.
[2] A two minute video showing the last part of the game is available on YouTube: http://www.youtube.com/watch?v=SzUFz-58PPA
[3] Two popular sources ranked this game as one of the biggest upsets in NCAA tournament history (Herwitt 2012, Shetler 2011).

Markieff Morris, Kansas players are performing below expectations. As a team, they have made 7.35 fewer field goals than expected (21 field goals – 28.35 field goals).

Now that we have made it easier to compare actual performance to expected performance, we want to get a better understanding of why the team has made 7.35 fewer field goals so that we can focus the time-out talk on either field goal attempts or field goal accuracy. One criterion for deciding how to focus the time-out talk would be to focus on the input that has the biggest impact on reducing the field goals. To isolate the extent to which fewer field goals is contributing to the 7.35 fewer field goals made, independent of the lower accuracy—and vice versa—requires some additional information about what actually happened and what was expected to happen. Panel A of Table 3 (Appendix) summarizes the field goals made up to the last minute of the final game, as well as the field goals attempted and the field goal percentage. Panel B of Table 3 summarizes the season averages. To make the comparison more meaningful, Panel C of Table 3 contains the season averages after adjusting for the actual number of minutes played in the final game. Comparing Table 3 Panel A to Panel C, the team has made 8.55 fewer attempts than expected (49 compared to 57.55), and is 6.4% less accurate than expected (42.86% compared to 49.26%). Quantifying the impact of these two inputs on field goals made is the next step.

Converting the impact of fewer field goal attempts and lower accuracy to the impact on field goals made has two purposes. First, as already mentioned, we want to get a better understanding of why the team as a whole has made fewer field goals. Second, it is difficult to compare the impact of field goal attempts and field goal accuracy on field goals made because they are measured on different scales (i.e., absolute number for attempts versus a ratio for accuracy). Converting each number to a common scale makes the comparison more meaningful.

When converting the attempts and accuracy into the number of field goals made it is important to understand the relation between the two inputs so that we can isolate the impact of each one. Because field goals made is the product of attempts and accuracy (i.e., field goals made = field goal attempts x field goal accuracy), converting either input into field goals made will depend on the level of the other input. For example, even if the team were 100% accurate, if they only made one attempt, then that excellent accuracy translates into just one field goal. Or even if the team made 100 attempts during a game, if they had an accuracy of only 1%, then that would translate into only one field goal.[4] Since the relationship is a multiplicative relationship, we have to hold one input constant, while allowing the other input to vary.

One way to understand how to isolate the impact of each input of multiplicative relationship is to view the problem from a geometric perspective. The area of a rectangle is equal to the product of its width and height. Quantifying the difference in area between two overlapping rectangles can be accomplished by breaking down the non-overlapping area into two smaller rectangles. Applying this idea to Kansas's performance during their final game is illustrated in Figure 1 (Appendix). The y-axis represents the field goals attempted, and the x-axis represents the field goal accuracy. The area of the smaller rectangle, with coordinates of y = 49 and x = .4286, is the actual performance during the final game based on the numbers from Panel A of

[4] Multiplicative relationships are also called compensatory relationships because you can compensate for a deficiency in one input by increasing the other input. In contrast, some relationships are additive, or non-compensatory. For instance, when making a cake, you cannot make up for a lack of sugar by substituting more flour. This makes it less complex to quantify the ingredients in terms of number of cakes, because doing so is independent of the other inputs you have. For instance, if a cake recipe calls for 2 cups of sugar, then 4 cups of sugar is enough to make two cakes, regardless of the amount of flour that you have.

Table 3. The area of the larger rectangle, with coordinates of y = 57.55 and x = .4926, is the expected performance based on the adjusted season averages from Panel C of Table 3. The non-overlapping portion of these rectangles can be broken down into two smaller rectangles.

- First, the rectangle with coordinates of y = 49 and x = .4286 to .4926 has an area of 3.14 (49 x [.4296 - .4286]), and represents the impact of lower field goal accuracy on the number of field goals made.
- Second, the rectangle with coordinates of y = 49 to 57.55, and x = .4926 has an area of 4.21 (.4926 x [57.55 – 49]), and represents the impact of attempting fewer field goals on the number of field goals made.

