5-2012

The Relationship of Quarterback Stability and Success in the NFL

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by

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An Honors Thesis in partial fulfillment of the requirements for the degree Bachelor of Science in Business Administration in Management.

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Fayetteville, Arkansas

May 11, 2012

Introduction

Tom Brady. Peyton Manning. Brett Favre. Troy Aikman. All of these individuals have played several years in the National Football League. The common bond that these men share is the fact that they all play the quarterback position. In fact, they are some of the greatest in the history of the game to do so. In the sport of American football, the quarterback is the premier position on the team. Almost always, he is the first person to gain possession of the ball to begin each play, and it is up to him to deliver the ball to the appropriate teammate in hopes of advancing it. In recent years, increased responsibility has been put on the quarterback to change plays at the line of scrimmage given the defensive alignment. The quarterback is commonly the star of the team, but this works both ways. One moment the quarterback is the ultimate hero who just led the game-winning drive in the final two minutes of the game, and then in an instant, he is the worst player to walk the planet after throwing an interception to cost his team a game. It comes with the position that is arguably the most scrutinized in all of team sports. It is often said that the quarterback gets too much credit when a team is winning, and he gets too much of the blame in a losing effort. But, does having a secure situation at this glamorous position equate to more wins in the NFL?

The importance of the quarterback has never been higher due to the rising trend of pass-heavy offenses in the NFL. With this study, we will examine the relationship between stability at the quarterback position and success of an NFL organization. Research will be done to discover if winning percentages differ across teams with differing amounts of changes at the quarterback position. Understanding if all the uproar about quarterbacks is actually supported by the findings will be beneficial for team executives and owners to act accordingly when approaching how to deal with the position.

Literature Review

There seem to be two common frames of thinking when talking about the biggest factors for success in professional football. The majority of previous research on this topic focuses on the caliber of defense and the quality of the individual playing quarterback. Over and over again, the phrase "defense wins championships" is preached by coaches, players, and even analysts. But, this in fact may not be the case. According to a study done by Tobias J. Moskowitz and L. Jon Wertheim, there have been a total of 427 playoff games in the last 45 NFL seasons (Moskowitz & Wertheim, 2012). Out of these games, the higher ranked offensive team has won 62% of the time compared to the higher ranked defensive team winning 58% of the time (Moskowitz & Wertheim, 2012). Note that the total exceeds 100% because sometimes the winning team is higher ranked in both offense and defense in comparison to its given opponent. These numbers show that offense wins just as much as defense does. This year was a perfect example. Here are the rankings for the four teams that made up the two conference championship games this season:

Figure 1 - 2011 Team Rankings

	NFL rank	Offense	Defense
AFC Championship	New England Patriots	2	31
	Baltimore Ravens	15	3
NFC Championship	San Francisco 49ers	26	4
	New York Giants	8	27

(Moskowitz & Wertheim, 2012)

The Baltimore Ravens and the San Francisco 49ers boasted intimidating defenses that were ranked in the Top 5 in the league. On the other hand, the New York Giants and New England Patriots relied much more on their potent offensive attacks than their lowly ranked defensive units. Ultimately, the Patriots and Giants won their respective conference championships and moved on to the Super Bowl, where the Giants ended up taking the title.

That is just one isolated example, but the common theme of always having a defensive-minded team as the champion is somewhat fading. The following table gives the offensive and defensive team rankings in terms of points scored and points allowed for each Super Bowl winner from 2002-2011:

Table 1- Super Bowl Team Rankings

Team	Year (Of Regular Season)	Offense Rank	Defense Rank
Tampa Bay Buccaneers	2002	18	1
New England Patriots	2003	12	1
New England Patriots	2004	4	2
Pittsburgh Steelers	2005	9	T-3
Indianapolis Colts	2006	2	23
New York Giants	2007	14	17
Pittsburgh Steelers	2008	20	1
New Orleans Saints	2009	1	20
Green Bay Packers	2010	10	7
New York Giants	2011	9	27

Five of these teams had offenses ranked in the Top 10 in the league, while six of them had Top 10 defenses. But, four out of the past six champions had a defense that was ranked in the bottom half of the league. The same can only be said about one of the previous six offensive units, supporting the trend of high-octane offenses garnering success in recent years.

