CS 6630: Process Book - Corporate Dashboard
Team Members: Srinivaas Ganesan and Vipin Jose

Basic Info
Project Title: Corporate Dashboard

Team Members
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Project Repository
https://github.com/vipinjose90/dataviscourse-pr-corporatedashboard

Member contributions
Srinivaas – Timeline, Snapshot to give quick view of all Bus with color coding, Table showing BU level details, Revenue walk, margin walk, Associate walk with onsite and offshore walk, Data generation for 12 months
Vipin – Project level details table (changing the table according to selection, sorting, resetting); Scatter plot (modifying the plot according to table changes, resetting and the customizing the scatter plot selection); Feature to link related nodes on scatter plot with row hover; dimming and selecting only the hovered row in the scatter-plot; Brush on the scatter plot to zoom and focus on a specific set of nodes; transitions on the scatter-plot chart.

Background and Motivation
In our prior professional experience, Excel was used to review financials and the limited visualizations it provides were used to analyze information. Given the differences in nature of data and the information that is sought from them, Excel was not sufficient in most cases, but we still used it. Also, creating dynamic views in Excel is very difficult and require (simple) programming work-around that can be difficult (as Excel is not primarily meant for programming). Using our knowledge of d3 we would like to work on a way to present a dashboard and use it to show that this can help better assimilate data compared to Excel.

Project Objectives
We would like to use the knowledge we have in d3 to create an effective corporate dashboard that helps visualize data efficiently. We will use concepts covered in class, assignments and also some other d3 based visualizations to study the month-on-month variation in financials for a corporate.

Data
We generated the data ourselves. We finalized 6 verticals and 5 horizontals which resulted in a 6x5 = 30 BU matrix organization. The corporation is structured as a matrix with skillsets (Software testing, Enterprise software, Analytics, Data Warehousing) and Industry sectors (Finance, Healthcare, Manufacturing, Technology). We model a typical services company where employees work for a client and are billed for the same. Each employee belongs to one or more 'projects' and also has one skillset. Employees belong to a project and projects belong to a customer. Customers belong to an Industry sector. The matrix view comes from the fact that employees also belong to a skillset.

Data Processing

Since we are generating the data this step is not required. We simulate a typical services company where few key customers contribute much of the revenue and a large number of small customers contribute less revenue.

Key Terms

To help the TAs understand the terminology involved please find below a summary of definitions:

Client: A customer the firm provides services for

Industry: The sector a client belongs to, for example: Wells Fargo is in Banking Industry, Walmart is in Retail Industry, Amazon is in technology industry and so on.

Vertical: An industry sector is referred to as a vertical. Sometimes similar industry sectors are grouped to the same vertical.

Horizontal: A skillset or a set of related skills that the company has proficiency in. For example QA refers to the team with all testing related technologies. A client usually requires work that belong to some horizontal.

Business Unit (BU): An intersection of a vertical and horizontal is a BU. A BU is a unit of management with dedicated leaders and support teams. Their performance is tracked by observing the Bus performance.

Project: A unit of work with a client. A project can be billed as Time and Material or Fixed Bid.

Time and Material: This is a model where a client is billed at a rate for the hours worked by the employee.

FixedBid: Here the client pays a fixed amount for the entire scope of work. The company needs to manage its resources so as to achieve the best margin.

Subcontractors: Sometimes special skills are needed for a project which may not be readily available within the firm, In such cases the firm hires external contractors. Such employees are usually at a higher cost and so are margin depletive.

Onsite: Employees who work at client location (in our case US) are referred to as onsite employees. They have higher pay and so lower margins

Offshore: Employees who work from a remote location (Say India) are referred to as offshore employees. They have lower pay (paid in Indian standards but billed to client at near American standards) and so are good for margins.

