

# The Use of Visual Analytics in Class Assignment: Singapore Charity Case Study

Desi Arisandi

*Singapore Institute of Technology, Singapore*

---

## Abstract

The change of business nature requires integration skills of business and other fields such as data science, statistic and information technology. To be able to produce highly competitive graduates, the accounting curriculum needs to embrace on analytic skills and data interpretation. However, introducing and teaching analytic topics to accounting students can be challenging as many accounting faculties might have not had the first-hand experience with the topic, and sample curriculums and textbooks in the subject are not readily available. This paper is trying to develop a case study as part of data analytics training for accounting students. The emphasis of the case study is visual analytics implementation with open-source charity data. Several teaching and learning settings such as requirement analysis, possible common mistakes, and overall challenges in class management are discussed in the study. With selecting Singapore charity organizations as the case study topic, there are two main objectives that this case study is trying to achieve, first is to increase the young generation's awareness of the charity functions and involvements. The second objective is to introduce the use of technology for the future accountant in understanding and managing datasets, especially the open-source data that more common with the transparency era. Utilizing data is extracted from the Singapore Charities Portal ([charities.gov.sg](http://charities.gov.sg)), the extracted data is from 198 charities across 7 sectors. Thus, this paper seeks to provide an overview of charities in Singapore holistically while attempting to induce business students major in the skill of data analytics.

**Keywords:** Not-for-profit accounting, charity organization, visualizations, data analytics

---

## 1. INTRODUCTION

Following the change in the technology and accounting industry, there is a strong requirement for business major students to have strong basic exposure to big data and data analytics. The inclusion of visual analytics in the assignment is to guide students on how to extract good quality information, analyze the underlying data, and present the data in the form of graphical. Furthermore, being conversant on analytical skills can also give graduates an edge in the job market.

Visual analytics or data visualization<sup>1</sup> as part of data analytic methods is gaining more popularity because the capability to enable users to browse, select, and visualize data with the easy-to-use application (Janvrin, Raschke, & Dilla, 2014). Data visualization tools are also able to produce an alternative avenue for accountants or auditors in presenting their findings. The narrative section of the audit or financial report for example, the visual content related to financial performances such as industry niche, warehouses or factories location, or raw material graphic can be presented with visualization instead of just text and number. Data visualization is also proven to be able to provide an effective solution for an accountant to visualize a vast amount of data and produce the managerial report and customize analysis.

---

<sup>1</sup> The term visual analytic and data visualization will be used interchangeable in this study.

\*Corresponding author. Tel.: +65-65921932; Fax: +65-65921190  
E-mail: [desi.arisandi@singaporetech.edu.sg](mailto:desi.arisandi@singaporetech.edu.sg)

In designing the case study, the teaching pedagogy is based on authentic learning and emphasized on the storytelling. Authentic learning is the teaching approach that utilizing technological tools to provide authentic learning experiences (Lombardi, 2007). The focus of authentic learning is to collaborate real-world data and problems to stimulate the learning environment and to provide constructive recommendations. Following the approach, students are assigned to collect the data set, to research the various information that can be quantitative and qualitative, to analyze the data, and to communicate the results.

The storytelling part is quite crucial for presenting the results. With a substantial volume of structured and unstructured data, to identify the trends or outliers are important but the most important is to be able to present or tell a story about the data. The design of the dashboard or visualization should be able to answer the assignment questions and “telling” or communicate the story of the underlying data. Besides the technical accuracy, a student will learn to intertwine between judgment and data exploration. The selection of chart and color are also part of identification about the storytelling skill from the students.

To stimulate the class’s interest, several famous examples or visualizations are displayed. One example that can be used is the cholera map of Dr. John Snow. A youtube animation video was used to tell this interesting story hence students able to understand the benefits of the visualizations, even for this case is to identify the source of death threatening cholera source that had taken more than 500 lives. The second example is the Figurative Map of the successive losses in men of the French Army in the Russian campaign 1812-1813 drawn by Charles Joseph Minard, recognized for his significant contribution in the field of information graphics in civil engineering and statistics. The famous 1869 Map of Russian campaign is able to display six types of data in two dimensions in those early days.

Regarding the research subject, the charity organization is selected to increase the young generation’s awareness of the Not-for-Profit entity. A charitable organization aims to relieve poverty or assist in the development of a community. The prime purpose of a charitable organization is to provide a public benefit. Since their purpose is to provide public benefit, they are essentially non-profit organizations. In Singapore, to become a registered charity, they must state their charitable objectives and disclose in their annual reports on how they achieved their goals. These reports must be made publicly available as the effort for public transparency. Recently, charities in Singapore have met with resistance when it comes to fundraising. Furthermore, the Commissioner of Charities (COC) passed a guideline to regulate commercial fundraising which possible adding complications for charities to adhere to for fund-raising.

The motivation of this research is to develop a case study that has meaningful experience for the students. The class material is delivered by using interactive media as a learning tool and a case study is designed to prepare them for real-world situations. The paper proceeds as follows. After the introduction section, the theoretical review will discuss prior research that is relevant to the study. Following the literature review, the case study is presented as an example of data visualization implementation in the class. Finally, the last main section is the conclusion and summary of the findings.

## **2. LITERATURE REVIEW**

Utilizing conventional method in teaching accounting is not enough to bridge the gap between classroom material and the industry requirements (Stanley & Edwards, 2005). Furthermore, with the high demand for accounting graduates that not only sound theoretical principles of accounting but also capable to demonstrate strong practical analytical mindset skills require a substantial change in the accounting curriculum. Before the use of data visualization, presenting accounting data is solely depend on the manual report or spreadsheet applications. These methods are only sufficient if the data is under manageable quantity and only limited to one source or type of data. Moreover, there is increasing demand from the stakeholders to have updated, integrated and interactive reports to assist in decision-making hence the need to use data visualization methods to visualize the data into dynamic and real-time dashboards cannot be avoided.