Aside from the defensive approach, most other studies correlate success with having a high performing quarterback. These studies have focused strictly on having an elite level quarterback on your roster, but not the number of changes at the position over time, which this study will do. ESPN football guru John Clayton classified fourteen quarterbacks as "elite" during the 2009 season, and he found that a team with an elite level quarterback won roughly 80 percent of their games when playing against a team that did not have one of those elite quarterbacks (Clayton, 2009). It led him to conclude that teams with elite quarterbacks have a greater chance of winning. Having said that, here is a list of all the quarterbacks that have won a championship in the past decade:

Table 2 – Super Bowl Winning QBs

Quarterback	Year/Years Won (Of Regular Season)	Total Pro Bowls
Brad Johnson	2002	2
Tom Brady	2003,2004	7
Ben Roethlisberger	2005, 2008	2
Peyton Manning	2006	11
Eli Manning	2007	2
Drew Brees	2009	6
Aaron Rodgers	2010	2

All of the quarterbacks that have won the Lombardi Trophy since 2002 have multiple Pro Bowl appearances, and it is safe to say that a few on this list, such as Aaron Rodgers, Eli Manning, and Ben Roethlisberger, have the opportunity to appear in a few more as they are still relatively young. Going to the Pro Bowl multiple times is one sign of an elite quarterback, so this data goes hand in hand with what John Clayton found.

Others also stress the importance of the position itself. Hall of Fame quarterback Steve Young goes as far as saying that it is the most important position in all of team sports, noting the difficulty of consolidating all team members to get everybody together each play (Young, 2012). He points out that a quarterback doesn't have a defense to bail him out like a pitcher in baseball and that it is much more intellectually demanding than the demands of a point guard in basketball (Young, 2012).

Purpose

The purpose of this research is to examine past stability of the quarterback position for all thirty-two organizations in the National Football League and how it relates to the success rates of each.

Finding a quarterback to stick with for a long period of time is a common goal for many organizations in today's game. If this study finds that having minimal change at quarterback over time is closely linked to higher winning percentages, owners and general managers will be correct in their extensive searches to find that special one to lead the team. As with many other studies in the past, this study is not directly looking at the quality of the individuals playing the position, but rather the frequencies of change for individuals playing for each franchise.

Research Hypotheses

It is virtually unanimous across football analysts and experts that being set at the quarterback position is a necessity for any organization to be a contender. Having a quarterback in the same offensive system for multiple years can lead to him becoming more comfortable within it, which could help lead to more success offensively. Also, enhanced chemistry with wide receivers and tight ends can play a vital role in a quarterback's success, thus leading to overall team success. Given all of this information, I have generated the following three hypotheses:

H1: NFL franchises with fewer quarterbacks over the past ten years will have higher winning percentages than those with more quarterbacks.

H2: NFL franchises with fewer quarterbacks over the past ten years will have more Super Bowl wins than those with more quarterbacks.
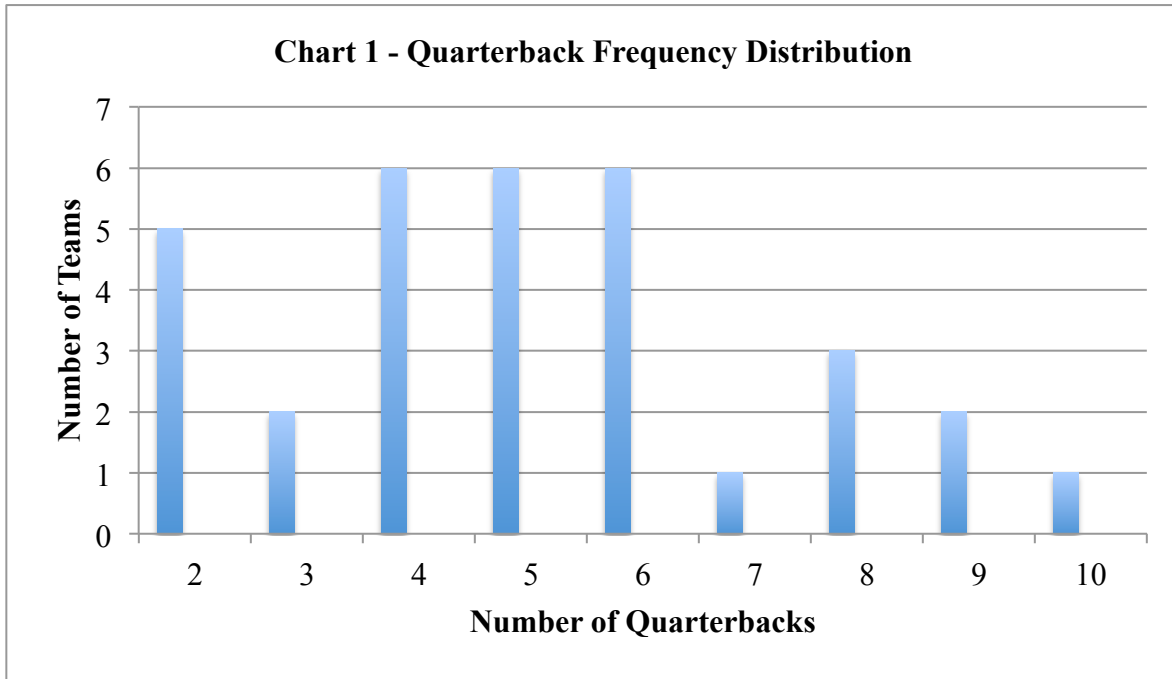
H3: NFL franchises with fewer quarterbacks over the past ten years will also have lower turnover at head coach than those with more quarterbacks.

