Interview Data Underlying the Article “Digitalization for a circular economy in the building industry: Multiple-case study of Dutch housing organizations” (under review)

**Title:** Digitalization for a circular economy in the building industry: Multiple-case study of Dutch housing organizations

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**README**

**Subject:** Interview data about how key employees of social housing organizations (from different organizational levels) understand digitalization and circularity and how do they deploy digital technologies in circular projects and processes.

**Description:** We conducted a multiple-case study of social housing organizations and collected data from multiple sources. Three cases from the Netherlands were chosen. The primary data concerns the interviews with the key informants who were involved in circular policy making and pilot projects. Secondary data sources were company websites, videos, web news, publicly available reports and newspapers. This document reports anonymized interview transcripts. We used “<< >>” to anonymize names, project names, project locations, company names, and products.

This study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Human Research Ethics Committee of the Delft University of Technology. Therefore, we collected verbal or written consent from the interviewees. Out of 13 interviewees, only nine accepted to share their interview transcripts openly in an anonymized format.

**Researcher:** Sultan Çetin was the principal investigator of this study. She collected (most of) the interview data and prepared this document.

Interviewee A.1

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| --- | --- |
| **Code** | A.1 |
| **Organization** | Case Alpha |
| **Role** | Senior advisor |
| **Date** | 17 Jan 2021 / 11:00 |
| **Duration** | 53 min |
| **Language** | English |
| **Interviewer** | Researcher (1): Sultan Cetin |

Interview transcript

[…] Introduction (not recorded)

Researcher (1):  
[…] Could you briefly explain your role in your organisation?

Interviewee (A.1):   
I'm a senior advisor at the department of strategy. And I'm working on innovation and sustainability, and sustainability for a few years now is introducing circular building in our organisation.

Researcher (1):  
Are you mainly involved at the strategic level?

Interviewee (A.1):   
Yes. And, I'm pushing everyone in the organisation to do pilots.

Researcher (1):  
Yeah, I read about that as well, and I know already. But just to make sure I am asking these questions.

Interviewee (A.1):   
Yes.

Researcher (1):  
Approximately how many circular projects or policymaking processes have you been involved in so far? More or less.

Interviewee (A.1):   
We started in 2008 for the first project, <<project name and place>>. But it wasn't really circular because circularity wasn't a hot item at that time. And it became more serious in 2018 when we, as a housing corporation, had to make a plan to be CO2 neutral in 2050. Then, I said, we also want to be circular by 2050, and then we started with all kinds of pilots. I started up a working group. A group of colleagues of mine who has an interest and motivation to work on circularity and have the opportunity from their managers to do pilots. Then I said to everyone who will come and join the group, it doesn't have to be too big, so a max of 10 persons, 10 colleagues. And everyone has to do a pilot. So, we have a lot of pilots.

Researcher (1):  
Do you have a list of those? Because I can't find such a list on the internet.

Interviewee (A.1):   
Yes, I have. We’ve just made a document. [Interviewee looks for a document on her computer]. I put it in here. Now you can see.

Researcher (1):  
If it's not private, could you send it to me so I can actually try to compile the information that I found from the interviews also from the web [Interviewee shares a link on the chat]?

Interviewee (A.1):   
Yes. I did put it in the chat.

Interviewee (A.1):   
Yeah. I saw it, so fast. Thank you so much.

Interviewee (A.1):   
Yeah, and that's, I think, most of the pilots we do. But during the years that we were working on circularity, there were more project leaders who were enthusiastic about it, and they did things. They did reuse materials and I don't have all those projects in there.

Researcher (1):  
But somehow you were involved in almost all circular projects in your organization.

Interviewee (A.1):   
Yes.

Researcher (1):  
 OK, so now I will ask a few questions about the circular economy objectives of <<Case Alpha>>. When you go through the documents and report, you see that << Case Alpha >> has a broad vision for environmental sustainability. At the higher level, CO2 neutral housing stock by 2050 is the goal and also you want to be circular by 2050. My first question is: how the circular economy concept is incorporated into the sustainability objectives? How do you see it in the broad sustainability?

Interviewee (A.1):   
We're working on it. In 2021 and in this year, we started with the pilots because we didn't know how to set our ambitions and how to set our goals and KPIs. By doing the pilots, we learned more about what will fit us and our ambitions in a broad way. So, in 2021 January, I made another group with two directors, three managers and two project leaders and two of us: myself and a colleague of mine from the department of strategy. And we were working on a road map. And, we started, well I started, by introducing them to the circular economy… That R Model and S Model of Stewart Brand. Uh, just the basics for what will all the buttons you can turn if you will go circular. So, if they have to make decisions about what we can do and what they can do on their work, they have to know what it means. Otherwise, they can't make good choices. So, we started with that, and then we started with a few of 2050 how will it look like and then we set ambitions on the first page of the document I just sent you there. You see also the ambitions. Our ambition is broad, and then it turns to what it will be on circular. And now we are defining our steps to our ambition in the long run. And we will set actions, and we will set goals. Well, that's what we are doing now.

Researcher (1):  
How does then <<Case Alpha>> define circular economy? When I look at your documentation, I see that energy, material cycles, biodiversity and quality of life, these kinds of elements, are considered within the circular economy. What is in there and what is not? Because there is a big distinction in the field like energy transition, something else than the circular economy.

Interviewee (A.1):   
Yeah, that's where I struggled with when I started because, in my opinion, circularity is the umbrella with energy, materials, biodiversity, social- all under the circular economy, but it was a step too far for the organization. So, we focused on materials. And we do also a lot on the energy transition, and it was already going. But we see it in three different focus points, so we have the energy transition, we have the circularity, and this year climate adaptation will also become one of the pillars. And next year, I think by the first day is also included in the whole, but if you look at the ambitions we set, then we said we want to use fewer materials and we want to use materials that don't do hazard to the ecosystem here and there. So that's already broader but also to focus on the materials. We see by working and doing the pilots. It's not all-in-one, it's already in broad.

Researcher (1):  
Yeah, it's just a matter of communication, right? Like when you say circularity, people immediately think about materials, but the concept itself doesn't really talk about only materials, but it includes others such as energy and water.

Interviewee (A.1):   
Yes.

Researcher (1):  
Connected to this, I wonder what CO2 neutrality really means in your organisation? Is it operational CO2, or if not, do the materials play a role in reducing CO2? How do you calculate that?

Interviewee (A.1):   
Uh, we haven't. What do we do is if you're looking at the energy transition now, then CO2 is all focused on the energy, energy in our buildings. So, we make the difference in our houses and not in our own organisation. So, when they are talking about CO2 nowadays, it’s still focused on only energy. I’m telling more and more there that there's also CO2 in the materials and the more we focus on the energy and CO2 goes down, the more important the part of the CO2 in the materials will become. So, it's a matter of time.

Researcher (1):  
I see. But currently, it's more like the operational CO2 using energy.

Interviewee (A.1):   
Yes. Slowly everyone, who's working with circularity, knows it's also in the materials.