One important function that data visualization can provide for modern accountants is to provide supporting assistance in creating customize the report and producing real-time information to support senior management to make a timely decision (Janvrin, Raschke, & Dilla, 2014). Visualization often displays the problems underneath the data and make it more apparent. Furthermore, this method also enables human perception to link the pattern with the hypothesis development or exploration analysis. However, to have data visualization able to serve many benefits, accountants need to have a strong foundation of theoretical knowledge and comprehensive analytical skills.

The visual analytics is the integration of computer analytical skills and human ability to raise appropriate business questions and control the boundaries of the analysis. Analytic based on data visualization systems have enabled users to interactively explore and derive insights from large corpora of information by exploiting human visual perception and abstract reasoning (Gotz & Zhou, 2009). The analysis is also expected to shed light on unexpected and hidden insights, which may lead to beneficial and profitable innovation (Keim, Kohlhammer, Ellis, & Mansmann, 2010). With the advanced of technology, the combination of a theoretical and practical component in teaching material can provide an opportunity for the student to study closely to the real-world cases (Stanley & Edwards, 2005).

Color and simple expression to control the display are showing the quality level of student submission. Comprehensive and interactive for the user to explore for insights on his own. Not only the process to record the data, monitor the transactions, implement the standards, and analyze the result are raising in terms of complexity but at the same time, the demand to be more efficient and effective in the processing are expected from the profession.

Based on prior research, there is a four-level learning process in terms of analytics applications (Verbert, Duval, Klerkx, Govaerts, & Santos, 2013). The design of the case study is aiming to fulfill all level requirements. For example, level 1 is only focused on the data, which can be visualized as an activity to overview or just to display the data. Level 2 is data reflection by asking and assessing the benefit of the data. Level 3 is to emphasize the creation of new insights. And finally, the last level is to induce a new behavior not only due to IT skills but also the behavioral change because of the new discovered pattern or trends.

### **3. SINGAPORE CHARITY ORGANIZATIONS**

Charities are a non-profit organization whose primary objectives are to set up exclusively for charitable purposes and carry out activities to achieve these purposes which benefit the public. Based on the Charities Act, an institution may be registered as a charity if the organization complies with 3 following conditions. First is the purpose of the organization is being exclusively only for a charitable purpose. The second condition is that the organization has a least 3 governing board members, of whom at least two must be Singapore Citizens or Permanent Residents. Finally, the third condition is that the objects of the organization must be beneficial wholly or substantially to the community in Singapore. If organizations satisfied these conditions, they will be recognized as a charity organization and must apply to be registered within 3 months of establishment.

In Singapore, there are essentially two classifications or statuses of charities. The first category is charities that are registered charities (non-Institutions of Public Character (Non-IPC))<sup>2</sup>, the other being IPC charities. All registered charities are able to enjoy income tax exemption. Properties that are used for charitable purposes will receive exemptions from property tax in full or partially upon application and review by Comptroller of Property Tax. A registered Charity may apply for IPC status if their activities are beneficial to the Singapore community as a whole or not confined to sectional interests or group of persons based on their race, creed, belief or religion, unless with special approval by the Minister. Besides tax exemption, IPCs are able to issue tax-deductible receipts for qualifying donations to donors. Donors are able to claim tax relief from their assessable income based on the amount donated, at prevailing deduction rate. With this status, IPCs are more appealing to donors in attracting donations, which is in turn, these organizations are rightfully held to a higher standard of regulatory compliance and governance. The following table is the classification from the charity of council tier guidelines (The Charity Council, 2017).

---

<sup>2</sup> This paper will use the terms Non-IPC and registered charities interchangeably. Charities with IPC status will be denoted as IPC or IPC charities.

Table 1. Charity classification.

<b>Guideline 2011</b>				
<b>Charity Status</b>	<b>Basic I</b>	<b>Basic II</b>	<b>Size<sup>3</sup></b>	<b>Enhanced</b>
Non-IPC	<\$50,000	\$50,000-\$10 million	\$10 million or more	N/A
IPC		<200,000	\$200,000 - \$10 million	\$10 million or more
<b>Guideline 2017<sup>4</sup></b>				
<b>Charity Status</b>	<b>Basic</b>	<b>Intermediate</b>	<b>Size</b>	<b>Enhanced</b>
Non-IPC	\$50,000-\$500,000	\$500,000-\$10 million	\$10 million or more	N/A
IPC	N/A	<\$500,000	\$500,000-\$10 million	\$10 million or more

The code of governance in the charity sector refers to the framework and processes concerned with managing the overall direction, effectiveness, supervision, and accountability of an organization. It is important because it affects how a charity is run and the services that the organization provides. Moreover, the code helps charities to be more effective, transparent and accountable to their stakeholders. This code is meant for all registered charities in Singapore, which excludes exempt charities (for example: based on the current guideline is the charity with gross annual receipts or expenditure less than \$50,000) and self-funded grantmakers. The code is not mandatory, but they operate on the principle of ‘comply or explain’ that provides the opportunity for the charity to elaborate the reasons for not complying or indicate the future strategy to follow the code. The organizations are required to submit a Governance Evaluation Checklist and disclosure of this checklist is made available for public viewing. The checklist is organized into nine sections and the guidelines are tiered based on the charity status and size.

Table 2. Code of governance sections.

