

The Relevance of a Cartographer in a Data-centric Marketplace

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Abstract. Geographic data (geodata) comes in many flavours. Whilst topographic products are ideal for cartographic display, many other datasets are more difficult to visualise.

The following report seeks to analyse three new applications of cartographic design and development: Cartography in understanding geodata, cartography in marketing geodata, and cartography in new-media reporting.

What all three have in common is the visual representation of geographic or location-based data to an audience that may not have specifically sought a map, will rarely be cartographic and is perhaps unlikely to have expected such visual interaction.

The paper showcases examples and makes arguments for the relevance of a cartographer in each situation, concluding with an evaluation on whether these arguments can be validated and substantiated and what that means for our industry going forward.

Keywords: Geodata, visualisation, stylesheets, marketing, storytelling

1. Introduction

From deciding which pub-restaurant to visit in Britain on a Sunday afternoon to managing disasters and emergencies such as the 2011 Tōhoku earthquake and tsunami; from managing local business assets to enabling national economic development; knowledge about location and spatial relationships is fundamental to modern human decision making. ‘Without maps, we would be spatially blind’ (Gartner 2013).

In April 2014, I volunteered to help the British Cartographic Society (BCS) run one of their Restless Earth workshops for schoolchildren. The disaster

planning exercise is centred on the city of Sendai in Japan, three days after a major earthquake and tsunami hit. Aside from the obvious and real benefits of the workshop, what has struck me ever since is how it proves the value of cartography in representing information efficiently, in selling an idea and in clearly communicating a story or plan of action.

Aided by the reduced costs of traditional GIS software, the arrival of open-source and cloud-based alternatives, in addition to the multitude of web base maps now on offer; more and more market sectors are embracing geographic data. The growth of location-based services has exposed the general public from all backgrounds to the 'power of location' and geographically-attributed data. Consumers, developers, businesses, journalists and researchers alike have become aware of geodata as a valuable asset to their decision making, tool creation, performance tracking, storytelling and general research and analysis.

Through our own experience and as a result of customer feedback, we are confident that cartographic techniques and styling can help make best use of geodata, including many datasets that we would perhaps regard as less cartographic or even 'non-map' products. It is our belief that cartographic visualisation can increase the level of understanding of most geodata products. All Ordnance Survey (OS) data products with significant geographical elements are expected to have cartographic stylesheets by mid-2015. This article aims to explore examples of cartographically-styled geodata and their use cases, and will also showcase the approach OS has taken in allowing customers to style OS data products with relative ease.

Historically the visualisation of geodata products in their marketing has been poor. We have sought to rectify this at OS by creating sets of self-explanatory visuals for each of our products to showcase their content, level of attribution, complementary products, and suggested market use(s): The aim being to achieve better storytelling and so offering customers a better insight into the value and potential of each product to their business. This presentation will explore the method we adopted in showcasing our products on the OS website, creating these new visuals from a blend of photography, cartographic design, case studies and intended uses. Marketing can make good use of the association of customer application with the dataset(s) and the business is now better equipped to show customers and potential customers the value of the underlying data, i.e. the products.

The internet with the ever-growing efficiency of social media has become a platform for mass sharing of statistical data, research findings and news stories in a concise and often visual format. Whilst OS is not as involved in this area, our research team has a long-standing relationship with university research across Great Britain, our social media presence is increasing and

our products are a data source for national and local media. This paper will use examples of statistical findings, pure scientific data and journalistic reports to show that cartography, above and beyond data visualisation, can add value to this reporting.

2. Understanding Geodata

2.1. Background

There is a lot of geographical and geospatial data out there, being used for a growing number of reasons. Like the physical universe, the digital universe – the data we create and copy annually – is vast. It is doubling in size every two years, and by 2020 the digital universe will reach 44 zettabytes, or 44 trillion gigabytes (EMC/IDC 2014). Research by Kahman, Burhardt and Weber (2012) into the extent to which data has a geospatial element recorded that on German Wikipedia between 57% and 78% of data was geospatially referenced. However this is largely based upon the coordinate attribute that exists in Wikipedia and is therefore a somewhat debatable reflection of the data universe as a whole. But even so, taking the average of this and estimating current data universe size at 8.8ZB for 2015 would imply that this year alone nearly 6 trillion gigabytes of geodata will be created. Lantmäteriet, the national mapping agency in Sweden, suggests that ‘the market for geodata is growing by 10-30% per year’.