Visualization Design
Tab 1

Column1	BFS	Health	Manlog	Tech
QA	300	112	294	173
Enterprise	223	101	260	213
HCM	300	120	245	108
Analytics	219	262	219	253

	June		July		MoM Change	
	Revenue	Margin	Revenue	Margin	Revenue %	Margin %
Walmart	123	34.0%	123	37.0%	0.0%	3.0%
Project 1	20	39.7%	26	33.7%	30.0%	-6.0%
Project 2	26	33.4%	25	36.3%	-3.8%	2.9%
Project 3	30	36.0%	21	33.4%	-30.0%	-2.6%
Project 4	21	33.4%	27	38.5%	28.6%	5.1%
Project 5	26	38.5%	24	35.0%	-7.7%	-3.5%
Apple	85	34.7%	88	34.7%	3.5%	0.0%
United Healt	66	38.5%	66	30.7%	0.0%	0.0%
CVS	80	32.0%	73	32.8%	-8.8%	0.0%
AT&T	85	36.0%	62	34.9%	-27.1%	0.0%
General Mot	73	38.4%	78	33.7%	6.8%	0.0%
Merck	86	33.2%	82	33.9%	-4.7%	0.0%
Verizon	72	34.7%	87	31.7%	20.8%	0.0%
Costco	66	34.0%	81	36.3%	22.7%	0.0%
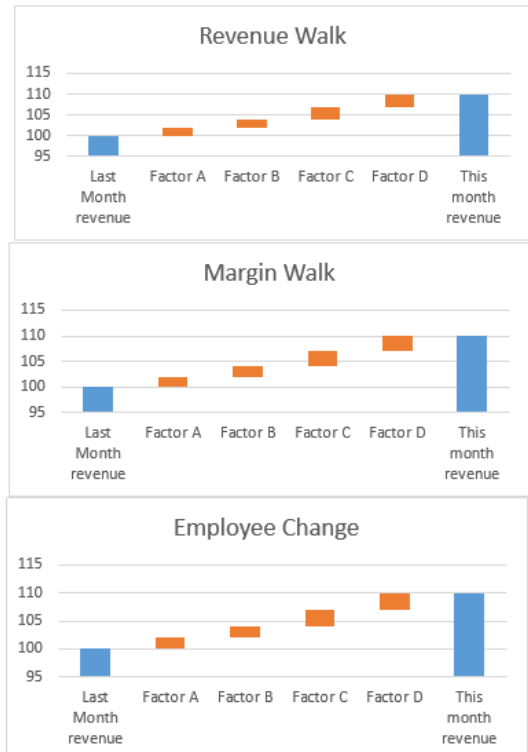
Tab 1 gives a practice level and project level overview. The first table shows the summary of financials for the matrix structure. Click on any of them populates the projects in the second table shown. Clicking on a customer will show projects under that customer. At any of these three levels (practice, client, project) click populates the three figures on the right. First gives a revenue walk explaining why revenue increased/decreased with the reasons marked (more bill days, exchange gains, new employees added, utilization etc.) Margin walk will explain the increase/decrease in margin.
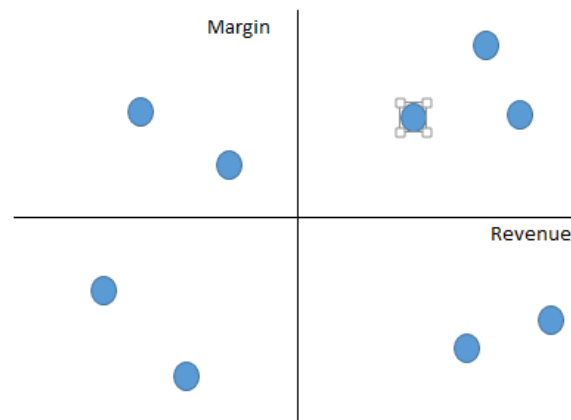
Tab3 is similar to tab2, but it gives a better project level view. A chart similar to the one above segregates projects based on the margin and revenue. Note that the mid lines denote average revenue per project and margins for the entire company. Clicking on any project will populate the three transition charts to its right and will also give some project specific information.