<b>Sections</b>	<b>Description</b>
Board governance	People that elected or appointed based on the rules to ensure charity’s compliance of relevant laws and regulations
Conflict of interest	Disclosure of the policies and procedures to declare, prevent, and address conflict of interest
Strategic planning	Vision and mission of the charity to provide benefit for the society and charity’s members
Program management	The strategic programs and activities to achieve the mission and vision of the charity
Human resource and volunteer management	Policy for the full-time staff and volunteer who manage charity operations and programs
Financial management and internal controls	Financial management and internal control policies to ensure legitimate resources allocation
Fundraising practices	Fundraising activities and procedures, including an engaging third party for fundraising
Disclosure and transparency	Charity disclosure of its mission, structure, programs, activities, finances, and other requested information
Public image	Charity continuously building a public image with its objectives

Charities rely significantly on donations and grants from individuals, government entities and other organizations to carry out their charitable activities. Charitable purposes include activities such as relief of poverty, the advancement of education, the advancement of religion, and other purposes that are beneficial to the community such as the promotion of health. They are expected to utilize their funding in an accountable manner, maximizing benefits to their targeted beneficiaries therefore the submission of financial information and code of governance on the COC data repository. The reported financial information consists of 3 years of data and submission status whether it is no submission, late submission, or received the submission. Besides the code of governance and financial information, charity organization also need to submit their organization profile to provide detail information regarding their legal status and organization structure.

#### 4. CASE STUDY

The case study is designed for accounting students with the pre-requisite of the introduction level of financial accounting. The requirement to ensure students understanding in basic financial statements. Although the structure of charity financial reporting is quite standard, several account names are different compare to the commercial reports hence the need for the instructor to explain the chart of account or reporting template of charity entity. At the beginning of the class session, students need to explore the charity disclosures, from the organization profile, code of governance and financial statements. Furthermore, the briefing regarding the procedure of how to collect the data is also needed to discuss in the class to guide students in adjusting to the new process of data collection.

<sup>3</sup> Total gross annual receipts or expenditure, whichever is higher.

<sup>4</sup> Effective date is 1 January 2018

In the prior term, the assignment always utilized the “ready” data that already prepared by the instructor hence students skip certain parts of data management.

#### 4.1.1 Data Management

As per the instructions stated on the assignment brief, students are required to collect 210 charity data from all sectors (Appendix 1) with the timeframe of the dataset spans from 2016 to 2017. The average number of collected data per sector for both IPC and Non-IPC would be 30. However, students should be experienced the problem in data collection because it is common for certain limitations to exist in real data collection. This experience is one of the learning points that students need to understand.

From the 210 data point requirement, students are only able to extract 198 completed charity data that can be used for the purpose of analysis. The 12 charities primarily lack financial data or other relevant data that prevent users to draw sound conclusions. Of these 12 charity data, 8 of these are classified under the Sports sector and lacked financial information. Of the remaining 4 remaining deleted data, 3 came from the Community sector (no financial data) and 1 Non-IPC charity from the Arts and Heritage sector (no report submission). The following table will show the breakdown of the count of charities in the final dataset.

Table 3. Data overview.

Sector	Count	IPC	Non-IPC
Arts and Heritage	29	15	14
Community	27	15	12
Education	30	15	15
Health	30	15	15
Others	30	15	15
Social and Welfare	30	15	15
Sports	22	15	7
Total	198	105	93

Besides the tabular format, students should be able to develop a simple bar chart (**Error! Reference source not found.**) to display the proportion of the data that they have collected. Furthermore, the colors for every sector can be arranged to be consistent through the assignment.

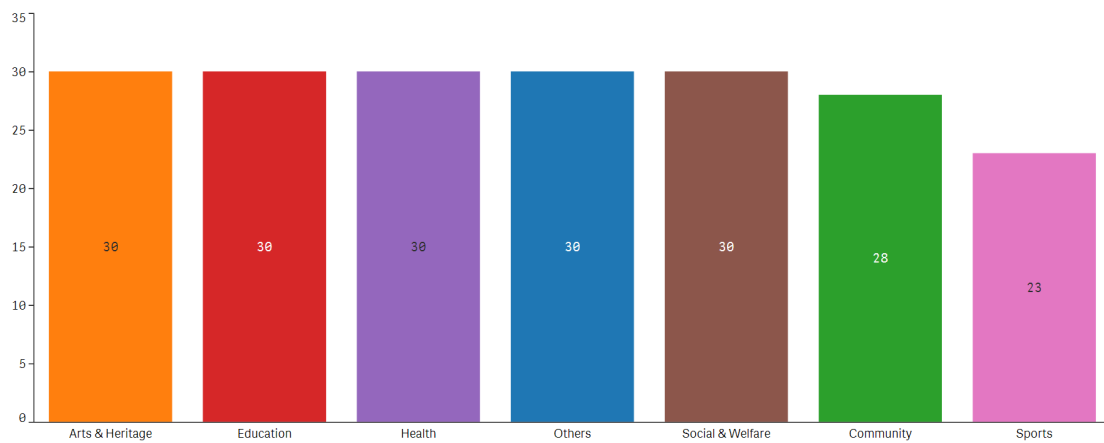


Fig. 1. overall trend of charity organizations

#### 4.1.2 Charity Sector Overview

From the collected data, the instructor is able to guide students in exploring the trends within multiple periods (time series analysis) or cross organizations. The following table displays the accounts summary for the charity organization (Office Commissioner of the Charity, 2013).

Table 4. Charity organization's accounts summary.