We are seeing evidence from companies such as PlaceIQ (Kaplan 2014) that business use of location and geodata is shifting from basic proximity-based targeting towards more intelligent and detailed geographic analysis such as locational behaviour and visit rates.

Something as simple as a daily commute to work is filled with business opportunity. If a company can not just pinpoint a home address and work address but also see what paths people take in order to get between the two, what diversions they take and what the causes are, then this information is very valuable.

While understanding human behaviour is a growing desire of market location analysts, current market analysis techniques also depend heavily upon the understanding of geodata. Here the scenario could be deciding where to open a new coffee shop or how best to distribute cash in a bank’s ATMs, both of which are simple yet real examples of surprisingly, relatively new uses of geodata. Deciding where to ‘set up shop’ is becoming big business. Back in October, HERE (Schick 2014) reported on Javelin Group, whose London-based ‘Location and Analytics Practice’ have alone worked with more than 200 firms and more than 250 shopping centre developers.



Figure 1. 'The Daily Show' commute map (Meshon & Havlan 2013)



Figure 2. New coffee shop site analysis (Wesson, OS 2015)

In the Banking, Financial services and Institutions (BFSI) sector, GIS use is expected to grow by over 8% over the five-year period 2013-2018 (PR Newswire 2014).

But an arguably more intriguing example is advertising. Increasingly accurate and complete business pictures and consumer profiles are being drawn from mobile devices and social media, making use of increased geospatial (location and time) accuracy to improve the accuracy or knowledge about a given target audience.

NinthDecimal, formerly JiWire, has made a business from using mobile devices to study human behaviour, building an understanding of people by connecting their digital and physical lives. Combining location data, with the known accuracy of WiFi hotspots; along with click data, device data, time of day data, etc. they are able to use algorithmic processing to understand how all of this information correlates. This big data needs to be cleaned and organised before it can be supplied to a third stage customer such as an advertising agency.

In the words of NinthDecimal President David Staas, 'We look at how locations are related to each other, we look at how people are connected to each other, and we look at how people are connected to those location patterns as well. From there we're able to create audiences.'

He gives the example of identifying a sports fan. Mobile advertisers used to target the content that somebody is browsing. Now they are becoming smarter using location information but this requires reliable correlation using a robust database, for example ensuring confidence that someone is in a football stadium rather than the supermarket nextdoor. They also have to integrate other data such as opening hours and calendars of events, for example what's happening at the stadium – is it a football match or a pop concert?

2.2. Sharing Knowledge

Something else that makes advertising a really interesting example is the possibility of multiple levels of data users.

The advertising agency is working with or purchasing from a geodata or service provider, whom themselves will have purchased, licensed or pre-created data. The agency might also be carrying out the investigation on the behalf of another company selling a product, their customer, who in this example becomes the end consumer of the geoinformation. Note it is conceivable that an individual, team or organisation to play the role of more than one user.