Researcher (1):  
Yeah, sure. We discussed this actually in the last meeting we were together with the other housing corporations, I remember now. So you already mentioned that you introduced R strategies and the levels from, I think, from Stuart Brand, right? What do you use actually when you implement and communicate circular economy? What frameworks do you use? Do you have a framework or not?

Interviewee (A.1):   
No, we don't have a framework. It's so specific on the project you have. We have demolition and a building and we have also renovation. And that's already different. We use Stewart Brand and the R models how do you call it in English? All the levels because reuse and recycle…

Researcher (1):  
Yeah, it's the 10 Rs framework?

Interviewee (A.1):   
Let's say 10 Rs or six Rs or 11Rs or whatever we use it in our communication to make clear to people what will where you can look too. Also, the materials you use but also other materials you don't use anymore and so it's more of knowing that and being aware of that it works like this.

Researcher (1):  
Yeah. Some of the core activities of housing corporations are already circular like maintenance, repair, renovation. So, how does <<Case Alpha>> make a distinction between circular and business as usual activities? Because, you know, maintenance itself is one of the circular strategies.

Interviewee (A.1):   
Yeah, but it's only the maintenance and we can make further steps also on that and that's when you look to the Rs. The last ambition we have is that we use the materials as long as possible. And that's not with what we do now, not always. We try to use it as long as possible, but in a while, it's at the end of life and then it goes, then we burn it. And so, for the maintenance we have two things […] How do you call it? Demountable… that all the materials and all the elements we put in, we can use it again without harming other elements in the same house. So that's the step we can make, and we can also use the materials we have. How sustainable they are. Is it harmful to the environment or not?

Researcher (1):  
Yeah, is your organization one of the signees of Amsterdam’s new rule for 20% bio-based material use in the new construction agreement?

Interviewee (A.1):   
Yeah, it's 20% wood use in new buildings in 2025. Yes, we are.

Researcher (1):  
So, my last question about the circular economy objectives is what is the level of maturity of circular economy in your organization?

Interviewee (A.1):   
What kind of level can I choose from?

Researcher (1):  
Of course, we're not really measuring this here. But it's about how far are you implementing circular strategies. Is it in baby steps? Or you tested it and now you are getting more used to it.

Interviewee (A.1):   
We are now making a big step from pilots to the road map. […] Two weeks ago, I was sitting with the whole board and the directors and telling them what we have done for the last three years and what we are going to do. So, this year is really the year that we bring it from the small to the organization. And, with the road map, then we will be really implementing the other strategies that we already have. I try as much as possible to introduce it in our common system. And, then turning the common system into a circular system […] but by using the things we already have- we have a list of materials that we use. We already have that. So, now, we have to look at that list of materials and use more circular materials in it. Everyone is used to working with that list. So, it's not another list next to this, no, we do it in the list also in our program of requirements for renovation and new buildings. In that document, I put in more and more circular things.

Researcher (1):  
Does this apply to all projects?

Interviewee (A.1):   
Yeah, then it's with all the projects and so then we make small steps. What we say—try to use as many sustainable materials as possible, try to make the installation more demountable.

Researcher (1):  
Now, I'm moving to the second part of my questions. They are about circularity in strategic decision making. This means that housing corporations have a large building portfolio, in your case, it is above 55 thousand units, and you decide on the goals at the higher level- CO2 neutral, circularity, et cetera. And then you test these in the pilots- That's operational level. But we are now curious about this: when you make decisions for the portfolio, what kind of principles do you apply in the portfolio policy?

Interviewee (A.1):   
Yeah, at a higher level, some colleagues of mine will do that. And at this moment, it's not focused on circularity. Not at all. That's the step we have to make maybe this year or the year after. And I don't know how much circularity will play a role on that level. Because on that level it's about what kind of houses do we have? What do we want with an area in the city? What is necessary for the area?

Researcher (1):  
Exactly, that's what I'm curious about.

Interviewee (A.1):   
The focus is on the renters, on the people, who live in the neighbourhood. So, you look to the liveability, how good it is to live in a certain area. And then we say, OK, we need higher rents up there or just low or we need some private houses there. So, we sell, or we build houses. So, then we can make a mix of all kinds of houses in an area. And I don't think that circularity at this level…

Researcher (1):  
But how was it then for the energy transition? Did it again start from bottom to up? How did you implement it? When you make decisions, think about now you have 55,000 housing units and you need to somehow renovate them, and you need to make decisions at the higher level.

Interviewee (A.1):   
Yeah, that was quite easy. This strategy is quite easy. Doing it is a lot of work, but the strategy is quite easy because then you know what you want- we want to go to label B. And now it's different. Now we want houses that don't use that much energy, so we were going for insulation. And that's a no-regret thing that you can do. So overall we are using insulation everywhere so that the houses don't use that much energy. But if we do a renovation then we also look at what kind of energy will come to that area -is it city warmth or is it something else? So, you're much more dependent on what the government will do in that area. So that's where we looked to and made our buildings more sustainable every time. But it's also a lot of regulation on that area and for circularity, you only have the MPG and that's quite easy now to do. By 2025, it will go to 0.5 and then it will become interesting. And, you will have to think about things like that [referring to MPG].

Researcher (1):  
Yeah, actually, my next question was about that – you want to be fully circular by 2050, right? That's the goal or ambition? And what does that mean? How are you going to measure and monitor your progress?

Interviewee (A.1):   
We don't know that yet because there's no one monitoring system chosen in the Netherlands. A lot of organizations are working on that- on how we can measure it-. We can't be circular fully circular in 2050, but what we can do is work circular and that's the goal to work totally circular in 2050. Because we have a lot of buildings who are not circular.

Researcher (1):  
Uh, if that is more like processes you define, you will work fully circular. Let's say all their operations will be circular.

Interviewee (A.1):   
Yeah, all the maintenance all the renovations and the new buildings. And then during that time, our all houses will be circular, but it's not in 2050. That's not necessary. Because, what is there already you have to keep it as long as possible.

Researcher (1):  
That's also another circular strategy, perhaps the highest one, right? -Rethink, don’t buy new stuff, don’t produce new buildings…

Interviewee (A.1):   
Yeah.

Researcher (1):  
But when it comes to calculations, I think it's not there. So that makes your job actually a little bit difficult if you want to have fully circular housing stock, it's already there, some of them, perhaps 100 years old.

Interviewee (A.1):   
Yes, exactly, and that's the difficulty with the renovation. With this stock that's already there. How much a circular is it? Yeah, that's difficult to measure. We're now trying to do it with one of the great renovation projects. And there is also <<a consultancy firm>> is involved and they have BCI [building circularity index] so we can try if it will work with the renovation… We don't know it yet.

Researcher (1):  
So then, my understanding from BCI is that it is at the building level. Isn’t it? Not for the portfolio.

Interviewee (A.1):   
No, not the portfolio now. It's building or elements in buildings. Also possible, so only the bathroom or things like that and I know that <<other housing organisation>> made a calculation also with a <<a consultancy firm>> and <<advisors>> for how circular their stock is now. But it's …

Researcher (1):  
Yeah, because it's a still running process as well, right? It's not static, and it's a really complex problem.