Accounts	Description
Receipts Category	
Donations in Cash	Donation in the form of cash, cheques, drafts, postal orders and any monetary instruments received by the charity without any use restriction from the donor.
Donations in Kind	Donations or gifts other than cash
Government Grants	Grants issued by the government
Investment Income	Resources from incoming assets
Program Fees	In this context, program fees refer to the fees collected from the residents (ie. Resident Fees)
Other Income	Other forms of income
Expenses Category	
Fundraising Expenses	Consists of direct and indirect expenses. Direct fundraising expense is for the cost directly incurred and paid for in the fundraising. Indirect fundraising expense is the personnel and administrative cost to support fundraising activities
Program Expenses	Resources applied by the charity to meet its charitable objectives. The costs include direct costs and support costs. Direct cost is the cost incurred directly because of the program activities. While support cost is the cost to support the activity but not the primary cause of the outcome.
Assets	
Land and Buildings	Land and building owned by the charity. Buildings are recorded minus accumulated depreciation or impairment losses (for the market value)
Other Tangible Assets	Other tangible assets example furniture, equipment, or vehicle. Similar to the building, this category is also recorded minus accumulated depreciation or impairment losses (for the market value)
Investments	Is an asset held by the charity for the accretion of wealth through interest, royalties, dividends or rentals
Inventories	Assets with the characteristics: held for sale in the ordinary course of business, in the process of production for such sale or in the form of materials or supplies to be consumed in the production process or in the rendering of services
Accounts Receivables	Refers to amounts owing to the charities either for supplies of goods and services provided or for grants/donations receivable at financial year-end
Cash & Deposits	Include saving in a banking institution and term deposits
Other Assets	Other assets, examples: prepayments, rental deposits, or utility deposits
Liabilities	
Current Liabilities	Present obligation of the charity with the duration of less than twelve months
Non-Current Liabilities	A liability that needs to be settled in more than twelve months after the balance sheet date
Funds	
Unrestricted Funds	Funds that can be used at the discretion of the governing board member in align with the charity objectives.
Restricted Funds	Fund that subjected to a specific trust
Endowment Funds	Capital fund that is to be retained for the benefit of the charity. Generally, comprise of permanent and expendable endowment funds.

Based on the treemap below, the Education sector (color: Yellow) received the largest portion of total donation in cash in the years 2016 and 2017. On the contrary, the Community sector (color: Green) received the least amount of total donation proven with the smallest area in the treemap. The following are examples of the potential underlying reason for the trends. The total cash donations received by the different sectors in 2016 and 2017. Total donations in cash have increased from 2016 to 2017 for 5 sectors: Community, Education, Health, Others and Social and Welfare sectors. On the flip side, cash donations for the remaining two sectors have a decreasing trend in 2017. Arts and Heritage saw a decrease of \$14.23 million while Sports saw a decrease of \$4.3 million.



Fig. 3. total cash donation 2016 and 2017

#### 4.1.3 Example Analysis: Research External Information

Charities in Singapore face downward pressure on their donations due to the volatile economy condition experienced in 2016/2017, there is the probability that government decision may significantly influence grants and income for certain sectors, or major activities can trigger public attention to particular sectors. The analysis can be varied from different aspects.

Based on the 2017 COC annual report, there was an increase of total tax-deductible donations in the year 2017 at \$1,051.90 million compared to 2016 which was at \$865.6 million (MCCY, 2018). The reason for this increment in donations may be due to the benefits gained from donations (tax deductions). The government decided to extend the 250% tax deduction for qualifying donations from 1 January 2016 to 31 December 2018 (MOF, 2017). This means that, for every \$1 of donations made, \$2.50 will be deducted from one's taxable income, causing the increase in donations for 2017.

#### 4.1.4 Example Analysis: Research External Information

Another justification for the increase of cash donations may be due to new digital alternatives for these donations. A prime example is Give.asia, which is a platform established by the National University of Singapore (NUS). The platform saw an increase in their donations by more than 100% from 2016 to 2017 (Straits Times, 2017). Digital donations have assisted in increasing the number of donors, as most are more comfortable with the anonymity of giving online. However, even with the optimistic signs of increment, Singapore charities are still facing an uphill battle of fighting for donations in a saturated charity industry and an increment in the general cost of living over the years.

#### 4.1.5 Specific Tier Status

In this analysis, students need to filter the collected data only for the two top tiers charity category: enhanced and advanced. The objective is to assess students' ability in filtering the subset of the data. The whole analysis should be done with one data source, but students should be able to split the data to accommodate the assignment requirements and develop an association for the subtables. The linkage (**Error! Reference source not found.**) between sub tables are important, because the data structure in the visualization tool (qliksense) are affecting the quality of the dashboard.



Fig. 4. example of data associations

The following figure is the chart that represents the number of organizations categorized in enhanced and advanced tiers according to their annual income or expense in the year 2016. The requirement is only to display a one-year period to test whether students have created the correct database to upload to the qlik sense data management. After developing the chart, students need to discuss and review the result, hence the need to obtain the different sources of information, such as online news or government regulations.

52.02% (103 of 198) that were used to sample the data have been categorized in enhanced and advanced tiers in terms of their income level in the year 2016. This complements the COC Singapore's Annual Report that stated that less than 50% of charities were small. However, it may not best reflect the entire population due to a key limitation, which is the sample size that can potentially deviate significantly compared to the actual population analysis.