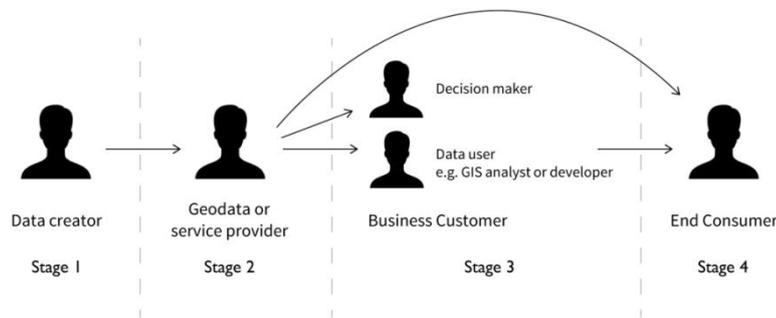


Figure 3. Different levels of data users at each stage of data cycle

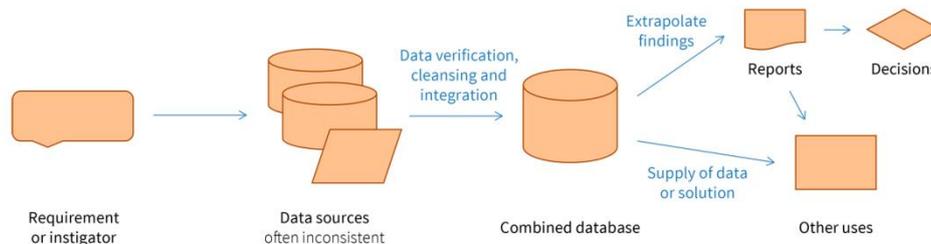


Figure 4. A typical geodata use process

Above the flowline of use of geodata has been represented as a process diagram. It is possible for each stage of this process to be carried out by any level of user, so good communication is essential. In the previous example, NinthDecimal has ensured the right assumptions have been made and they have also been able to extrapolate findings, for example one of their projects looked at the marketing of healthy breakfast products to mothers (Aquino 2013). Using addresses and travel patterns they saw that suburban mums and car pool mums engaged with the brand more than urban mums or those who stayed within tighter geographical footprints. They have done a lot of the work for their client.

But how did NinthDecimal communicate these findings to their advertising agency customer? And how did the advertising company then communicate this to their customer the breakfast product makers? What if the advertising company captured or purchased the data and wanted to perform the analysis themselves?

Visual and/or cartographic representation makes it easier to spot trends and to uncover opportunities. Furthermore being able to show this geo-

graphically in conjunction with other mapped data adds value both in terms of understanding and in terms of verification. We can definitely provide a high-quality base on which to overlay third-party information but also where customers are using OS data and joining their own information onto it, or vice versa, represents an interesting area of growth. This is not just possible with the topographic vectors of OS MasterMap or OS VectorMap but also other data products such as address (e.g. Address-Base) or height (e.g. OS Terrain), giving existing and new market sectors easy methods of enriching and referencing any data with a geographic element (Wesson 2015).

The advantages of improved market and spatial analysis with a GIS are well-documented for many industries and markets, one such example being real estate as covered by Directions Magazine, GIS Lounge, USC and Harvard amongst others. Yet, even with a GIS, the message, patterns or story may still be missed.

This is easier to explain using the simple coffee shop example. Although a simple example, it is hardly trivial: Coffee has become a more valuable global commodity than oil or gas, or gold. Starbucks alone is worth over US\$50 billion (Burns 2014). Detailed data analysis could ascertain the likely 'premium' locations at which to open a new shop, but it is the visualisation that most powerfully explains the reasons why. On a map one can see where potential sites are in relation to likely audiences, competition, crime hotspots, transport network, and so on.

A highly-visual report can be created that is both easy for making and justifying decisions. It can also be engineered for different scenarios such as time of day or high and low seasons.

In order to create this visual representation of the information and findings, a GIS is likely to be used and a visual style needs to be created and applied. This combination of skills is something quite unique to the field of modern cartography. As Vetana Research reported in 2013, 'People are aware of the usefulness of location analytics but most are unable to derive from it insights they can use to do their jobs better.'

So to help give our customers a better starting point, OS have chosen to release stylesheets with our data products. These are as 'plug and play' as possible and are publicly accessible through GitHub. By providing stylesheets for our vector products we are improving their usability and our customer experience; enabling customers to have the benefits of our raster mapping, coupled with the added capabilities that vector data brings such as data-linking.

The steps of the customer are incredibly simple. They must navigate to OS' GitHub repository at github.com/OrdnanceSurvey and search for stylesheets relevant to chosen product, follow the on-screen instructions on each GitHub page to select the correct zipped folder. Then the user can follow a Quick Start guide which instructs them to download any extras such as fonts and patterns, shows how to install these prior to loading data and offers step-by-step instructions to then apply the stylesheets.

The end result is the same styled data as created by the cartographers at OS. Although it is cartographically-styled, the data is still just that: it can be interrogated and operated on in the usual way.

2.3. Validation

Sviokla's (2009) three primary benefits of graphic representation are a result of his work with clients and we have seen similar evidence at OS.

1. **'A great visualisation can help create a shared view of a situation and align folks on needed actions.'**

Stylesheets offer consistency in visualisation between all parties who wish to utilise the information in its data form, whether that be the data providers, customers, decision makers or end users. They can help communicate a common message and lead to a shared understanding.

