Welcome to InTransition, a programme dedicated to the practise of content communication in the public sector. Here's your host, David Pembroke. David Pembroke: Hello ladies and gentlemen and welcome to InTransition, the podcast that examines the practise of content communication in government and the public sector. My name's David Pembroke and thank you for joining me. Today, we will speak about software engineering, algorithms, and all sorts of other complicated, complex things that help you to understand your audience, and to achieve your objectives. We'll do that with one of the smartest young people in Australia, but before we come to the interview for today, we start as we do each week, with the definition of content communication as it relates to government and the public sector. Content communication is a strategic, measurable and accountable business process that relies on the creation, curation and distribution of useful, relevant and consistent content. The purpose is to engage and inform a specific audience in order to achieve a desired citizen and/or stakeholder action. So, to my guest today, it's Renee Noble, who is a software engineer at Data 61, but she's also responsible for the algorithm that drives Ribit, which is the job matching service that we've been discussing over the last couple of weeks, that is part of Data 61, which is also part of the CSIRO. My guest today is Renee Noble who is a software engineer at Data 61, but she's also been a young researcher intern at NICTA. She's worked as a tutor at the University of Sydney, and she's also been an engineering intern at Amcor, but at the moment her job is to really make the algorithm work at Ribit, and what I want to talk to her today about is really about science and engineering, and how in fact people can use data to better inform their content in order to achieve those business objectives. Renee joins me now. Renee, thanks for joining me on InTransition. Renee Noble: Oh, pleasure to be here. David Pembroke: Renee, just take me back to, let's go back a little while I suppose, to maybe when you first started to get interested in science and maths, all those years ago, back at Coffs Harbour High School, on the northern New South Wales coast here in Australia. Renee Noble: Yep, well I've always been a bit of a nerd. I loved everything. The first time I picked up chemistry, I fell in love with it. I wanted to have periodic tables all over my walls. I loved maths. I guess I never quite knew what it was useful for until I decided to enrol in Sydney Uni, because I just kind of flipped through the book, of course, as you could do at universities and went, "Well, I like maths, I like physics and chemistry" and I actually settled on combined chemical engineering and science degrees, and doing a chemistry major. Had no idea what computer science was when I got to uni.

	Luckily, I got to uni, I met a few people, and they told me what programming was all about, introduced me to programming for the very first time, and then I tacked that onto my degree, and now seven years later I'm sitting here, I'm working at the CSIRO, Data 61, as a computer scientist, writing algorithms that affect people's lives every day. Yeah, it's a great field to be in and I guess you can touch so many people's lives, and I guess I'd never quite known what you could do with maths. I'd always been in love with maths, and I guess I hadn't realised that you could use all that maths knowledge. When you can programme, you can do it basically maths on steroids, get all the maths and all the algorithms you love out to everybody and make a real impact.
David Pembroke:	It's certainly a good time to be a nerd, though, isn't it?
Renee Noble:	Oh, it's a fantastic time to be a nerd. I'm trying to promote it to everybody I can get to.
David Pembroke:	But interestingly, looking at your background, you're just not interested in maths. You're also, when you were at Sydney University studying, you were involved in the debating team, the choir, the netball team, the touch football team. How have you balanced those sides of your life?
Renee Noble:	I guess I like to be busy. I get bored easily. At the moment, I'm working full time at Data 61, but on the weekends, I run a national programme called "The Girls Programming Network" where we teach girls to code for free; by girls, for girls. I also teach a swing dancing class every Tuesday, so there's never a dull moment. I like to keep busy, and I guess I just want to tell everybody about all the things I love and make the most impact that I can.
David Pembroke:	In terms of having that impact and using data at the moment, what are some of the simple ways that you describe what you do to the people who are at the swing dancing course?
Renee Noble:	I guess I tell people I'm using people's data to work out what kind of people they are and what they want to get out of using something like Ribit, and possibly that trying to get value out of them, or give them value that they didn't realise they wanted. I guess what I tell people is that I'm making matches based on the data that I can see of them and the data that I can see for the whole community, to make the best good that I can.
David Pembroke:	What's best practise to you in terms of data analysis? The reason I ask that is because I think increasingly in terms of creating content for government and public-sector organisations, we have to become much better at using the data so we can understand what are the stories that people are interested in, what time of the day do they like to see them, what are the formats that they like, what are the channels that they like, so all that information is there available to us. But what is best practise and how can people take best advantage of the

