CHARTS IN DATA VISUALISATION CAPITALISED IN ACADEMIC REPORT WRITING

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Abstract

Data visualization impacts decision-making and improves organizations. It refers to presenting data in graphical or pictorial forms, which will allow audiences to acknowledge patterns faster. Interactive visuals enable executives and experts to see through the layers of detail. It changes perspectives and users can review the facts behind the analysis. Reports coming from complex data visualization tools make it possible to encapsulate complex information on operational and market conditions in a brief series or even in a single graphic. Decision makers can easily interpret wide and various data sources. Interactive elements engage and inform professionals and business partners on problems and pending initiatives; this is the profile of the job market we are preparing our students for, hence teaching report writing to capitalize on information conveyed by charts and visual organizers proves to be very useful, as my didactic activity with undergraduates and master students this year has confirmed.

Key words: teaching report writing, enhancing student employability, data visualisation, decision-making,

Data visualization can even change organizations. It is highly effective because the human brain processes visual information more easily than written information. Using charts or graphs to summarize complex data grants faster comprehension of connections as compared to rich reports or spreadsheets. It provides a very clear form of communication allowing business leaders to interpret and act upon their information more rapidly. Data visualization tools can provide real-time data that are easier for stakeholders to evaluate across the enterprise. Faster response to market changes and quick identification of opportunities is a competitive advantage in any industry.

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Visual organisers readily provide higher quality information for report writing, so findings are communicated in increasingly constructive ways. Business reports submitted to the senior management are formal documents that are often inflated with static tables and a variety of chart types. They become so elaborate that they fail to make information vibrant and memorable for those whose opinions matter most. One benefit of big data visualization is that it allows users to track connections between operations and overall business performance. Thus everybody will better understand connections between operations and results. Finding a correlation between business functions and market performance is essential in a competitive environment. Managers can see where variances occur and immediately start devising a plan. In this way, data visualization allows executives to spot problems immediately and act fast.

Data visualization strategies constitute a new idiom in itself, so acquiring it together with report writing tools in English enable our students to extract relevant information and know-how from all available sources, thus enhancing their employability. In this way they can embrace newly emerging trends and become exposed to more opportunities in adaptable companies. By using big data visualization for monitoring key indicators, business leaders can more easily spot market shifts and trends in varied and large data sets. A key benefit of data visualization is that it exposes changes in timely manners, but unlike static charts, interactive data visualizations encourage users to explore and even manipulate the data to uncover less evident factors. This creates pro-active attitudes in the use of analytics. Team members actively explore related issues and correlate them to actual facts to identify the underlying causes of visible phenomena, and find ways to minimize their impact.

Data visualization also provides a ready means to create stories from the data. Thus the development of product performance over time in multiple geographic areas can be seen, making it easier to spot the units that perform very well or the ones underperforming. It allows executives to investigate specific locations to identify what is done well or poorly.

Such insights will be used to brainstorm marketing strategies by region to support higher performance overall. Big data visualization tools provide a more efficient way to use operational data. Changes in real-time performance and market indicators are easier for a wider audience of business leaders to recognize and respond to.

Here is a graphic representation of information report steps capitalising on data visualisation benefits, as I chose to teach it to both undergraduates and master students. It proved to be successful and incredibly useful, as other subjects do not teach but require it, and it is only English as

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a subject that explains the mechanics of academic writing more than other disciplines in Romanian schools.