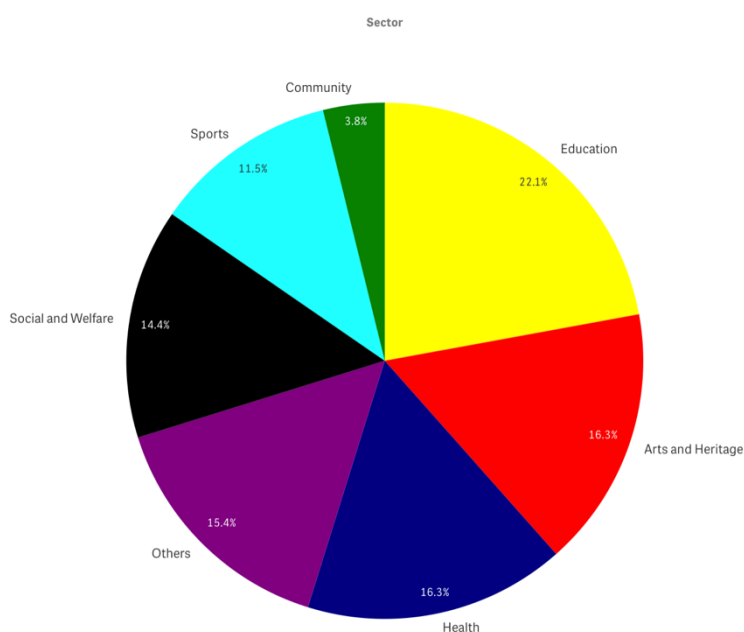


Fig. 5. proportion of enhanced and advanced tier in 2016

#### 4.1.6 Example Analysis: Research External Information

The Education sector (color: Yellow) has the greatest number of organizations that have been categorized in these enhanced and advanced tiers (22.1%). This may be explained by the high amount of government grants received



or could be due to the presence of large educational institutions as these students are heavily subsidized under the Tuition Fee Grant Scheme. Both Arts and Heritage sector (color: Red) and Health sector (color: Dark Blue) hold 16.3% of the number of enhanced and advanced income bracket charities. The figure from the sector Arts and Heritage is relatively significant and may be explained by the contribution from the Cultural Matching Fund (CMF). Established by the Ministry of Culture, Community and Youth (MCCY) in 2013, CMF provides dollar-for-dollar matching grants for private cash donations to the organization under Arts and Heritage sector (MCCY, 2019). For the health sector, which is the second-highest amount of total donation in cash for the year 2016, the MasterCard survey (Chong, 2017) found out that assisting those with a serious illness is one of the other main causes consumers in Singapore would support and donate for.

#### 4.1.7 Expenditures Comparison

To identify the movement trend from one year to another, students are guided to use the waterfall chart. The chart below is one of the examples of the use of waterfall charts to display the movement of total expenditure from 2016 to 2017 for each charity sector. The waterfall charts have provided us with a quick understanding of the total expenditure for each sector in both the years 2016 and 2017.

#### 4.1.8 Example Analysis: Linking to the Prior Analysis

Overall, there is a positive movement of the waterfall charts, meaning that there has been an increase in expenditures for all sectors for the two-years. However, two sectors had cut down on their expenditures, namely the Arts and Heritage (color: Red) and Sports (color: Light Blue) sector. This analysis can be supported by the prior analysis of total donation in cash, where the treemap has allowed us to spot a trend that these two sectors also had a decrease in their total donation in cash from 2016 to 2017. Thus, we can infer that since they had a decrease in their total donations, which results in a decrease in income, the 2 sectors may not be willing to spend as much, thus resulting in the drop-in expenditures.

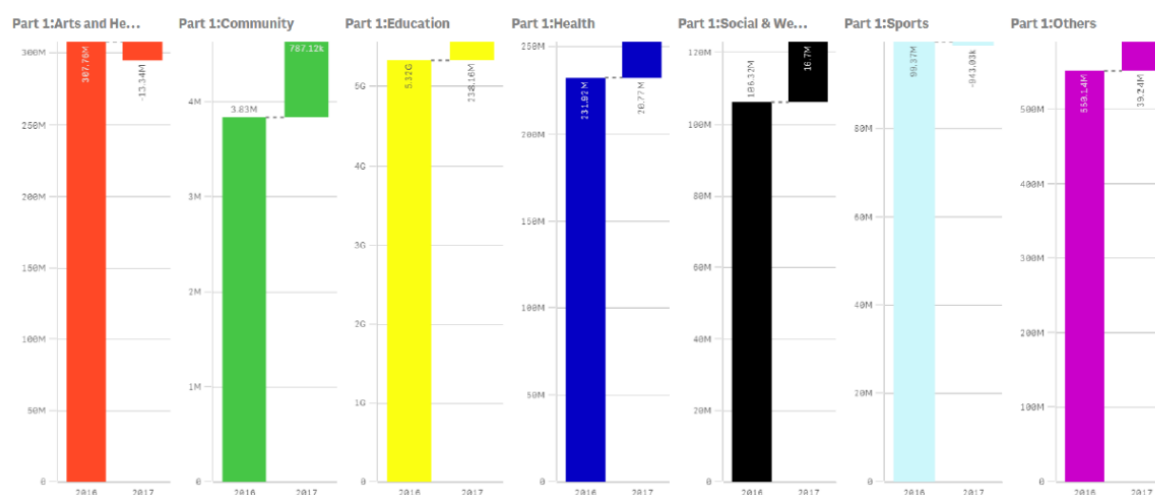


Fig. 6. expenditure trend 2016-2017

#### 4.1.9 Common Size Ratio

The Common Size Ratio Analysis would allow students to see how each item in the financial statements as a percentage of an appropriate corresponding total, or base amount, within the same year. With this assignment, the student is guided to implement vertical analysis using charity data with the focus only on the balance sheets item.

#### 4.1.10 Example Analysis: Comparison Analysis

Across the sectors except for the Education sector, the category of Cash and Deposit appears to account for the largest proportion of assets at nearly or more than half of the total. The Others sector, in particular, had 78.51% of their total assets in Cash & Deposit. On the other hand, the "Education" sector has the least at 13.98%. This could be due to the majority of the assets for the Education sector mainly lies in Investments since their expenditure could be focus mainly on improving quality and achieving objectives of education.

