1. **Using the data provided, verify if the CEO's hypotheses are true.**

   The CEO hypothesizes that Boston has better employee engagement due to the more interactive nature in Boston. He believes Boston's teams have higher cohesion and higher manager visibility. In order to verify these hypotheses I had to use the data provided to generate insights. Firstly, what I understand from cohesion is how well employees communicate within a team. That means I had to focus on calculating how much on average an employee from each office communicates with his team members of that office. The results of this analysis are as follows:

   --- Cohesion ---
   Teammates in Boston email each other on average : 25.44 times
   Teammates in Palo Alto email each other on average : 26.23 times

   So, as you can see the teammates in Boston on the contrary communicates lesser than that in Palo Alto by about 3%.

   Secondly, I had to calculate the manager visibility for each office. That means how much on average an employee from each office communicates to the managers of their team in that office. The results of this analysis are as follows:

   --- Manager Visibility ---
   Teammates in Boston email their manager on average : 26.08 times
   Teammates in Palo Alto email their manager on average : 26.36 times

   So, as you can see the teammates in Boston communicates to their managers almost as much as that in Palo Alto (a minor difference of ~1%).

   Looking at these data points lead to the conclusion that **CEO's hypotheses are in fact false**. But, as shown below, looking at the overall engagement – that is how much on average an employee from each office engages with other employees of the company irrespective of teams or office sites – shows reasons why CEO notices Boston scoring higher on employee engagement surveys:

   --- Overall Engagement ---
   Teammates in both the locations send emails on average as follows:
   Boston   11.45
   Palo Alto   10.75

   Boston employees on average communicate about 6% times higher than employees of Palo Alto office. A major portion of this difference contributes the fact that employees from Boston office communicate more with the employees of Palo Alto office rather than within teams of Boston office.

2. **What next steps would you recommend H███████ take to achieve their goal of improving engagement in the Palo Alto office?**

   As seen from the task 1, there is higher cohesion as well as manager visibility in Palo Alto office than that in Boston office. However, its overall engagement is lesser than that of Boston office employees. This could be due to multiple reasons:

   a. Its possible that administrative teams sit in Boston and thus there are higher correspondences from Boston office than to them
   b. Its possible that managers from Palo Alto office may be managing employees from Boston office and thus there are higher "update or request mails" from employees to their managers in Palo Alto

c.   Teams from Boston could be dependent on inputs from Palo Alto team members and thus more communication from-to
d.   Palo Alto team members may prefer calls over mails
e.   Managers in Boston office may require lesser emails from their subordinates
     … and so on …

In order to increase this overall engagement I would recommend H▮▮▮▮▮ to focus on the following things:

i.   Expand administrative teams in Palo Alto – this would increase the engagement from Palo Alto to Boston office
ii.   Educate employees on significance of 2-way communication thus increasing cohesion
iii. Optimize manager-to-managee ratio in each offices
iv.   Enforce guidelines on preferred mode of communication to be email
v.   Enforce standards and guidelines on what needs to be communicated using email and what not

3.   What, if any, are some of the limitations of this analysis?

There are a few evident limitations of this analysis:

a.   The information required to identify the correct manager visibility is missing – mapping of employee to manager id, which would help one analyze if members from one office are in fact communicating more to employees of another office primarily because their manager sits in a different office
b.   Presumption here is that there is only one mode of communication between employees – that is email. Office showing lesser engagement could be engaging equally if not more via other modes of communication such as face-to-face dialogue or calls
c.   Only two metrics are used here to judge level of engagement – cohesion and manager visibility – while there can be many more metrics that can give a better understanding of engagement, such as communication outside the team, if the communication is direct or indirect (To / CC / BCC), if each communication is about a unique topic or are they continuation in subject chain, and so on.
d.   The quality of communication – content of email – is considered to be irrelevant here while in reality it can be the deciding factor of level of engagement


4.   Please quantify and visualize the communication between teams and across sites.

o   *Do individuals email others at their own site more often than they email people at the other site? How much more or less?*

The results are as follows:

--- Communication across sites ---
| Boston	Different Location	5.90
	Same Location	14.80
Palo Alto	Different Location	5.55
	Same Location	20.10

Communication across sites
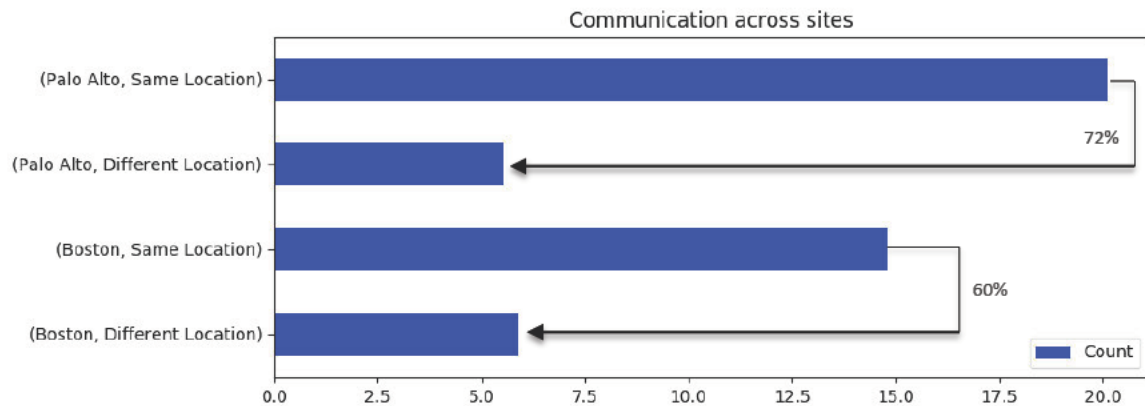
As you can see individuals email others **on average ~67% times more often** than they email people at the other site. (~72% in case of Palo Alto and ~60% in case of Boston)

o *Which teams communicate the most? Which teams communicate the least?*

The results:

