

Final Statistics Project

1. Introduction

I work for a large biomedical testing company (11,000 employees worldwide) in the Human Resources department and my final project is based on actual salary increases between two key departments for the 2015 budget year. My alternative hypothesis is that the two groups will not be equal and that there will be a statistically significant difference in the allocation of % increases between the Supply Chain group and Marketing, in favor of Marketing. The Null Hypothesis is that the both groups will be equal.

The reason for my thinking is that manufacturing organizations in the medical industry are by nature not competitive with their compensation strategy, having shallow pockets for salary increases and bonuses. They do not have a reputation for paying competitively or attracting people because of a high salary/sign on bonus. My previous experiences have been in the high tech industry which is a different animal with regards to compensation. High tech companies typically pay at the mid-point of the salary range, give generous stock options and bonuses. They put a larger emphasis on compensation as a retention tool because they want to retain their top talent. The medical industry has a lower turnover rate therefore many of the organizations do not believe they have to pay competitively to retain talent. The average age in my company is 42 years old and the average tenure is 18 years. So, we could conclude that people like to stay working there and that pay is not an issue. At my company, each department manager is allocated a budget pool for salary increases and this has been between 3 and 5% over the last 4 years.

Supply Chain (formerly known as 'manufacturing') has a frugal mentality, spending little to no money on people development and employee retention. There are 3500 employees globally in the department, mostly comprising assembly workers and team leaders. These folks are not highly educated with only a few senior managers holding college degrees. This department is viewed as a 'necessary evil' we need in order to build products but is not seen as a critical component of the executive staff. With this in mind, my assumptions are that they do not fully engage in the performance management and people development process. Therefore, they pay little attention to financial reward/recognition with regards to our pay for performance philosophy. What I mean by this is that they use a 'peanut butter' approach to salary increases and give everyone more or less the same % increase regardless of actual performance. My assumptions are also based on the fact that the supervisors and team leads from Supply Chain are not very discerning in managing performance and making tough decisions around rewarding top performers. Nor do they appear to be concerned about retaining top talent. Their culture is one based on continuously reducing costs, making products as cheaply and efficiently as possible without impacting quality, their environment is slow, routine based work and lacking in innovation.

On the other side we have marketing. This group is seen as strategic and critical to our strategy development and execution. It is this group who determines the markets we go after, products and services we take to market and conducts the statistical analysis around customers, competition, market share, pricing, etc. We have highly educated, experienced business people in our marketing organization. In order to attract top talent we have to pay competitively and once again, this is an issue for us. However, evidence suggests that we have been able to 'bend' the guidelines and hire on some seasoned, well paid marketing professionals in the past 2 years. The culture in this organization is fast paced, innovative, results driven, political and energetic.

My hypothesis is based on my assumptions that the marketing management team is more creative with budget allocation and salary increase distribution than Supply Chain. I believe Marketing would reward top talent far more than Supply Chain and I also believe that Marketing would have a clear picture as to who their top talent was and use compensation as one of many retention tools.

2. Data Collection - Proposed

We have a global human resources data base that contains everything from performance ratings, training records to salary history. I asked one of the compensation analysts to run a report that contained salary increases for Brea/Fullerton based Marketing and Supply Chain employees for 2015 budget year. The criteria I used was that each person be full-time and salaried so that I was comparing 'apples to apples'. To ensure the data was a true random sample, I requested that the employee names were omitted and asked for 30 data items for each group. I felt that this would eliminate any bias on my part.

Data Collection - Actual

It was a very simple process to collect the data. I was emailed an excel spreadsheet with the raw data. See appendix A for raw data and appendix B for variance statistics.