Altogether, the difference in area between the rectangle representing the actual performance and the rectangle representing the expected performance is 7.35, which is the sum of 4.21 and 3.14—the area of the two smaller rectangles.

An alternative way of making these calculations is to compare the size of the original two rectangles to a third rectangle equal to the actual field goal attempts and the expected field goal accuracy. This third rectangle, with the coordinates of y = 49 and x = .4926, has an area of 24.14 (49 x .4926).

- The difference in area between the third rectangle and the rectangle based on the actual performance in the final game is 3.14 (24.14 – 21). Because both of these rectangles are based on the same number of field goal attempts, the difference is due to the field goal accuracy.
- The difference in area between the third rectangle and the rectangle based on the expected performance is 4.21 (28.35 – 24.14). Because both of these rectangles are based on the same field goal accuracy, the difference is due to field goal attempts.

Now that the impact of each input to field goals made has been isolated and quantified, we can use it to help determine the focus of the time-out talk. Because the impact of field goal attempts is larger than the impact of decreased accuracy (4.21 versus 3.14 reduction in field goals made) you may therefore decide to focus your comments on telling the players to make more field goal attempts (e.g., run it down the floor and shoot it as fast as you can) because that aspect of their performance is more "out of control" than the field goal accuracy.

- What other questions do you want to know the answer to so that you can give appropriate guidance during the timeout?
- Can we dig a little deeper to see which players are performing below expectations?
- Who appears to be "on fire" by performing well above expectations?
- Which players do you want on the court during the final moments of the game?

VARIANCE ANALYSIS

This coaching approach is similar to the management philosophy of management by exception. Management by exception recommends that management should prioritize their time based on the degree to which a process or input deviates from what was planned (Horngren, Datar & Rajan, 2012, pages 227-228). One tool a manager can use to identify deviations from budgeted for planned inputs is variance analysis. Variance analysis highlights the extent to which inputs are out of control, and isolates their impact on profit.

For example, at the end of a fiscal period a manager will want to understand an organization's performance, and how it can be improved. A manager could begin by comparing the actual earnings to the budgeted earnings for the period, after controlling for how much

inventory was actually sold. The manager could dig deeper by identifying the line item on the income statement—direct material, direct labor, variable overhead, fixed overhead—that deviated the most from expectations. The manager could then determine which input caused the line item on the income statement to deviate from its expected value.

For instance, suppose that the cost of direct materials is deemed to be the most "out of control" line item on the income statement because material costs are a significantly higher than expected. The unexpectedly high cost could be a result of purchasing the material at a higher price than expected, using more material than expected, or some of both. If the cost of material turns out to be the biggest factor causing direct materials costs to be out of control, then resolving the problem should begin by talking to the purchasing manager to understand why costs are so high. Alternatively, if the amount of material used is the biggest factor causing direct materials cost to be out of control then resolving the problem should begin by talking with the production manager. In summary, identifying and quantifying the differences between expected and actual earnings is an important first step in the management by exception philosophy. Using variance analysis as a tool to find areas of concern helps a manager focus their time on what will improve the firm's performance the most.

CASE STUDY

A simple organizational setting in which wooden spin tops are manufactured and sold will be used as an example of how variance analysis can help a manager identify problems in their manufacturing process. Table 4 (Appendix) contains estimated and actual information about The Wooden Top Company. The only direct material used to make tops is wood. Direct labor consists of the compensation paid to the employees who make the tops by fastening the wood to the lathe, and then carve and polish the tops. The variable manufacturing overhead consists of the cost of electricity to run the lathe and light the room in which the tops are made, the cost of the polish, and the cost of the chisels that are used to carve the wood. The fixed manufacturing overhead consists of the cost of rent, insurance and property taxes for the shed in which the tops are made, the depreciation of the lathe, and the fixed salaries.