PROCESS BOOK

As we are generating data for the project significant time was spent in data generation. We simulated the financials of a company with onsite/offshore model where few employees work from client locations in onsite and remote employees work from offshore. The story if that of a company trying to increase its profitability by reducing onsite-offshore mix, subcontractor dependence and employee utilization. Our visualization will show if the individual projects were able to achieve the goals set by the management and also highlight projects where there is scope for improvement.

We simulated a company with 100 clients, 3800 to 5000 employees (employees increase roughly by 100 every month) and 300 projects.

We have added a prototype for the views we discussed in our original outline.

DESIGN EVOLUTION

As we started working on this we made several changes based on peer feedback, consultation with TAs and our own thought process.

1) The summary table was changed into a summary matrix. Initially we proposed a summary table with key highlights but when we designed it we saw that there were too many numbers and tough to see what is what. TA Carolina wanted to include some visual cue to see which is the biggest and so we moved from table to a snapshot.
   This was the original table idea implemented in d3

As you can see there are so many numbers and tough to see what is what!. Hence we captured the matrix nature of the organization by drawing a matrix. Below is the redesigned image. We call this a matrix view
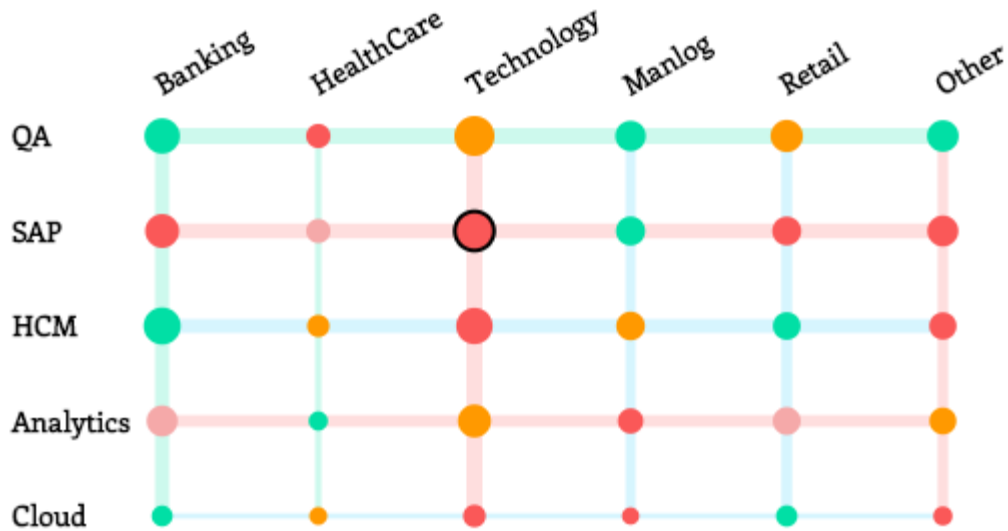
Here the verticals are shown as vertical bars and horizontals as horizontal bars. The width of each bar denotes the share of its revenue in company revenue. So, QA with a very thick bar has a big share in revenue of the corporate. The intersections are shown as circles. And circle radius denotes share of the BU (Business Unit) in overall organization.

Revenue and Margin are two things one would like to track and one immediate question is the revenue more than last month and is the margin more than last month. This leaves with 4 combinations (Revenue up, margin up; Revenue up, margin down; Revenue down, margin up; Revenue down, Margin down). These four combinations are encoded with the colors green, orange, light red, red. So one can immediately say the BU's performance by seeing the color. We feel this matrix is much better than the original table idea.

