Using Open Data for Public Benefit

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Good afternoon, ladies and gentlemen, and thanks for joining our webinar. I'm Charles Maddox with the eye for group and I got my my colleague from build world labs and Ron Khan. And we got an exciting topic today, which is open data and all the nuances and things to consider when you are when you have an open data project and how you go about developing one and some of the considerations and ethical considerations as well. So without further ado, thanks, everyone, for joining us. And I'll turn it over to you, sir.

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Thanks, Charles, for having me. Yeah. So the agenda for today is to cover a few topics relevant to kind of the world of open data. How do we access open data? How do we work with open data? What types of things do we actually take into consideration when thinking about how open data can be a part of any type of data projects up? So we'll dive into a number of kind of key concerns and considerations as we approach open data. Open Data has really proliferated in the last decade especially, there are a number of different open data platforms, we'll talk through several of those today. There are a number of governmental institutions that have really made some great strides in making sure that open data is accessible and robust. There has been a strong movement in trying to make government in general more transparent and accessible. There are a number of different institutions at the municipal and state and federal government level that have really invested a lot of time, energy and resources into making open data more available and more accessible. And these types of organizations are constantly thinking about how to introduce more and more data to the public domain. We'll first start by introducing the idea of open data and kind of contextualize the idea of open data a bit. But why do we even care about open data? And what can we learn from it? So in general, open data can be considered with kind of two, two layers or two levels. There's the idea of legal openness of data. So you know, are you able to access this data in some type of legal way? You know, you we're not looking to, you know, institutions aren't really looking to put legal barriers in the way when institutions try to make data relevant and available to the public. And so this idea of legal openness is a really important one. And it's not something that I think was as important of an issue to organizations within government and other types of organizations maybe, you know, 10 years ago, but especially now, I think a lot of organizations that are in kind of engaging in this practice of providing open data to the public, are definitely thinking through all the various legal considerations that are, that kind of needs to be addressed in order to make open data available from a legal perspective. And then there's this other idea of kind of technical openness, that there shouldn't be any technical barriers to using that data. So providing data in some

type of like non machine readable form, in tables in PDF format. Any type of format that makes it difficult to work with data wouldn't really be considered as being technically open. So this idea of technical openness is really important, because, you know, institutions have really tried hard to convert data from non machine readable forms to machine readable form, so that you can actually work with it in, you know, using tools like Python and our other, you know, open source tools and proprietary tools are out there to actually work with work with data. So, there are three important definitions or principles behind the kind of definition of what it means to be open. So we talked, we alluded to a few of these ideas, before, we talked about kind of legal and technical openness of data. But availability and access are is a principle that is extremely important. This is the idea that people can actually get to the data. So a lot of this kind of hits on this idea of technical openness,

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reuse and redistribution is the idea that people can reuse and share the data. So this kind of gets to the idea of legal openness to an extent the idea that people have access to data and are able to work with it and then share it in some type of way. A where there aren't some of these like legal barriers in the way for people to be able to do that. And then there's universal participation, meaning that anyone can use the data. So there are parts of the world where you know, data is not really accessible, due to the sheer fact that they may not have the appropriate tools, the appropriate infrastructure in place to be able to access it. So more and more organizations have really started to think deeply about this idea of universal participation. And what does it take to make data available to the public at large, and the public at large, being defined as kind of this, like broader international community, particularly in parts of the world is the role of different societies in the world that may not have access to, you know, some basic kind of fundamental tools in accessing open data? So universal participation is a concept again, that people have really thought more and more about, how do we make data universally available. So there are three uses of data in general. And these also apply to open data as well. So the next couple of slides, I'll talk through the uses of data a little bit more generally, but several of these ideas can be applied to the use of open data to so the first kind of step is to observe. So what does your data look like at some point in time? It's essentially a snapshot of the world at some point in time. So an example at this phase could be like, how many customers were served during the last month? Or what's the temperature today? Or what's the most frequently tweeted topic? What was the most frequently tweeted topic last week, this all kind of falls into the realm of observing observation. And then there's this use of, then there's this use related to reasoning. So basically, using data to gain some type of intelligence or gain some type of vision of some future version of the world predict what will happen next. So how many customers, you know, will request services next month, and what will the temperature be next week or next month based on what we have, based on the data that we have in previous months? What actions will create more tweets, these are all questions that really kind of hit it this idea of reasoning, using your data to reason. And then this idea of acting or automating. So using data to change the world in some way, change a company in some way, make some data informed decision, whatever that data informed decision is, this idea that when you have some alert go off, or when you reach some threshold, or reach some specific metric, that there is some type of change that is then instituted. And these are kind of like the three buckets for the three kind of generic large buckets for general uses of data. But they all very much apply to how open data is used as well. So it turns out that these aren't really like individual buckets that are meant to be acted on in some type of linear fashion, they actually define the core components of of what a data project overall might entail. So you