oceans of data that are out there that can inform those very important decisions that they need to make? Yes. There's a huge amount of data and we're collecting more data by the second. Yeah, really deciding how to use that data and making sure your

assumptions are valid when you start out with something. I guess when we use data, we have to make sure we're completing a cycle to make sure we take the data, we do something with it, we make some prediction, or we just make a decision based on it, and then we need to check that that decision actually worked out to make an improvement. Because we could otherwise, if we're deciding what content to show somebody, or what jobs to assign them on Ribit, if we just make a guess and we don't ever go back and ask the question, is that better than randomly assigning someone an article to read or randomly assigning some jobs that they might be interested in viewing? If we don't check with them by collecting data in some way, to complete a validation process, then it's all for nothing.

David Pembroke: OK, so we start with the assumption. Let's go through an example perhaps of creating content to engage with students that are going to open up opportunities for them within let's talk about the Ribit network because that's something that you are obviously engaged with on a daily basis. What are some of those assumptions that you need to start with?

Renee Noble: Well, you need to think about how much time they have, what are students interested in actually reading? Is it a time of the year where they want to be working on their resume? Or, is it a time of the year that they're stuck into their studying and that they're not actually going to have much time to read this at all? We need to think about, are engineering students interested in reading an article on business? Or, maybe business students aren't interested in reading articles on human interest. We need to think about the kinds of people who are going to be reading it, and then think about, "So what's going to drive our decisions on which content to send to which people?"

David Pembroke: OK, so context is that first point that you raise, and I think that's fundamentally important as a driver, because people are influenced at different times of the year, as you say. If it's summer holidays, you're not going to be creating content that's relevant to winter time, for example. Understanding that context upfront, but then understanding those interests, but it would seem to me that there are so many things that could go into just about any sort of consideration. How do you go about narrowing down and understanding those assumptions, and the assumptions that are going to have the most impact on the decisions that you're making?

Renee Noble: A lot of the time we actually leave it up to the computers. There's so many bits of information and we can't possibly know everybody's motives or understand what every individual wants, so we can make assumptions on a large basis. We don't want to send out content during the summer holidays about internships

Renee Noble:

because people are on holidays and travelling, so we can start with large assumptions like that, but on an individual basis, we need to look more in depth at each individual person, which you can't do as a human. We let algorithms figure out these patterns, and a lot of the time, there's so much more information hidden beneath the surface that we couldn't possibly figure out by ourselves, so we let algorithms pick up unstructured data.

So, we use things like free-form text and use a bunch of algorithms that can turn that text into numbers which we can use to compare between how much someone might like a particular article or a particular job. We can see the similarities in how they write and how that might increase their likelihood of enjoying some article.

- David Pembroke: Now, most people who are working in communications don't have the mathematic skills that you're talking about. Obviously, they may be able to access them within their own ICT areas or their other people who may be working in data that they can help to work with them, but what's some best or simple best practise that people could possibly use, or some of the services that are now freely available? I understand that Google has basic AI services that you can access. Obviously, Watson from IBM, there are basic free services that can be used. Are they some of the tools that can be used to help you to make some of these decisions?
- Renee Noble: Definitely. Things like Google Analytics can track how many people are visiting your site and things like this, and I think yeah, collecting that end of the line data is really the key point. Whether it's using Google Analytics or calling up your customers or taking a survey, just getting that statistical information, doing basic things like, "On average, a lot more people listen to this or engage with this content." On average, medians, seeing how one demographic might be more greatly affected than another, just basic statistics you can do in Excel, is something that would be really helpful for making you more aware of how they engaged with it and making your decisions for next time you're going to send something out to them.
- David Pembroke: Is it important to measure everything?

Renee Noble: I don't think so. I think you need to target very specifically what you want to get out of it. You should be looking at who your audience is, what is your goal, and then what is a metric that is going to show you what if they're really engaged with it, or if that was really the right decision to send it out to them? I would choose a few targeted metrics and then collect data around that. You don't need to collect everything, because that's just a pile of numbers that you have to do something with. Most of them are going to end up going to waste.

I would start with a key metric and start from the very beginning, knowing what data you want to collect and how it's going to prove the point that you have been successful in measuring their engagement.