Methodology

Through extensive research of all thirty-two franchises, information on all starting quarterbacks that have started a minimum of six games in one season from 2002-2011 was gathered. This data was gathered primarily through the use of NFL archives, individual team media guides, and prior general knowledge that I already had. In addition to compiling all of the quarterbacks in the past decade, I acquired a few more statistics in specific categories for each franchise. Included in the study of each team were the overall winning percentage, number of total wins, playoff appearances, Super Bowl appearances, Super Bowl championships, and number of head coaches. In accord with the quarterback data, all of these statistics represent information regarding the past 10 NFL regular seasons from 2002-2011. All of this information was gathered in the same fashion as well.

After the widespread data collection process, all of the data was entered into a single spreadsheet in Microsoft Excel. Each team represented a single row in the spreadsheet, while all of the statistics were entered into corresponding columns. Upon completing the organization in Excel, the next step taken was the analysis of the data. I exported the data from Excel into SAS Enterprise Guide prior to analyzing. The reason for doing this was to allow me to manipulate the data in a few different ways. It allowed for easier compilation of the summary statistics as well as an easier venue to perform the T-tests. Once the dataset was imported into SAS Enterprise Guide, the initial goal was to determine what the data said by determining the summary statistics. After that, the objective was to run three separate T-tests comparing the teams with the lower number of quarterbacks to those with the higher numbers. Each T-test would be testing one of the aforementioned hypotheses mentioned earlier. In doing this, we would be able to determine if there are statistically significant differences in winning percentage, Super Bowl championships, and number of head coaches in relation to stability at the quarterback position.

Results

Chart 1 - Quarterback Frequency Distribution

A frequency distribution bar chart with "Number of Teams" on the y-axis (0 to 7) and "Number of Quarterbacks" on the x-axis (2 to 10). Bar values: 2 quarterbacks = 5 teams; 3 = 2; 4 = 6; 5 = 6; 6 = 6; 7 = 1; 8 = 3; 9 = 2; 10 = 1.

Above is a frequency distribution bar chart for the number of quarterbacks for each franchise within the time frame. The range for number of quarterbacks for a particular team within the last ten years went from the low of 2 to the high of 10. Out of all the possibilities, the numbers of four, five, and six quarterbacks all had the highest frequency of being the number for six franchises each.

The mean was 5.15 for the number of quarterbacks to start at least six games in a season over the last decade, and the median for the data was 5. The standard deviation to go along with this was 2.22.