might start with observing what what some state of the world looks like, at some given point in time, or what state of the state of the company looks like. At some point in time, you'll then begin to understand what this data is actually trying to tell you how you might be able to draw some intelligence from it, reasoned through it, and then be able to make some data informed decision, use your reasoning to actually institute some type of action or institute some type of change. And then that change then goes back to providing you with a version or an A, and a picture as to what the new state of the world is, the new state of the company is the new state of an organization and kind of go back to this observe kind of portion of the cycle and then kind of work your way back around. So really is meant to be a very cyclical approach to kind of how you work with open data. So when might you actually want to use open data? So

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the primary or the main reason that I've kind of seen in terms of why an organization or a set of individuals might want to use open data is simply to just augment other data they might already have. That other data could be proprietary data, it could be other data that is available in one or more public form. But whatever that data is, the data itself may not be sufficient enough to solve a problem. It may not be sufficient enough to create like a machine learning model, for example, that has enough features that you could feed into that model to actually get a high accuracy or like high recall and so on. This idea of using open data to augment other datasets or other data sources that you already have is a really, it's a really powerful use of open data, you can combine it with the data you already have, in order to gain more insights, gain additional features to your, to your potential model that you're trying to run. So there are a number of reasons as to why augmenting your current dataset, whatever it is that you're working with, with additional datasets might be helpful. You can also use it as a proxy for other datasets. So there might be datasets that are proprietary, and you may not have access to, for whatever reason, there might be an open data set that may serve as a proxy for that proprietary data set of the data set that might be more difficult to obtain. And so open data might be particularly useful in cases where you aren't able to get the specific data you need for a project. But you might find an open data set that might be able to suit your senior project or suit your purpose. And then on its own, you might have an idea for a project that uses Open Data entirely. There are a number of different examples that we'll kind of talk through today that talk about how you might be able to use different Open Data Sources combine them in really interesting ways to get to some really interesting conclusions. So okay, there are a number of different open data sources out there in the world. So we'll talk through, we'll approach this topic in a couple of different ways. One is we'll talk about some libraries in open source languages like R and Python that have become popular in, in, in working with open data. And then we'll talk about open data sources more generally, like where can you find open data, who is out there in the world that is producing these really nice open data sources? What types of organizations have really engaged in this work over the last several years? So kind of approach it from that perspective as well? So the short answer is, you know, open data is everywhere. And there are a number of organizations out there in the world, governmental and non governmental that have, again, really invested a lot in making data more accessible. Well, first start with some R and Python libraries and software suites that have become particularly popular in their use of analyzing open data or just working with open data, extracting open data cleaning open data, there are a number of our Python libraries out there in the world that have just become really popular for this type of use. I'm focusing specifically on R and Python, because these are, in general, two open source programming languages that have become

particularly popular over the last several years. You know, I think it's important to keep in mind that there are other proprietary software suites languages, statistical analysis packages that are out there in the world, this status and SPSS of the world that are proprietary nature, but they also have powerful libraries embedded in them that allow you to kind of manage and work with open data. And we won't be focusing on those, we'll be focusing more on open source libraries, specifically related to our Python programming languages. The first language that we'll start with is our Open Gov, it is a library that or package I'll use packages and libraries kind of interchangeably. But it's a package with an R that allows you to process open data, validate open data, and access open data in general, in a few different forms. It's a library with an honor that has become quite popular, the emphasis of the library, many of the functions are kind of geared towards like government data. So if you're working with non governmental open data, this may not be the library of choice, although there are functions and methods inside of this package that might still be relevant. But definitely for government open data. This is a great library.