REVENUE WALK
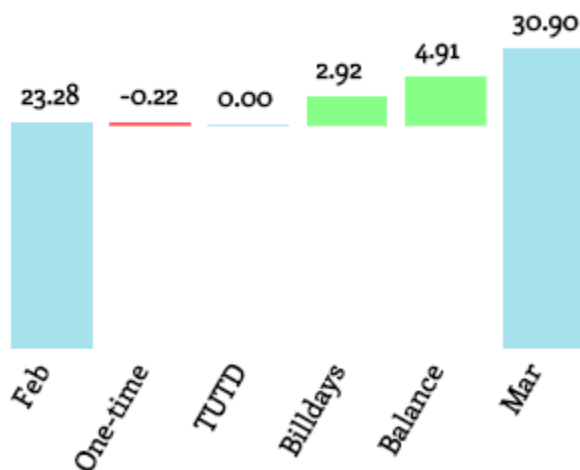
When a BU shows a revenue uptick month on month we would like to show the major contributors for that change. We cull out four main contributors for these: Billdays, True up true down, One-time

adjustments and balance change in revenue. Each BU adds people for its work and this increase results in increased revenue. But there are other factors too.

i)   **Billdays**: As a service organization that bills by the hour, months with more days give more time to bill. Since March has 31 days there will definitely be more revenue compared to Feb. Such an increase cannot be attributed to the BU but it is an external factor. So it's calculated separately and shown as Billdays.

ii)   **One-time**: Accounting errors can sometimes cause revenue shifts. Sometimes managers miss billing deadlines which can cause this month's revenue to flow in the next month. These are all one-time events and do not show the true financial of the practice. Hence they are culled out and shown as one-time

iii)   **TUTD**: Projects can be Time and material or Fixed Bid. In Time and material an associate works for x hours at an agreed upon rate y and the client is billed x*y. In a fixed bid project the client pays for a piece of work to be done in a certain time period. If the client pays $100,000 for a work to be done over 10 months, the accounting team recognizes $10,000 every month. But in between if the project manager feels he needs more time, say 11 months, then the revenue recognized till date is more than what we ideally should have (we recognized 100,000/10 every month while we should have recognized only 100,000/11). To adjust this the accounting team passes a true down, which adjusts the revenue down to the correct value. Such entries are removed and made into a true up/down value.

iv)   **Balance:** The remaining figure reflects the true increase or decrease in financials for the practice. This is shown under the tag Balance.

MARGIN WALK
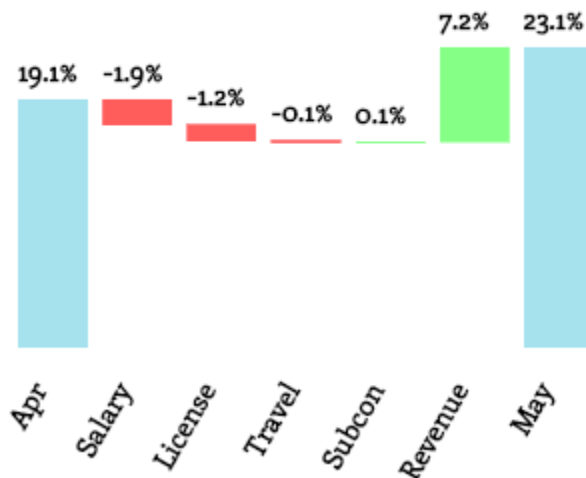
When a practice margin moves from 19.1% to 23.1%, we would like to know what were the reasons for the change. We calculate the various factors and display each of them as a separate block. The reasons that can cause a shift in margin come from the formula of margin. Margin = Revenue – (Salary + Software Licenses + Travel&Entertainment + Subcontractor costs). Each factor brings an increase or decrease in
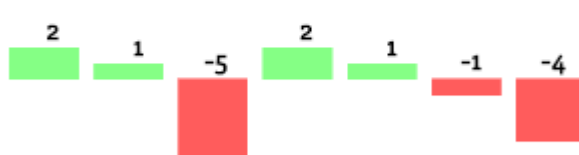
margin and these are shown neatly as a waterfall chart bridging last month's margin with this month's.