Interviewee (A.1):   
Yes, it is. It's more complex than the energy transition.

Researcher (1):  
Exactly, yeah, because there are many unknowns, not enough regulation, I think. I think it's a good PhD topic -somebody needs to sit four years to get this done.

Interviewee (A.1):   
If it's possible, yeah.

Researcher (1):  
Uhm, you said circularity is not there yet at the portfolio level, but again, what kind of information or data would you need to make decisions for sustainability at the portfolio level? Think about circularity now.

Interviewee (A.1):   
I think the first step that we have to make on that path is - are we going to demolish an apartment building? Or are we going to renovate? And these are questions that you have also on the whole portfolio. So maybe that's the first small step that you make in that direction.

Researcher (1):  
Then what kind of information would you need to actually compare these kinds of scenarios at the portfolio level? Just to give an example, the material composition of those buildings like structural strength or that kind of information… What would you say then?

Interviewee (A.1):   
Yeah, you must know all the costs on the one side and on the other side the materials and also how do you call it … The connections, I think that's an important one and the status of the materials. But what is also important in decision-making now-if we demolish or not is how the floor planning is- if it's still up to date if it can, is it still good, usable nowadays. Or is it too small? Things like that. That's really important in making decisions if we are going to demolish or not. It's also reflected the renters. Is it meeting their needs?

Researcher (1):  
So then how do you access this kind of information at the moment? If you want to make a decision.

Interviewee (A.1):   
Well, in December for the first time, the person who is making that list [program of requirements] demolishing or renovation, asked me what he should put in there from a circularity point of view and I'm still working on that. I just don't know yet what, uh.

Researcher (1):  
But then, do you, for instance, use an ERP system or something similar to collect these kinds of data? So probably <<Case Alpha>> has a map where buildings are located.

Interviewee (A.1):   
Yes, we have that, and we have a data system with all the houses - the building year and floor plans. These are already in our system.

Researcher (1):  
So can you, for instance, see the floor plans of all of your projects? Is it like a BIM model?

Interviewee (A.1):   
Yes. Almost all of them. No, it's not on BIM. It's before BIM… It's just a photo of the building.

Researcher (1):  
Ah, OK, so you had everything on paper that somebody scanned. For instance, if you want to see a unit somewhere in Amsterdam, you just click on it and then you see the floor plans of that property. But it's like a really like a PDF scan or something…not digitalized in terms of 3D models.

Interviewee (A.1):   
Now it's a PDF because first, we wanted to put all our buildings in BIM. But it's a lot of work and is it really necessary every time? You can put something in BIM when it’s new. Because then you work with it already. But if we put a house or apartment complex in BIM, and then we demolish it… It's a lot of costs and we don't use it anymore.

Researcher (1):  
Yeah, I see that you don't see the value, at the moment, for the existing building stock.

Interviewee (A.1):   
No.

Researcher (1):  
So, I don't know if you're familiar with that, but I'll ask anyway, but you don't have to answer. What digital tools do you use for data collection, for example, do you need that data when demolishing a building? Where do you look at?

Interviewee (A.1):   
Yeah, that's something I don't do. That's in all our systems and there are a lot of groups in our organisation who look through all kinds of different data and also for the renters and how good it is living in the neighbourhood, and these are all special trajectories. But I'm not involved in that.

Researcher (1):  
OK, do you exchange data with other organizations when you implement circular strategies? You have many groups you probably exchange knowledge with other groups but in the projects.

Interviewee (A.1):   
Data… I don't know if we exchanged data. If you're working on one project like <<a colleague’s name>> I don't know if you speak to him/her.

Researcher (1):  
I can ask him/her this question as well.

Interviewee (A.1):   
Yeah, when you're working on a project then we deliver the data which the contractor has to use. But that's not very much.

Researcher (1):  
So, have you ever used a circularity tool? It could be such as a material passports application or something specific for the circular economy.

Interviewee (A.1):   
We were doing one pilot with a material passport. But it's interesting for us when we are going to do something with the building. And not before that. Because it's a lot of work and a lot of costs.

Researcher (1):  
Can you explain a little bit more?

Interviewee (A.1):   
Yeah, it's a lot of effort to put everything to make digital.

Researcher (1):  
Do you create the passports yourself? I don't know what product you use, is it <<a material passport platform>>?

Interviewee (A.1):   
Yeah, we are doing pilots with them.

Researcher (1):  
OK. So, then you'd need to put all the information yourself and this requires time. Did I understand you correctly?

Interviewee (A.1):   
Yeah, time and money. And, we don't have that.

Researcher (1):

I know. So, why do you think then it’s important to have passports? You're testing it now. How is your experience with it?

Interviewee (A.1):   
Yeah, I don't know if it's important to have a passport. I don't know that yet. I think we needed to have passports in the beginning, but now I don't know. I think we need to collect the data at the moment that we really have to use it. So, when we demolish a building, we put a contractor there. They will look around and they also know what they can reuse or recycle. And then, is it necessary to put it all in digital to make it all digital? I don't know yet. Because when we demolish a building, then it's gone. And then you don't use the things you made digital.

Researcher (1):  
Yeah, I see. What were the challenges you faced with <<Material passports platform>>?

Interviewee (A.1):   
We ask another company to do that for us and what was difficult also that <<Material passports platform>> wasn't as far as they say they are. They have a lot to learn and a lot to do as well.

[…] In consideration about how much data we want to make digital—First, we said a few years ago we want to put all our houses in BIM. But now we are really rethinking that. Because you have to think about costs and time and where we use it for and when we use it for. Maybe we only need data when we are really going to use it. And then, it’s also done we have to deliver the data or can it also be the contractor?

Researcher (1):  
Perfect, perhaps my last question for you- What kind of digital tools could support you in implementing circular strategies and also for decision making at the portfolio level and at the building level? So, you can think about the tools available, also imagine one that will be invented for you.

Interviewee (A.1):   
Yeah, I don't know what tools are available. So, I think BIM is a good tool the one I know, but not for everything. And, that's on the building level. On the portfolio level, we need the information which we already have about floor plans and how old the building is. But then, maybe also, what kind of materials are in it, are they toxic or not? Or they are hazardous for the people or the planet… risks involved…

Researcher (1):  
What kind of risks are you talking about?

Interviewee (A.1):   
For the environment or their health. Because when there are risks involved, we have to do something about it.

Researcher (1):  
Have you heard about <<an AI tool>>?

Interviewee (A.1):   
Yes, we are not yet using it.

Researcher (1):  
OK last one: have you used green roof applications like <<an IoT product>> to maintain the roofs?

Interviewee (A.1):   
Not that I know.

Researcher (1):  
Thank you so much for your time. I'll stop the recording now and say goodbye.

Interviewee A.2

|  |  |
| --- | --- |
| **Code** | A.2 |
| **Organization** | Case Alpha |
| **Role** | Project developer, Renovation & Major Maintenance |
| **Date** | 17 Jan 2021 / 13:00 |
| **Duration** | 57 minutes |
| **Language** | English & Dutch (a few terms translated to English) |
| **Interviewer** | Reseacher (1): Sultan Çetin |

Interview transcript

[…] Introduction (not recorded)

Researcher (1):  
Could you please explain your role at <<Case Alpha>>?