2. **'Visualisations can help an analyst or a group achieve more insight into the nature of a problem and discover new understanding.'**

At our various masterclasses and our cartographic hack camp over the past few years, existing customers of data products revealed to us that a session on cartographic styling not only improved their understanding of our data products but also showed them features and attributes that they previously has not known existed. This became something of a catalyst in the development and evolution of our cartographic stylesheets.

3. **'Great visualisations are efficient — they let people look at vast quantities of data quickly.'**

Human beings understand visually. Almost half of the brain is involved in visual processing with 70% of sensory receptors in the eyes (Merieb & Hoehn 2007). We can get the sense of a visual scene in under 0.01 seconds (Semetko & Scammell 2012). So a data viewer or user at any stage of the process will benefit from a visual representation.

The strategy behind OS creating and releasing cartographic stylesheets is to allow our customers to make our geodata, our digital products, easier to use

and to ensure that they are being used to their full potential. It is a way of improving our customer and partner experiences and attracting new customers by removing pain points and entry barriers. Converting raw data into a legible ‘map’ can help customers see real time-cost savings, realise more of the product’s potential, and share this clearly with their end users.

The evidence of the need for and success of these stylesheets comes primarily from the direct requests and feedback of customers, and from our research highlighting that there is no other consistent authoritative source.

Customers wish to take our digital data and apply a visual stylesheet to it for a variety of applications. Initially the uptake was from local authorities and data service partners but we are increasingly seeing new customers such as engineering and environment consultants. So we are convinced that geodata is something that cartography, and more specifically a cartographer, can help people to understand.

The skills of professional cartographers to fashion uniquely powerful and affective images of place are increasingly being disregarded, in the search for easier and more cost-effective solutions (Dodge & Perkins 2008). In April 2015, a heated debate on Twitter showed how highly emotional some can get over the subject of fast food or ‘Burger Maps’, and the same should apply to geodata. There are no hard-fast rules, if a geo-visualisation is successful then it is right, otherwise it may well be wrong. Yet the same cartographic design principles we have shaped as cartographers at OS (2013) also completely apply to the visualisation of geodata.

3. Marketing Geodata

3.1. Background

‘When used effectively, GIS can be a powerful tool for amplifying business strategies — or developing new ones’ (Schuble 2013).

Established providers of geodata are facing increased competition from online service providers, open data, crowd sourcing, device capture, and so on.

If six trillion gigabytes of geodata are being created every year, and that figure doubling year on year, then data suppliers need to work harder to market their products and to promote their value, advantage and unique selling points. However the author would suggest that many traditional suppliers do not even do a very good job of telling the potential customer what exactly it is they have for sale or license in the first place.

3.2. Examples

For fair comparison this paper will largely avoid the complication of geo-portals and, because it is an area or work OS has been trying to improve upon, it will instead focus on the products as presented on their webpages. Last year 57% of marketing was digital, compared to 27% in 2013 (Watton 2014).

Český úřad zeměměřický a katastrální (ČÚZK), the Czech national mapping agency (NMA), provide a summary page on each of their products which is really clear and the format is wonderfully consistent between products. They also provide stylesheets in the form of ESRI Layerfiles. So for a customer all of the information is there and very concise. It is an excellent service from an NMA and it is clear what the products are but there has been little effort to market the products to non-mapping organisations, only a handful of suggested uses presented as a simple list within the main body of text.

Constrained by being embedded within another site, Ordnance Survey of Northern Ireland (OSNI) has been more concise than CUZK in its product summarisation. There is little content but a small image showing the product (on map products only) and a longer bullet point list of suggested uses. The recommended uses do seem to target a wider audience with suggestions such as market analysis, engineering and environment, and asset management; but there is still a distinct lack of visual information.

The U.S. Geological Survey (USGS) try to explain the map, GIS and scientific uses of their data, for instance when describing their National Hydrographic and Watershed Boundary datasets. It is evident that some work has been done to create visuals but these are both small and unexplained. However the user guide section does say that video demonstrations and tutorials are forthcoming.

Looking at the private sector, Intermap, a leading supplier of elevation data, appear to do the exact opposite to the NMAs. There are no technical descriptions on the opening pages. The focus is immediately on a marketing information sheet and a case study example, highlighting the difference in marketing practices between public and private sector that is most likely developed from their traditional audiences.