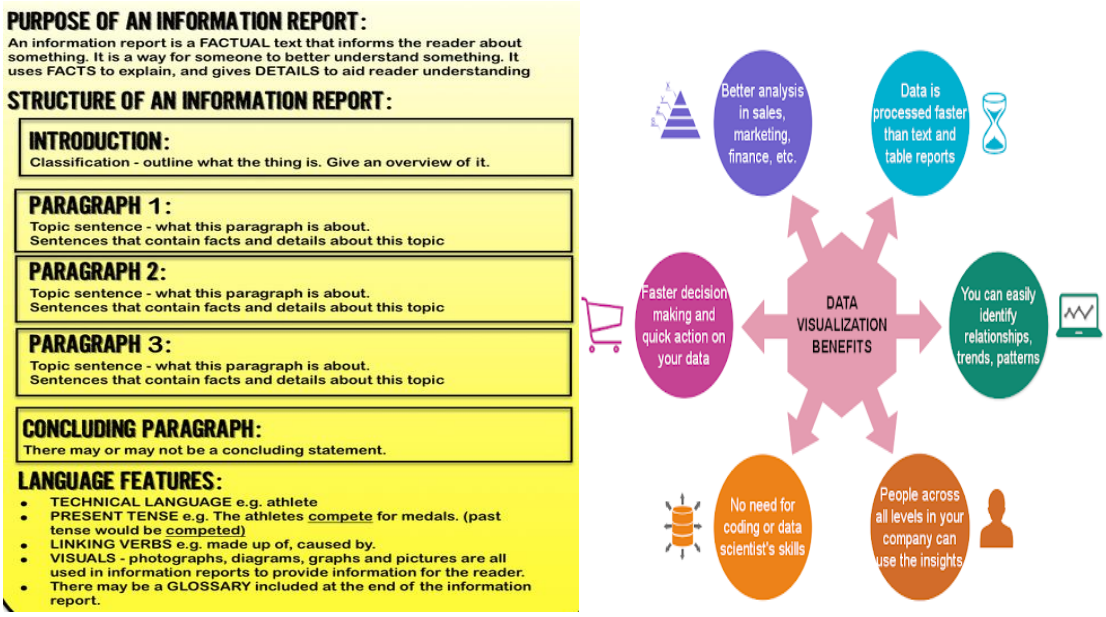


Fig. 1. Information report structure capitalising on data visualisation, cf. www.columnfivemedia.com

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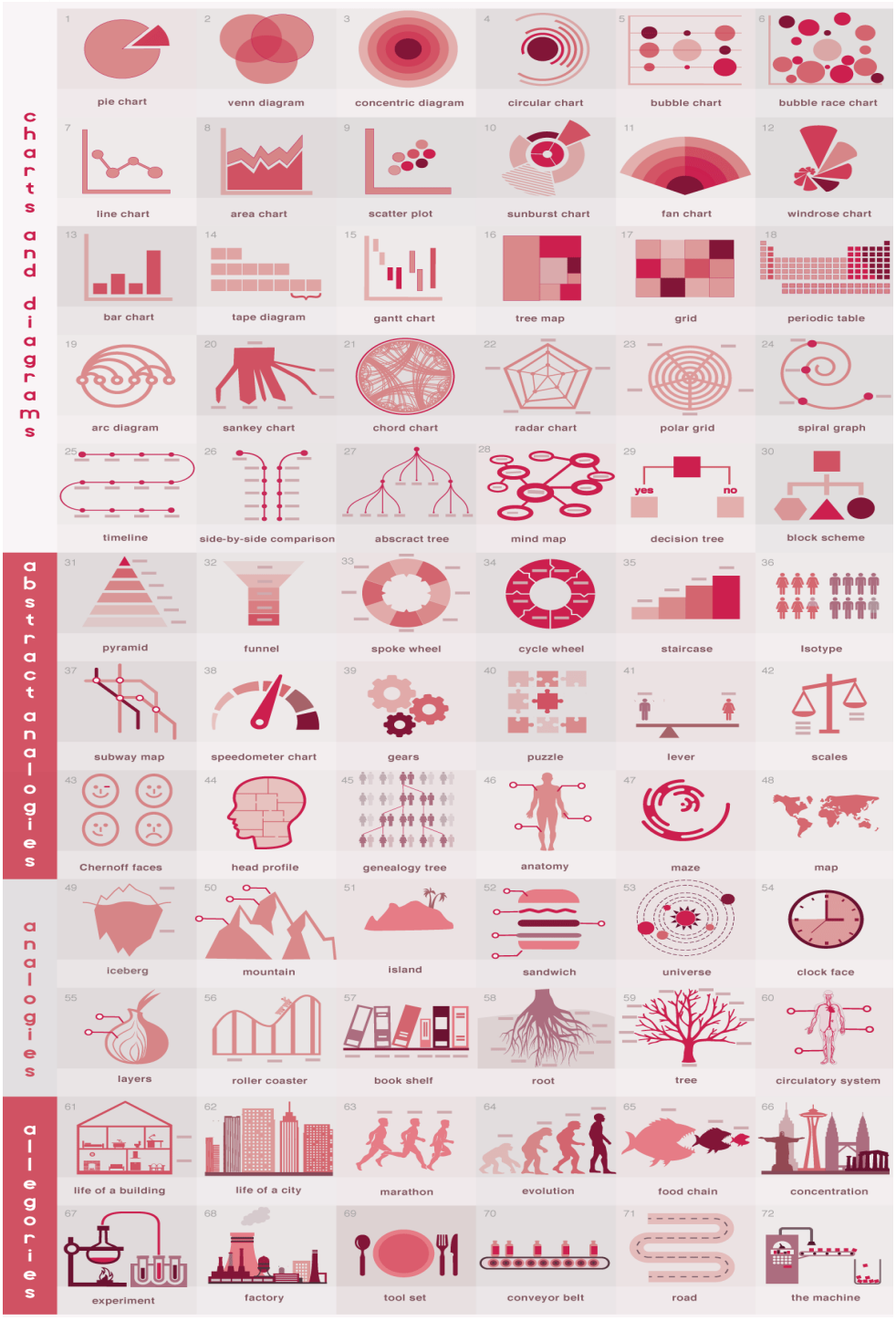