Interviewee (A.2):  
Now I must think in English.

Researcher (1):  
Please, take your time.

Interviewee (A.2):  
I'm, let's say, project leader renovation and maintenance.

Researcher (1):  
You said previously that you've been involved in circular new construction, renovation and maintenance projects, so I grouped my questions into three categories. First, I want to start with circular new construction.

Interviewee (A.2):  
Yep.

Researcher (1):  
Could you briefly explain the circular new construction projects you've been involved in?

Interviewee (A.2):  
We have a renovation project, built a new extension on a house.

Researcher (1):  
Yeah, but you can speak Dutch from time to time. I can understand well Dutch.

Interviewee (A.2):  
“Uitbreden”. Do you know that?

Researcher (1):  
Yes. To expand.

Interviewee (A.2):  
You know, to make it bigger on a grid of 60 by 60 centimetres, as everything is constructed on a grid, so you're going to make an extension for the whole house or just the part, or make it deeper into the garden or less deep. So, you can do everything with it.

Researcher (1):  
About that- was it in new construction? It sounds like a renovation project.

Interviewee (A.2):  
No, it is a renovation project, but this is a new construction on a renovation project.

Researcher (1):  
OK, because it's an extension, right?

Interviewee (A.2):  
Yes, there was an extension, but it was made of glass and wood. Now, we make one that is completely circular. So, I think that is new construction. Do you mean steel beams, or do you mean by construction?

Researcher (1):  
I mean niuewbouw (new construction).

Interviewee (A.2):  
Oh, okay, well you could see it as new construction.

Researcher (1):  
Just to continue correctly […] I have three groups, right? Do you have another renovation project which is circular?

Interviewee (A.2):  
Yes.

Researcher (1):  
Great, we will come back to that. What circular principles or strategies did you apply in that project?

Interviewee (A.2):  
We looked for reused materials from the site- so, windows or wooden construction, we used in the extension. And we created some new parts and there were completely circular as well, so there was nothing glued or something, always screwed. You can take it away and put it somewhere else with the same value as it is here.

Researcher (1):  
You said you reused some materials in the extension. Where did you get those materials from?

Interviewee (A.2):  
We got the windows from the renovation project. We had doors to the garden from another project from the builder-the constructor. And we use the skin-you know pergola?

Researcher (1):  
Yes, I do.

Interviewee (A.2):  
The wood from the pergola is on the facade now.

Researcher (1):  
Ah, OK, you changed the functions of the materials as well…

Interviewee (A.2):  
Yes, but we keep it in high quality as it was very good wood, very hart tropical wood and we use that and I think it will be good for the next 30-40 years.

Researcher (1):  
Was it one project or series of buildings?

Interviewee (A.2):  
It's 60 houses.

Researcher (1):  
All materials you used there, were they identical in each project or because you obviously use reclaimed materials? And sometimes there are not enough of the same material available.

Interviewee (A.2):  
Oh yeah, I know what you mean that we had enough windows and doors they came from another project from another side of the country. But they were also enough. So, we had enough wood for the façade.

Researcher (1):  
OK, that's awesome. So, then connected to this -What kind of information or data did you need? For instance, you mentioned a few things, right? Strategies like reusing or design for disassembly. What else did you use? Bio-based materials as well, right?

Interviewee (A.2):  
Yes, the isolation was from spijkerbroek (jeans).

Researcher (1):  
OK, then thinking about these-what kind of information did you need?

Interviewee (A.2):  
Ah, we had a very good group of people who work together and we had a great architect and also the builder was very curious to look everywhere and get information from. So altogether we searched what we could use and <<a researcher>> helped us a lot.

Researcher (1):  
Yeah, but my question here is more about, for instance when you want to reuse materials you need to know certain things about that. So, I am curious about that information. Do you remember what did you need to know? It could be perhaps the physical properties or the size […] of reused windows. For instance, did you need a certain performance? […] these are just examples.

Interviewee (A.2):  
OK. We have several companies who collect all materials and they put it on the site and then you can see what they have got. So, we checked there. If it's something we could use and the windows from the project. We designed the new window frames in a way that would fit with old materials.

Researcher (1):  
OK, thank you. You looked at the sizes (dimensions) and materials.

Interviewee (A.2):  
Yeah, if we made the new ones fit with the old materials.

Researcher (1):  
OK, so you access the data then through the website probably it's a marketplace of the demolition company, right?

Interviewee (A.2):  
Yeah, something like that. Yes.

Researcher (1):  
So some of the contractors have a website (marketplace) where they put some material and you can go check what you could use.

Interviewee (A.2):  
Now we looked there, but they were still not enough wood for us to use, and so we had to make something new. But the new materials were also completely made circular.

Researcher (1):  
So how did you find those materials?

Interviewee (A.2):  
 <<company name>>, you know them? They make windows.

Researcher (1):  
No, I'm making a note.

Interviewee (A.2):  
They collected the materials and they made us the windows. Because they are experts already. They know how where to reach it.

Researcher (1):

So, do you remember whether you used any digital technology? Your architects perhaps used BIM or material passports? Or did you scan the existing building to get information?

Interviewee (A.2):  
We scanned the exterior faces of the houses. We also use BIM. And we are now looking for how to make a passport for the extension. We are working on it; it's not already finished.

Researcher (1):  
For the scanning, you did you use point cloud? -Just to make sure, I'm asking this.

Interviewee (A.2):

Yes.

Researcher (1):

Did you exchange data with other organizations during the project?

Interviewee (A.2):  
Between the architect and the builder also with the factory. So, they exchanged data digitally, yes.

Researcher (1):  
Did you communicate through emails, or did you use BIM to exchange data? How was it?

Interviewee (A.2):  
Uh, both.

Researcher (1):  
Both OK.

Researcher (1):  
Just considering this renovation project, not the other circular operations, what kind of tools could support you when implementing circular renovation strategies and decision making? You can think about the tools available at the moment also the ones that will be invented for you.

Interviewee (A.2):  
Well, I'm not exactly sure what technical use there is on the market for us. We didn't use a lot of stuff to help us with it. Only BIM, I guess, and material passport will come later. We are working on it right now. And we had a company to measure everything we used- how circular is it, how biobased is it?

Researcher (1):  
Can you tell me a little bit more about that company? What did they do? How did they measure?

Interviewee (A.2):  
Do you know BCI from <<a consultancy firm>>?

Researcher (1):  
Yeah, I know sure.

Interviewee (A.2):  
Yes. They have put on paper for us how circular the extension really is.

Researcher (1):  
Ah OK, this is how you calculated.

Interviewee (A.2):  
Yes.

Researcher (1):  
Just I will repeat your answers for the new extension. You said BIM, material passports and scanning technologies were really helpful and, in the future, these could enable your operations as well, correct?

Interviewee (A.2):  
Yes.

Researcher (1):

Any anything else do you want to add to this? We want to give you the floor to dream of everything because you are the one who implements those strategies, and you know the best of what you need.