ASSOCIATE MOVEMENT

Onsite

Offshore

Anlst   Assoc   Sr Assoc   Manager   Sr Mgr   Director   Subcon

Change in associate levels is a crucial information the management would want to see. This is shown at the level of onsite and offshore to see how the split is. Typically employees at onsite are higher in cost and lower in margin whereas employees at offshore are lower in cost and higher in margin. So it would be good to have an increase at offshore and a decrease in onsite from a margin perspective. These changes are shown in this plot.

 PROJECT LEVEL DETAILS

We provide project level details to the user to see. For any filter we shortlist the projects for that combination of vertical/horizontal. This table can be sorted based on revenue or margin. Clicking on any client shows the projects under that client. This innovative display makes it very easy to see things at a project level or client level. Also this is interlinked to the scatterplot which is explained later.

Project Level Details

| Client/Project	Jan		Feb		MoM Change	
	Revenue	Margin	Revenue	Margin	Revenue %	Margin %
American Electric Power	49664	20.9 %	64549	-1.1 %	29.97 %	-21.97 %
AOL Time Warner	91515	32.2 %	83761	7.9 %	-8.47 %	-24.38 %
AT&T	76832	31.2 %	85889	22.3 %	11.79 %	-8.87 %
BellSouth	67869	20.1 %	78663	19.9 %	15.90 %	-0.27 %
Cisco Systems	91838	29.6 %	66355	6.6 %	-27.75 %	-22.95 %
Compaq Computer	99075	19.4 %	74871	11.7 %	-24.43 %	-7.66 %
Dell Computer	117600	51.4 %	95165	13.2 %	-19.08 %	-38.23 %
Electronic Data Systems	52416	6.8 %	19373	-11.9 %	-63.04 %	-18.66 %
Hewlett-Packard	59689	26.2 %	59072	29.9 %	-1.03 %	3.70 %
Honeywell Intl.	79399	19.9 %	113846	18.3 %	43.38 %	-1.59 %
Ingram Micro	83850	28.2 %	84058	26.7 %	0.25 %	-1.46 %
Intl. Business Machines	99406	35.0 %	48759	-56.3 %	-50.95 %	-91.29 %
Lockheed Martin	71110	22.6 %	86875	1.3 %	22.17 %	-21.35 %
Lucent Technologies	55680	38.6 %	84800	34.3 %	52.30 %	-4.36 %
Microsoft	68070	26.7 %	80493	35.2 %	18.25 %	8.49 %
Motorola	64810	20.3 %	43293	5.1 %	-33.20 %	-15.20 %
SBC Communications	56590	33.6 %	40867	-43.8 %	-27.78 %	-77.34 %
Sprint	67796	42.2 %	54868	17.6 %	-19.07 %	-24.68 %
United Technologies	108418	48.5 %	91142	38.0 %	-15.93 %	-10.45 %
Verizon Communications	113319	26.5 %	83406	12.2 %	-26.40 %	-14.33 %
Viacom	81668	37.0 %	106597	19.8 %	30.52 %	-17.19 %

This neat table shows all the clients and their month on month performance. Click on any one shows the projects under them. Filtering for a BU shows only the clients under that BU.

| Client/Project	Jan		Feb		MoM Change	
	Revenue	Margin	Revenue	Margin	Revenue %	Margin %
American Express	302595	28.8 %	262248	21.1 %	-13.33 %	-7.63 %
Bank of America Corp.	322523	12.8 %	276181	8.0 %	-14.37 %	-4.81 %
> Bank of America Corp._Analytics_project	85081	22.1 %	63527	4.6 %	-25.33	-17.42 %
> Bank of America Corp._HCM_project	87949	18.0 %	83113	10.2 %	-5.50	-7.72 %
> Bank of America Corp._QA_project	51713	-23.8 %	58473	8.9 %	13.07	32.68 %
> Bank of America Corp._SAP_project	97780	19.6 %	71068	7.8 %	-27.32	-11.80 %
Bank One Corp.	121483	-3.5 %	140364	-21.1 %	15.54 %	-17.56 %

SCATTER PLOT

This gives an overview of all the projects in the BU through a scatter plot. The x axis denotes the margin percentages and y axis denotes the revenue range. A circle is positioned to the correct revenue and margin for the project. One circle is placed for the prior month and one for the current month. This encoding makes it very easy to visualize the transition from last month to this month. One can immediately gauge the movement from previous month to current month by seeing the circles.