There were also some other interesting descriptive statistics found within the data. As far as winning percentage, the highest recorded was 76%, while the lowest was a measly 29.2%. The gap in total number of wins associated with these percentages was 136 to 47. In fact, there were only five teams total that surpassed the 100-win barrier. No team won more than two Super Bowl crowns within this time frame, although there were three organizations lucky enough to accomplish that feat. One franchise made four Super Bowls and another made three to top the list for most appearances in the big game, while nineteen teams never even got there once. Only one of the thirty-two teams failed to make the playoffs all ten years, and the highest number of playoff appearances was nine out of the ten. To further validate the common stereotype of the cutthroat world that football coaching is, there were only two head coaches that lasted all ten years as the top dog of his respective team. On the other hand, one franchise ran through six different men from 2002-2011.
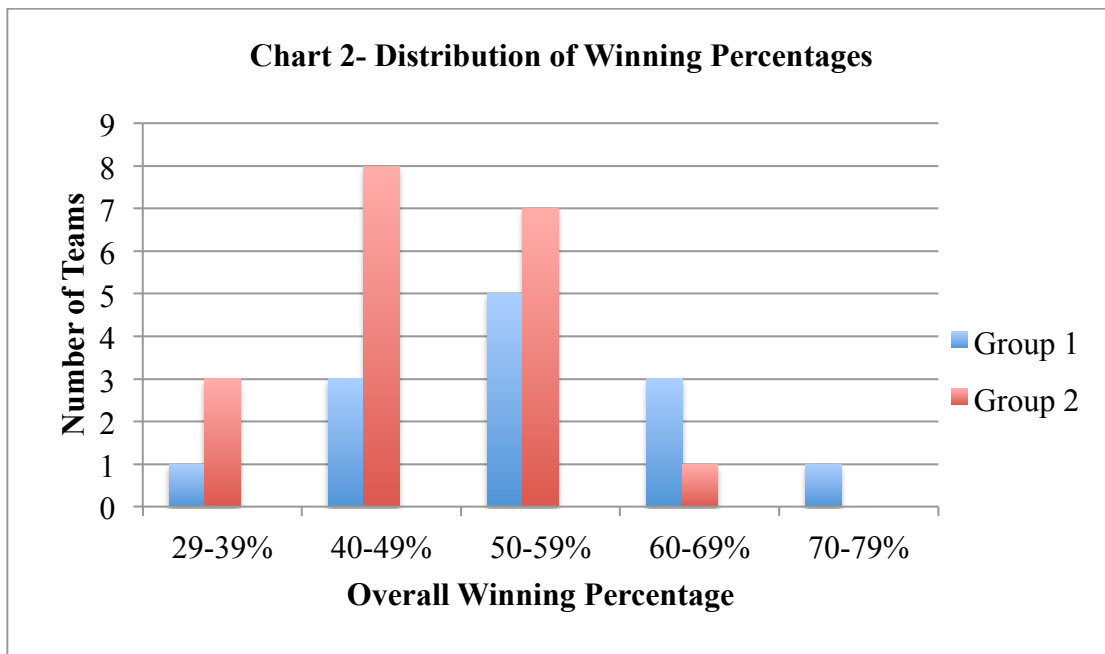
T-Test 1 – Winning Percentage

Before running the T-tests, the franchises were split up into two groups based on the number of quarterbacks they have had. There were thirteen that have had four or less, and there were nineteen that have had five or more. So, the teams with four or less were put in one group, and the rest were put in the other group. For the sake of identification, let's call the group with four or less Group 1 and the group with five or more Group 2 throughout these analyses.

The purpose for running this t-test was to determine if there is a significant difference in the mean winning percentage of Group 1 compared to Group 2. The null hypothesis is that there is no statistically significant difference between the mean winning percentages of the two groups. The alternative hypothesis is that the mean winning percentage of Group 1 is significantly greater than the mean winning percentage of Group 2. This makes this t-test a one-tailed test. An alpha level of .05 is in place for this test. Here is a summary of the output gathered:

Group	N	Mean	Std Dev	Std Err	Minimum	Maximum
1	13	0.5486	0.1155	0.0320	0.3500	0.7600
2	19	0.4624	0.0814	0.0187	0.2920	0.6130
Diff (1-2)		0.0862	0.0965	0.0347		

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	2.48	0.0188
Satterthwaite	Unequal	19.998	2.33	0.0306

Chart 2- Distribution of Winning Percentages

The mean winning percentage for Group 1 was 54.9% with a range of 35-76%. Group 2 had a mean of 46.2% and ranged from 29.2- 61.3%. It was determined before the test that the two groups had equal variances, so the pooled method was used to determine whether the null hypothesis should be rejected or not. Since it was a one-tailed test, the p-value of .0188 is halved into .0094. This falls under the alpha level of .05, so we reject the null hypothesis and conclude the mean winning percentage of Group 1 is statistically significantly greater than the mean of Group 2.

T-Test 2 – Super Bowl Championships

The purpose of this second test was to determine if there is a statistically significant difference in the number of Super Bowl wins by Group 1 compared to that of Group 2 within the last ten years. The null hypothesis is that there is no significant difference in the mean number of championships won by teams in Group 1 compared to Group 2. The alternative hypothesis is that the mean number of championships won by teams in Group 1 is significantly greater than the teams of Group 2. Once again, this is a one-tailed test and an alpha level of .05 is in effect. Here is a summary of the output of the test.

