

Use of annotations for storytelling with data in business

Introduction

Explanatory annotations, both visual and written, are an important part of the presentation in a visualisation. This report focuses on how annotations can help storytelling in business graphs.

According to (Kirk, 2012) a visualisation should help bring to light learnings from data that you wouldn't be able to get otherwise. In the context of storytelling, the visualisation's function is to explain, and the visual result should tell a story relevant to the audience. In business settings, the audience wants to be informed but also wants to use insights for decision-making. The visualisation should thus be designed for this purpose and annotations can be a useful design tool. They make the narrative more accessible and help maximise the potential insights.

The examples identified and described throughout this work are on the topic of travelling trends during Covid-19. As demonstrated in the literature review, there are many examples on this topic that showcase the use of annotations for storytelling; however, these are mostly in non-business settings. This report aims to fill this gap by exemplifying the use of annotations in business graphs on the same topic.

Through careful analysis of the theory around annotations, we have identified six key principles for effective use. We use this set of principles to critically analyse an empirical case. The analysis leads to suggestions for further improvement of the worked example. Our work concludes with suggestions for future work.

Literature Review

This report focuses on visualisations using data on travelling during Covid-19. There are many examples in literature from academic research papers, online research publications or news media, which explain the declining trends in travel during the pandemic. However, there are not many examples of business graphs targeted to clients on the same topic.

To better illustrate the differences in the use of annotations in business and non-business context, we initially present a visualisation from McKinsey on a different topic. McKinsey is a world leading strategy consultancy and the visualisation presented serves as a typical example of a business graph. We then present three examples of non-business graphs on the topic of travelling during Covid-19 and briefly assess their use of annotations.

Business graph example

Fig. 1 shows a graph from a 2020 McKinsey report on India's economy (McKinsey, 2020), which is characterised by (Moss, 2021) as typical of *"clear and insightful charts"*.