As for funds, the Community sector (color: Green) has shown the largest proportion of funds in unrestricted at 96.46%, suggesting that their expenditures would actually be free and unrestricted by donors to be used in certain areas. The Education sector, opposite of the Community sector, only has 15.10% of unrestricted funds since their government grants and cash donations are the highest as identified by the previous analysis which then suggests that expenditures could be subjected to approval by rules and regulations. Education was also the only sector with Endowment funds where Universities and other Not-for-Profit groups would constantly need to withdraw from the invested fund to utilized for specific needs to further enhance operations.

Lastly, only Arts and Heritage and Education sectors have more Non-Current Liabilities as compared to Current Liabilities. This could be due to the charity organizations in the Education sector requiring a large expenditure to sustain and therefore required to take on some long-term debts. As for Arts and Heritage sector, government grants and cash donations might not be sufficient for the charity organization to sustain their expenditure, and as a result, may also require taking on more long-term debts.

Dashboard 2: Comparison Analysis of Charity Organizations

Part 2: Common Size Ratio Analysis Balance Sheets

Sector	UEN	Year	Values															
				Land and Buildings	Other Tangible Assets	Investments	Inventories	Accounts Receivables	Cash & Deposits	Other Assets	Total Assets	Total Unrestricted Funds	Total Restricted Funds	Endowment Funds	Total Current Liabilities	Total Non-Current Liabilities	Total Fund and Liabilities	
Arts & Heritage				24.21%	12.41%	19.87%	0.00%	1.99%	40.10%	1.42%	100.00%	49.71%	14.13%	0.00%	15.84%	20.32%	100.00%	
Community				0.00%	0.00%	58.33%	0.00%	0.00%	41.67%	0.00%	100.00%	96.46%	0.00%	0.00%	3.54%	0.00%	100.00%	
Education				19.46%	2.20%	50.06%	0.00%	13.98%	13.92%	0.38%	100.00%	15.10%	1.26%	45.05%	7.39%	31.29%	100.00%	
Health				0.00%	11.35%	7.89%	0.00%	17.91%	59.66%	2.58%	100.00%	71.59%	5.44%	0.00%	17.78%	5.18%	100.00%	
Others				0.00%	15.16%	0.00%	0.00%	4.23%	78.51%	2.10%	100.00%	78.50%	0.00%	0.00%	15.19%	6.31%	100.00%	
Social & Welfare				0.00%	3.85%	1.71%	0.10%	5.33%	88.95%	0.06%	100.00%	61.18%	21.35%	0.00%	17.47%	0.01%	100.00%	
Sports				0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	

Fig. 7. common size ratio analysis

#### 4.1.11 Board Members

Use to distribution plot chart to display the average of how many board members for every sector and compare between IPC and Non-IPC. Students are also able to derive more analysis by connecting to other charts. Analyzing the distribution plot will depict that the average number of board members in charity classified as IPC will be larger than those without IPC status (Non-IPC). This is reflective of the fact that organizations that attained IPC status will be held to a higher standard, which requires more oversight, check and balances and operational reviews. They will also usually heavily comply with the Code. The average number of board members in an IPC organization is 11 while the average number of board members in a Non-IPC organization is at 8.

Further analysis may be drawn should we compare the relationship between the number of board members and the total income for that charity. From a logical perspective, we would assume that should a charity have more board members, they would have stronger oversight and will thus eventually lead to higher income (contributed through either grants or donations). Thus, sectors with the highest number of board members on average will tend to have more income (measured in donations and grants). However, according to our analysis, there was no relationship between the average number of board members and the total income generated.

Although Arts and Heritage have the least number of board members (for both IPC and Non-IPC organizations), they rank third in the total income generated; while the Education sector has their number of board member closer to the mean of the dataset, but they rank first in the total income generated. This is even more apparent when we look at the Community sector. Although they have the highest average number of board members, it did not translate to them generating more income. In fact, they were that sector that generated the least income across all 7 sectors. Thus, although there is a logical explanation between the status of the charity and the average number of board members, there is no relationship between board members and the total cash generated.

Dashboard 2 - Comparison Analysis of Charity Organisations

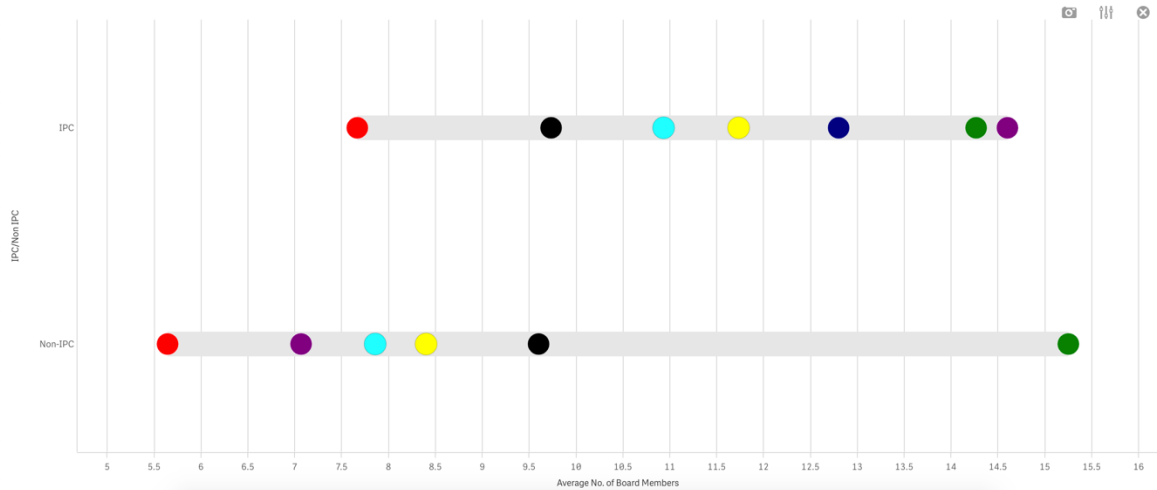


Fig. 8. distribution plot

#### 4.1.12 Code of Compliance

A pivot table can be used to display data with several subcategories. The following figure shows the code of compliance from the charities with tier and status categories. Students need to design the data structure starting from the biggest category, for example: as the filtering selection, data is arranged from the charity sector followed by the IPC or Non-IPC status and then the charity category. The right panel is the number of charities that follow the filtering selection. The instructor also needs to incorporate basic color script to arrange the font color based on the category, for example green color is compliant and red is for non-compliant.