Figure 2 (Appendix) shows how the concepts from the basketball coaching example can be applied to a manufacturing business setting. Specifically, the middle column is like the third rectangle that was calculated, and is based on the actual quantity of input (e.g., feet of wood, hours of labor) and the standard price of the input (i.e., expected cost of wood, expected direct labor wage per hour, and expected cost of variable overhead per direct labor hour). The difference between the first and second column quantifies the impact on profit of using a volume of the input that is different than expected, and is called the quantity variance. The difference between the second and third column quantifies the impact on profit of paying a price that is different than expected, and is called the price variance.[5] The sum of the quantity and price variance is called the spending variance. If a variance has a positive impact on budgeted profit (i.e., use less of the input or pay less for the input) than that variance is considered to be favorable, otherwise it is considered to be unfavorable.

[5] This price variance is actually a mixture of the pure price variance and the joint price/quantity variance. This terminology is consistent with that used in popular accounting textbooks (Horngren et al. 2012) and accounting literature (McIntyre 1976, Mister 1983).

Suppose you are the owner of this small company, and it is the end of the period. Assume that you do not carry any beginning or ending inventory. Using the information from Table 4, the concepts from the basketball coaching example, and Figure 2, answer the questions below.

Required:

1. Calculate the budgeted income statement and the actual income statement, and then compare the two. What would be your reaction from this comparison?
2. Calculate the budgeted income statement after adjusting it to reflect the actual number of tops that were produced and sold. This is called the flexible budget. Compare it to the actual income statement. How, if at all, does your reaction change from the comparison you made in requirement 1?
3. How much of the difference between the flexible income statement and the actual income statement is due to customers paying a higher price than expected?
4. How much of the difference between the flexible income statement and the actual income statement is due to using less wood than expected?
5. How much of the difference between the flexible income statement and the actual income statement is due to paying more for the wood than expected?
6. How much of the difference between the flexible income statement and the actual income statement is due using fewer direct labor hours than expected?
7. How much of the difference between the flexible income statement and the actual income statement is due to paying a lower direct-labor wage than expected?
8. How much of the difference between the flexible income statement and the actual income statement is due to using a lower amount of the variable overhead cost driver than expected?
9. How much of the difference between the flexible income statement and the actual income statement is due to paying a higher variable overhead rate than expected?
10. How much of the difference between the flexible income statement and the actual income statement is due to paying more fixed costs than expected?
11. If you had only a short amount of time to investigate why actual performance differed from what you expected, where would you start your investigation?

REFERENCES

Herwitt, J. (2012). *Top 10 Upsets of the NCAA Tournament.* Fox News. Retrieved from http://msn.foxsports.com/collegebasketball/lists/Top-10-upsets-of-the-NCAA-tournament#tab=photo-title=No.+9+Northern+Iowa+upsets+No.+1+Kansas+in+second+round&photo=29583853.

Horngren, C. T., Datar, S. M., and M. Rajan (2012). *Cost Accounting: A Managerial Emphasis*, Prentice Hall, Boston.

Lipscomb, K., Fallica, C. (2012). *NCAA Tournament Bracket Facts.* ESPN. Retrieved from http://espn.go.com/mens-college-basketball/story/_/page/tcmen12trends/2012-men-ncaa-tournament-bracket-trends-consider-making-picks-field-68.

McIntyre, E. V. (1976). *A Note on the Joint Variance.* The Accounting Review, Vol. 51 (1), 151-155.

Mister, W. G. (1983). *Note on the Interpretation of Standard Cost Variances.* Journal of Accounting Education, Vol. 1 (2), 51-56.

Shetler, M. (2011). *March Madness: The 25 Biggest Upsets in the Past 10 Years.* Bleacher Report. Retrieved from http://bleacherreport.com/articles/632329-march-madness-the-25-biggest-upsets-in-the-past-10-years/page/8.

SOLUTION

1. Calculate the budgeted income statement and the actual income statement, and then compare the two. What would be your reaction from this comparison?