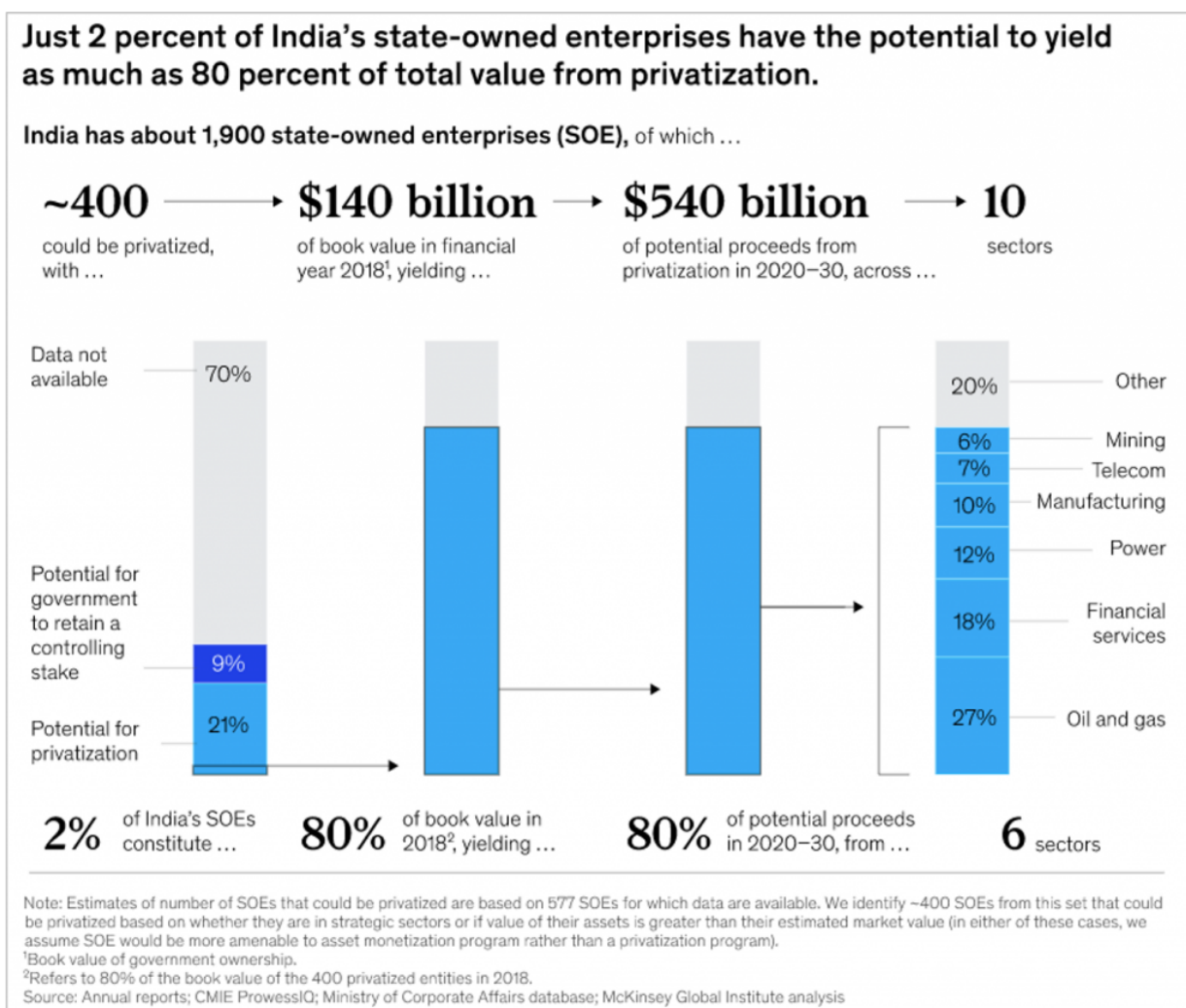


Fig. 1 – Business graph example from (McKinsey, 2020)

The graph is designed in a way that guides the reader along a path of key data points with annotations supporting this path. The top headline provides the key takeaway. The arrows and colouring of bars highlight specific parts that are important to the narrative. Finally, the footnote includes details on the source and assumptions behind the data. This is important in business graphs, as consultants often need to defend their findings to business executives (Moss, 2021). Overall, the McKinsey graph exemplifies the use of annotations in business graphs.

Visualisation in academic research papers

In academic research papers, the purpose of data visualisation is usually to illustrate research findings. The audience wants to be informed for the purpose of learning or to support policymaking. Aesthetics are less important and typography styles are occasionally set by journal editors. This results in annotations playing a small role in the presentation of graphs. They are used primarily for data clarity, to describe graph elements and to emphasize specific data.

Fig. 2 shows a graph from (E.R. Sepherd, S. Atherden, Theophilus Can, Loveridge, & J. Tatem, 2021), which analyses UK mobility trends using Facebook location data and examines the impact of lockdowns on travel patterns.

