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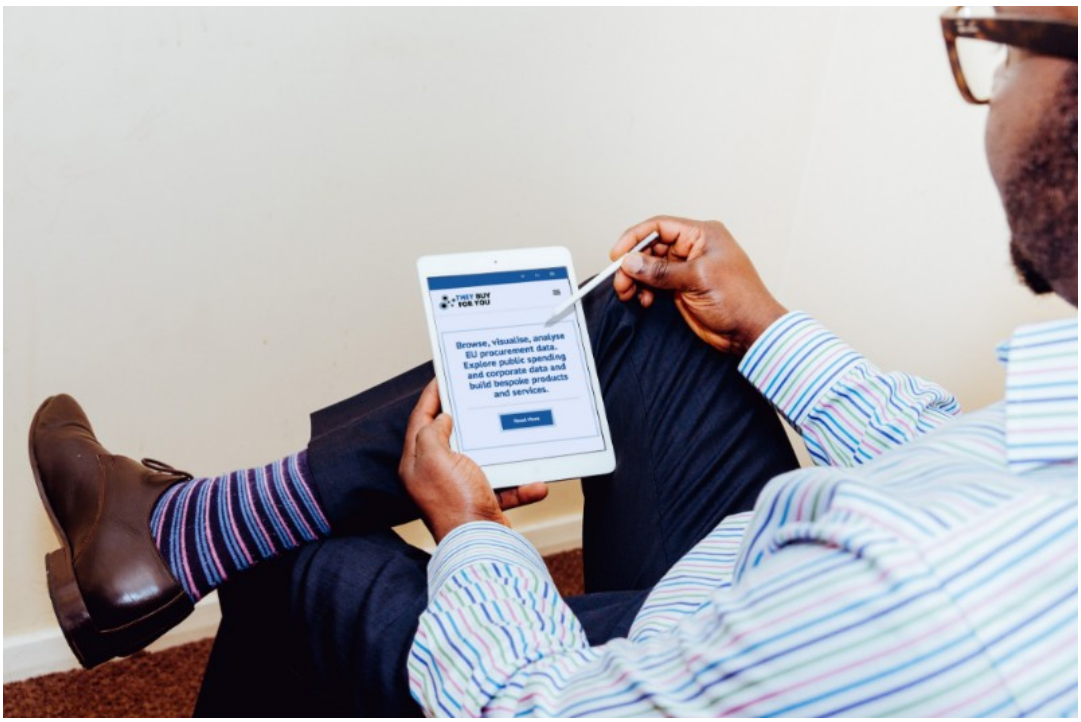
MARCH 2020 #5



Contents

In this edition of the TBFY newsletter, we invite you to take a look at our **hands-on guidelines for data visualization**, discover how the Ministry of Public Administration in Slovenia develops **TBFY tools to detect anomalies in public spending data** and how tender data can reveal **cross-country difference in tender response times**.

Showing where taxpayers' money goes: some guidelines on procurement data visualization

The European procurement market is a huge beast. In 2017, the total value of public purchases of goods and services across the European Union was estimated to be a whopping €2 trillion (or about 13% of GDP). Although the EU took significant steps in 2016 to open up the procurement market, it still recognizes that a lot of work remains to be done to level the playing field so that small and medium-sized enterprises (SMEs) can compete with big business for tenders in a fair and transparent fashion.

opportunities for new and small businesses. This is incredibly important as the best innovations often start small!

One way to bring some well-needed transparency into the procurement market is to visualize who is doing what, when and how: where do public funds go and how are stakeholders connected? How have these networks evolved over time? Presenting this data in a concise manner is not just a way to uncover unrealized business opportunities but also helps detect patterns of collusion and corruption. Data visualization is a fantastic approach to make sense of data and to provide better insight into the complex world of procurement. But no one size fits all and for practitioners who work in the fields of open data, procurement and transparency it is important to sift through the good, the bad and the ugly.

