

Insightful Analysis of City of Toronto's Consulting Expenditure*

Shivank Goel

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This paper investigates and discusses about the impact of consulting expenditures on efficiency and performance of the City of Toronto in recent years, especially from 2017 to 2021. A comprehensive dataset about consulting expenditure was obtained from City's Open Data Portal, and after analysing the data, it was revealed that there is a consistent increase in consulting expenditures with a strategic focus on technical and management/research and development areas. Visualizations, including bar graph, pie charts and scatter plots gives clear insight into expenditure patterns. A further analysis can be performed to dive deeper into specific areas of consulting services.

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*Code and data are available at: <https://github.com/shivankgoel003/Consulting-Services-Expenditure>.

1 Introduction

Undoubtedly in today's dynamic governance, it has become extremely crucial to analyze the budget allocation and expenditure of the government, in order to ensure the effective and smooth running of the governmental operations. And within this complex system, the role of consulting expenditures emerges as a critical factor to be considered. In the pursuit of this objective, governments, including federal entities, strategically enlist the expertise of consultants. "Consultant" is defined as a person or company, which under an agreement other than an employment agreement, provides expert or strategic advice and related services for consideration and decision-making (University 2023). These individuals or entities typically bring a wealth of experience, turning out to be valuable assets for addressing specific challenges.

According to John Ivison in a National Post article, "All federal governments use consultants — they are seen as a useful way to acquire specialty services or to fulfil particular requirements without having to hire permanent staff" (Ivison 2023). In this context of governance, we center our study to municipal governance of the City of Toronto which has been using different consulting services over the years to improve its working. The report provided by the City of Toronto states "Overall, the City of Toronto (the City) and its A&Cs spent \$37.7 million on consulting services in 2019 for operating and capital combined, which represents an overall increase of \$12.6 million (or 50.1%) compared to 2018" (Divisions, Agencies, and Corporations 2020).

This paper aims to analyze the impact of consulting expenditures on the efficiency and performance of the City of Toronto's operations, vendor preferences, and the types of services acquired. We analyse the trend between the consulting vendors within the budget type and shall discuss how consulting expenditures are reshaping the City of Toronto's Operations. To explore, our study will utilize data over past five years for the expenditure of City of Toronto in consulting. We intend to observe relationships, patterns and shift in consulting vendor preferences within different budget types, along with understanding the type of services provided by these consulting services to the City. This shall provide us with a better knowledge of City's operations and future goals. At the end of this paper, we shall discuss the results of our research and also highlight limitations and constraints associated with our study. We shall perform statistical analyses for this purpose and use R programming language (R Core Team 2023) to see the correlations, visual representations, and other results.

The remainder of this paper is structured as follows. Section 2 and Section 3

2 Data

2.1 Data Collection

The data for the purpose of this paper, was obtained from the City of Toronto Open Data Portal and is titled, “Consulting Services Expenditures”. The dataset was comprehensive with past five years’ expenditure history for different divisions, agencies, and entities of City of Toronto. It was well organized and formatted under Excel file (xlsx). The source dataset comprised two segments of data, one from year (2012-2016), and another from year (2017-2021), however, for purpose of this study, we were only interested in the data ranging from year 2017 to 2021.

2.2 Data Structure and Limitations

The data was downloaded using the `opendatatoronto` package (Gelfand 2022), in programming language R (R Core Team 2023), and certain libraries and packages were installed including (`tidyverse`) (Wickham et al. 2019), `dplyr` (Wickham et al. 2021), `knitr` (Xie 2021) and `ggplot` (Wickham 2016). The tables were created using `kableExtra` (Zhu 2021). The dataset was structured with each year’s expenses being reported on a separate excel worksheet. The columns, which define the features of data are as follows:

1. Budget Type: Classifying the budget under which expenses were charged.
2. City/ABC: Identifying abbreviations corresponding to City clusters or various agencies, boards, and commissions.
3. Expense Category: Categorizing expenditures in alignment with predefined codes.
4. Division/Board - Name of city division or agency, board, commission.
5. Contract Date: The issue date of the consulting contract.
6. Contract/PO Number: A unique identifier denoting the contract or purchase order number.
7. Consultant’s Name: The name of the consultant or the consulting company engaged.
8. Description of the work - A brief description of the contracted services
9. yyyy Expenditure\$ - Total expenditure for the specified year in dollars

Limitations:

It is important to note that the data did not encompass certain smaller agencies, boards, and commissions. Also, the dataset is almost 1 year(s) behind its refresh rate.