Budgeted Income Statement

(Budgeted number of tops * Expected cost per top)

Revenue (1,600 tops x $13 per top)	$20,800.00
Direct Material (1,600 tops x $1 per top)	$1,600.00
Direct Labor (1,600 tops x $4.50 per top)	$7,200.00
V. MOH (1,600 tops x .45 DLH per top x $0.60 per DLH)	$432.00
Gross Margin	$11,568.00
Fixed MOH	$5,000.00
Operating Profit	$6,568.00

Actual Income Statement

(Actual number of top * Actual cost per top)

Revenue (2,400 tops x $13.25 per top)	$31,800.00
Direct Material (2,400 tops x $0.92 per top)	$2,208.00
Direct Labor (2,400 tops x $3.99 per top)	$9,576.00
V. MOH (2,400 tops x 0.42 DLH per top x $0.70 per DLH)	$705.60
Gross Margin	$19,310.40
Fixed MOH	$5,500.00
Operating Profit	$13,810.40

The overall reaction would be very favorable since actual profit is $7,242.40 more than expected. The initial reaction to costs, however, might be unfavorable because they are all much greater than expected.

2. Calculate the budgeted income statement after adjusting it to reflect the actual number of tops that were produced and sold. This is called the flexible budget. Compare it to the actual income statement. How, if at all, does your reaction change from the comparison you made in requirement 1?

Flexible Budget

(Actual number of tops * Standard cost per top)

Revenue (2,400 tops x $13.00 per top)	$31,200.00
Direct Material (2,400 tops x $1.00 per top)	$2,400.00
Direct Labor (2,400 tops x $4.50 per top)	$10,800.00
V. MOH (2,400 tops x 0.45 DLH per top x $0.60 per DLH)	$648.00
Gross Margin	$17,352.00
Fixed MOH	$5,000.00
Operating Profit	$12,352.00

The overall reaction is still favorable, but now that the number of tops is controlled for the comparison is much more meaningful. The only cost that exceeds the expected cost for making 2,400 tops is for variable overhead. Thus, an important takeaway is that it is important to control for the change in output before making too many inferences about operational performance.

Another item to point out here is that the difference between the income on the budgeted income statement and on the flexible budget is called the sales volume variance. This quantifies the impact of selling 800 more tops than expected, holding everything else constant. Thus, the sales volume variance is $5,784 favorable.

3. How much of the difference between the flexible income statement and the actual income statement is due to customers paying a higher price than expected?

This is the difference between revenue on the actual income statement and revenue on the flexible budget: $31,800 - $31,200 = $600. Because it has a positive impact on budgeted profit, the impact is considered to be favorable. This is called the sales price variance.

4. How much of the difference between the flexible income statement and the actual income statement is due to using less wood than expected?
5. How much of the difference between the flexible income statement and the actual income statement is due to paying more for the wood than expected?

	Standard Quantity Allowed x Standard Price	Actual Quantity x Standard Price	Actual Quantity x Actual Price
	2,400 tops * .5' per top *$2.00	2,400 tops * .4' per top *$2.00	2,400 tops * .4' per top *$2.30
Direct Material	per ft. = $2,400	per ft. = $1,920	per ft. = $2,208

Quantity Variance = $480 F

Price Variance = $288 U

Spending Variance = $192 F

6. How much of the difference between the flexible income statement and the actual income statement is due using fewer direct labor hours than expected?
7. How much of the difference between the flexible income statement and the actual income statement is due to paying a lower direct-labor wage than expected?

	Standard Quantity Allowed x Standard Price	Actual Quantity x Standard Price	Actual Quantity x Actual Price
	2,400 tops * .45 DLH per top *$10.00 per DLH =	2,400 tops * .42 DLH per top *$10.00 per DLH =	2,400 tops * .42 DLH per top *$9.50 per DLH =
Direct Labor	$10,800	$10,080	$9,576

Quantity Variance = $720 F | Price Variance = $504 F

Spending Variance = $1,224 F

8. How much of the difference between the flexible income statement and the actual income statement is due to using a lower amount of the variable overhead cost driver than expected?
9. How much of the difference between the flexible income statement and the actual income statement is due to paying a higher variable overhead rate than expected?

	Standard Quantity Allowed x Standard Price	Actual Quantity x Standard Price	Actual Quantity x Actual Price
	2,400 tops * .45 DLH per top *$0.60 per DLH =	2,400 tops * .42 DLH per top *$0.60 per DLH =	2,400 tops * .42 DLH per top *$0.70 per DLH =
Variable overhead	$648	$604.80	$705.60

Quantity Variance = $43.20 F | Price Variance = $100.80 U

Spending Variance = $57,60 U

10. How much of the difference between the flexible income statement and the actual income statement is due to paying more fixed costs than expected?