**Code of Compliance**

Sector  IPC/Non IPC  [Compliant or N...

Income Category

	Compliant	Non Compliant
Arts and Heritage	29	-
Community	24	3
Education	30	-
Health	28	2
Others	30	-
Social and Welfare	30	-
Sports	14	8

Fig. 9. pivot table code of compliance

#### 4.1.13 Example Analysis: Comparison Analysis

When comparing between IPCs and Non-IPCs, there are generally more IPCs complying with the code. This is logical as IPCs would be held to a higher standard especially with the purpose of maintaining status and upkeep the public trust to continue receiving grants or donations.

#### 4.1.14 Employees

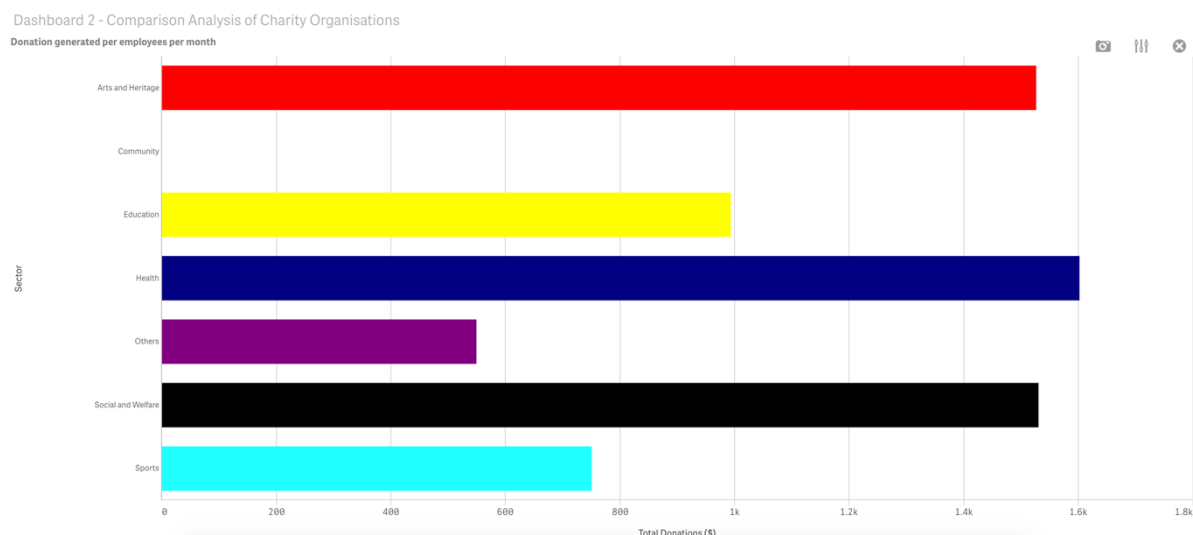


Fig. 10. bar chart for employee performance

The objective of the above figure is to provide a comparison, across the different sectors regarding cash donations generated per employee in a month for 2017. This chart looks simple but the data management behind this chart needs further attention from the students. To collaborate between total donation for the specific year and number of charity human resource, the analysis needs to develop a linkage between two sub tables data. If the student is able to create this collaboration, then the subtables are linked because of the primary key.

#### 4.1.15 Example Analysis: Comparison Analysis

Based on the data collected, the Education sector can be seen to have raised \$994 worth of cash donations per employee in a month despite having 27,170 employees. This data was relatively low as compared to the remaining sectors which had a lower number of employees. It is thus possible that, as a result of it having access to a larger amount of grants, the sector requires lesser cash donations from its donors. This is further supported by the financial statements of the respective IPC charities (in the Education sector) where the companies received a substantial amount of grants and cash donations in kind.

The difference between Others and Sports sectors are noteworthy as although it displayed a marginal difference of \$201 in the total cash donation generated per employee in a month, there was a significant difference of 7,222 in the number of employees. The employees in the Sports sector had to work harder to raise more funds as a result of the limited grants given by the government. This can be seen on other occasions as well. Griselda Khng and Olivia Chen, Singapore Sailing 49erFX class duo, failed to obtain a grant from Sport Singapore's Sports Excellence Scholarship to finance their training for Tokyo Olympics 2020 (Chia, 2018). As a result, due to the lack of support and insufficient funds gathered through crowdfunding, the duos had to obtain bank loans to sufficiently finance their training. Therefore, with that similar thought, it is possible that the employees in the Sports sector had to be more proactive in initiating a variety of programs to increase its fundraising as a result of being granted lesser government grants.