Fig. 2. How to think visually, cf. Ana Vital, Founders & Founders 2015

Charts and diagrams:

- Pie Charts: the most common, best with few slices
- Venn Diagrams: few overlaps best; do not show size
- Concentric diagrams: the middle is the essence and importance decreases going outwards
- Circular charts: compare length, cannot change the scale, good for schedules and time intervals

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- Bubble charts: circles in order of magnitude roughly compare quantities, budgets, populations.
- Bubble race charts give sense to bubble positions: the closer to the top, the better (y axis); both axes: closer to the top and further to the right, the best

- Line charts: show how something changes (versatile, abstract)
- Area charts for trend comparison: the difference in line charts by colouring spaces below the line
- Scatter plots to see clusters, outliers, where values fall
- Sunburst chart is a ring chart/multi-level pie chart/pie chart with hierarchy for periods in a period
- Windrose chart: how much goes into which direction.
- Bar chart: numbers as bar lengths.
- Tape diagram to show ratios: how one number relates to another
- Gantt chart for time intervals and their connections, or future predictions, or scheduling projects.
- Tree map to show a hierarchy: to visualize budgets, then budgets within them
- Grid for arranging things and a visual analogy where every cell is equal
- Periodic table: the position in a column & row carries meaning.
- Arc diagram: shows the interactions between any two nodes. It reveals patterns well.
- Sankey chart: line thickness represents numbers.
- Chord charts, like arc diagrams: interactions between 2 nodes. Line thickness: strong interaction
- Radar chart: spoke length shows a number, like a bar chart. Good for analyzing
- Polar grid: shows characteristics like a radar chart, but more spokes can be added
- Spiral graph is a time sequence: events closer to the present start furthest from the centre. Used for future predictions, evolution, history.
- Timeline: time sequence where events start at the top left corner, moving in a spiral. Used to visualize biographies, stories, and instructions.
- Side-by-side comparison: 2 parallel lines with points itemizing the differences between 2 things.
- Abstract Tree: to show hierarchies and groupings, for anything that has sub-types
- Mind map: anything can be connected to anything. Used for brainstorming or to show faulty logic
- Decision tree: how decisions flow from each other; a node shows the kind of decision that one is
- Block scheme = flowchart: shows a solution or an algorithm. The nodes call to action based on their shape. A rounded rectangle is start/finish, a diamond is a decision, a parallelogram is input or output, and a rectangle is a process. Use it for decision making, visualizations of strategies, court decisions, debates

Abstract Analogies are reminiscent of physical objects, but they are simplified and abstract.

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- Pyramid: a hierarchy where every upper layer is progressively smaller than every lower layer. Used to show social classes, how power and money are distributed in society.
- Funnel: the reverse of a pyramid.
- Spoke wheel, all spokes support the centre equally; order is unimportant: equal members/parts
- Cycle wheel: the never-ending nature of a cycle; unsure of what leads to what
- Staircase: the number of steps it takes to achieve something.
- Isotype: shows quantities in the number of objects/icons rather than by enlarging object size
- Subway map: how routes with multiple stops intersect, how theories connect
- Speedometer chart: how increasing the value of sth goes from safe to dangerous, from slow to fast
- Gears: moving one gear sets all others in motion. It is about leverage: sth small with big result
- Puzzle: how irregular pieces fit together despite looking like misfits.
- Lever: how a small thing can balance/outweigh a big thing. Good for negotiation, growth potential
- Scales: comparison, especially in decision making. Use it to show pros and cons,
- Chernoff faces: to understand people's motives, feelings, and familiarity. Every variable in the face (eye, nose, mouth) can be changed to convey information.
- Head profile: compartments inside the head, where thoughts reside and connect.
- Genealogy tree: abstract tree to trace lineage
- Anatomy: parts of an object/person, describing what each part does.
- Maze: tangled paths to a solution; there is more than one way out; to compare strategies, policies
- Maps can be used figuratively to show the world of the Internet Make a legend.