Hovering over the circles shows the link to the prior month and the transition effectively. We also show a tooltip that gives some additional details of the project and financials.
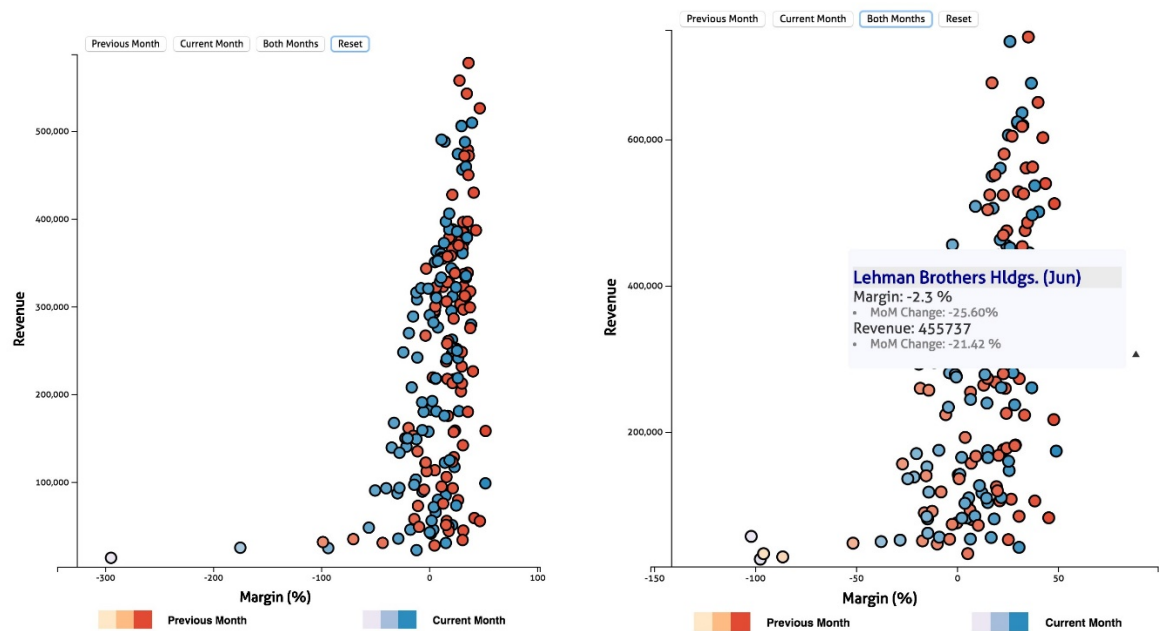

Hovering over the table entries highlights the corresponding entries in the scatter plot. We implemented a dim for the background circles as this ensures we can clearly see the foreground ones. This design change was part of the design evolution. The design evolution also includes the idea of circles for previous and current month and a link that connects the two. This new change makes it very intuitive to appreciate project wise movement.