David Pembroke:	Yeah, because I suppose it goes to that point about a pattern, doesn't it? That you're going to see a pattern but to have a pattern you need to collect data over time.
Renee Noble:	Definitely, yes. And you want to be collecting the same data from the very start, so that's why I would say if you're going to have any sort of strategy around engaging people, you need to have that metric from the start and that strategy for collecting data, and for processing it, from the very beginning.
David Pembroke:	How time intensive is that? Obviously, that's a question, how long is a piece of string? In your experience, how much time and attention should people be giving to establishing these datasets and interrogating the datasets that they're collecting?
Renee Noble:	I think you can do a lot with a little information and get a lot of the way down the line, but yeah, it's highly contextual, but even yeah, just doing a survey or watching what someone's clicked on maybe. You can get a lot of feedback using some simple tools to see how they've engaged. Even if we've just given someone an article and they've clicked on it, that's already an indicator that they've engaged with it, and that's a very good beginning I think.
David Pembroke:	How do you get people engaged in doing surveys? Because it would seem that you turn it around three times, there's somebody else who's got another survey that they're urging you to fill in, because obviously they're looking for data. What are some of the techniques that you use to encourage people to take a survey?
Renee Noble:	I would say that it's really focusing on how we can improve the quality of the product we're delivering to someone doing a survey. If they can see a benefit towards themselves for doing a survey, that's a good start I think.
David Pembroke:	You need to describe the benefits. What about offering them some sort of incentive or bribe to be involved as well?
Renee Noble:	I've definitely seen that work in organisations I've been involved with in the past. The allure of a free iPad will go a long way.
David Pembroke:	Yeah, it does. We certainly know that because we do our own surveys and we often, well actually always, put an incentive in place because we find that that lifts the numbers markedly. Do you think it in any way compromises the data you're getting if you do have an incentive in place?
Renee Noble:	It's hard to say. Possibly, but I think people, if it's a simple enough survey to fill out, and they can engage with it, multiple choice questions or something, easily, then they will give it a good go I think to fill that out appropriately. Free-form text would be harder to collect because it takes a lot more time and effort, but hopefully you get at least some good data and you can filter manually by the

	quality of the responses you get. Because we have to remember, even when we're using computers, humans are always in the loop because this is just a system designed to help out humans. We have to be able to process that human information which is hard for computers to do still.
David Pembroke:	In terms of survey and survey design, how much expertise do you feel is needed to be able to put together an effective survey? The tools themselves, your Campaign Monitors, SurveyMonkeys. They're very intuitive and they're very good for you and very easy for you to be able to set up very quickly, but how much expertise do you think is needed to make sure that the questions that you're asking are getting you the information that you need?
Renee Noble:	I think it can be hard. It definitely takes a lot of practise. I wouldn't say I'm an expert in this by any means. I mostly collect data by watching people's engagement with a website by clicks and things like that, but I think designing, yeah, well designed questions are an essential part of designing a good survey, and given examples or constraining it to multiple choice, or choosing from a list of options would help if you were trying to collect data that you can aggregate easily to make larger scale decisions.
David Pembroke:	In terms of the size and numbers of questions, what's your view on how big or how small surveys should be? Or, how quickly they're able to be filled out?
Renee Noble:	As a user of surveys, an individual, I can speak on that. I often go, "Oh, five minute survey? That's too long. Maybe I'll think about doing it later." If it's something that you can see a single page and you can get through it quickly, then that's something I do personally, and I think that would be very common amongst people of my generation at least, and probably all people. If you don't know what you're getting back from it, then you're not invested in it very much.
David Pembroke:	How do you describe those benefits to people? How is it you can introduce this notion of, "This is valuable to you?" Like, is it a Yeah. Do you write an article about why it's important? Or, how is it that you try to describe the value of filling out that survey?
Renee Noble:	I guess on a platform like Ribit, it's a lot harder when the people you're talking to aren't people you know personally, aren't necessarily warm contacts. Hopefully people are seeing the value of the platform and if you make it a more personal sounding message, I would say it would be more effective, rather than making it sound very robotic, very like, "Everybody receives this message and this is just part of the drill."
David Pembroke:	Okay. How often are you going out and surveying? Or, how often do you think people should go out and survey their audience?
Renee Noble:	That is very dependent on the kind of data you're collecting and the kind of time span that whatever you are acting on takes place over. If it's a longer term study