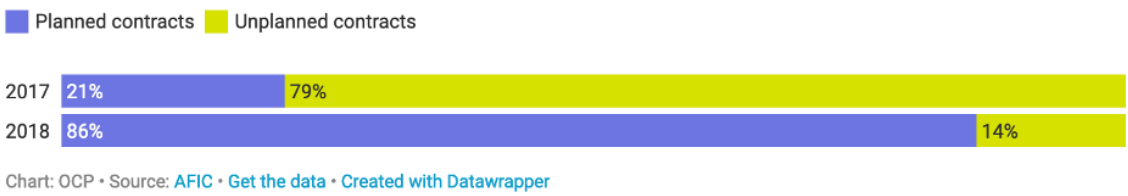
So what are the principles of a good data visualization strategy? Here are some basics that any open data advocate and procurement professional should consider:

Be clear about what you want to communicate
If you work in the area of procurement, you're likely to sit on tons of heterogeneous datasets. Your data is probably numerical (e.g. tender volume), related to time or categorical (e.g. sector of spending), and spatial (e.g. geographical coordinates). Not all of this data will be equally important for all of your stakeholders to see. And not all of your data will require visualization. The first step in getting your visualization strategy right is to think carefully about what users will want to see and what insight you wish to get across in the most efficient way.

Once you've worked out what data you want your stakeholders to consume, you should think of some appropriate analyses, statistics, indicators and aggregates that best summarize and communicate your data. You may wish to provide intel on how information about contract dates, volumes, etc. has evolved over time, or present a comparison between bidders and suppliers, or evaluate some KPIs, or show how data is geographically distributed. We recommend thinking about this carefully at the design stage. And consider how these variables hang together. A good data visualization strategy is clear about what it wants to achieve. Here are some examples of how a simple and clear message could be communicated visually:

Source: https://informationisbeautiful.net/beautifulnews/75-mobile-money/

Source: https://informationisbeautiful.net/beautifulnews/575-best-things-free/



Source: https://medium.com/@opencontracting/better-together-how-ugandans-are-improving-procurement-with-data-and-dialogue-3090ecaed857

Think about every element of your visualization design - it matters

Data visualizations are designed to make it easy to compare data or tell a story – both of which can help users to understand a topic and make decisions. This includes selecting a chart type that fits your data and the message you want to convey with and about your data. You will want to think about the graphical elements, who would see it and where (e.g. on a desktop browser or on small screens, such as a mobile device). But you will also need to think about the type of font you use, if you use icons or not, the colour choices and if they are readable but also if they convey a message. You should consider the axes and scales you use in the chart and how to label them. The issue of legends and annotations and whether people can actually read and make sense of what you created is important too. As is thinking about whether your users could face constraints, such as physical ones (e.g. colour blindness) or in terms of skills (e.g. avoid technical terms) or of bandwidth and screen size (e.g. avoid large charts that require scrolling or interactive visualizations that don't convey the message when it does not load fast enough).