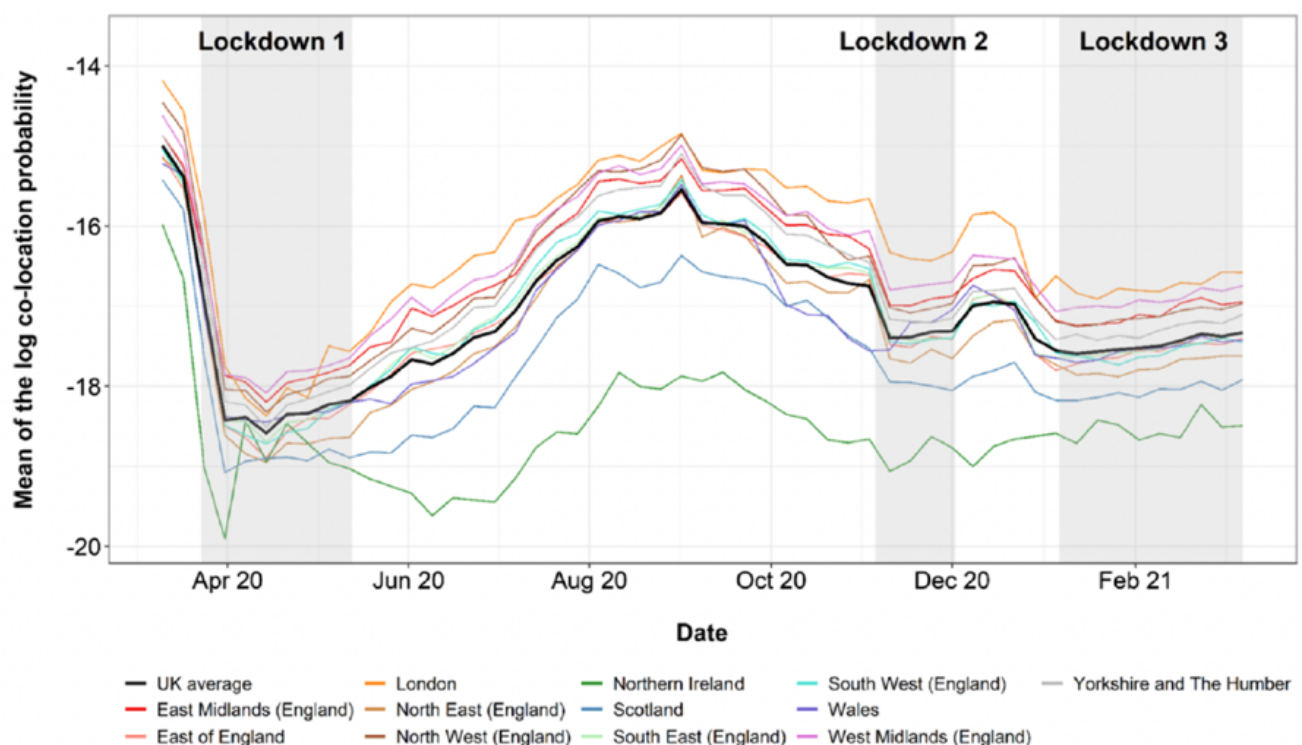


Fig. 3 Weekly average log co-location probabilities for Facebook users whose home location is within different UK NUTS level 1 regions and an average across all UK regions. Data included between March 10th 2020 and March 9th 2021. Summary statistics for each region are provided in Additional file 3: Table S1

Fig. 2 – Graph from (E.R. Sepherd et al, 2021)

This graph includes axes labels and a legend, but also has annotations that highlight specific parts. Three shaded and labelled areas draw attention to lockdown periods. Also, the figure description provides additional context on the data. This is a clear and informative graph; however, it wouldn't be suitable in a business context as it doesn't communicate the key message.

Visualisation in online research publications

Our World in Data¹ is an example of an open online research publication. Their analysis and visualisations are freely available; therefore, they need to be understandable and accessible by different people. Their purpose is to inform as accurately as possible, and annotations are critical in this. Aesthetics are more important than in academia.

Fig. 3 shows a chart by (Ritchie, et al., 2020), which analyses Google mobility data and illustrates how Covid-19 has changed the willingness of British people to visit different places.

How did the number of visitors change since the beginning of the pandemic?, United Kingdom



This data shows how community movement in specific locations has changed relative to the period before the pandemic.



Source: Google COVID-19 Community Mobility Trends – Last updated 4 April 2022, 16:50 (London time)
 Note: It's not recommended to compare levels across countries; local differences in categories could be misleading.
 OurWorldInData.org/coronavirus • CC BY

Fig. 3 – Graph from (Ritchie, et al, 2020)

The graph includes many annotations that make it easy to read. The title is a description of the data question, and the text below describes the data in more detail. The legend is clear, and the footnote includes details on the source. Overall, the graph's annotations focus on making it easily comprehensible rather than bringing out the key message. In a business context, instead of a description of the data question, the title would have the key message.

Visualisation in news media

News media and journalists use visualisations for storytelling of news to the public. Choices on graph presentation are often set by the narrative of the news story, which may need to provoke a particular reaction to make news catchier. Annotations play a key role in bringing

¹ <https://ourworldindata.org>

out key messages and in making the graph aesthetically attractive.

Fig. 4 shows a graph from (Financial Times, 2021), which is part of an article titled “*Travel sector braces for post-pandemic world*” analysing the impact of Covid-19 on the travel industry.