	of people's interaction with a site, then you would probably want to do it less frequently, but if you want to see how many people are using something on a daily basis, then more regularly would be appropriate.
David Pembroke:	Okay, so this is your responsibility obviously, is to do the data analysis for the Ribit team, but can you describe how do you fit into the general working of the actual programme? Where do you sit and how do you integrate what you're doing into the broader business line and business activity of that actual programme there at Data 61?
Renee Noble:	Yes, so being able to predict good jobs for students and good students for jobs is a key part of Ribit that will set us apart from other jobs platforms, we believe. We put a lot of effort into making sure that it's integrated well into the platform so we can show people the full value of the thing that we're creating. I guess I work a lot with the rest of the team on how it's going to appear on the frontend of the website and how we need to work around collecting the right data so we can make the correct predictions.
	And I also focus a lot on being able to collect the right data so we can actually validate this experiment to see that we're actually improving the quality of jobs that we're giving students and students we're passing onto jobs, by seeing if they're actually engaging with these new students more than they would with a simpler algorithm or more than they would engage with students that we assign to them at random.
David Pembroke:	Yeah, okay. Then, how important is design then as it relates to data collection and impact?
Renee Noble:	I would say design is the largest part of my job. Whether it's designing how all the parts of the algorithm are going to work together and how we might aggregate different results from different parts of the algorithm into one big, very good number, rather than lots of different smaller less effective numbers. Or how we might collect that data from the users and there's a lot of it to do with If we had so much more data, we could do a lot more with it, but we have to have a trade-off of how much data we can reasonably ask a student to put in and how much we can get out of it. We could ask them to put in a huge amount of data and we could get a huge amount of value from that possibly, to give them a really good job prediction.
	Or, we could ask them to put in a smaller amount of data and not get as valuable a job prediction, but they're more likely to engage with the platform because they haven't had to put in that huge overhead of effort. It's really a trade-off between those two points.
David Pembroke:	OK, but ultimately, it's delivering a great experience for the user?

Renee Noble:	Exactly, yes. We want to make sure that from signing up on the platform to getting some job recommendations to applying for that job, it all has to be integrated well, and we want to make sure that one part doesn't over influence the other, so making sure we have a streamlined experience where you have to basically do nothing and you get some jobs out of the end. We need to make sure we balance that we've asked for just enough information to give them great recommendations and also, I guess if you put more in, you get more out is part of our platform. Getting students to realise this is a great opportunity for them to make sure they can put in enough information so they can get out the value that they're seeking.
David Pembroke:	What's the most difficult part of your job?
Renee Noble:	The most difficult part of my job I would say is collecting that data. We've talked about surveys a lot and it's hard to get people to give you the data to make sure that it is working in the end. Because we not only want to predict what job a student might click on, or what they might apply for, we want to see if they not only got the job, but had a really good experience at the job. Because if we can predict where a student and a job might both have a great experience together, that's the exact kind of predictions we want to be making. But without being able to collect that data easily on how great an experience they had when they arranged the internship, it's hard to make predictions to create more of those experiences. Working with limited data is my hard point.
David Pembroke:	Yeah, but that would seem to be a very difficult thing to do because each of their experiences is going to be impacted by all sorts of different things. It could be as simple as the transport is very difficult to get to the job, all the way through to the actual business had a very poor culture and didn't understand. How does that impact your prediction algorithms?
Renee Noble:	Yes, definitely. There's so many factors that would affect something like that, and at the moment we don't get that far down the line, and we're just seeing what students are engaging with, because if we can at least get them looking at more jobs or applying for more jobs, that's a great starting point. Then, in the future when we have a lot more students getting those jobs, we can start figuring out who's having the best experiences, why the jobs appreciated that intern, why the intern appreciated that job experience, and then work on improving the algorithm from there.
David Pembroke:	Are you embedded in the team there? Where do you live in terms of the organisation of Ribit, Data 61? How are you integrated into the team and how do you work with the other team members so they can get best value out of your expertise?
Renee Noble:	I am part of Data 61 as a broader company, but I basically, I'm on loan for as long as need be to Ribit. I work just as any other team member would. I have a few interns that I supervise within the team, teaching them machine learning