Rather than a few vague examples the private company suggests an expansive list of specific uses for their product. However I am unconvinced that this 'one size fits all' message is that persuasive to a potential customer navigating their site. The case study is also delivered in a 'sales pitch' format with little explanation or showcase of what the customer, San Luis Obispo

County, actually did with the data other than load it into their GIS. I also looked at other companies with links to the GI industry such as Airbus, but they were less relevant to the comparison.

So this internet research leads to the question, what more can we do to better market our geodata products?

3.3. OS Products

The past few years at OS has seen an overhaul of the OS website and in particular the products' webpages, initially to improve customer experience and later as part of our corporate rebranding.

The main focus of the work on the product pages was around restructuring them to be easier and more efficient to use with an improved design and layout. From the very outset of the project there was a desire to include a way of visualising the products somewhere on these pages. After several drafts, it became apparent that a key weakness of our old product pages was the inability to quickly and easily grasp what was on offer and to envisage the possible use. So rather than just have a styled view of the product, it was agreed that some visual representations of each product were needed, that these should be as self-explanatory as possible, and that these 'images' needed to take centre-stage in the design of the pages.

Other ideas included increased use of videos and pages split into sections each with a relevant accompanying image but for increased immediate impact, it was agreed that a revolving set of still hero images at the top of each page would be the best approach.

Due to the geographic nature of the data being showcased, it was decided that our cartographic design team should be responsible for creating these images as we possess the required skills, as discussed in chapter two, in addition to good knowledge and software skills of the wider discipline of graphic design.

We agreed to create these new visuals from a blend of photography, cartographic design, case studies and intended uses.

In the end, due to the corporate website template, the images became smaller than hero images but still significant enough to showcase the products on offer, make an impact and tell a story. For each product we agreed with our web marketing team to show between four and six images per product with at least two showcasing the product and its attribution and another two or more demonstrating examples of its possible use.



Figure 5. Previous/old example showing an addressing product on the OS website



Figure 6. New example of an addressing product on the OS website

For the images showing the product we tried to keep it simple, just displaying the content but cartographically and using the official stylesheet where possible. We wanted to show a potential customer as near as possible what they will get.

For the images highlighting attribution we decided to concentrate on key attributes and to convert any fieldnames that were not obvious or contained underscores and so on, into plain English. A common style was used across the product portfolio where ‘pop-up’-style call out boxes highlight the attributes of specific features in a geographical area in order to showcase the level of detail within the content. This and any other overlays were all created by the cartographer.

Then for the images of typical user scenarios, we used some real world case studies but mainly fictitious examples based upon known existing or targeted customer uses. In order to ensure replicability, real OS product data was used in its customer-facing form.

Some of the more complex scenarios were given clarification and immediate identification by the addition of stock photography. This was thoroughly researched, also by the cartographer, in order to find the perfect match for the use case being communicated.

The images were then named in an agreed manner and delivered to our web editors who loaded them into the web authoring system as a set per product and published them to the web. The result being a set of revolving images at the header of each product’s webpage that clearly communicate what each product is, what it contains and how it can be used. Marketing can make good use of the association of customer application with the dataset(s) and the business is now better equipped to show customers and potential customers the value of the underlying data, i.e. the products.