Table 1: Sample of Cleaned Consulting Expenditure Data 2021

Budget Type	City/ABC	Expense Category	Division Board	Consultant's Name	Expenditure
OPERATING	City Manager	Technical	City Clerk's Office	Free & Fair	21187
OPERATING	City Manager	Technical	City Clerk's Office	Kevin Skoglund	19939
OPERATING	City Manager	Technical	City Clerk's Office	Ocad University	2976
OPERATING	City Manager	Management/R&D	Concept 2 Keys	KPMG LLP	86420
OPERATING	City Manager	Technical	Concept 2 Keys	KPMG LLP	185216
OPERATING	City Manager	Technical	Concept 2 Keys	Watson & Associates Economists Ltd	89646

2.3 Data processing and cleaning

Data cleaning and processing is extremely important to get the accurate results to perform the analysis. The dataset was divided into sheets for each year (2017-2021), therefore, each sheet was read into a separate dataframe for further processing. Also since, the first two rows were acquired as headings for better visualization, these rows were skipped during the reading process. Similarly, the last two rows were also omitted as they were assigned with the total expenditure value, which we did not require explicitly. The expenditure column for each year had certain values enclosed within parenthesis, these values were changed to numeric values and parenthesis were removed as part of data cleaning. The column names in each dataframe were standardized using the `clean_names` function from the `janitor` library. After this, selected columns of interest were extracted from each dataframe, focusing on relevant information such as budget type, city/agency identification, expense category, division/board, consultant's name, and yearly expenditure. Some of the longer expense category names were simplified into shorter names using `mutate` function. At the end, the cleaned datasets for each year were saved as CSV files for future analysis. A sample of cleaned consulting expenditure data for year 2021 can be seen in (Table 1)

2.4 Data Analysis

We carried out a thorough data analysis to obtain insights into the trends and patterns within the "Consulting Services Expenditures" dataset. The focus was on visualizing expenditure trends across various dimensions, such as budget types, total expense and expense categories. We intended to study the results between the expenditure and expense type over the period of 5 years from 2017 to 2021.

We investigated the trend between the expenditure and budget type, the findings were summarized into a table, where maximum, minimum, average and total expenditure values were observed in relation to the Operating and the Capital budget types. The summarized table can be seen in (Table 2).

As a part of our study, we also aimed to observe the total expenditure by expense category for each year, and sought to identify the areas of consulting services that received the highest allocation of expenditure. The expense categories are narrowed as : Creative Communications,

Information Technology, Management and Research and Development, Legal and Technical. Studying this shall help in future to understand City of Toronto's performance and efficiency in certain areas. For the purpose of this, a bar graph was plotted between the expenditure category and total expenditure amount over the period of five years. A pie chart was also created to understand the general trend between expenditure and expense category.

We plotted two scatter plots to examine how expenditure value has varied over the years for Consulting services allocation. One of the scatter plot has definite data points, while the other scatter plot with a smoothed line has continuous data points. However, they both represent the same general trend of consulting expenditure over the years by City of Toronto.