Interviewee (A.2):  
I also saw a company, I really don't know their name, but they use drones to get the view of site or something like that, but we don't use that just yet. But I think this very helpful in the future.

Researcher (1):  
Right? Yeah <<another housing company>> is using them. Probably you're talking about spot <<AI company>>. They use drones and they scan everything, and they use AI algorithms to identify where the windows are located if there's a leakage… you mean that one probably.

Interviewee (A.2):  
Yes.

Researcher (1):  
So what do you think were the challenges did you face when implementing new digital tools? Did you really use a new tool? Because you use already BIM, but now you're trying to implement material passports. Perhaps we can talk about that. What are the challenges?

Interviewee (A.2):  
We don't know exactly which database is corrective use. You can put a lot of information in the BIM project. But then you have to get it into a material bank. You have to let the world see what we got on the site. And we don't know exactly what the right company for this is. I don't know what their name is…

Researcher (1):  
<<a material passports company>>?

Interviewee (A.2):  
Yes, <<a material passports company is a company where you can put all your information in their platform. That’s a great material bank- That's what I'm thinking of how it looks. But you must pay every year to keep your data in there.

Researcher (1):  
Your colleague told me that <<Case Alpha>> used <<a material passports company>> in pilot projects. Were you involved in those projects?

Interviewee (A.2):  
Yeah, I'm now involved. My colleague started it and she's gone now so I took over the project.

Researcher (1):  
Is it a new construction project?  
Interviewee (A.2):  
No, also renovation over a really a big building.

Researcher (1):  
OK. We will talk now about the renovation projects. Now we completed the new construction part. I'll ask actually the same questions for circular renovation projects. So, could you briefly explain what circular renovation projects you've been involved in?

Interviewee (A.2):  
I have two projects: One is with the extension, and the other one is <<a project name>> in Amsterdam. It's a high apartment building. We also made a BIM project of it. We looked at all the materials that were in the building and these were put into <<a material passports company>> as well to check how accessible <<a material passports company>> really is.

Researcher (1):  
How did you get the data from the existing building? Did you scan it?

Interviewee (A.2):  
I think this was already scanned and put in a BIM file in the project. And they also incorporated all the materials that are in the building and make a list.

Researcher (1):  
Your team, right? People from <<Case Alpha>> did that?

Interviewee (A.2):  
No, we let the architect do this. So now we know how many doors there are or how much wood, concrete, windows … like that. Now we can make a file [of the materials] that we can use in another place or maintain.

Researcher (1):  
But then what was the goal for this project renovation? It is a circular renovation, right? What circular principles did you want to apply there?

Interviewee (A.2):  
One of the cases was about how we can pay attention to materials that are on the site and another thing is that all other new materials are circular. So, when the isolation comes on the roof, we reused blue plastics plates.

Researcher (1):  
Was it for water insulation or heat isolation?

Interviewee (A.2):  
Yes, heat insulation.

Researcher (1):  
What is it again?

Interviewee (A.2):  
Per plaat.

Researcher (1):  
OK, I'll search it later on now we're recording so.

Researcher (1):  
Yeah, it's hard plastic you can stand on it. It's very hard.

Researcher (1):  
Did you recycle it?

Interviewee (A.2):  
No. We got it from our [sloper] demolisher contractor.

Interviewee (A.2):  
They look around the whole of Holland to see where materials come from demolished buildings. So, we can use that. It's very good material and we use it new materials too. But it's not only the heat insulation but all other things that we want to use like walls-they are usually from gypsum board but now we make them totally from wood.

Researcher (1):  
OK, but what do you do with the old gypsum boards? Do you throw them away from the old building?

Interviewee (A.2):  
It's a very noisy building, all the hard materials are put together with no isolation between them. So, when you knock on the wall you hear the sound from three houses below. So we took out old ones and put new ones.

Researcher (1):  
What happened to the old ones? Are they recycled or?

Interviewee (A.2):  
No, we're not really sure. It would be grinned to make concrete brick…Probably…

Researcher (1):  
Yeah, but it wasn't one of the strategies of yours then. Because in some projects you know that some materials will come out and you make sure that it is reused somewhere else. But in this case, I see that there wasn't a clear strategy for that.

Interviewee (A.2):  
It’s actually really done yet. Right, we have a strategy- Everything that comes out must have a second life or be recycled? That's the only way. Everything that comes out must be given a second life and everything that comes new must be circular in some way.

Researcher (1):  
Yeah, I see. So, you talked about the roof. I was wondering if you implement green or blue roof concepts like water collection …

Interviewee (A.2):  
It's going to be green roof.

Researcher (1):  
Did you use specific technologies to maintain it? I'm not sure if you're familiar with some companies or projects where they use IoT systems to collect data from the you know, temperature, rain and then the system maintains itself. Do you have such a system or it's just a green roof?

Interviewee (A.2):  
It's a green roof. Most of all the water that it's not going out altogether, but slowly. Because in the neighbourhood, there is a big water problem. It's lying below, much more below sea level than other parts. So, every water is coming to that side. The government asked us to release the water slowly out.

Researcher (1):  
OK. Do you apply any strategy for water reuse or recycling?

Interviewee (A.2):  
We try, I don't know if it's definitely going to be there, but we try to reuse it, yes.

Researcher (1):  
You told me that you use plastic components or many similar examples you gave for this project. What kind of information did you need to be able to reuse?

Interviewee (A.2):  
That was our demolishing contractor [sloper] knows a lot about where to get materials. He's all over the country.

Researcher (1):  
So the location you need to know right to be able to find where they are so that one of the information requirements, but do you also need to know physical properties? Because you said you're using an insulation material? Can you use anything there or because you need to comply with the building law, right? There are certain criteria?

Interviewee (A.2):  
Yeah. Now you must have a certain amount of isolation to get low-temperature installation, so we have to put on a lot of isolation for low warming heating.

Researcher (1):  
Actually, we covered some of the questions already speaking, so I'll skip some of them. In this project, it turns out that you use BIM through your architects and again scanning tools and you identify the materials there… but did you inspect yourself as well? Did you create the BIM, but there's this window, for example, are you sure of the material? What kind of material or the quality of the window? How did you get that kind of information?

Interviewee (A.2):  
Demolisher and contractor work together to get the right information on site. So, they first scanned and made the BIM project and they got on the laptop and they looked through the building and checked

Researcher (1):  
Ah, OK, and they corrected it there as well by inspecting. I see. And then on the other side you had <<material passport platform>>.

Interviewee (A.2):  
Yes.

Researcher (1):

Can you explain the process? How did it work with the passports? So, first, you've made the model and put all the data, and then did you extract information and put it in <<material passport platform>>? Or how did it work?

Interviewee (A.2):  
Yeah, it's like that. All the knowledge we had, we put some, not all because it was a pilot. We didn't put everything in <<material passport platform>>, just a few things that were easy to do so. Just to check how it works. And we're not really sure if this is the right way for us. I think with the things I hear from <<material passport platform>>, probably there's a better way, but I don't know which way that will be.