New York Life Insurance	353482	-0.6 %	505822	17.8 %	43.10 %	18.43 %
Prudential Financial	503676	15.2 %	425033	11.8 %	-15.61 %	-3.44 %
State Farm Insurance	28918	-86.3 %	51868	-28.2 %	79.36 %	58.07 %
TIAA-CREF	156996	7.0 %	152196	-14.9 %	-3.06 %	-21.84 %
UnitedHealth Group	46547	-9.8 %	49775	-37.6 %	6.93 %	-27.82 %
Wachovia Corp.	84473	30.7 %	102135	4.9 %	20.91 %	-25.77 %
Wells Fargo	604305	27.2 %	636292	32.2 %	5.29 %	4.98 %
Aetna	216679	47.9 %	147025	25.8 %	-32.15 %	-22.03 %
Bristol-Myers Squibb	324752	28.9 %	374383	49.4 %	15.28 %	20.52 %
Cardinal Health	321026	6.2 %	351749	-2.6 %	9.57 %	-8.87 %
CVS	80315	7.1 %	82153	4.8 %	2.29 %	-2.21 %
Johnson & Johnson	276040	-0.4 %	311129	1.1 %	12.71 %	1.60 %
McKesson	650604	40.1 %	411679	1.4 %	-36.72 %	-38.63 %
Merck	192333	4.0 %	164973	2.3 %	-14.23 %	-1.76 %
MetLife	47709	-51.5 %	25804	-97.4 %	-45.91 %	-45.86 %
Pfizer	105584	21.1 %	116624	12.3 %	10.46 %	-8.85 %
Walgreen	411413	8.5 %	384185	-7.8 %	-6.62 %	-16.33 %
Alcoa	371908	23.7 %	317015	23.7 %	-14.76 %	-0.09 %
Allstate	124984	19.5 %	56936	-101.9 %	-54.45 %	-121.41 %
American Intl. Group	267884	19.1 %	244338	6.7 %	-8.79 %	-12.40 %
Boeing	474837	24.6 %	416703	22.2 %	-12.24 %	-2.36 %
Caterpillar	33325	-95.8 %	80872	-14.6 %	142.68 %	81.22 %
Delphi	410428	20.4 %	444898	35.7 %	8.40 %	15.33 %
DuPont de Nemours (E.I.)	33406	5.3 %	103311	15.2 %	209.26 %	9.99 %
Enron	343269	19.3 %	361097	30.7 %	5.19 %	11.41 %
Ford Motor	739974	35.3 %	621869	30.0 %	-15.96 %	-5.30 %
General Electric	390552	36.6 %	328541	23.9 %	-15.88 %	-12.70 %
General Motors	223469	-5.6 %	138124	-21.3 %	-38.19 %	-15.64 %
Sysco	259479	-18.2 %	292544	-18.9 %	12.74 %	-0.69 %
TXU	413217	32.6 %	339584	-1.7 %	-17.82 %	-34.24 %
United Parcel Service	50809	-17.1 %	43947	30.7 %	-17.44 %	47.85 %
Aquila	259354	23.9 %	260237	37.0 %	0.34 %	13.09 %
CenterPoint Energy	117756	-7.9 %	174256	15.2 %	47.98 %	23.10 %
Conoco	272705	30.8 %	239247	14.8 %	-12.27 %	-15.99 %
ConocoPhillips	52470	25.4 %	80824	18.4 %	54.04 %	-6.99 %
Dow Chemical	107796	26.8 %	109258	14.6 %	1.36 %	-12.20 %