Table 2: Summary of Consulting Expenditure by Budget Type (2017-2021)

Year	Budget Type	Total Expenditure	Average Expenditure	Maximum Expenditure	Minimum Expenditure
2017	CAPITAL	15162294	97194.19	664651	257
2017	OPERATING	6272968	57550.17	1104096	571
2018	CAPITAL	17630373	99047.04	1158970	290
2018	OPERATING	7937059	60588.24	551844	142
2019	CAPITAL	24187895	95604.33	1142322	350
2019	OPERATING	13679086	75159.81	2669450	285
2020	CAPITAL	29080374	120665.45	2385610	480
2020	OPERATING	13711910	73325.72	1719545	40
2021	CAPITAL	27381861	101414.30	2309192	58
2021	OPERATING	18883546	73476.83	2869378	200

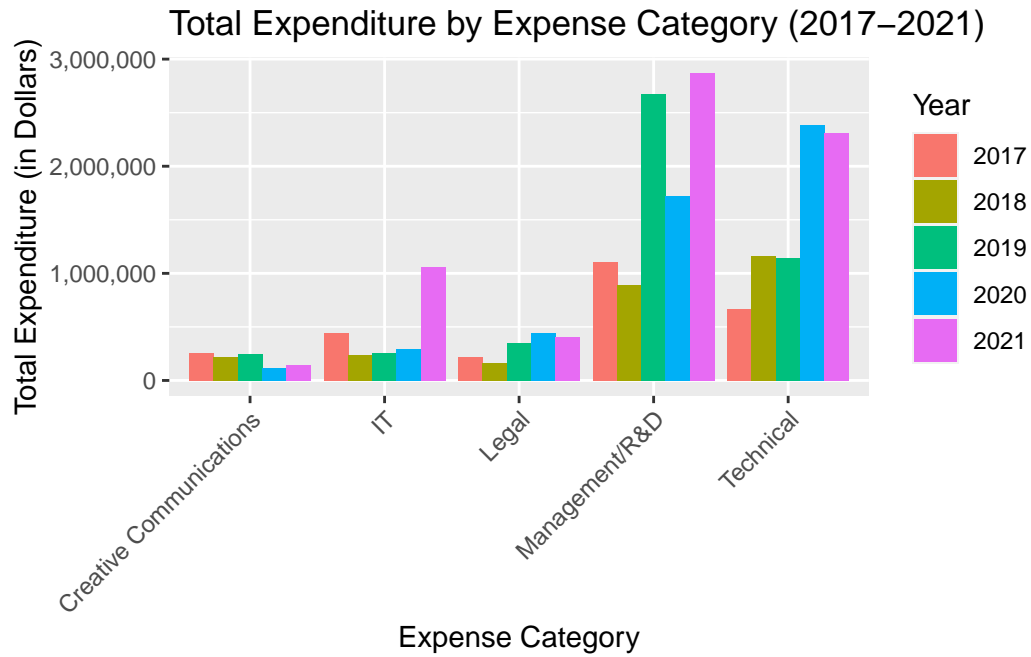


Figure 1: Bar graph for Total Expenditure by Expense Category (2017-2021)