Group	N	Mean	Std Dev	Std Err	Minimum	Maximum
1	13	0.6923	0.8549	0.2371	0	2.0000
2	19	0.0526	0.2294	0.0526	0	1.0000
Diff (1-2)		0.6397	0.5691	0.2048		

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	3.12	0.0039
Satterthwaite	Unequal	13.19	2.63	0.0204

Chart 3 - Distribution of Championships

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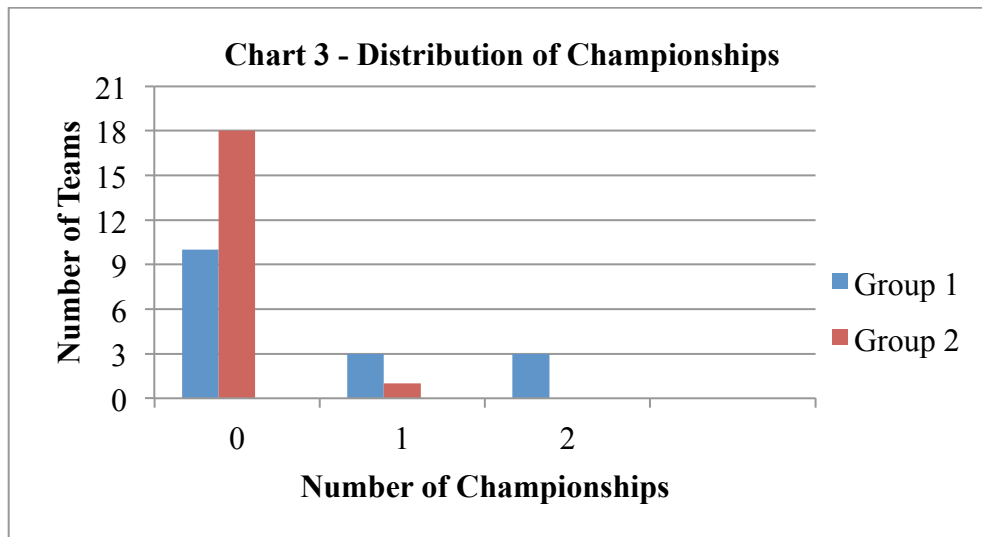
The mean number of championships won for teams in Group 1 was .692 with a range of 0 to 2. Group 2's mean was a far smaller .053 and a range of 0 to 1. Using the pooled method again, the p-value was .0039. The one-tailed test calls for half of that, so the final p-value of .002 is far below the alpha level of .05. As with the previous test, we reject the null hypothesis and conclude that the mean number of championships won by Group 1 is statistically significantly greater than the mean of Group 2.

T-Test 3 – Head Coaching Turnover

The purpose of this final test was to determine if there is a statistically significant difference in the mean number of head coaches for teams in Group 1 compared to the teams in Group 2. The null hypothesis is that there is no difference in the mean number of head coaches between the two groups. The alternative hypothesis is that the mean number of head coaches for Group 1 is less than the mean number of head coaches for Group 2. The same alpha level of .05 will be used for this one-tailed test. Here is the output gathered from the test.

Group	N	Mean	Std Dev	Std Err	Minimum	Maximum
1	13	2.2308	0.7250	0.2011	1.0000	4.0000
2	19	3.2105	1.2283	0.2818	1.0000	6.0000
Diff (1-2)		-0.9798	1.0562	0.3802		

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	-2.58	0.0151
Satterthwaite	Unequal	29.518	-2.83	0.0083