Researcher (1):  
Well, what do you think was the challenge then? Why did it not work as you taught?

Interviewee (A.2):  
When we're finished with the renovation, all the information you have in <<material passport platform>> and the next thing when you want to use it again, it will be over 15-30 years perhaps later. And all these years you have to pay for getting your information there, in <<material passport platform>>. So, I think it's a very expensive way to maintain your information. There must be something less difficult, I think, but I don't know what.

Researcher (1):  
Yes, it's clear. So, you tried out new tools- but one more thing I'm curious about that material passports, experiment you've done… On one hand, you said you use the BCI index from <<consultancy company>>, which calculates the circularity performance of your building. On the other hand, you have CI from <<material passport platform>>. It also calculates the circularity of buildings, right? So, what are the differences? Did you use both, did you check both options?

Interviewee (A.2):  
Uh, we don't use both options. I think what <<consultancy company>> does is more to the point. I think looks <<material passport platform>> more basic. You get less information from it. You get some pictures with this material. Little does this or does that or? But when <<consultancy company>> calculated BCI, the outcome is more precise.

Researcher (1):  
I see.

Interviewee (A.2):  
I think.

Researcher (1):  
Do they use an Excel kind of tool, or do they have software as well like <<material passport platform>>? How did they calculate it?

Interviewee (A.2):  
I think all <<material passport platform>> use both something of their own, and other platforms, but. They also checked <<material passport platform>> but I think they don't use the outcome of it.

Researcher (1):  
I see. I'll talk to them to ask how they calculate it later on. But, to make it sure, it's not a material passport, right?

Interviewee (A.2):  
Yeah, just to let us see this material is better because of … or you can better use this one because it has less... Impact on the environment or something like that. That's what they, that's why we use our concepts to help us explain why materials are better than the other one.

Researcher (1):  
I see.

Interviewee (A.2):  
And I think you must see it apart from the material passport.

Researcher (1):  
You mentioned that you don't want to pay for your information for 30 years until you need it. Thinking about now, your new construction projects or extension project, even now with the renovation project, you have a BIM model from your architect. What do you do with that for 30 years? Do you keep it?

Interviewee (A.2):  
This is also a problem which we are struggling now with. We're not really sure, if we want to go along with BIM. <<Case Alpha>> is searching for the best option and now we have everything on the table and must check what really works for us. It's just like AutoCAD you know the drawing. The first AutoCAD and the last don't communicate with BIM. I think when you have a complete renovation ready and everything is put into BIM, even if we change something it's already in BIM. Everything is correct. And then if it goes somewhere, your drawer and waits until the next renovation or something like that. And then in the meantime, there are several ways BIM will evolve. How does that work in the future? We don't know!

Researcher (1):  
I see. Thinking about renovation now, again, I'll ask the same question- What kind of digital tools, you can really dream about a tool, that could help you with the renovations? What would that be?

Interviewee (A.2):  
Yeah, there was something that stays the same for a long period of time. It's for example Windows- how many updates do you get from Windows? Almost every month, I get an update from my laptop. That's not something we want because when you're 30 years further how many updates do you need for your BIM so? There must be something like this without changing every month. And I'm just saying I don't know but every year or so that's very important, I guess. And what probably already exist- when you walk through the building with a camera, there's not only scanning on the outside. Also scanning on the inside. It says materials as they are in say what it is- So you don't have to change everything later. Yeah, so I think that will be very helpful.

Researcher (1):  
Uhm, so now we are moving to the last section. Circular maintenance. You're also a manager of maintenance. I'll ask you first general questions and then move to circular maintenance projects you've done. Does <<Case Alpha>> their own maintenance team or is it outsourced?

Interviewee (A.2):  
It's both. Yes, we have a group of people who go daily to a house to maintain them, our technical personnel.

Researcher (1):  
Is it for responsive maintenance?

Interviewee (A.2):  
Yes. And all the other stuff is outsourced to smaller or larger companies.

Researcher (1):  
What is your role then as a maintenance manager?

Interviewee (A.2):  
Then we have multi-year maintenance tasks. Every year we check which projects are ready for maintenance. I get an order to see what is necessary for this project to get a good energy label, circular, people, who were living there- How are they? How is the neighbourhood? and all together make a good project from it. So, this is my role I do everything from a to z.

Researcher (1):  
What kind of technologies are used for maintenance planning?

Interviewee (A.2):  
Excel.

Researcher (1):  
Excel? OK. My supervisor has been working in the field and he says some of the housing corporations have special software for maintenance planning. So, you use Excel then.

Interviewee (A.2):  
For renovation we use Excel. I guess, my colleagues for planned maintenance are using special software. But I really don't know what it is called.

Researcher (1):  
So, are you familiar with the technologies that are used for responsive maintenance?

Interviewee (A.2):  
No, not really.

Researcher (1):  
Is there an app? It could be, perhaps, your tenants make a picture and send it to the team, that kind of communication tool could be an example…

Interviewee (A.2):  
Well. What we have is when a complaint comes in, it can be sent to a portable device our colleagues have. So they know when they're on their way-the address is there…something wrong, they go and check.

Researcher (1):  
It's an app then?

Interviewee (A.2):  
Yes, sort of app. Special device. I don't know what it is called and I don't know how that works but it's something that they have.

Researcher (1):  
Ah, OK.

Researcher (1):  
Not sure though if you could answer this, but I'll ask anyway- Perhaps you have an idea? What kind of technologies are used for surveying or monitoring buildings or building systems, especially for the purpose of maintenance?

Interviewee (A.2):  
We let a company do condition measuring. We get reports from them and then we know what items must be maintained each year.

Researcher (1):  
But do you know how do they do that? Do they go collect data by eye?

Interviewee (A.2):  
I think both. Mostly they go to the project and just see what's there and put it on a table. And then take pictures and put everything in one project.

Researcher (1):  
Now I have a really important question for you, so when you think about circular principles one of them is, right? We need to maintain our systems to expand their lifetime. So, considering that what is the difference between circular and regular maintenance in your work?

Interviewee (A.2):  
Yeah, it's very new for us. So, we don't do a lot of maintenance …. I think projects it's very new right now. But I think what makes it more circular is that we don't throw everything away. Normally it was a big container, everything was thrown away and everything comes new.

Researcher (1):  
Is it overall now? Is it an overall strategy or is it like a project you were involved in?

Interviewee (A.2):  
But it's not really a strategy. This is the way they work.

Researcher (1):  
…Not to throw away. You said we don't throw away anymore, right? Is it now a company strategy or is it just for the circular projects?

Interviewee (A.2):  
Now it's almost a company strategy. <<A colleague> is working very hard to get, with a group of people, to get our ideas and things we've done already into a strategy for the company.

Researcher (1):  
You said that you were involved in a circular maintenance project. Can you tell me about that? What kind of a project was that?

Interviewee (A.2):  
It is the project that I just told you about. -What do we have on-site? What can we use? What can we use on the other site and all the materials coming in as the circular level?