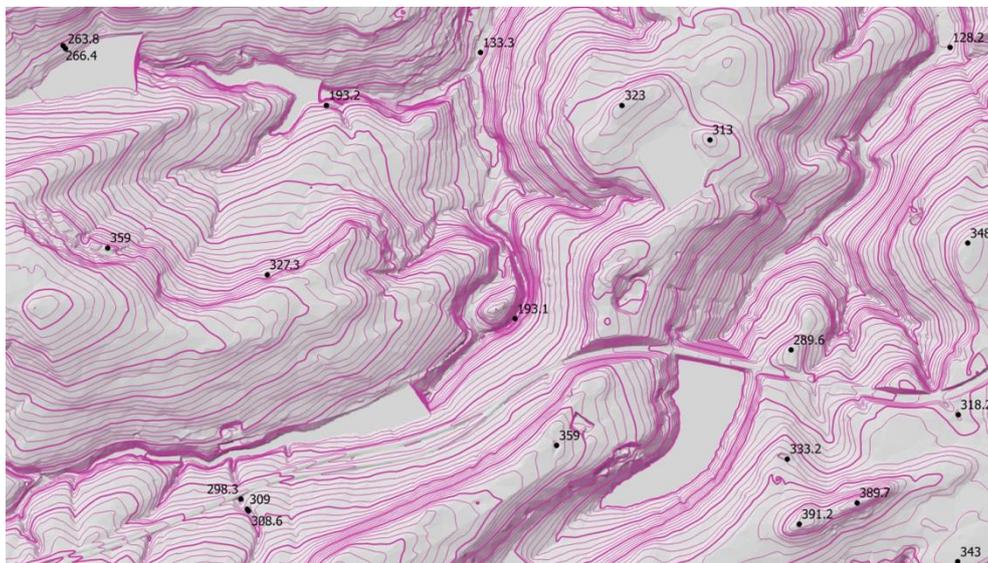


Figure 7. OS Terrain 5 – content

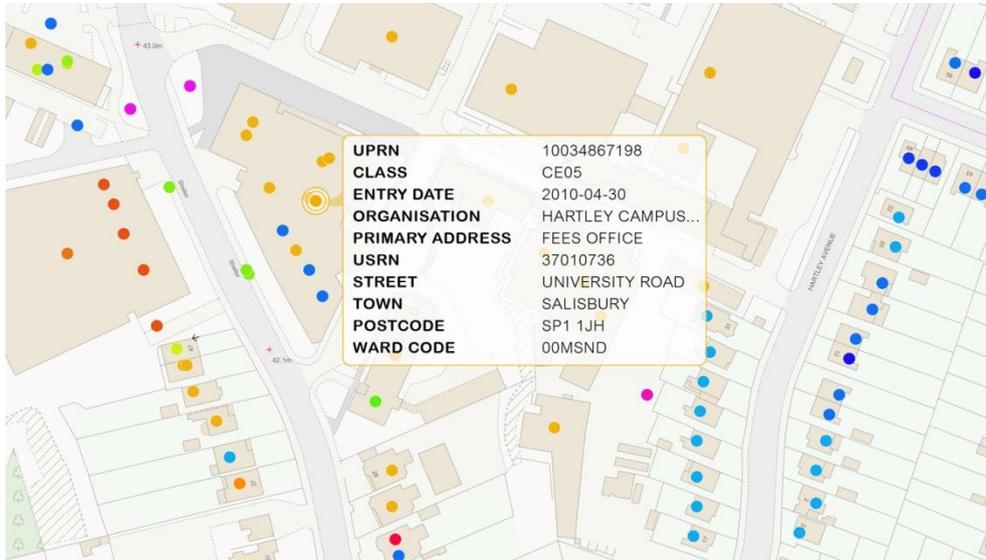


Figure 8. OS AddressBase Premium — attribution



Figure 9. OS Open Rivers — application

4. New Media Reporting

Wikipedia defines new media as ‘content available on-demand through the Internet, accessible on any digital device, usually containing interactive user feedback and creative participation’. ‘Common examples of new media in-

clude websites such as online newspapers, blogs, or wikis, video games, and social media.’

New media reporting is a term I have coined to cover data-based storytelling over the internet and social media. Common forms include statistical findings, scientific studies and journalism. ‘Our quest to extract meaning from information has taken us more and more towards the realm of visual storytelling’ (Popova, 2011). The problem is that, as well-known inventor George Dyson put it, ‘Information is cheap but meaning is expensive’ (Popova 2011, Klanten et al. 2011). Just like business has seen the value of adding location to datasets for analysis and decision making, I believe that cartography, above and beyond data visualisation, can add value to this new media reporting.

Infographics and visualisations are good ways of sharing information and telling stories powerfully and efficiently. The use of visualised information on the internet has increased 9900% since 2007 according to Google Trends. Yet this data increasingly has a location, and the knowledge of place is, and always has been, a most valuable part of story-telling; I think the phrase is ‘setting the scene’.

The following infographic is little more than a list of petrol prices in various countries around the world. The graphic element associates the story with driving and the 16-strong list puts across the message that Britain and Turkey are expensive for fuel where as in Turkmenistan it is little more than a dollar a tank. By contrast, this fairly simple map from Twitter shows the cost of diesel around the world. While this type of 2.5D cartography is often frowned upon, there is no denying that the vast differences in cost and the regional and spatial relationships are immediately identifiable.