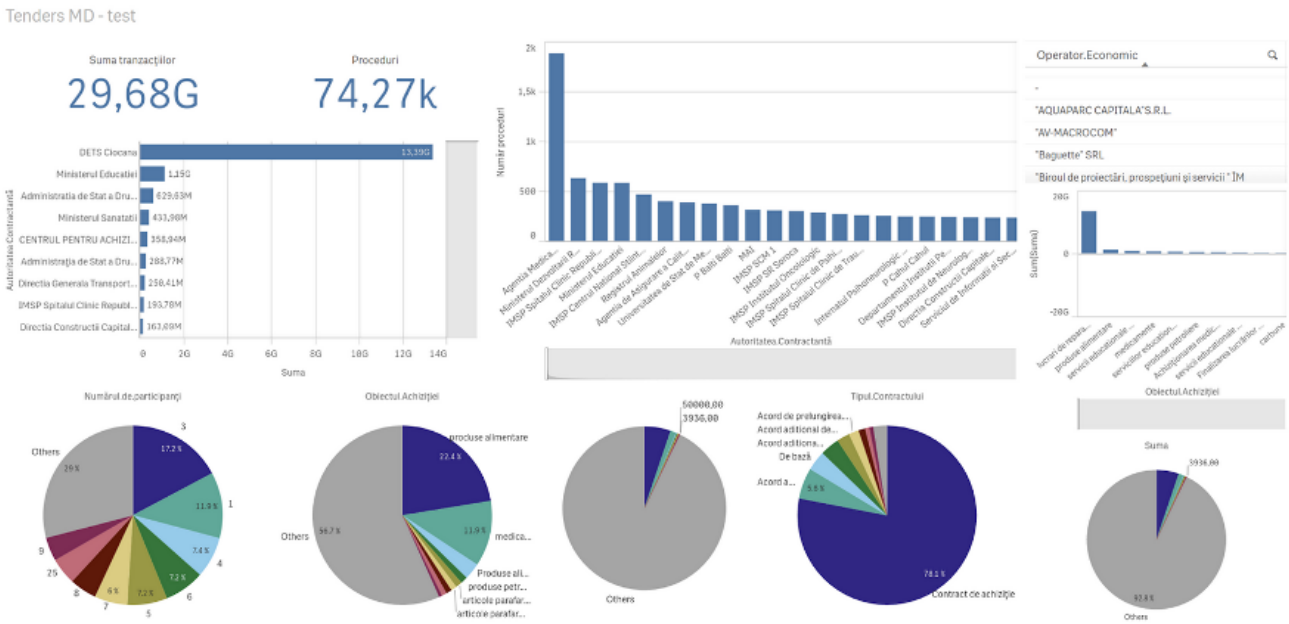
Avoid chart junk

Chart junk describes all visual elements in charts and graphs that are not necessary to comprehend the information on the graph, or that will otherwise distract the viewer from this information. This means avoiding graphical excesses that don't 'respect' the data and the audience. The visual layout should help to deliver the message and should contain the minimum amount of elements on a chart necessary to achieve this. So when you have chosen the data, the message and a chart type, review the visualization and see if you can reduce unnecessary lines, background images or elements. You can use custom styles and shapes to make data easier to understand at a glance, in ways that suit users' needs and context. Explain your charts, bars and indicators well, e.g. by labelling your axes clearly and to the right amount of detail – for instance by providing units of measurement. Think about the language your audience is most likely to understand and don't forget that communicating things as easily as possible includes the largest range of users to consume your content. Avoiding unnecessary complex words is also a way to reduce chart junk.