True analogies, looking like the physical objects people are familiar with

- Iceberg: visible part much smaller than the underwater one. Show effort/success/abstract process
- Mountain: a challenge where winning means climbing to the top.
- Island: an isolated process, clearly marked boundaries, complex life inside
- Sandwich: multi-layered entities with suspended levels to show ingredients (buildings, vehicles)
- Universe: things that revolve around a bigger thing without a visible force pulling on them
- Clock face: time divided into discrete parts.
- Layers: different levels that can be peeled off to get to the heart (how to get to the truth/secret)
- Roller coaster: things go from good to bad in a second, repeatedly (running a business, emotions)
- Book shelf: the size of books and the order show volume of information and priority
- Root: how something takes hold (ideas, immigrants, virus, celebrity)
- Tree with ever smaller branches: describe knowledge, the spread of ideas, evolution of species,
- Circulatory system: movement from the heart towards the outer parts

Allegories are stories or a series of analogies. They are familiar so we do not retell them

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- Life of a city: structuring inhabitants into grids of apartments, streets, and districts, while allowing for entropic movement along the sidewalks. Shows how a structure process works, combining the predictable with the random
- Marathon: a type of timeline, the state of things as the race progresses, especially at the final steps.
- Evolution=timeline, a gradual change something dramatically different than the start.
- Food chain: the big eat the small (company acquisitions, competition, budget reallocation)
- Concentration: compare things that never occur together
- Experiment: things connected in an unusual way, combined/separated/combined again
- Factory: a man-made environment. Use this analogy only if all the natural ones are not suitable.
- Tool set: describing how someone works or following a process
- Conveyor belt: automatically adds or subtracts something from a series of identical objects.
- Road: anything that can be broken down into steps can be visualized as a road.
- Machine: a man-made object.

The key to making visualizations reliable basis for reports is the new information. The best visual analogy is familiar to most people, has a structure, and matches the narrative path of the report story. Objects with fewer details are more familiar. Take all detail out of objects, and we are left with abstractions – graphs and charts. They are unemotional, and unmemorable. But it is a starting point, and a practical way to visualize information fast. Therefore, it makes sense to look at all visual information as a continuum from the detailed and familiar (trees, stars, cities, etc) to the abstract and simplified (charts and graphs). We can think of this continuum in the reverse because it takes less effort to create an abstract visualization.

Critical Thinking	**Evaluating, analyzing, and/or synthesizing relevant information to form an argument or reach a conclusion supported with evidence.**					
Category	**0**	**1**	**2**	**3**	**4**	**5**
Evaluating		**Minimally** determined the relevance and reliability of information that might be used to support a conclusion or argument		**Partially** determined the relevance and reliability of information that might be used to support a conclusion or argument		**Extensively** determined the relevance and reliability of information that might be used to support a conclusion or argument
Analyzing		**Inaccurately** interpreted information to determine meaning and to extract relevant evidence		Interpreted information to determine meaning and to extract relevant evidence **with some errors**		**Accurately** interpreted information to determine meaning and to extract relevant evidence
Synthesizing		**Inaccurately** connected or integrated information to support an argument or reach a conclusion		Connected or integrated information to support an argument or reach a conclusion **with some errors**		**Accurately** connected or integrated information to support an argument or reach a conclusion
Forming Arguments (Structure)		Made a claim and provided **incomplete** evidence to support it.		Made a claim and provided **partial** evidence to support it.		Made a claim and provided **complete** evidence to support it.
Forming Arguments (Validity)		The claim, evidence, and reasoning were **minimally** consistent with accepted disciplinary ideas and practices		The claim, evidence, and reasoning were **partially** consistent with accepted disciplinary ideas and practices		The claim, evidence, and reasoning were **fully** consistent with accepted disciplinary ideas and practices
Comments:						

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Fig. 3 Connecting data visualisation to critical thinking to facilitate report writing in academic level ESP,

cf. www.critivalthinking.org

Last, we know that we are visualizing information and read it, interpret it and convey it in reports, but data is something less than information. Knowledge is information that you managed to connect to your life experience. Information becomes knowledge once it is acquired, understood, used, digested, or otherwise experienced. In the end what matters is a strong connection to a mental image. This connection explains the information you are visualizing without you having to tell it.

This article summarises the sources, student feedback and creative personal didactic effort to provide modern and effective ways to cultivate ESP report writing skills for academic levels, that my students might be able to use in their future careers, to enhance their employability.

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