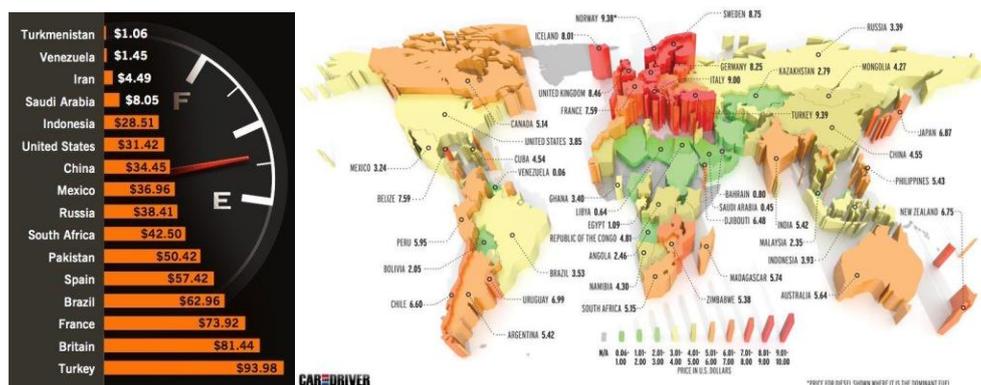


Figure 10. Cost of petrol (gasoline) in dollars to fill a Honda Civic (*left*, twblog 2015) and cost of diesel in dollars (*right*, Car and Driver, via Otspotz 2015)

In media and journalism, it seems that every other story on news bulletins and in newspaper articles has a map featured in it, and sometimes offering very little value to the story. Yet, when used appropriately, cartography can add an immense amount to reporting. Aside from stories where the map is the focus, for example flood risk (of which there are many good examples by the Norwegian TV company NRK), cartography can be significantly beneficial to journalistic reporting in two main ways. The first is by bringing a sense of place and distance to a story. For example the Google story of 'A Day in the Life of Winslow Homer' (Ziegler et al. 2014).

The second is by making a story more understandable and more immersive, for example this story map by The New York Times.

Recent advances in interactive and web-based cartography, such as the evolution of ESRI's story maps, have led to new ways of integrating maps with stories. The full and interactive version of figure 12, *A Rogue State Along Two Rivers*, can be found on The New York Times website. A beautifully designed story map, it works by breaking the story up into text boxes that are more manageable in size, both for the reader and the designer, and simultaneously separating the elements of the story based upon location. Without the satellite mapping, the story in pure text format just wouldn't be the same.

Sadly not all new media uses of cartography are great. I recall an interesting conversation in 2013 with representatives from a leading international publication that is known to frequently use maps, GIS and cartography. They told me how as cartographers they only work on the printed literature and that all of the online maps and visualisations are created solely by developers. Holmberg & Foote (2008) suggest that 'online maps are not always well integrated with the stories and not all maps actually make it onto the online versions'. When it comes to representing data, there are job vacancies in roles such as 'Visual Journalist', for which the required skills are definitely those of a developer rather than a traditional cartographer. So in summary there is definitely a need for cartography in new media reporting but it is also evident that developer coding is often also required.

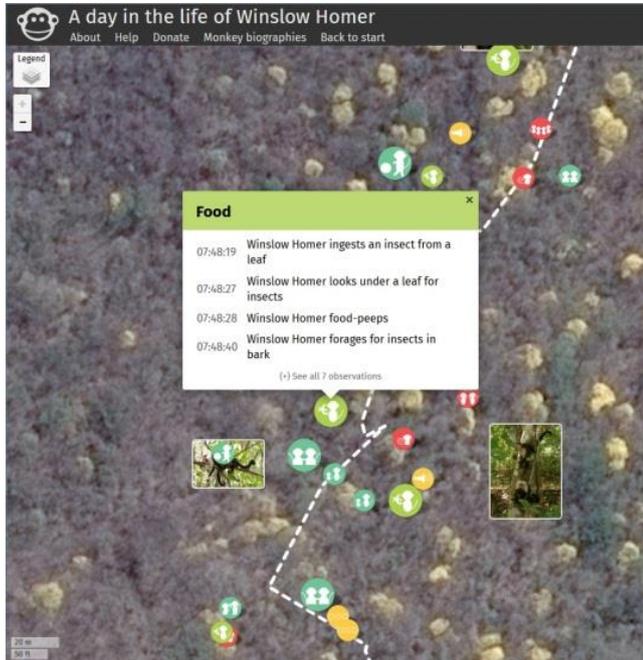


Figure 11. Tracking capuchin monkeys (Ziegler et al., Google Maps 2014)