Expenditure Share by Expense Category

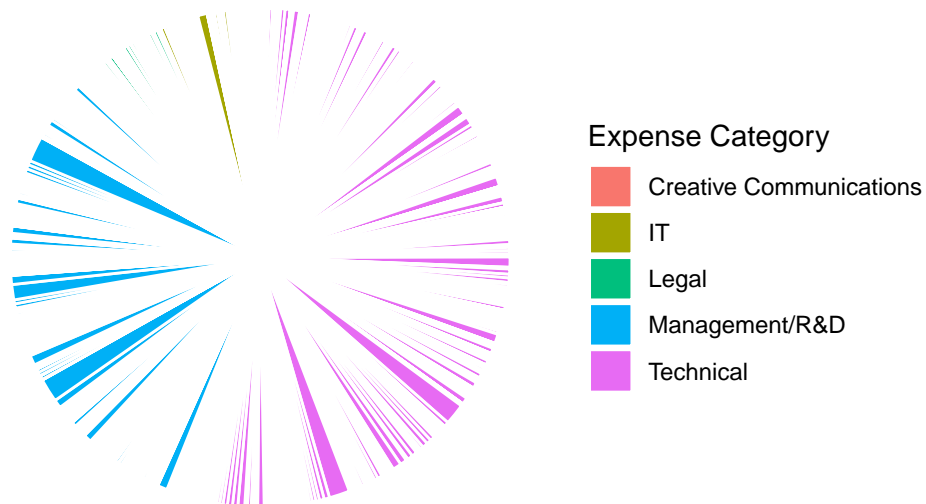


Figure 2: Pie chart for Expenditure Share by Expense Category

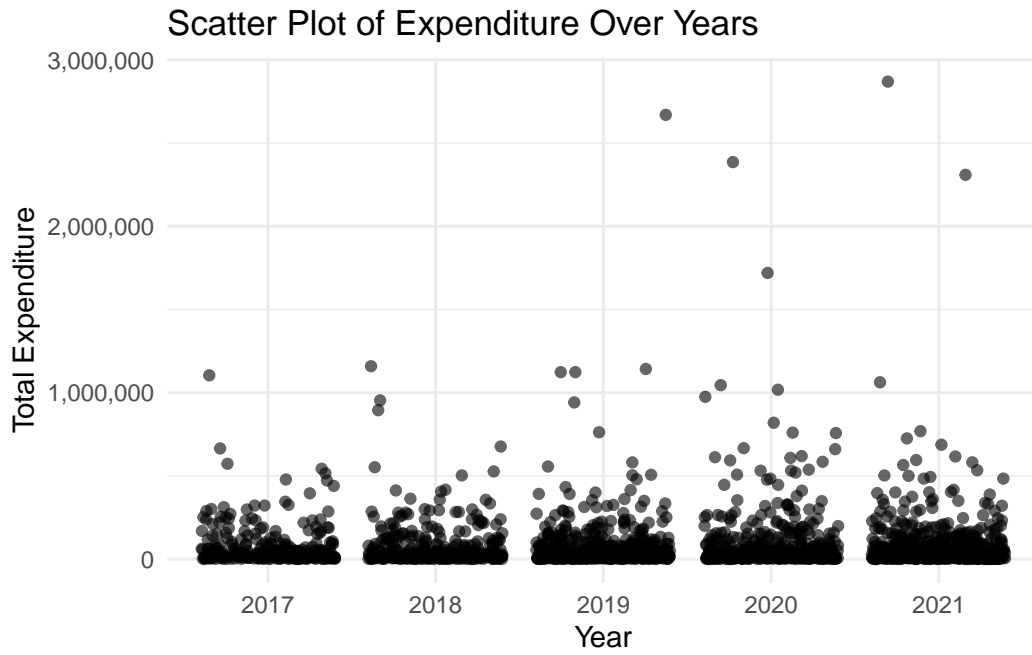


Figure 3: Scatter plot of Expenditure Over Years

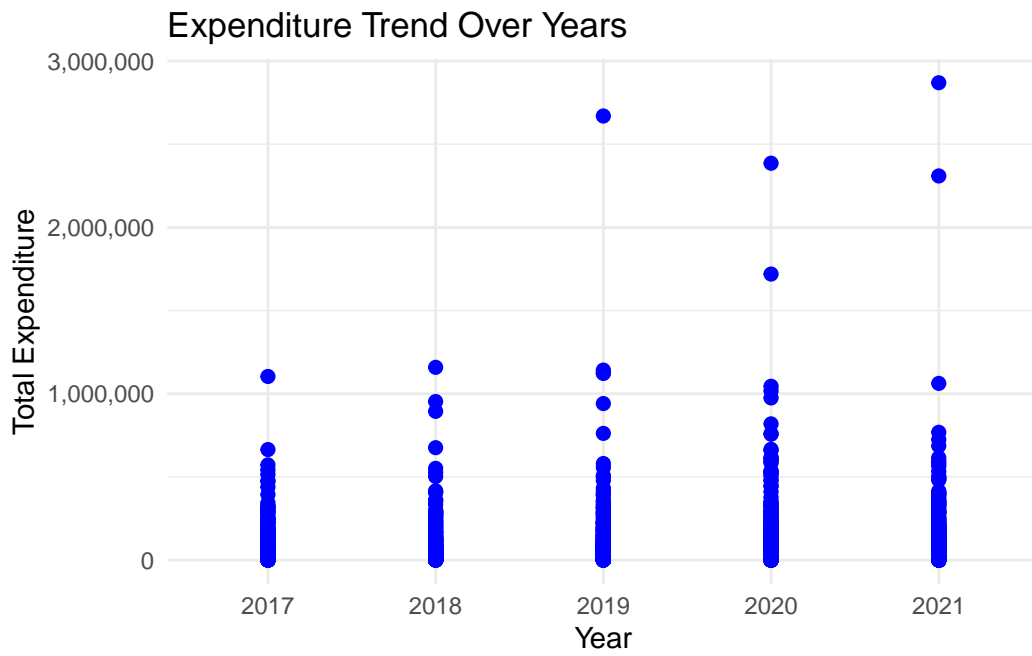


Figure 4: Trend plot of Expenditure Over Years

3 Discussion and Results

3.1 Consulting Expenditure trend with respect to Budget Type

We can see in the summary table (Table 2), that the consulting expenditure cost with capital budget type has always been relatively higher than the operational budget type. A capital budget is the system which is used by businesses to decide on long-term upgrades and replacements where as operational budget is a company's financial plan for its day-to-day expenses.

This clearly means that a higher amount of money was expended on Consulting firms for the purpose of long term capital budgets than the operational budgets. It can also be seen that the consulting expenditure for both operational and capital budget has always increased from year to year, except for 2021, where the consulting expenditure for Capital decreased. It is also noted that the consulting expenditure amount for Operating budget has doubled in 2021 compared to 2017's expenditure, whereas there has not been a higher increase from 2017 to 2021 in consulting expenditure for capital budget.

3.2 Expense Category relationship with Total Consulting Expenditure

It is evident from the graph (Figure 1) that Technical as well as Management or Research & Development are the areas, for which majority of consulting vendors are hired and paid for. This means, that these are the two areas where City of Toronto is primarily focusing on within the past recent years as part of development. It can also be seen that in these areas the amount of consulting expenditure in 2017 versus the amount of consulting expenditure has drastically increased. Back in 2017, City of Toronto expended approximately 700,000 dollars on consulting services for technical, however, in 2021 they spent over 2 million dollars. Also for Management or R&D consulting expenditure, the City spent approximately 1 million dollars in 2017, whereas, in 2021 they increased it to approximately 3 million. Creative communications is the area, where least amount of total money is expended for consulting services. It is also worth noting, that Information and Technology consulting expenditure has drastically increased in 2021, compared to other years.