--- Communication between teams ---

Analytics	Analytics	26.89
	Business	5.72
	Tech DC	3.67
	Tech HYPE	9.03
Business	Analytics	9.06
	Business	17.49
	Tech DC	7.64
	Tech HYPE	6.96
Tech DC	Analytics	3.94
	Business	7.80
	Tech DC	32.65
	Tech HYPE	10.39
Tech HYPE	Analytics	6.79
	Business	7.70
	Tech DC	9.99
	Tech HYPE	20.57

Communication between teams
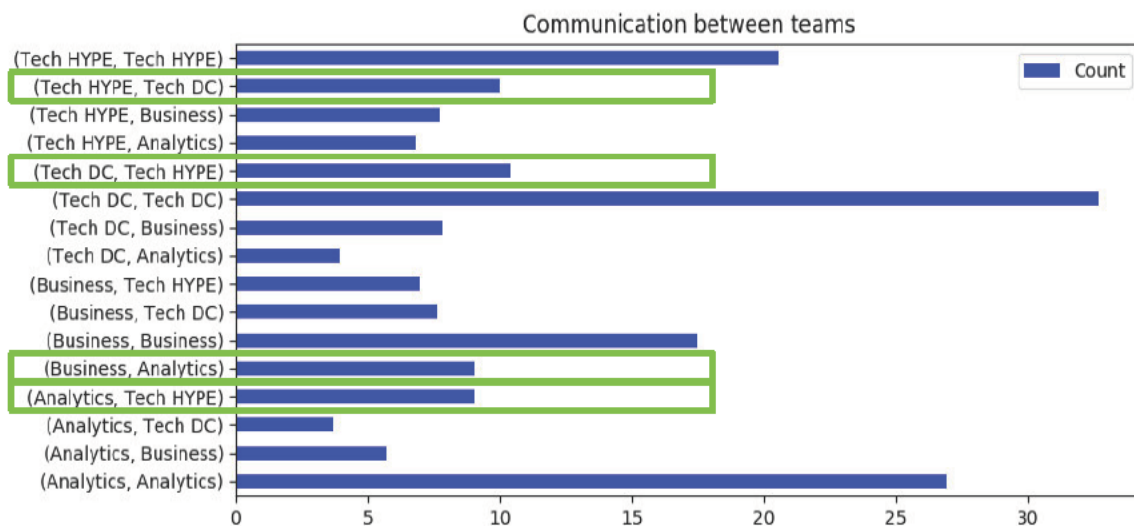
The teams **interacting the most** with other teams are:

    a. Tech DC ←→ Tech HYPE
    b. Business → Analytics
    c. Analytics → Tech HYPE

Communication between teams
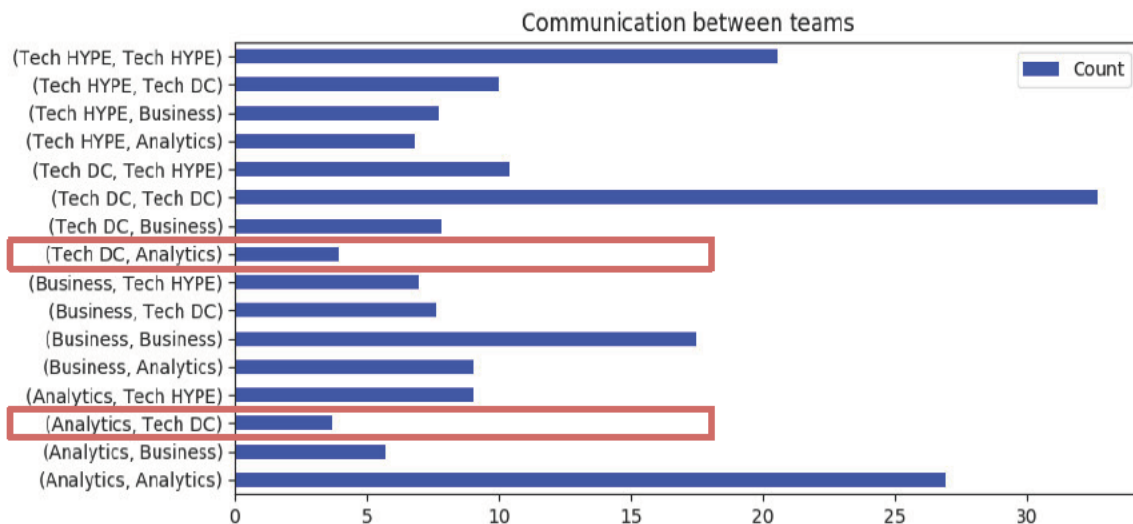
The team **interacting the least** with other team is:

    a. Tech DC ←→ Analytics