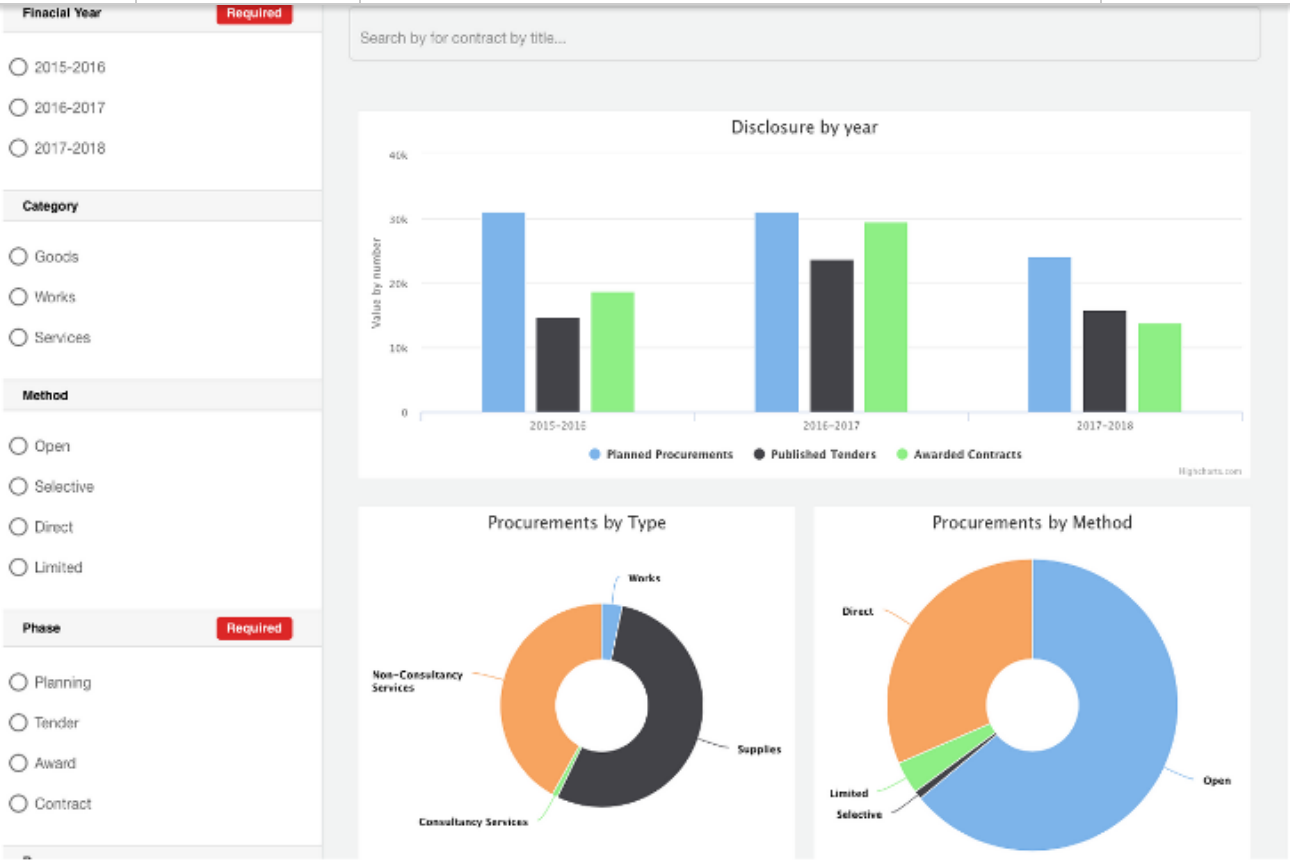
your visualization as simple as possible. That's why separate but connected charts can sometimes better tell a story than one complex chart. Dashboards are often used to monitor changes in data (for more guidance on dashboard design, see Stephen Few's *Information Dashboard Design*). A good dashboard can contain different types of charts, such as bars, time series or indicators presented in an aesthetically pleasing way that strikes the right balance between keeping things tidy and simple but providing valuable insight (see https://datavizproject.com/ for an overview of the data visualizations commonly used for this purpose).

This means on a dashboard you'll need to arrange your content in a meaningful and effective way. Prioritize the most important information using layout structures. Research that tracks how users navigate on a website has revealed that people associate different levels of relevance and importance depending on where content is located on a page. Users tend to pay more attention to the top-left and centre sections of a screen; your most important visualizations should go here. Material in the bottom-right corner, however, is often considered less relevant. Also make sure that items that are logically close to one another are in proximity on display too, e.g. avoid spreading spatial data all across the screen.

Here are some examples of dashboards for procurement data:



Caption: Example dashboard, *Opening up Moldova's contracts. Progress and challenges*



Budeshi.ug and key visualizations

Caption: Example dashboard, *Better together: How Ugandans are improving procurement with data and dialogue*

A lot more can be said about data visualization and we have compiled more detailed guidelines under https://theybuyforyou.eu/visualizationtool/guideline.html.

This post is an adapted version of our original contribution to the Open Contracting Partnership blog series.