Overall, it can be visualized even by pie chart (Figure 2) that the consulting expenditure was maximum for Technical, followed by Management/ R&D, followed by Legal, followed by IT and lastly Creative Communications over the span of years. Hence, this can be used to understand City's performance and efficiency.

3.3 Total Consulting Expenditure trend over the years (2017-2021)

In order to study overall general trend for consulting expenditure over the years from 2017 to 2021, we plotted scatter plots(Figure 3,4), which showed that each year money spent on consulting vendors and services has increased from year to year. It seems there has not been a

significant increase from 2017 to 2018 consulting expenditure. This overall signifies that City of Toronto has allocated a higher budget for consulting purposes each year, meaning they have expanded and grown themselves in recent years.

4 Conclusions and Limitations

Based on the data analysis and results, it can be concluded that:

1. There has been a consistent increase in consulting expenditure over the years, indicating City of Toronto's growing reliance upon external experts.
2. The higher consulting expenditure in the capital budget type suggests a strategic allocation of resources for long-term upgrades and replacements.
3. Technical and Management/Research & Development are key areas of focus for consulting services.
4. Future studies could explore the impact of consulting services on specific projects or departments, providing more insights.

The limitations for this study are: 1. It focuses on the data from year 2017 to 2021. Changes in trends or patterns outside this period may not be captured. 2. External factors that could influence consulting expenditure trends, such as changes in government policies, economic policies, etc. are not taken into consideration.

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