Because fixed costs should not vary with the number of tops made and sold, the fixed cost on the flexible budget is the same as that on the budgeted income statement, $5,000. Thus, the difference is $500 unfavorable. This is called the fixed overhead budget variance.

11. If you had only a short amount of time to investigate why actual performance differed from what you expected, where would you start your investigation?

This is subjective, but it seems reasonable that you would start with the largest variance in terms of magnitude (relative or absolute). This is a good time to point out that favorable does not necessarily mean "good" from a strategic point of view. Since the sales volume is so much greater than expected, you may begin by questioning why the sales estimate was so far off and try to improve the estimate for next period. This is also true for the DL quantity variance.

This would also be a good time to discuss the interaction among variances. For instance the direct material has a 288 unfavorable price variance and a 480 favorable quantity variance. This could occur because higher quality wood was purchased, resulting in less waste. Overall the tradeoff was beneficial because the cost of wood was 192 less than expected for the actual volume of tops sold. These numbers are small when compared to the other variances, but relative to the cost of wood on the flexible budget they are the first and third largest variances. The higher quality of wood may have also contributed to the higher sales volume and sales price if customers perceived the tops to be of higher quality.

Summary (sorted by absolute magnitude)		
Sales Volume Variance	5784	F
DL Quantity Variance	720	F
Sales Price Variance	600	F
DL Price Variance	504	F
DM Quantity Variance	480	F
DM Price Variance	288	U

Summary (sorted by relative magnitude)		
DM Quantity Variance	20%	F
Sales Volume Variance	19%	F
DM Price Variance	12%	U
DL Quantity Variance	7%	F
DL Price Variance	5%	F
Sales Price Variance	2%	F

APPENDIX

Table 1: Season Average Versus Actual Performance

		Season Average		Actual	
	Position	Minutes played	FG Made	Minutes played	FG Made
Brady Morningstar	G	21.4	1.11	8	0
Cole Aldrich	C	26.8	4.09	27	6
Marcus Morris	F	24.7	4.83	27	4
Markieff Morris	F	17.6	2.37	19	3
Sherron Collins	G	33	5.17	37	3
Tyrel Reed	G	15.6	1.71	25	2
Tyshawn Taylor	G	23.1	2.54	21	0
Xavier Henry	G	27.5	4.54	31	3
Totals		189.7	26.37	195	21

Table 2: Flexible Season Average Versus Actual Performance

		Flexible Season Average		Actual	
	Position	Minutes played	FG Made	Minutes played	FG Made
Brady Morningstar	G	8	0.42	8	0
Cole Aldrich	C	27	4.12	27	6
Marcus Morris	F	27	5.28	27	4
Markieff Morris	F	19	2.56	19	3
Sherron Collins	G	37	5.80	37	3
Tyrel Reed	G	25	2.75	25	2
Tyshawn Taylor	G	21	2.31	21	0
Xavier Henry	G	31	5.12	31	3
Totals	0	195	28.35	195	21

Table 3- Panel A: Kansas Box Score Summary For Game Against UNI
(One Minute Remaining in the Game)

Name	Position	Minutes	FG Made	FG Attempts	FG Pct
Brady Morningstar	G	8	0	1	0.00%
Cole Aldrich	C	27	6	8	75.00%
Marcus Morris	F	27	4	7	57.14%
Markieff Morris	F	19	3	4	75.00%
Sherron Collins	G	37	3	13	23.08%
Tyrel Reed	G	25	2	5	40.00%
Tyshawn Taylor	G	21	0	5	0.00%
Xavier Henry	G	31	3	6	50.00%
Totals		195	21	49	42.86%