	and artificial intelligence and they're helping to get the algorithm up and running. I attend all the meetings to make sure that the platform as a whole is going to incorporate properly the value that I'm trying to provide, and using the results that I create to best give them to the students in a way that they can take advantage of them. Whether that's talking about how the user interface works and looks, how we need to put things into a database so that it can be stored.
	It's all connected, so I'm constantly talking to people designing interface, or people designing the database, and everyone up to the management who decides what the direction of the platform is, because really, this is a huge value add for Ribit, because it's really what's going to set us apart from everybody else.
David Pembroke:	Yeah. Obviously, yeah. That intuitive sense and the value I suppose that it ultimately creates, and if you're making better decisions based on the effectiveness of the algorithm, obviously that creates the value that the user is looking for.
Renee Noble:	Definitely. We want to make sure that value is apparent upfront. So we're showing them, "Hey you've bothered to put in this effort to sign up for this platform. Well, here you go. Here's some value straight away." Then can see the value of coming back to Ribit, keeping on giving us more of the information we need to help them to get to a better place in their career.
David Pembroke:	Now, this integration of data analysts into all sorts of different roles, be it a job seeking platform like Ribit, or into a government communications area where you're actually bringing the data analysts in for the first time, it's new. It's really a new area for particularly government communications people to start to leverage so as that they can make better decisions about content types, topics, channels, et cetera. What is your advice to an organisation who is thinking that, "Yes, okay, I can see the value that we're going to be able to create better content and distribute better content because we're going to know more as a result of data analysis," but what's the advice that you might have for those teams in how they could best prepare to bring somebody in? What do you need to do your job very, very well?
Renee Noble:	I think we really need a team that's going to listen to you and say, "Yes, I can get you that data," if they want to see the results. Because working with the team, if you don't have access to the right data, makes it very difficult. They say garbage in, garbage out, so if you can't get the data you need to make a good prediction of what you want to do, then you're not going to be able to provide the value that they're seeking. Having a team onboard who is willing to listen to you, provide you with the things you need, and also willing to give you a bit of time, because of all of this, if they call it data science for a reason, everything's an experiment and you need to design the experiment, you need to write up the

code to perform the experiment, and then you need to see if the experiment actually worked. That involves validating which is often more data involved, so having a team that's willing to work with that process will allow you to get the full amount you can out of a data scientist. David Pembroke: OK, so patience is important? Renee Noble: Definitely important. It's taken me a bit of time to get things up and running and to work out what data you need to make sure everything is working along the way. But I'm glad I've had a team that's been willing to support that and we're going to deliver something hopefully very valuable soon. David Pembroke: Again, these questions are probably how long is a piece of string? But how patient should people be? How long could it possibly be to be able to start to derive value? Renee Noble: Well, I think you've got to start with a good minimum viable product. Looking at what is the least amount we can do to improve how we're deciding how we deliver content to somebody? Sometimes it's as simple as just collecting some data around who's already viewing it, some simple demographic information, and you can start from there. But if you want a much larger scale, more in depth approach to something, then you're going to have to wait a bit longer. David Pembroke: OK. Now, just a final question, I'm interested, and obviously the focus that we've been doing here or looking at so far is really the data that's coming out of the platforms, and you're looking at the activity based data, then you're looking at that qualitative data that you're receiving when you're doing surveys, but how do you integrate the broader, the larger open datasets? Obviously again, using Ribit as an example, there's all sorts of data around students, there's all sorts of data around the numbers of students and their particular expertise. How do you integrate open data into the algorithms that you're building? Or, do you in fact integrate those open data sources? Renee Noble: For a start, if you're looking for the minimum viable product, I would say you avoid that and you can stick with the information you have, tangible, on hand. But we're definitely looking at how we can use more information that's around to design better algorithms. Whether you might think initially trying to assign a job to a student, you would look at all the jobs and figure out what's best for them, but another way we could go even within the platform, there's open data that you wouldn't think was necessarily useful. You could look at, "Well, I know that 50 other students have applied for this job already and you're not quite as qualified for the job, so maybe I shouldn't recommend it as highly for you, because it would be a waste of you are time, possibly." There's data already inside your platform that's already open, that you have on access.