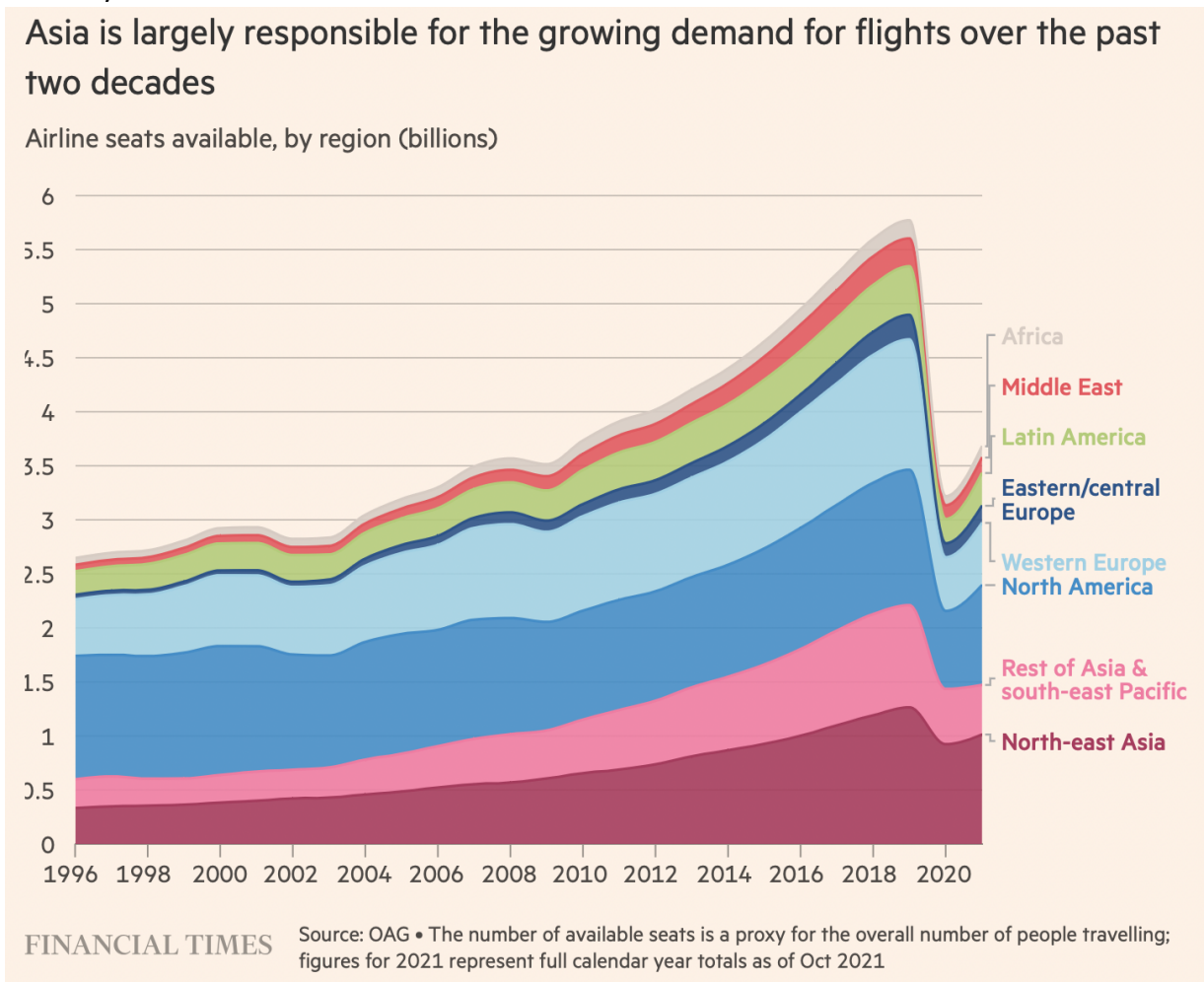


Fig. 4 – Graph from (Financial Times, 2021)

The graph is sufficiently annotated for readability; axes and legend are clear. It also includes details on the source and context about the data in the footnote. The top headline represents the graph’s key message followed by a description of the data. The use of annotations has similarities with McKinsey’s example. This is because the Financial Times is a news agency whose target audience is business people. The difference with a business graph targeted to a specific client would be in terms of the key message, which would need to be tailored to the client’s need.

Theory

Data visualisations leverage on humans' ability to process visual information faster and more efficiently than written information (Kirk, 2012). They are important in communicating information and they should be designed with the audience in mind. This means considering the audience's level of knowledge and providing enough context to assist them in understanding (Camoës, 2011).

In business settings, visualisations are used to tell a story but also encourage decision-making. Simplification and subitization are two important characteristics; business graphs need to present messages in a simple, clear, and complete manner to stimulate apprehension and quick action (Pollock & Campagnolo, 2015). They also need to be appropriately referenced, especially when presented by consultants.