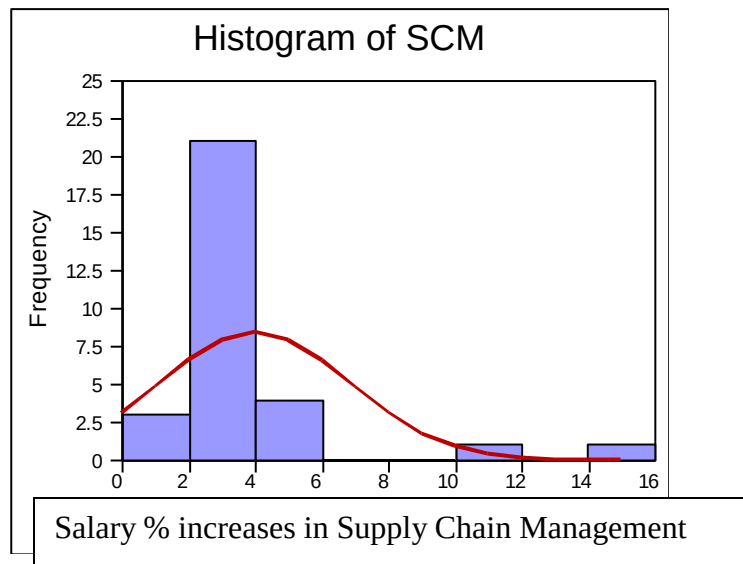
3. Analysis of Data

The first action I took was to use statistics tools to calculate some basic numbers such as the mean and median salary increases for each group. I found that there were some extreme scores for the Supply Chain Management (SCM) group but when I checked this with the median and mode, I was satisfied that the test provided me with an accurate picture.

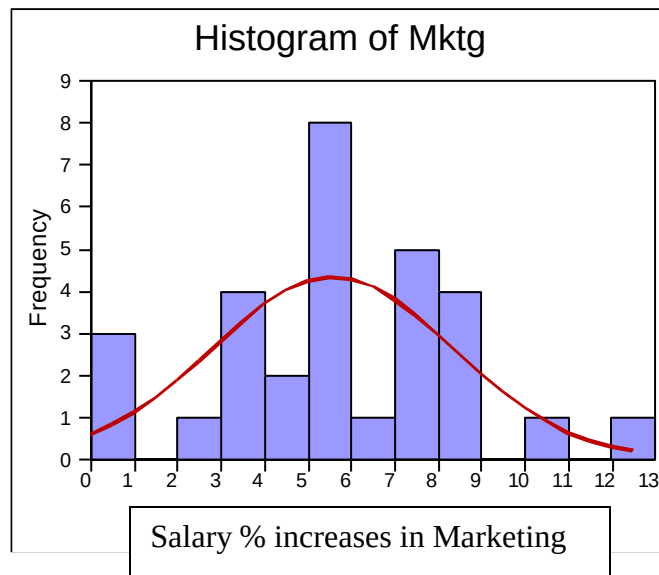
Statistics Tests Results:

<i>Marketing</i>		<i>Supply Chain Management</i>	
Mean	5.34	Mean	3.50
Standard Error	0.50	Standard Error	0.51
Median	5.00	Median	3.00
Mode	5.00	Mode	3.50
Standard Deviation	2.76	Standard Deviation	2.82
Sample Variance	7.62	Sample Variance	7.94
Range	12.00	Range	14.00
Minimum	0.00	Minimum	0.00
Maximum	12.00	Maximum	14.00
Sum	160.20	Sum	104.85
Count	30.00	Count	30.00

A more useful tool to use in my analysis was a variability test. I decided to use this as there were some extreme scores for both groups. The mean score did not inform me as to how the salary increases were allocated across the 30 employees and I could not tell at this point if my data supported or rejected my alternative hypothesis. The data for Supply Chain showed a low variability in that most of the results were clustered around the mean of 3.5 with a few extreme results at the high end.



The variability for Marketing looked very different. There was a high degree of variability in the increases given. As you can see from the chart below, the Marketing results followed the classic curve more closely with 2/3 being in the middle of the curve.