But then further, you can go and look at data that's existing around the rest of the world and you could, for instance, we are working on trying to work out what students might write and how that would relate to what a job would write about itself, a description, and using techniques to compare those to work out what jobs are best for which students. If we have access to more language and more pieces of text, then we could further develop the model of language around the job applications and job descriptions and student descriptions that would allow us to better create an atmosphere where we know more about how people write about jobs, which would allow us to make better predictions. David Pembroke: OK, wow. That's fascinating. Just a final question, how do you write an algorithm? How do you produce an algorithm? Renee Noble: OK, so I guess there's a few different ways. There's some tools that would make it easier to have some kind of built-in artificial intelligence or something like that, but what I spend my day doing is writing code. I write in Python, a scripting language, mostly and there's a lot of libraries out there that feature a lot of existing algorithms. A lot of it is about taking the data you have, manipulating it, getting it in a state where you have all the pieces of information on hand, and either writing your own number cruncher to figure out what is the best way to sum something up, or aggregate some data to make a prediction, or using an existing piece of code that you can get from a free library to utilise that to make the prediction for you. Then, taking those predictions, possibly using multiple different predictions and adding them together in a way that is relevant to your context and then saying, "This is what my algorithm does." It's a composite of different bits of information and different number crunching parts that produces a result that is relevant to the value I'm trying to create. David Pembroke: OK. Very good. Crossing that line from that technical discussion, it's quite technical, maths based, science based work. Then, that science based communication, then turning it into a form, a language form that people can understand, you're obviously very good at that. But is it a challenge for people to be able to communicate effectively around what they're doing? Renee Noble: Definitely. There is a lot of technical stuff and being able to break it down so others can understand the broad strokes of what you're trying to do is a really important part I would say of data science, and working in a team. Because you need to be able to communicate what you're trying to do, what your experiment's about, and why you need to do it to be able to tell others how you need to do it, what information and support they need to provide, how you need to collect the data, if they need to do a survey, or if you need to add something else to this platform you're using, in order to be able to complete the experiment. Because it is very experimental and if we can't communicate why we're doing it to others, then why would they give us their trust and their time and their value to be supported?

David Pembroke:	Yeah, because I can see very clearly, as you've described, as we've had this conversation today, there's no question in my mind that every communication area is going to have to have a data analyst who is doing this agile approach of testing and learning, of creating the hypothesis, working with the team, then setting up the experiments, running the experiments, getting the data, and because that is going to help us to get more accurate in the content types, the content channels, the timings, et cetera, that we need. Because as there's massive competition for people's time and attention, and unless you're relevant, you're just not going to be considered.
	The only way I think you can be relevant is to go through these testing cycles to just get better and better and better, as you're doing there at Ribit. It's fascinating time, isn't it? Bringing these two worlds together, that have long often not been talking to each other.
Renee Noble:	Definitely. People have kept, "Oh, it's in communication, far away from maths and science" but yeah, it's the time to marry them up to give everybody what they want.
David Pembroke:	Yeah, indeed. Well Renee, thank you very much. Because I'm not a maths person, I'm nothing further from my mind, but we have our own data analyst here at contentgroup and I'm just forever fascinated by the experiments. We can see it already in how it's improving our decision-making because we're seeing things, we're seeing those patterns and being able to react to it. We're going from the days of relying on the old tummy compass and now we're getting the hard data which is helping us to make better decisions which ultimately is getting us better results for the government organisations that we're working for.
	It's an exciting time, very early days I've got to say, but yeah, and I think everyone's going to be the same, so we all have to take this challenge of improving and integrating the data analysis into our work. Thank you very much for your time today and good luck with everything at Data 61.
Renee Noble:	Thanks for having me.
David Pembroke:	And to you, the audience, thank you very much for joining me once again. That was a fascinating chat. I think Renee, what a great communicator, someone who's done wonderful things on the Ribit platform there, but really the way she was able to explain, and I think most of you listening would be thinking, "Yeah, we need a Renee Noble on our team, don't we? We need those people to really add that value, because we can't rely on the tummy compass anymore. We've really got to take on the challenge of data. We can't ignore it, and we have to take it on," so there you go. All right. Thanks very much for tuning in once again this week, for giving up a little bit of your week which I very much appreciate, and I'll be back at the same time next week. Once again, it's bye for now.

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