Researcher (1):  
Then this is not really a circular maintenance project, right? Because it's still part of the renovation project. I was more curious whether you had …. Because maintenance is one of the core activities of housing corporations and I was wondering if there is a circular line in that sense whether they are trying to make their maintenance circular, not within the circular project, a maintenance service. Did you get my question?

Interviewee (A.2):  
Not, not really.

Researcher (1):  
So OK, housing corporations deliver different kinds of maintenance services. Are there any developments at the moment in <<Case Alpha>> to make these operations circular?

Interviewee (A.2):  
All looks like a renovation and also they try to reuse materials- The toilet or a sink or …They are normally thrown away. Now they pick them up, they reuse them. And then bring them back. I don't know if this is what you mean.

Researcher (1): I'm just trying to find out as well. You said you are responsible for the great maintenance, right? What do you look at like exactly? What do you maintain?

Interviewee (A.2):  
Yes. We try to maintain the most of buildings from inside and outside when it's possible.

Researcher (1):  
And then you make plans for it, right?

Interviewee (A.2):  
Yes.

Researcher (1):

My question was more like when planning when you make decisions, do you include circularity? Because obviously in circular projects that you try to do everything as much as you can. I was curious for more about your business-as-usual jobs, not circular pilots, do you include circularity there as well?

Interviewee (A.2):  
Yes, we try. We are on the front of a big trip- So now it's a few projects, but we try to get all the projects to think and look like this. But it's in kids’ shoes we say in Holland.

Researcher (1):  
No, I haven't heard that expression.

Interviewee (A.2):  
No. Well, when something is very new, we say it's standing in kids’ shoes.

Researcher (1):  
Or baby steps?

Interviewee (A.2):  
Sure. We are taking baby steps right now and I think when <<a colleague>> is ready to get the company with a new strategy with the roadmap, everything is going to be much faster. A lot of my colleagues are saying yes, it's very important, but how do we do it? And it's very difficult. It takes a lot of time and where they will get the materials from and what do I use and so it's difficult to let them go on their own and check and in and discover something. I think when the roadmap is done, they have to do it and then it goes very quick.

Researcher (1):  
Yeah. My last question-What kind of digital tools would you need to make your all maintenance work circular?

Interviewee (A.2):  
That's great, yeah. What's very important is I guess is to make the finance visible. Because when you have several circular projects or materials, they have some value at the end. And now, we don't calculate with it. So, we have to make our finance colleagues, who check everything, if it's not too expensive or everything is according to <<Alpha Case>> plans. We need to make them see, in some way, for now, it is new, it costs more. But it pays itself back because it has more value in the end than now.

Researcher (1):  
So… a tool that makes the financial, let's say benefits, of the circular choices visible to other people.

Interviewee (A.2):  
Yes, because in the end, everything is about money. It would help a lot if we could make them see, OK, it's on every way. It's better not only for your environment but also for your wallet. Because in the end, it has more value then. =

Researcher (1):  
Yeah, I see. Do you want to add anything else, uh?

Interviewee (A.2):  
This is really something I would like to have, and I don't know where to get it. And a lot of people are thinking about it and I think there is nothing like this on the market right now. To make this understanding better. And I think by <<Alpha Case>> we have a lot of projects where we're learning a lot. It has to be a snowball. This will get bigger when it rolls.

Researcher (1):  
Yeah, you are front runners.

Interviewee (A.2):  
Yes, exactly.

Researcher (1):  
I covered my questions. I'll stop now the recording before saying goodbye.

Interviewee A.3

|  |  |
| --- | --- |
| **Code** | A.3 |
| **Organization** | Case Alpha |
| **Role** | Technical advisor |
| **Date** | 26 Jan 2021 / 09:00 |
| **Duration** | 41 mins |
| **Language** | English & Dutch |
| **Interviewer** | Sultan Cetin |

Interview transcript

Researcher (1):  
Could you introduce yourself and your role at <<Case Alpha>>?

Interviewee (A.3):  
I am <<name of interviewee>>. My function is the planner of maintenance. I inspect houses if they needed a painting, a replacement for the heaters, mechanical ventilation, on the outside of the building, and some installation… I do that with the contractor and supervisors.

Researcher (1):  
You manage the process, but you have your own contractors. Then let me start with a question immediately – Does <<Case Alpha>> have their own maintenance team or do you work with contractors?

Interviewee (A.3):  
Well, we have our own maintenance team, but that is for the daily maintenance, and we do the planned maintenance with the contractors.

Researcher (1):  
About your role… I checked your profile on LinkedIn as well. In the past, you’ve been involved in maintenance projects. But currently, your function is a little bit different than maintenance, right? Do you cover new things, or then I'll ask questions accordingly?

Interviewee (A.3):  
Yes, since January I have had a new role. I'm a technical advisor for the data quality, the base quality and the process of the new construction. Because now, in our department, we have to make data in control, so I and my other colleagues try to make the data in order. There is another investigation done by a company. I forgot their name. It is a company that conducted interviews to investigate where are the problems and what interventions are needed to make our data in order.

Researcher (1):  
Yes, I see. It does not matter for me to know the name of the company. What is important is that you are working on your data.

Interviewee (A.3):  
And, from next week on we start a new workgroup for data-in-order. And, we defined four steps for that in our department.

Researcher (1):  
That’s cool.

Researcher (1):  
My next question now-- I am starting with a group of questions that are related to digitalization of your organization and more general questions. But I don't know if you're knowledgeable about that. We can skip those questions as well, but I'll try my chance. How does <<Case Alpha>> understand and use digitalization?

Interviewee (A.3):  
How do we use it?

Researcher (1):  
Yes, also how do you understand it? (digitalization)

Interviewee (A.3):  
We have different programs (software) for digitalisation, but not everybody uses them. We have <<an enterprise portal>> as our main program.

Researcher (1):  
Is it an ERP system?

Interviewee (A.3):  
Yes. And then we have Microsoft the SharePoint.

Researcher (1):  
OK, so, you use a cloud system to share information within the company. How far do you think you’re digitalized when you look at your processes or projects? Just to give you an example, perhaps just to open up the conversation-- for instance, <<Case Gamma>> at the moment is building their entire portfolio on BIM. So, they digitalized the entire portfolio. I know from your colleagues that that's not the case for <<Case Alpha>> but I'm more curious how digitalization works in your organization.

Interviewee (A.3):  
Only new construction and renovation projects are in BIM and the existing buildings are on SharePoint— Floor plans, etc. And, we have (meerjarige begroting) multi-year budget, so that we do that in <<software>> so we know when does the maintenance starts, in which year.

Researcher (1): You use this software to come to analyse and follow up your planned maintenance.

Interviewee (A.3):  
Yes, analyse and follow up.

Researcher (1):  
You use this software for maintenance, but when it comes to managing the building data you have like floor plans and all drawings etc … these are on PDFs?

Interviewee (A.3):  
Yes, and we have in a DWG.

Researcher (1):  
DWG, what is that?

Interviewee (A.3):  
That's before BIM you have…

Researcher (1):  
Oh, 2d drawings?

Interviewee (A.3):  
Yes, correct.

Researcher (1):  
I use 2d drawings not necessarily DWG as a term. That’s why I did not get it first.