Annotations form a visual presentation layer that can amplify the effectiveness of visualisations in storytelling. They can be graphical, textual, or visual and their role in storytelling is directly related to the way in which insights are captured and communicated (Ren, Brehmer, Lee, Hollerer, & Kyoung Choe, 2017). Some of the key functions they should provide are to explain key messages, to highlight critical parts of the graph, to provide relevant context and to improve aesthetics and memorability (Ren et al, 2017). Annotations should also help the reader to navigate the graph, provide extra meaning and communicate clearly the most valuable and relevant findings (Kirk, 2012).

While annotations can assist in storytelling, they could also impact data clarity. For example, too many data labels may clutter the graph. Cleveland (1985) discusses how graph elements should be used to convey information clearly. The main purpose is to visually show the data, highlight key messages in graphical form and draw attention to important data features. To ensure clarity, annotations should not clutter the graph region and should make the data stand out.

For the purpose of this report, we focus on the following annotation elements: title, labels, captions, visual elements (axes labels, reference lines, background shading, gridlines, tick marks), legend and references.

Based on the theory, we conclude in six key principles, which summarize how annotations can be used effectively in storytelling in business graphs. Annotations should:

1. **Help explain key messages relevant to the audience.** This can be done using titles or headlines.
2. **Highlight critical data or parts of the graph.** Captions are common but also visual annotations such as background shading or reference lines.
3. **Provide necessary context and references.** This usually means details on the data sources or assumptions behind the data. Footnotes are common for this purpose.

4. **Enhance aesthetics and memorability.** Visual and graphical annotations can be important in this case (e.g., use of icons or symbols), but also the overall structure of the graph region.
5. **Aid data clarity.** All annotations should be accurate and clear (e.g., in terms of labels or units). They shouldn't clutter the graph region. They should help make important parts of the graph more visible.
6. **Be simple but also provide enough detail to support decision-making.** Annotations should make the narrative relevant for a business audience.

Empirical Case

Fig. 5 shows a time-series bar chart showing the number of commercial flights during the pandemic for five European countries. This visualisation is intended for a consultancy report for a car rental company. The scope is to provide recommendations on the adjustment of the client's operations based on travel trends during Covid-19.

The annotation features used in this chart are highlighted in red. We will assess the design choices that led to them and their effectiveness, specifically around the key principles set earlier. We will also consider what could be done differently or additionally.