Chart 4 - Number of Head Coaches
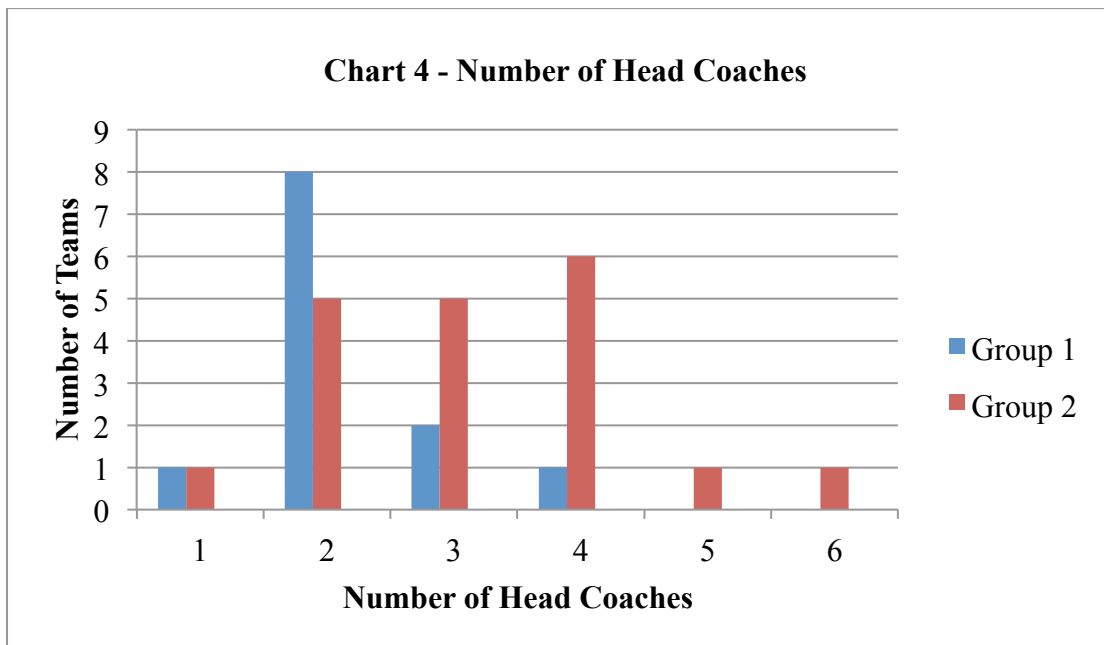
The mean number of head coaches for the teams in Group 1 was 2.23 with a range of 1 to 4. Group 2 had the higher mean at 3.21 and a range of 1 to 6. The two groups had equal variances, so the pooled method was used for a third straight time. The p-value associated with this method was .0151, which came out to be .0076 after halving it for the one-tailed test. This p-value is below the alpha level of .05. As a result, we reject the null hypothesis and conclude that the mean number of head coaches for Group 1 is statistically significantly less than the mean of Group 2.

Analysis of Results

All of the tests that were run supported the previous hypotheses made. But, I wanted to look into the results a little deeper even after this. To begin with, breaking down the teams within Group 1 and Group 2 provides even more support to Hypothesis 1. Here is an extended breakdown of statistics for each number of quarterbacks:

Table 3 – Extended Distributions

Number of Quarterbacks	Number of Teams with this Number	Average Winning Percentage	Total Number of Super Bowls Won	Average Number of Head Coaches
2	5	65.5%	7	1.8
3	2	57.3%	2	2
4	6	45.2%	0	2.67
5	6	51.9%	0	2.5
6	6	44.9%	1	3.17
7	1	47.9%	0	3
8	3	39.9%	0	4
9	2	47.4%	0	3
10	1	35.6%	0	6

The five teams that all only started two quarterbacks are in the lead in every category. They have the highest average winning percentage, most number of Super Bowl wins, and lowest number of head coaches. This further supports all three hypotheses made earlier in this study. Also, as previously mentioned, there were only five teams to surpass the 100-win barrier in the past decade. Four out of those five teams had only two quarterbacks within the time frame. So, four out of the five teams with the most wins in the decade have all had the lowest number of quarterbacks. All seven franchises that had only two or three quarterbacks were all in the Top 9 for total wins. This extended breakdown also provides a clearer view on how the Super Bowl wins were distributed. Nine out of the ten were won by franchises that started only two or three quarterbacks within the decade. The lone exception was the Tampa Bay Buccaneers, who won Super Bowl XXXVII in 2002 against the Oakland Raiders ("Tampa Bay routs", 2003). Their quarterback that year, Brad Johnson, only played one full season with the team after that, which has led to the team going through six other significant starters since then. The final information gained from this table is the spread of head coaches. The number of head coaches virtually goes up in succession as the number of quarterbacks increases. Logically, if teams with fewer quarterbacks have higher winning percentages and win more championships, then it would make sense for the teams with more quarterbacks to have a higher turnover rate at head coach because

they are not winning as much. Winning keeps coaches around, even though it has become almost unrealistically tough to continually please championship craved fan bases. The Group 2 teams have roughly a mean of one head coach more than that of Group 1, which supports Hypothesis 3.