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There's another library are open side, which, unlike the previous library I talked about is a bit more general a bit more generic and working with all types of open data. Again, another write library with an art that is quite popular and quite robust in providing you with tools to be able to access or work with open data. There are a number of different libraries and Python. Open data sets is one that allows you to again manage open data work with open data, clean open data, do various transformations of open data. There is a A library called Open Data Cube. That is a library that focuses specifically on how to manage open data that is specifically geospatial in form. So there are a ton of different functions and methods housed within this library that allow you to access and work with geospatial data specifically. So this is a really nice library, if you're wanting to do any work that involves like geospatial analytics or location intelligence. Soda pies are really popular Python library for accessing and extracting open data in dynamic ways from various open data sources, there are a number of different governmental institutions, not just in the US, but across the world that are, that are using soda pie as kind of like its main as their main library or library of choice to be able to work with open data, sort of pies become really popular, we'll talk more, we'll talk a little bit more about soda pie. And in the next several slides, or in slides that follow up. So those are kind of a pop, those are kind of the the libraries and packages that have become, I think, really popular to kind of the world are the world of Python, will now kind of transition to some popular data sources. So these are places where you can actually get open data. So whereas we just talked about the various libraries within open source programming languages that are useful for working with open data, we'll talk now about where you like, where do you actually get open data from. And there are a number of different sources. And I've kind of gone through and provided a little bit of like a theme for the different sources that are available, we'll start with this idea of jobs for tomorrow. So looking at employment data, or sources, where you might have information about open datasets that are relevant to kind of workplace employment, there are a number of different multinational organizations that have really large, robust open datasets. You know, these are all organizations that, you know, probably are familiar to most of us, the UN, the IMF, and World Bank, you know, these are all international development organizations that have curated quite a bit of open data over the last several years, and that have worked really hard to make open data accessible to, to the public. So there are a number of different development banks across the world as well, that also kind of made similar strides and making open data available and accessible. There's a ton of stock market

information out there in the world that is provided through various kinds of federal governments, you know, around the world. data.gov is the open data platform that is that is kind of managed curated by the US governments, Australia, Indonesia, Kenya, Peru, UK are some other examples of governments or countries that have federal government structures that are really invested a lot in making open data more accessible. There are a ton of open data platforms for various countries. This link here at the bottom of the index, that okf n.org, will provide you with a nice little list of countries around the world that have made strides in making open data that is country relevant or country specific, available to the public. There are a ton of access to capital related open data sources that are out there. We talked about the World Bank, generally specifically within the World Bank, though there's the global FINDEX database, which provides you with some really nice open data sources that get at this idea of capital. So that's a really nice one. There is this findet gateway that was developed. This is a organization that had developed a open data platform to

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make open data available to the public that is relevant to global response to COVID. How countries organizations have kind of tracked their COVID cases, how they dealt with COVID cases, a lot of COVID related information is now housed in this findet gateway. So there any projects that you're interested in that have anything to do with COVID COVID response. This is a nice platform that has relevant datasets, open datasets for, for for for these types of topics. There are a number of open data sets that that are available through NASA via their Landsat platform. These are open datasets that again, kind of touched on the idea of, you know, open data for like geospatial analytics. There's a ton of aerial mapping data, there's a ton of like satellite information data that is available through through this open data library. So this is a really good one, if you are looking to kind of add to your add some location features to your to your data projects. There are a few open datasets that are relevant to the world of you know, individual financial management, perceptions, attitudes, the fin sculpt surveys are really good one. There are open data platforms that are relevant to city level data. So municipal data. This is the link for the open data platform is managed by New York City government, probably out of all the municipal governments across the country, your city is probably one of the most one of the largest repositories of open data. New York state also has a very robust open data platform. So they've really done a good job investing in, in making open data more relevant and more accessible to the public. I had mentioned these already, the various open data sources that were provided through federal government structures and institutions. There, there's an open data platform that houses open data related to financial markets, this insight to impact platform is a really good one for that a lot of these that I'm going over, if you just Google these platforms, you'll be able to get to the bits of the link pretty pretty directly. I mentioned that only because I realize I'm hacking through these various platforms pretty pretty quickly here. There is a, there's a more general kind of search engine for open datasets. See, Ken has a really good resource that provides you with information on how to access different countries or city data portals their open data portal specifically. So if you just want a general search engine that you want to work with, to try to find a specific open data set from a specific type of institution or part of the world, this is a good place to this is a good place to start. And then there are just some other open data platforms that are out there in the world. Harvard has their open data platform that they've been working on for a number of years called Data verse, data versus@harvard.edu, they attempt to organize by academic discipline, you can kind of see the different academic disciplines that they attempt to kind of bucket their open datasets in. And you can also see that there are quite a few that

are housed within within this platform. So this is a really good place to look if you're particularly if you're interested in open data that is a little bit more more academic in nature. This one I really, really like this is a open data platform that allows you to access data that might have been relevant to some type of peer reviewed research study. If I am particularly interested in research paper, and I'm really interested in working with data from that research paper, this is the first place I'll look, papers with co.com is a great resource that allows you to access in open data form, the data that a published or peer reviewed research project might have used, you know, in their particular study, this is a good one, I use this one quite frequently, particularly if there's data that I am seeing in some type of peer reviewed literature that is relevant to something that I'm working on.