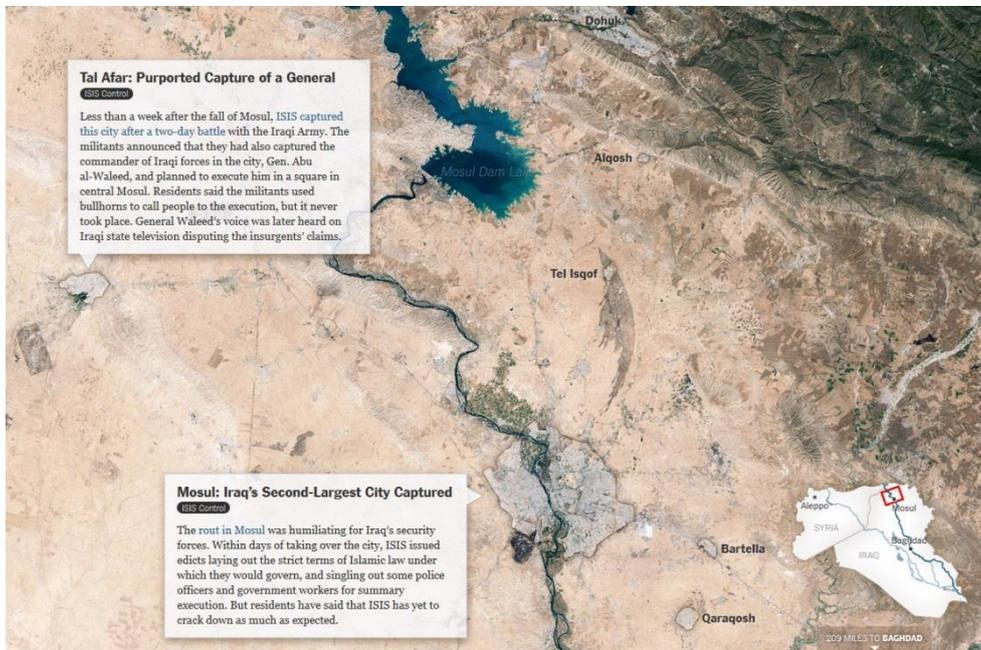


Figure 12. The story of ISIS (The New York Times 2014)

5. Conclusion

Cartographers just like any other profession want to feel valued and thus we 'want others to believe that the job we do requires a degree of skill'. Ball (2014) concluded that cartographers are required due to the increased volume of mapping requirements but fell short of drawing any concluding comments on our skills and abilities.

'Due to the vast quantities, sources, and sinks of data being pumped around our global economy at an ever increasing rate, the need for superior visualization is great and growing' (Sviokla 2009). Pictures are proven to be the best method of delivering information; neurologists know this as the pictorial superiority effect (Lundry 2009).

In many of the examples given in this paper one could argue that the introduction of geospatial analysis and cartography has made the datasets and tasks more complex. A piece of work such as Velo, showing all of the data concerning bike shares in Moscow as statistical graphics, graphs, heat maps and relationships shows just how complex geodata can become. Yet if one knows how to manipulate and style the data then the end result can actually be cleaner and far easier to understand.

Good understanding of geodata, successful marketing of geodata and engaging reporting via new-media all depend upon the presentation of the data. Well-presented geodata, just like good cartography, communicates its message clearly and provides a pleasing user experience.

The nature of geographic and geospatial data is such that its visualisation requires specialist skills. Someone that understands geodata file formats, GIS and the experience of a user; all in addition to general design and visualisation skills and knowledge. Someone who can understand, manipulate and interpret the data as well as style it masterfully to tell a clear story. It seems that there is a need for a cartographer after all.

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