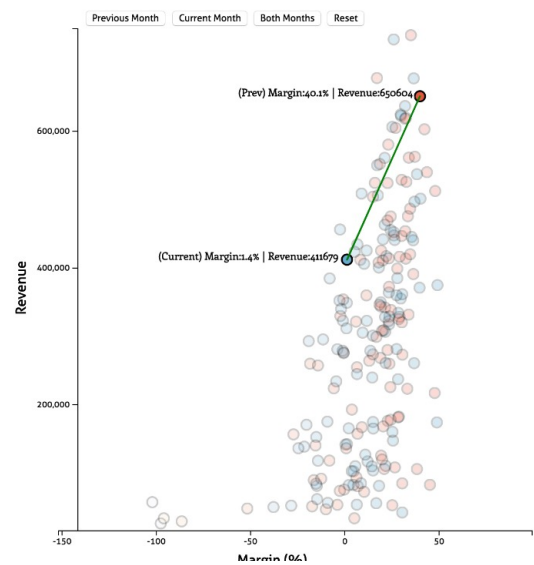
We also include a brush function to see the projects in any congested areas. This gives a better view. Also using the controls one can set for a month or the prior alone to get a better view.
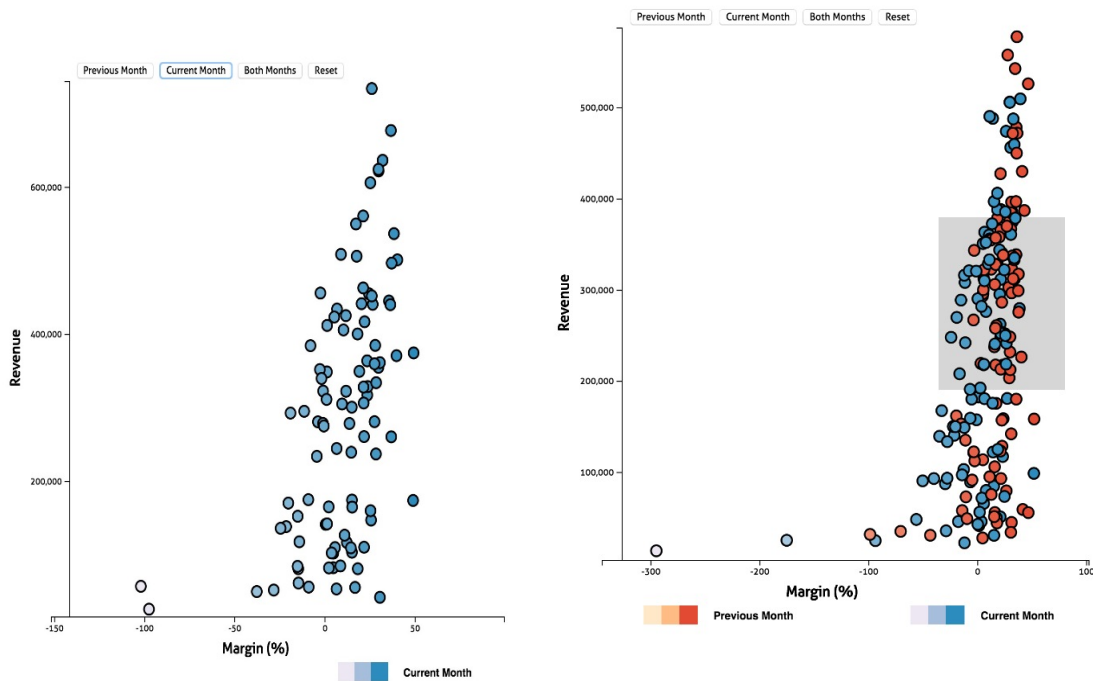
EVALUATION

We completed all the features we mentioned in our initial report. Data generation was challenging and so was creating these visualizations which give a cogent view of a problem or in our case, a corporate dashboard. We can derive many inferences from the visualization which effectively makes the story. For one we see that the company has more reliance on Time and material projects and so they earn more revenue in months with 31 days and hence higher margins and lower revenue in months with 30 days and hence low margins. This leads to unpredictable revenue and margins. To move away from this we must use a Fixedbid model where revenue is decided upfront and a share is apportioned every month regardless of the days in the month.

The second inference we see is increased dependence on subcontractors. Over the months the share of subcontractor count especially at onsite is increasing and we see that this evidently pulls down the margins.

The third inference is fluctuations is margins caused by software license use. Sometimes the practice need a specific software for a month and using it causes a spike n costs and hence a decrease in margins. To overcome this we can introduce an amortizing model where license expenses are amortized over many months or a constant corporate pool model where projects are not charged for these software usage but rather it sits in a company level pool.

Many such other optimizations that can lead to steady and predictable margins can be evidently inferred from our visualization. Also using the filters of BU or by scanning through customers and seeing the scatterplot one can see clients or projects that are consistently bad performing and find ways to improve them.