A few other points can be taken from further examining the data. Aside from winning the whole thing, the statistics for stability at quarterback are in favor of just having the opportunity to do so. According to the data, fourteen out of the twenty teams to appear in a Super Bowl since 2002 come from the Group 1 teams that have had four quarterbacks or less. The remaining six belong to the larger contingent of Group 2 teams. Another interesting finding deals with probability of making the playoffs. The teams in Group 1 have combined for a total of 65 playoff appearances, while its Group 2 counterparts have only amassed 55. This may seem like a very minimal difference, but the fact that there are six fewer teams in Group 1 makes it much more powerful. It is hard to look past the overwhelming support that higher success is in favor of teams with fewer changes at the quarterback position.

Relationship to Business World

The results from the three tested hypotheses in this study can be taken and applied to what managers need to consider in the business world. The main issue that this study is trying to analyze is essentially if differing levels of turnover at quarterback influence the overall success of organizations. In the business world, the same thing could be said. Franchises wanting to limit the amount of change at quarterback are similar to managers wanting to keep turnover rates of employees at a low level in business. Having a low level of turnover is important for any business. A high level of turnover can mean a few different things. One is that the selection device for hiring is a poor predictor of who will succeed at the job. As a result, a higher number of people that will not do a good job performing will be hired, thus leading to more having to be fired. Another reason for higher turnover could be an unpleasant culture in an organization. If employees are treated poorly or have to deal with unsatisfactory working conditions, they are more likely to leave. This is not good because employees that you have developed and invested in are leaving to go elsewhere, most likely to join competitors of yours. Also, having to continually train new employees will increase costs.

So, business managers can walk away with a few points from this data of NFL teams. First, it is important to have an effective system in place to acquire talent. Once employees are brought in, the goal is to develop them and keep them. Just as quarterbacks get more comfortable within an offense, employees will grow accustomed to systems and responsibilities in an organization. The longer they are there, the better they will be at handling those responsibilities. Undoubtedly, this will have a positive impact on overall success of the organization and bring them more "championships". This leads directly into another key point managers can draw from this study. The statistics showed that teams that were able to harness some stability at quarterback were the ones that had fewer changes at head coach too. That being said, managers and execs in the business world can be compared to head coaches here. Finding a way to keep and develop employees will make them look better and improve their job security as success is more likely.

Conclusion

  This study does support findings that franchises with fewer changes at quarterback over the last ten years have statistically significant higher winning percentages, more Super Bowl victories, and fewer head coaches than those franchises with a larger amount of changes. It is possible that the importance placed on this position is indeed warranted.

  The importance of this position shows no signs of depleting in the near future as more and more teams are throwing the ball at a higher rate. For general managers and executives, it may be smart to try to find one guy at quarterback and stick with him through the ups and downs, because he might just end up leading them to the top.

Appendix

Overall Dataset

Group	QBs	Win %	Pas	SB As	SB Ws	HCs	Wins
2	8	0.416	2	1	0	3	69
1	4	0.539	5	0	0	4	90
2	5	0.579	6	0	0	2	99
2	5	0.406	0	0	0	4	65
2	6	0.5	3	1	0	2	84
2	9	0.512	3	1	0	2	85
1	4	0.438	3	0	0	2	71
2	8	0.348	1	0	0	4	56
2	6	0.527	4	0	0	4	87
2	5	0.53	4	0	0	3	88
2	6	0.292	1	0	0	4	47
1	2	0.61	7	1	1	2	105
1	4	0.407	1	0	0	2	66
1	2	0.678	9	2	1	2	120
1	4	0.472	2	0	0	2	77
2	5	0.454	3	0	0	3	74
2	9	0.435	1	0	0	4	70
2	7	0.479	3	0	0	3	79
1	2	0.76	8	4	2	1	136
1	2	0.565	4	1	1	2	95
1	3	0.558	6	2	2	2	96
2	6	0.503	5	0	0	3	86
2	10	0.356	1	1	0	6	58
2	5	0.613	7	1	0	1	106
1	2	0.663	7	3	2	2	116
1	3	0.589	5	0	0	2	99
2	8	0.433	2	0	0	5	71
1	4	0.503	6	1	0	3	86
1	4	0.35	2	0	0	3	57
2	6	0.467	3	1	1	2	77
2	5	0.53	4	0	0	2	88
2	6	0.405	2	0	0	4	66

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