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The monetary data exchange is useful for economic recovery social recovery projects. Hum data.org is a nice platform that would be able to provide you with open datasets that are relevant to kind of economic recovery method. This is an international platform to use. They have datasets from all over the world. And other places look so you can kind of see, you know, the Open Data is kind of generally bucketed in like one of two ways, right? You might have various institutions, whether they be like city level, government, state level, government, federal level government, you know, all of those types of institutions may have open data platforms that they've established. And then there are more like thematic ones, you know, we talked about a few of them, you know, there might be themed ones towards, you know, COVID response or like access to markets or you know, financial data. There are open datasets out there. They're open data forms in the world that attempt to kind of organize a lot of open data in more like kind of thematic and, and subject specific ways. Okay, I'll now kind of talk through a few kind of things to consider when thinking about like how to work with open data. Right now we have access to a ton of open data, we have access to more open data now than we ever did, you know, before. But what are some important things to kind of keep in mind as we begin to use open data, we'll talk through some key ethical principles. And above all else, the thing that you should keep in mind is that deliberation is really, really important. So constantly questioning your approach, constantly questioning your methodology, constantly questioning your intentions of how you use open data. This is, in general a good habit to keep when you work with data in general, but specifically, with with open data, it's, you know, there's, there's a particular kind of responsibility that comes with the idea of being able to use open data to further some type of project further some type of cause. So above all else deliver, above all else, deliberation is extremely important. And the first part of that is, is keeping in mind that ethics is a process, it's not really a destination, right? So this idea that, you know, asking yourself, how open data is being used throughout the, throughout the lifecycle of your project is a really good approach. I don't think I think start like a number of checkboxes that you check off, it's more, it's more a, it's more a process. And it's more we're thinking about how you're actually using data or open data. Accounting for vulnerable stakeholders. So there are a number of different considerations that you should keep in mind when working with, you know, data in general, but open data specifically. And I think this, this idea of considering who might be missing from your training data from your data set that you're looking to embed into some model is particularly important thing to keep in mind. Because you might have the most powerful data set in the world, but it might also just be biased in some way, it might be missing a good chunk of data that might be relevant to a specific population, and then, you know, your, your your data that you feed into any model is going to be, or the model that you create is only going to be as good as the data that you feed into it. So if it's biased in some way, then you'll end up

with a bias model, if it's missing some components, your model will be absent of that component. And so it's important to keep in mind what things are actually missing from your, from your data,

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assessing values that are in art embodied by your algorithms, this is a bit related to this previous idea that we talked about, thinking about who's actually missing. But there might also be algebra algorithms that you are intending to use that may not have as much clarity, or they may not be algorithms that that may not be as interpretable, or as kind of openbox might be more blackbox algorithms. In general, I think it's good to avoid blackbox algorithms, if you don't know where they're derived from, if you don't know how certain features are weighted in a model, then there's a risk involved. And if you're feeding open data into an algorithm like this, just because the Open Data is open. And you might think that okay, well, all open data is good data. And I'm good, as long as I use open data, you know, it relates back to the previous idea that there might still be something missing from your open data. But some of those, some of those concerns might be further exacerbated if you if you feed those types of features, or datasets into algorithms that are more blackbox in nature, and that might have some like, hidden, hidden feature, like hidden agenda, or things that might not be as transparent. And so in general, always good to use transparent algorithms. And this is particularly true for public facing organizations. Maybe not as relevant to organizations that are more proprietary in nature, particularly if they're like, their intellectual properties involved and things like that. But particularly for like public serve against institutions, if any public serving public facing institution is using any sort of blackbox algorithm that probably isn't a very good thing. Okay, and then we get to this idea of always keeping in mind your user and your problem. So keeping in mind, who will actually be the end user of your, of your analysis, who will be the end audience of your analysis? Who's going to use your, you know, fancy machine learning model that you created from the open data set that you're able to curate? Keep thinking mind, the end user is a really, really important consideration. And it's always something that you should keep in mind when thinking about how you've developed a algorithm using a set of features from like an open data set. Keeping that in mind, keeping that end problem in mind is just in general, really good practice for any data project, but particularly relevant, particularly important for any project that you're using open data to, to do. And then again, consider the trade offs. What's the worst, always think about? What's the worst that could go wrong? And start there. Think about how your open data might maybe exacerbate some type of like, you know, inequity or inequality, are there other things that could potentially come out of the use of open data for whatever data project you're working on, that may be more nefarious than good, you know, we all kind of work with this, we all kind of work with open data with the intention that, okay, we're going to be, you know, hopefully moving towards some project that would hope to accomplish some sort of social good or public good. But always think about what could potentially go wrong. And again, this is also related to some of the other key kind of ethical principles that we've talked about, where we've talked about, you know, like, who is missing, right, who's not being represented? I mean, there are concerns like that, that, again, always need to be taken into consideration when thinking about potential trade offs and potential uses for your, for your open data.