Table 3- Panel B: Kansas Season Averages					
Name	Position	Minutes	FG Made / game	FG attempts / game	FG Pct
Brady Morningstar	G	21.4	1.11	2.74	40.63%
Cole Aldrich	C	26.8	4.09	7.34	55.64%
Marcus Morris	F	24.7	4.83	8.49	56.90%
Markieff Morris	F	17.6	2.37	4.23	56.08%
Sherron Collins	G	33	5.17	11.97	43.20%
Tyrel Reed	G	15.6	1.71	3.46	49.59%
Tyshawn Taylor	G	23.1	2.54	5.63	45.18%
Xavier Henry	G	27.5	4.54	9.94	45.69%
Totals		189.7	26.37	53.8	49.02%

Table 3- Panel C: Kansas Season Averages Based on Actual Minutes Played In Final Game					
Name	Position	Minutes	FG Made	FG Attempts	FG Pct
Brady Morningstar	G	8	0.42	1.03	40.63%
Cole Aldrich	C	27	4.12	7.40	55.64%
Marcus Morris	F	27	5.28	9.28	56.90%
Markieff Morris	F	19	2.56	4.56	56.08%
Sherron Collins	G	37	5.80	13.42	43.20%
Tyrel Reed	G	25	2.75	5.54	49.59%
Tyshawn Taylor	G	21	2.31	5.12	45.18%
Xavier Henry	G	31	5.12	11.21	45.69%
Totals		195	28.35	57.55	49.26%

Table 4: Wooden Top Company Example

	Estimates	Actuals
Number of tops produced and sold	1,600	2,400
Sales price	$13.00	$13.25
Direct material		
Feet of wood per top	0.5	0.4
Cost per foot of wood	$2.00	$2.30
Cost of cheese per sandwich	$1.00	$0.92
Direct labor		
Direct labor hour per top	0.45	0.42
Rate per direct labor hour	$10.00	$9.50
Cost of direct labor per top	$4.50	$3.99
Manufacturing Overhead (MOH)		
Variable MOH per DL hour	$0.60	$0.70
Fixed MOH	$5,000.00	$5,500.00

Figure 1: A Geometric Explanation of the Basketball Variances

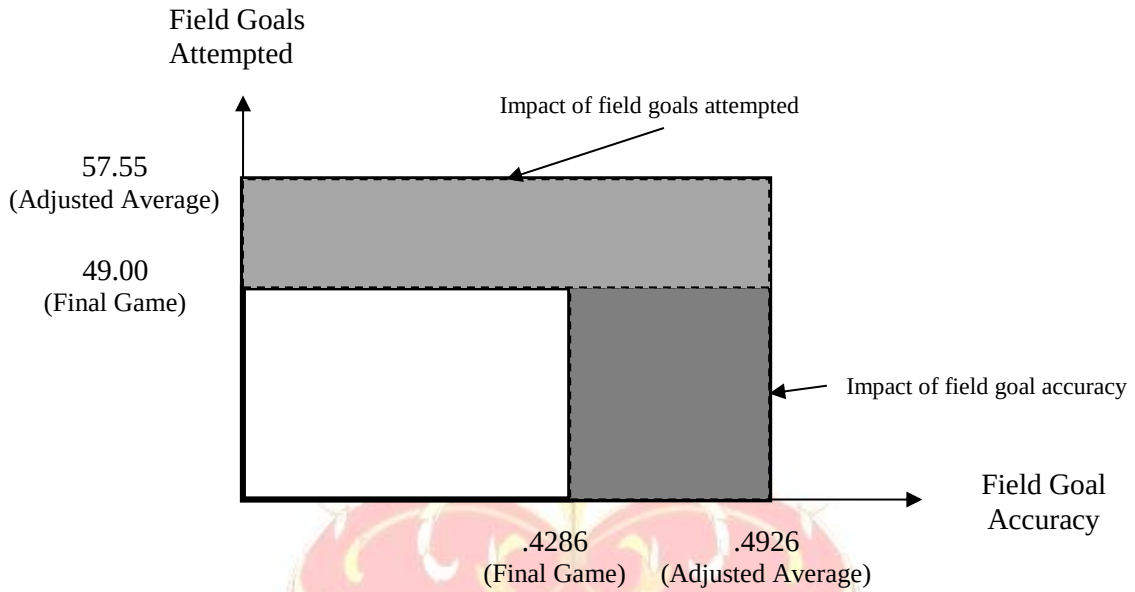

Figure 2: A General Model for Calculating Variances