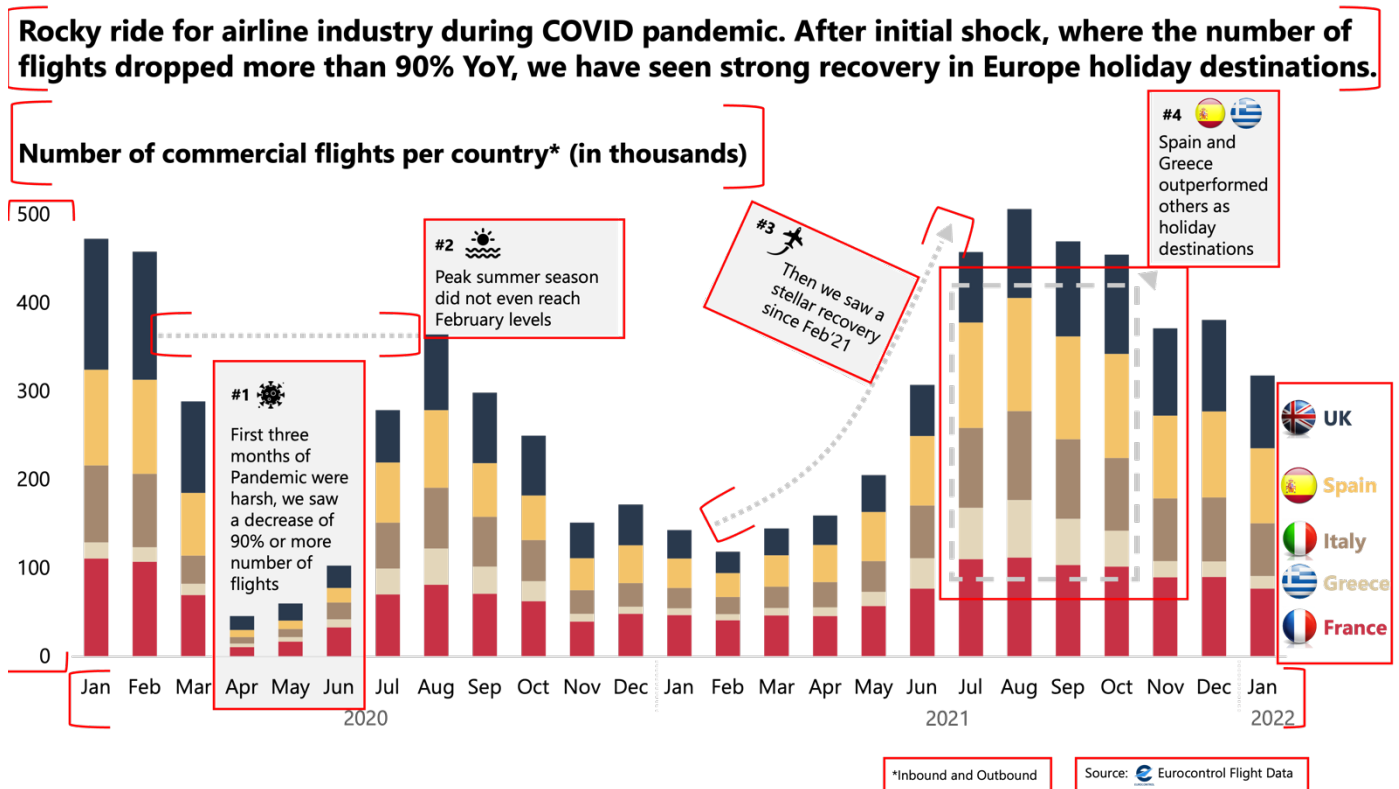


Fig. 5 – Empirical case visualisation

1. The headline clearly sums the key takeaway and is made relevant for a car rental company interested in international travel and holiday destinations.
2. Visual (background shading, dotted box), graphical (symbols), and written annotations (captions) are used to emphasize specific parts. These are grouped and numbered, which helps the reader to follow a set narrative. A dotted line is used as reference line for the value of total flights in August and a second dotted line is used as trend line going from February to July. Both are highlighting specific values or trends that are part of the narrative.
3. There are two footnotes: one explaining the data and one on sources. More detail could have been provided on references (e.g., link to the dataset) to

improve credibility of the data and findings.

4. The graphical icons (e.g., the airplane symbol in the 3rd caption) make the graph more attractive. The country flags help the reader remember the countries included.
5. The graph's annotations overall don't interfere with clarity. The chart title is accurate, and the legend is appropriate. However, there are no axes labels. Although units are displayed in the title, a units label could have been included on the y-axis to make it even clearer.
6. The design of the graph retains simplicity but also provides detail on the data where it is considered important. The 4th caption highlights the data for Greece and Spain in a way that could translate to actionable insight for the client (e.g., to adjust operations to focus on these two countries).

Overall, the design of this visualisation follows most key principles set earlier. It explains the key message and uses annotations to tell a story and enhance aesthetics. It is simple, readable, and relevant to the target audience and provides insights that could support decision-making. However, it could be improved by providing more detailed references on the data sources and adjusting some chart elements for clarity.

Discussion and Conclusion

In this report we presented examples of visualisations on travel trends during Covid-19 and analysed the design choices for storytelling. In the literature review, we presented examples from an academic research paper, an online research publication and a news agency and demonstrated the different use of annotations.

We analysed the theory on annotations for data-driven storytelling and concluded on six key principles that define how annotations can be used more effectively for this purpose. In the empirical case we critically assessed a visualisation against these principles. The target audience in this case was a business client. This assessment illustrated how annotations can support storytelling in business graphs.

Our work showed that annotations can be a useful visualisation design tool that makes the story more accessible to the audience and can optimise the communication of messages. This is particularly important in business settings, where graphs are used to instantly communicate insights and to determine actions.

Further work could be done to assess the individual role of annotation elements and how each element contributes to storytelling. Kirk (2012) provides a first-level analysis on the role and purpose of each annotation element, but without considering one to be more effective than the other. It can be argued that some annotation elements are more critical than others, depending on the visualisation purpose and target audience. Our work in this report has indicated that headlines and titles are particularly important in bringing out key messages in business graphs. It would be interesting to study which elements are more important in delivering a narrative in business graphs compared to non-business graphs.

Ren et al (2017) argue that there is limited awareness in the visualisation research community on the role of annotations in storytelling with data. Our work here aims to raise awareness and demonstrate through worked examples how annotations can be an important visualisation design tool.

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