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So I've kind of kind of summarized a lot of what I've talked about in terms of ethical considerations and concerns on this slide here. You know, these are again, concerns that are questions that you probably should be asking yourself, do you work with any data relevant project? What does success look like?

Who's going to use my data? Or who's going to use the analysis of my data? Who's it going to affect what can I hope to change with this analysis? what's the worst that's going to happen if we fail? What's the worst that happens when we succeed? constantly going through this questioning get not just that specific phases, but kind of throughout your data project, our I think, you know, that that makes for a really good approach. Thanks for really good, responsible approach. So I know we kind of talked through a lot. I'll kind of quickly summarize here, you we talked about some benefits of using open data, we talked about this idea of transparency and accountability and accessibility, the ease of iteration and kind of collaborating on open data, there are a ton of benefits that are that are, that are, I think, relevant to the use of open data. And there are definitely risks as well, right, like with anything in life. So there are a lot of risks, you know, a lot of those ethical considerations, if not handled appropriately, if not handled responsibly, can lead to a ton of risk. You know, this idea of helicopter research that you're accessing some like data set for some, you know, country out there in the world, and then just using that data, to provide some type of analysis without any type of context for where that data comes from, who's collecting that data, without any reference to the researchers that worked in the surveyors that work to actually collect this data. Without that context, sometimes the use of open data may not be very helpful and not not may not be very relevant, it might may not be very useful. So always keeping in mind, the original source of where your data set come from, where your data set came from, and including, you know, individuals organizations that were responsible for putting that data set together, is really important, because that then would provide you with additional context for how that data was collected, therefore, providing you with more information about how to make your make your data project that much more relevant and useful. Great. And that's it. I'm going to stop there and hand it back off to you, Charles. And would be, we'd love to answer any questions that kind of came in as we were talking through several of these ideas, logical data

34:06
rates, so yeah, anyone from the audience? Now's the time to kind of chime in and ask any questions about the Open Data topics that were just covered. So the q&a session is open. And while we're waiting in line, I got a I got a question that I was just curious when, as you're going through and showing all the different data sources that are out there, just from your, your perspective, and I was kind of astonished. I was like, wow, there's just data all around us that we have access to that probably a lot of people don't even really know about, but what are some of the kinds of interesting data sources out there that are probably you know, that people would probably find that case? I'm glad I know about that. I didn't know that that data was out there. I might go take a look. Is there anything like interesting data sources that you think are that are out there that people might be surprised to know About.

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Yeah, so the federal government has made, I think, particular strides in making data more accessible to the public. And so data.gov is a really, really great platform to access, open datasets that have been provided for, and through federal government agencies, including census data. And I mentioned the census data specifically, because there are a number of different data sets that are made available by the Census Bureau that actually weave into other data projects quite nicely, it provides you with a lot more context for the work that you might already be doing. You know, there's a lot of, I feel like there are a lot of projects kind of out there in the world that hit on, you know, kind of social economic components of, you know, just how the society functions. And so being able to being able to look

through data.gov, for Census data for other data that is relevant to data that other agencies collect other federal agencies collect might be a good place to look, if you're looking to, you know, add in some additional features into your, into your model, they're just a really, they're, it's a really robust platform, there are a ton of datasets that are now available through data.gov. And there are probably datasets that you are probably thinking like, Oh, I didn't even know that this was available, I didn't even know the data was collected in this way. So there's, there's just a ton of data out there, through through through data.gov, I spent quite a bit of time working on data.gov open datasets.