My final test was the t-test analysis. The results of this clearly show that the t-stat is higher than the t-critical and according to the theory, this means that I can reject the null hypothesis, because the t stat result is higher than 2.

t-Test: Two-Sample Assuming Unequal Variances

	<i>Marketing</i>	<i>Supply Chain</i>
Mean	5.34	3.495
Variance	7.623172	7.93937069
Observations	30	30
Hypothesized Mean Difference	0	
df	58	
t Stat	2.561632	
t Critical two-tail	2.001717	

4. Conclusion

The results of the tests that I conducted supported my hypothesis with the sample data I used. The Marketing group was more discerning with regards to allocating a wider variability of % increases as opposed to the SCM group who seemed to give the majority of people in the sample a similar % increase. In HR we call this the 'peanut butter' approach to salary planning.

However, to be confident with the results, I would conduct further tests. It would be interesting to see the results by manager to assess if some are more thorough in their salary planning. I would select data by manager and run similar tests to see if this makes a difference. I would use the same 30 data items as well as looking new data.

It would also be interesting to review more raw data from SCM and see if the low variability pattern continued. Were the extreme scores a fluke or are there some higher performing employees that needed rewarding? Do we really have mediocre performers in SCM compared to Marketing? Another test I would conduct would be to check for any correlation between % increase and performance rating. I did not have this data but could easily obtain it. This would enable us to be clear about our pay for performance philosophy vs the budget we provide business groups as well as the skills of our managers in making everything add up at the end of the year!

I will not take my findings to my VP yet as I think it would be better to conduct some of the other tests described above. The implications of my project so far are highly interesting. The majority of our workforce are baby boomers and we are starting to see more of them retiring. The concern we have now is how to attract younger talent who have higher expectations around compensation. I believe I can now provide some solid statistical analysis to figure out what options we have to attract and retain a talented workforce.

Appendix A

Raw Data - salary increases 2015

Marketing	Supply Chain
5	2.75
8	3
7	2
5	3.5
4	2.8
3.5	0
4.5	2
5.5	2.5
5	0
8	3
7	3
6	2.5
10	3
7	3.5
12	3.5
3.5	2.9
2.5	3.75
5	5
0	11.7
3	2.25
5	2.25
5	3.2
0	3.5
8	4.5
5.2	3.5
7	4
0	0
8	3.25
3.5	14
7	4

Appendix B

Variance Stats

Mktg

X	dev	
5	-0.34	0.12
8	2.66	7.08
7	1.66	2.76
5	-0.34	0.12
4	-1.34	1.80
3.5	-1.84	3.39
4.5	-0.84	0.71
5.5	0.16	0.03
5	-0.34	0.12
8	2.66	7.08
7	1.66	2.76
6	0.66	0.44
10	4.66	21.72
7	1.66	2.76
12	6.66	44.36
3.5	-1.84	3.39
2.5	-2.84	8.07
5	-0.34	0.12
0	-5.34	28.52
3	-2.34	5.48
5	-0.34	0.12
5	-0.34	0.12
0	-5.34	28.52
8	2.66	7.08
5.2	-0.14	0.02
7	1.66	2.76
0	-5.34	28.52
8	2.66	7.08
3.5	-1.84	3.39
7	1.66	2.76
total		
160.2		
Mean		total
5.34		221.07
		N-1 =
		29
samp		
var		7.62
std dev		2.76

SCM

X	dev	
2.75	-0.75	0.56
3	-0.50	0.25
2	-1.50	2.24
3.5	0.01	0.00
2.8	-0.70	0.48
0	-3.50	12.22
2	-1.50	2.24
2.5	-1.00	0.99
0	-3.50	12.22
3	-0.50	0.25
3	-0.50	0.25
2.5	-1.00	0.99
3	-0.50	0.25
3.5	0.01	0.00
3.5	0.01	0.00
2.9	-0.60	0.35
3.75	0.26	0.07
5	1.51	2.27
11.7	8.21	67.32
2.25	-1.25	1.55
2.25	-1.25	1.55
3.2	-0.29	0.09
3.5	0.01	0.00
4.5	1.01	1.01
3.5	0.01	0.00
4	0.51	0.26
0	-3.50	12.22
3.25	-0.25	0.06
14	10.51	110.36
4	0.51	0.26
total		
104.85		
Mean		total
3.50		230.24
		N-1 =
		29
samp		
var		7.94
std dev		2.82