Elena Simperl *is Professor of Computer Science at King's College London. She leads several projects on TheyBuyForYou, an EU-funded research consortium where she and her team built a cross-European knowledge graph of procurement data alongside a series of interfaces and tools that enable SMEs to realize new procurement opportunities. Elena is also the Principal Investigator of the Data Stories project that develops novel ways for citizens to engage with data in a post-truth society.*

Laura Koesten *is a researcher at King's College London. She was a Marie Curie Skłodowska fellow at the Open Data Institute and at the University of Southampton, UK investigating the user perspective in dataset search. She is part of the TheyBuyForYou and the Data Stories project. In her research she is looking at ways to improve Human Data Interaction by studying sensemaking with data, data reuse and collaboration and human factors in data science.*

Ensuring that public procurement is fair and just: An overview of SEPPAS – the Slovenian Ministry of Public Administration business case

What is SEPPAS and what is our business case about?

SEPPAS stands for Slovenian Electronic Public Procurement Analysis Services and is centred around Slovenian public procurement data. Our main focus is to detect corruption by searching for anomalies in the data to detect patterns that could indicate fraud or otherwise suspicious activity.

previous years. Annual GDP growth is hovering around 3,5-5% and was nominally around 48bn EUR in 2019. The below figure indicates the volume of public procurement in the country since 2011.

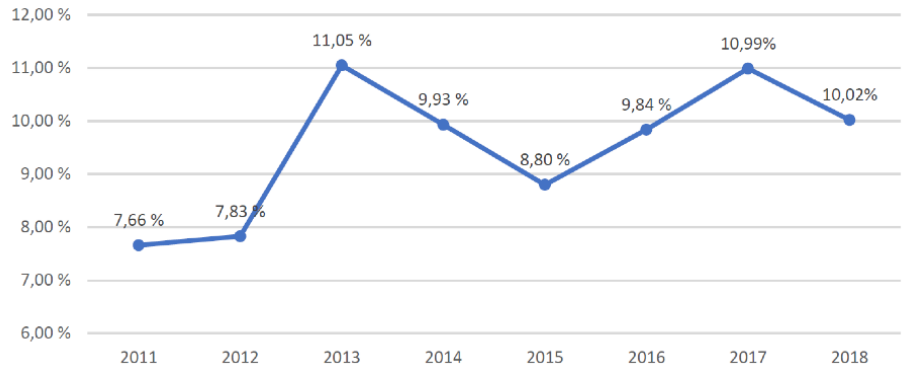


Image 1: Percentage of public procurement expenditure in Slovenia as a fraction of GDP.

What is our general idea and approach to our business case?
Slovenia has a useful collection of historic public procurement data that is being analysed within the scope of the TBFY project. Data is systematic and structured, so it lends itself to analysis and experimenting with new approaches to detect anomalies.
Slovenian Public Procurement is worth over 4.1bn EUR in terms of public procurement contracts annually and that is a significant part of public spending in Slovenia. Public procurement must be as transparent as possible and there are a number of rules and regulations in place to ensure all the proceedings meet the high standards of the Slovenian government.

One way to ensure standards are followed is to search for anomalies. Different approaches can be utilised in anomaly detection. One approach would be to feed all the data into a data analysis engine and run anomalies detection algorithms. This means that a very experienced public procurement professional will have to interpret the results that the algorithms produce to determine their usefulness. The second approach would be to set predetermined markers and then check for these results from the algorithmic output. What we propose is a hybrid of these two approaches where we set several indicators that are checked but we still allow the algorithm to run the data and display »red flags«. A skilled public procurement professional will still be needed to assess the importance of the outcomes and present them to the interested public.

What do we hope to gain from anomaly detection?
We hope our findings will help us improve the public procurement process in Slovenia and make it more transparent. The more transparent the process is, the more bidders we hope to attract so the more economically sound the whole procurement process becomes.

A recent World Bank study has found that an increase in the number of bidders yields significant savings in public procurement (in the range of 20%). With public procurement in Slovenia being worth more than 4.6bn EUR in 2018 this could mean savings in excess of 900m EUR.

We also envision linking our public procurement data with other public databases, thus improving transparency even further. Moreover, there are other tools being developed to further facilitate public procurement. One added benefit would be a tool that lets public procurement specialists know what to expect when preparing a bid. An example of such welcome information would be:

- the number of bids to expect (that would influence the choice of public procurement procedures to choose),
- an average distribution of bids,
- average decision time.