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Not imagined like so like for like a nonprofit organization looking to do some grant, to provide a grant, for example, like doing education, and you're part of the city that might need some some additional support. But there's some, like datasets out there that can kind of tell the story, particularly to the to the needs that are out there and various aspects. And I would assume, right?

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Yeah, absolutely. I think if you're, if you're working on any type of relevant project, as a member of an organization that is, you know, based in some like geographic, you know, vicinity, I think one good practice that people could probably just do today is like, go out there and just survey the, you know, survey, what datasets, what organizations, houses, public datasets, open datasets that are relevant to kind of like, where you live, where your organization operates, look at, look at the city that you operate in, see if you can find open data platforms that are available and made through, you know, the city's platform, look at your state look@data.gov, there might be additional, you know, datasets out there through data.gov, that's directly relevant to the work that you do. And like you had mentioned, education, there's a ton of federal department of education data through available through data.gov.

38:09
Another question, so you mentioned a lot about the different platforms, and you're going through all the different platforms? And so those platforms, then would you say that they are actually taking like a first crack at a specific specific datasets, and then they're allowing some, you know, some like, algorithms and some, some basically some filters in access to those those datasets? Is that kind of the the reason for the platform, those different platforms that are out there?

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Yeah, absolutely. And I think the extent of sophistication actually differs like platform to platform. So there are, there are definitely organizations out there that have included, you know, you know, kind of kind of like inbuilt tools within the platform. So, you know, you can filter data, set open datasets, in certain ways, you can, you can get through and do like a really detailed mining of a data set, there are other organizations that may not be as big that may not be as sophisticated in their platform, and that just kind of make the data available, they might only be making the data available in specific forms and specific file type formats, you know, the other organizations that might make it available through different file formats, they might even have like a nice little API that you can kind of connect to, to get, you know, get more like real time or dynamic data for for a particular open data set. So it really just depends organization or organization, you know, and also, you know, but by no means was the list that I provided meant to be like exhausted. I mean, there are there are a number of different platforms out

there in the world, that are probably good are probably really good that it just, you know, I kind of just, you know, I didn't cover for whatever reason, I just haven't been exposed to them in my work. So, that's the only reason I didn't cover that. So yeah, the list that I provided wasn't meant to be like an exhaustive list or anything like that. But yeah, again, I would really encourage you if you if you work in a specific sector or if you work in a specific industry, or if there's some geographic vicinity that your work is really focused on, I would really encourage people to go out and just seek what open data platforms are actually out there and relevant to the work that you all are doing. Got it?

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Is there any training that's available to people that, you know, are interested in going out? Is it just kind of trial by air and learn on the job go out to these days, you know, these platforms? And? Or is there any kind of training course or anything that you recommend that somebody can kind of upskill themselves to go out and maybe be effective in hit the ground running on these these particular tools that you just talked about?

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Yeah. Yeah, that's a great question. There are there are platforms out there that, you know, again, might be more sophisticated in nature that have like whole trading modules on how to access and work with their specific platform. Those are those would be particularly helpful if you know, you're still just trying to like learn about the world of open data. And maybe you're interested in working with that specific platform, those types of trainings can be particularly helpful. I think that there are trainings like that for, for census.gov. And for data.gov. I think they have developed modules that you can access. I know for data.gov, they have a pretty active help desk and help feature that allows you to, you know, you can get you can get a you can get a statistician on the phone and talk through kind of like what you're looking for, what type of format, you might want a particular data set, and they can kind of talk you through, like how to how to access the platform, how to work with it. So there are resources like that. But again, it really just depends platform the platform.

41:44
Alright, great. All right. Well, yeah. Any questions from the audience? I know we don't have we have one person here locally in our room here. And then on LinkedIn, live to anybody have any questions or comments that you want to make about the presentation here. And then, as always, who you know that attended the webinar here, we're going to send out a recording and we also to send out our contact information. So if you'd like to get a hold of Imran his contact information will be out there and available to you on any of this material that we share today. So there are no other questions. Thank you so much, Mr. For for having this presentation with us was very informative, and definitely appreciate your time today. Yep,

42:31
thank you. Alright,

42:33
thanks a lot, everybody. Have a great day.