Another interesting data point that should be highlighted would be the Social sector. In spite of having only 1,360 employees, the Social sector was able to generate \$1,530 cash donations per employee in a month. This could be attributable due to:

- Implementation of SG Cares in late 2016 that was managed by the National Volunteer and Philanthropy Centre (NPVC) and National Council of Social Services. (NCSS, 2018) SG Cares's objective was to reach out to vulnerable individuals and families through the integrated delivery of social services and building. Hence, this was a good platform to create awareness for the citizens to understand more about such programs.
- NPVC also took the opportunity to engage 40 thoughtful leaders in the Social sector to explore innovative crowdfunding methods. Those efforts were deliberate and as a result, motivated the leaders to improve their fund-raising methods.
- In addition, the National Council of Social Service redesigned and redirected to the concept of "micro-volunteerism". This new structure enhances the flexibility of the professional and freelance volunteers' commitment as it enables them to choose their own schedules to volunteer such as designing a website

or driving a senior to the hospital. These micro-volunteering activities are typically driven by skill sets, social and peer groups, or location and other convenience based on decision factors. Hence, it becomes more convenient for volunteers to perform volunteering acts.

## 5. SUMMARY AND LIMITATION

This paper is presenting the design of the case study for teaching data visualization to accounting students. The case study will be describing the assignment setting, requirement analysis, common mistakes and issues in student works and challenges related to teaching on data analytic skills for non-IT students.

The case study can guide students to understand the data and underlying problems. However, for the instructors, two factors need to focus on: technical skills and problem-solving approaches. Technical skills mean the instructor has to understand that none of the students have an IT background hence the need to teach about the fundamental database or data cleaning process. The problem-solving approach means that the instructor has to find a way to entice students in participating in the discussion or analysis brainstorming.

However, there are some limitations that need to consider for this case study, first is there were insufficient data from the respective sectors. Therefore, the analysis might not be completed. The second limitation is because the visualization software that selected in this case study is mainly working on windows operating systems hence students with other types of systems need to use the cloud version or the class should be conducted inside the computer lab.

## REFERENCES

- Hong, C. (5 September, 2017). The Straits Times. Retrieved from Singaporeans most willing to support children's causes: <https://www.straitstimes.com/singapore/sporeans-most-willing-to-support-childrens-causes>
- Gotz, D., & Zhou, M. X. (2009). Characterizing users' visual analytic activity. *Information Visualization*, 42-55.
- Janvrin, D. J., Raschke, R. L., & Dilla, W. N. (2014). Making sense of complex data using interactive data visualization. *Journal of Accounting Education*, 31- 48.
- Keim, D., Kohlhammer, J., Ellis, G., & Mansmann, F. (2010). Mastering the information age solving problems with visual analytics. Goslar: The Eurographics Association.
- Lombardi , M. M. (2007). Authentic learning for the 21st century: An overview. Durham: EDUCAUSE.
- MCCY. (31 December, 2016). Charity Portal. Retrieved from Publications: [file:///C:/Users/user/Downloads/Commissioner%20of%20Charities%20Annual%20Report%202016%20\(3\).pdf](file:///C:/Users/user/Downloads/Commissioner%20of%20Charities%20Annual%20Report%202016%20(3).pdf)
- MCCY. (03 April, 2018). Ministry of Culture, Community and Youth. Retrieved from Publications: <https://www.charities.gov.sg/Publications/Pages/Publications.aspx>
- MCCY. (28 February , 2019). Ministry of Culture, Community and Youth. Retrieved from Cultural Matching Fund: <https://www.mccy.gov.sg/sector/policies/cultural-matching-fund>
- MOF. (04 December, 2017). Ministry of Finance. Retrieved from TAX DEDUCTION FOR DONATIONS: <https://www.mof.gov.sg/Policies/Tax-Policies/Corporate-Income-Tax/Tax-Deduction-for-Donations>
- Office Commissioner of the Charity. (2013). ACCOUNTING GLOSSARY S / N RECEIPT Donations Gifts to Charities / IPCs comprise of donations in cash and in kind. In order for a gift of property to qualify as a donation, the ownership of the property must pass to the Cash donations include cash.
- Stanley, T., & Edwards, P. (2005). Interactive multimedia teaching of accounting information system (AIS) cycles: Student perceptions and views. *Journal of Accounting Education*, 21-46.
- The Charity Council. (2017). Code of governance.
- Verbert, K., Duval, E., Klerkx, J., Govaerts, S., & Santos, J. (2013). Learning analytics dashboard applications. *American Behavioral Scientists*, 1500-1509.

### **Appendix 1. Charity Sectors**

---

Arts and Heritage	The Arts and Heritage generally consist of segments in Historical & Cultural Conservation, Literary Arts, Music & Orchestras, Professional, Contemporary & Ethnic, Theatre & Dramatic Arts, Traditional Ethnic Performing Arts, Training & Education and Visual Arts. They are largely focused on promoting and growing the local arts and heritage scenes.
Community	The Community sector generally consists of grassroots and community development councils among others. They are split according to their locations - South West, North West, Central, North East and South East.
Education	The Education consists of Local Educational Institutions/Funds, Foreign Educational Institutions/Funds, Foundations & Trusts, Uniformed Groups, Government-Aided Schools and Independent Schools.
Health	The Health sector consists of Cluster/Hospital Funds, Community/Chorionic SICK Hospital, Day Rehabilitation Centre, Diseases/Illnesses Support Group, Home Care, Hospice, Hospital/Statutory Board, Nursing Home, Other community-based Services, Palliative Home Care, Health Professional Group, Renal Dialysis, TCM Clinic and Trust/Research Funds.
Social and Welfare	The Social and Welfare sector consists of charities that support: Children/Youth, People with disabilities, Elders, Needy families and Support Groups.
Sports	The Sports sector consists of NSAs, Non-NSAs, Disability Sports, Competitive Sports, Mind Sports, Trust Funds and Youth Sports. They look to advance and promote the sports scene in Singapore.
Others	The Others segment consists of Animal Welfare, Children/Youth, Environment, Humanitarian Aid, Self-Help Groups, Think Tanks and other General Charitable Purposes.

---