One tool that we are currently developing in this context is a decision tree which shows graphically the importance of parameters when conducting a public procurement procedure. It shows the factors which need to be implemented for maximizing the probability of success, defined as a procedure receiving a valid bid.

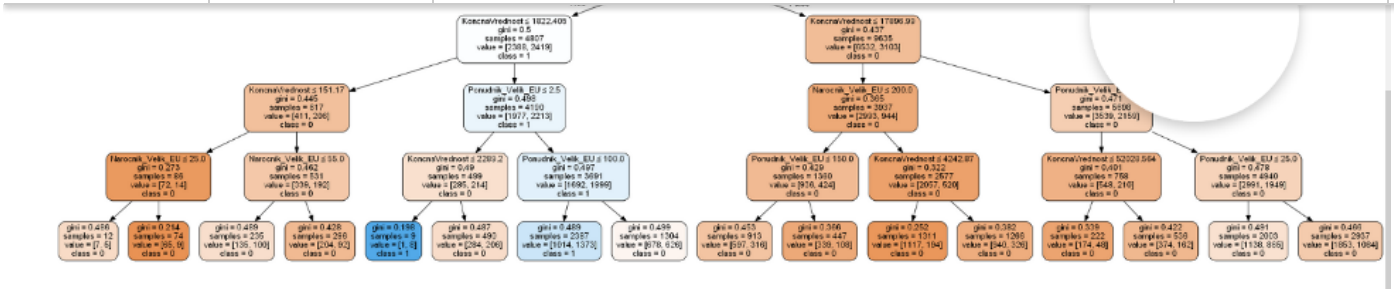


Image 2: Example of a decision tree

Of course, we always strive to acquire more than one valid bid as this shows the process is economically sound and that the procurement market is competing for business. To achieve this, our business case is also designed to detect collusion and other unfair practices. Agents might be unfairly coordinating their activities to influence the market which negates the basic principles of public procurement. These types of activities must be detected as soon as possible, and offenders prosecuted to the full extent of the law, barring their further cooperation in public procurement procedures.

Example: number of employees of a bidding party

One example of an analysis we consider in Figure 3 below is the number of employees of a bidding organization and the value of a specific tender. The rationale here that it is unlikely to see high value tenders being won by a bidder with an abnormally low number of employees, which could indicate fraud. It does not automatically mean that there are unfair business practices behind this, however it does raise suspicion and warrants further investigation. Even more so if additional warning signs are also present, such as high occurrence of the same bidder winning tenders or if the same economic entity (or the owner) has faced criminal charges or sentences in other countries. Assessing this risk would obviously fall on an experienced public procurement specialist and involve specialized prosecution officers who are experts in economic criminal activities.

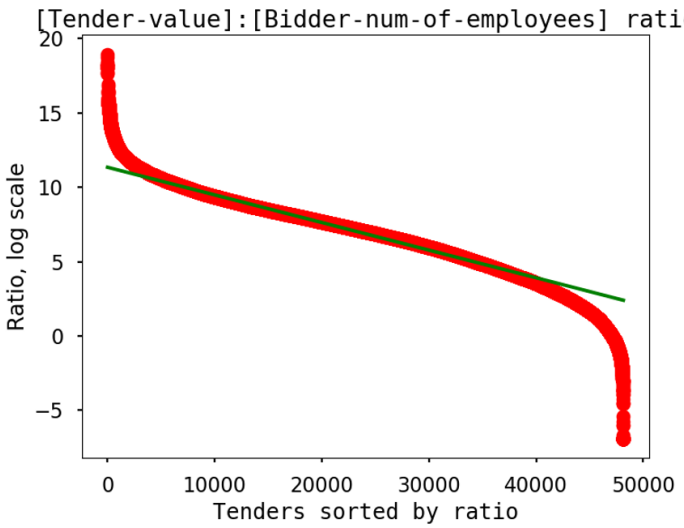


Figure 3: Tender value vs. Number of employees ratio

Our tools also help us focus on social considerations in the so-called Most Economically Advantageous Tender (MEAT) award criteria to foster sustainable public procurement. MEAT refers to awarding contracts on the basis of criteria other than price, such as social and environmental considerations and quality criteria. Social public procurement aims to increase the level of social criteria used in public procurement procedures. It may take into account a number of factors, such as:

- employment possibilities;
- adherence to labour standards;
- social inclusion of persons with disabilities and the elderly
- equal opportunities for men and women;
- promotion of permanent employment;

Social criteria considerations in public procurement are an important aspect of public procurement and are specially regulated in Slovenian public procurement legislation. Beyond our work in anomaly detection, we are planning to use the tools developed in the TBFY project to monitor further the implementation of social criteria in public procurement.

Mitja Medvešček *is Secretary of the Public Procurement Directorate at the Ministry of Public Administration in Slovenia.*

A free hand or a free market? How competitive is public procurement in Europe?

The most value for money in public procurement is linked to a competitive tendering process. This means encouraging multiple bidders to present offers. There are many ways to do this, all of which have a demonstrable effect on value for money of a purchase. In this series of articles, we will explore how competitive the overall public procurement tendering process is for European countries. Data was extracted from Tenders Electronic Daily or TED, one of the many data sources we use for tenders and contracts data. We looked at data over the past three financial years (FY), counted as between 1st April and 31st March.

This first part of this three-part series explores the average response time for tenders. In order to encourage more than just the incumbent supplier to bid, there needs to be enough time for any bidder to submit a suitable response. Failure to do so at best makes the process uncompetitive and at worst makes the process collusive.

Average response time for tenders (3 FY average)

The top five countries who provide the most time for bidders to respond are the Netherlands, Denmark, Serbia, the UK and Sweden.

Country	Average response time	TrendTED average
Netherlands	77 days	+37% 40 days
Denmark	61 days	+33% 40 days
Serbia	50 days	+23% 40 days
United Kingdom	48 days	+33% 40 days
Sweden	45 days	+22% 40 days

All five countries have seen improvements over the past three financial years, that is to say the time for response is increasing. Meanwhile, the TED average stands at 40 days and is also improving. The top three: the Netherlands, Denmark and Serbia, are all significantly ahead of average at 77, 61, and 50 days respectively.

The averages for the top 5 are somewhat close to the TED average suggesting that the other side of the average provides between 35 and 40 days. The data generally supports this with only Malta, the lowest, falling outside of

Country	Average response time	Trend	TED average
Malta	31 days	+11.5%	40 days
Albania	34 days	-14.3%	40 days
Austria	34 days	+3.3%	40 days
Slovenia	35 days	-6.5%	40 days
Romania	45 days	-1.3%	40 days

When we look at the bottom five, 3 have seen response times getting shorter and therefore worse over the past three years. By contrast the top 5 has seen double digit percentage improvement. There is grounds for optimism however: the lowest of the TED European countries, Malta, gives an average of 31 days to respond. This in itself is not generally an unreasonable period of time to respond to a call to tender.

To conclude, in this aspect, European countries on average provide at least a month to respond to tenders which is generally sufficient for all but the largest contracts. In the next part of the series, we'll be looking at tenders with an abnormally low description and title, another key indicator of uncompetitive tenders.

You can find out more about our research at www.spendnetwork.com or look at our data at https://openopps.com.

This was part one of a three-part series that was originally published on the OpenOpps blog series. Watch out for part two in our next edition.

Alex Yeung *is Manager at OpenOpps and Spend Network. We manage the largest open database of over 20m procurement documents in the world mapped to a common standard (Open Contracting Data Standard). Our database is ever growing as we collect tens of thousands of procurement documents every day from hundreds of sources. We use this data to work with governments around the world to provide better value for money and outcomes for public procurement.*

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Our mailing address is:
University of Southampton
Highfield
Southampton, SO17 1BJ
UK

info@theybuyforyou.eu