Interviewee (A.3):  
And we also used card library files and we looked at the history in our workspace. We have complex information-- the situation off at the complex, will there be a renovation or demolition or new building or planned maintenance, which label has it, it a senior apartment or for the youth-- So we get our information from everywhere from the complex information from our ERP system. Also, BIM or old drawings from the archive.

Researcher (1):  
So as I see you have many different sources of data, so this question is not on my list. But out of curiosity-- If one of your employees wants to reach a certain type of data, is it easy for them to reach it? Or, that's we need to travel through different software and talk with people? Do you have a central system that combines all of these?

Interviewee (A.3):

No.

Researcher (1):

Probably you're going to do this with the new project you mentioned right?

Interviewee (A.3):  
Yes. But still, the focus is on the cloud.

Researcher (1):  
So then everyone could easily access data.

Interviewee (A.3):

Yes.

Researcher (1):

I'm curious your opinion about your opinion-- What is the level of maturity of digitalization in your organization? So, you partially answered that. But is it your answer? I can't get it. But thinking about other tools, etc. What do you think?

Interviewee (A.3):  
There are so many tools that we can use so that the level is going up. But <<Case Alpha>> is not ready for that because the people working, they are not used to … they are not flexible with the systems. They are working for so many years and are stuck in one tool. It is difficult to teach those people to innovate and so that will make it easier for them.

Researcher (1):  
Yes, this is actually quite interesting, and I was going to ask another question at the end about the barriers to introducing new tools. Well, you already mentioned, perhaps we can talk a little bit more. I speak with other organizations, large organizations as well and I quite hear that a lot - people refuse to use new tools. It's hard to keep them used otherwise no one will use and they will stay there. So, I heard this kind of stuff and it's interesting that it's the case where I hard as well. So, do you recognize any other challenges when you introduce new technologies in your organization?

Interviewee (A.3):  
It’s hard but I am quite a bit enthusiastic, and I try to make it work. I say- Let's do it. Let's try it and then that they come along with. But still, it's hard to get everyone now.

Researcher (1):  
That's an internal challenge. But do you see other challenges? It could be the software solutions could be expensive, it's a huge investment. Do you face this kind of stuff as well? Not only did people side with other things, it perhaps, for instance, but your ICT team also is not well equipped to introduce new technology … You can think of other challenges as well.

Interviewee (A.3):  
Yeah, also it's expensive and since last year we ended our ICT. We fired the ICT crew and have extended ICT who are not really a propagate with each other. If we have a new program and it's very hard to convince them to use it.

Researcher (1):  
I see so that ICT team--Was it a large team?

Interviewee (A.3):  
No, I think ten people.

Researcher (1):  
OK, it's not existing anymore, so you have now an external ICT contractor. My last question in this group of questions--You partially answered, but what kind of data or information is collected from the housing stock? And how do you do it?

Interviewee (A.3):  
For maintenance, we collect data from the installations like the built here, the type and brand. And that is in a well collecting the card library. We need also data for our tenants- floor plan with the size of the house (in m2) We also collect data from the installations from and another contractor will control the houses with an energy label and if there is double glass, is there floor isolation or other kinds of isolation… I think there's a lot more, but...

Researcher (1):  
Yeah, but I got a feeling now what kind of data you're collecting. Have you ever used any advanced technology like the Internet of Things? Especially for predictive maintenance. Sometimes you put sensors and the sensors give you errors so you can go and fix … Or is it more like people go inspect and make notes and then you put that in information in your system?

Interviewee (A.3):  
Yeah, that is—I will go with the contractor on location, and we inspect it and we get advice from the contractor and that information we put in our system.

Researcher (1):  
But you don't use sensors or that kind of advanced technology?

Interviewee (A.3):  
Not yet, no.

Researcher (1):  
OK, now I'll move to more sustainability and circularity related questions. I know you haven't been involved in projects, but perhaps some colleagues come and ask you some questions. Perhaps you have some knowledge on that, and these questions are more related to data and let's say technology side. Does <<Case alpha>> use information from the housing stock in policy decisions when it comes to sustainability or circular economy? For instance, your colleagues come and ask us to you some questions about the portfolio because they need to make a decision?

Interviewee (A.3):  
I don't know that part.

Researcher (1):  
OK, we can skip. It was difficult for me to prepare questions for you because I usually spoke with people who are really deep into the circular economy. So, I just kept my questions a little bit broad. So does your organization exchange data with other organisations?

Interviewee (A.3):  
Yes, we have known an umbrella organization, AEDES, so we exchange data with them.

Researcher (1):  
What kind of data do you exchange? How?

Interviewee (A.3):  
That I don't know, but I know that we do it. And it's so more for the lesson learned or, problems if they also have the same problem, so we can brainstorm or this kind of stuff.

Researcher (1):  
Have you ever used specific tools for circularity in your work?

Interviewee (A.3):  
Not yet, but I've heard that we have a company that a reused…So if there are some projects and we can reuse them so we can give them to the contractor. They repair it then they can move those elements in another project.

Researcher (1):  
What kind of a tool are you talking about? Because now you what you define sounds like a process for reuse. But did you mean? A tool? I think I didn't get it.

Interviewee (A.3):  
Now- form a door or panel, all the building materials we can reuse.

Researcher (1):  
Yeah, my question was more about the digital tools for instance material passports or some BIM applications?

Interviewee (A.3):  
Oh, that's yes. Also, the material passport that is in the making. And, but we are discussing whether we should use the material passports in the future.  
Researcher (1):

You have done a pilot project with <<a material passport platform>>? How was your experience with that?

Interviewee (A.3):  
I have a little bit of experience with it. Because… I'm writing a vision about BIM and how we use it in the future, but I have so a little experience in BIM, so I'll ask <<a company>> that's a company that our modelers…They will advise me what to do.

Researcher (1):

I only saw <<material passport platform>> as an app, that’s all.

Researcher (1):  
So, you haven't used it.

Interviewee (A.3):  
No.

Researcher (1):  
So do you already know a little bit about your vision on BIM? How should <<Case Alpha>> use it?

Interviewee (A.3):  
Now it's just difficult because my colleagues are having many problems about it-- Why do have to put too much energy into the BIM model to have all the information in it and then we are not going to use it. And I think that we must see the BIM model as a tool that stores only basic information so that we can use it for the maintenance and reference book.

Researcher (1):  
I see. So, you see BIM as an information model that has the basic information about the buildings, and you see it more in a practical way. So, for instance, you want to keep the information, you might need for the maintenance and perhaps later on for demolition or whenever you need that data, not all data.

Interviewee (A.3):  
No, because it causes us too much energy and it's too expensive.

Researcher (1):  
So I think that the benefits are not clear for you. This is what I'm hearing from you BIM might bring so much benefit to <<Case Alpha>>.

Interviewee (A.3):  
Yes, it is clear, but the different departments are using BIM in different ways, so I'm puzzled about what is needed for new construction, maintenance, and renovation.

Researcher (1):  
I see.

Interviewee (A.3):  
I combine two and this is what we do with a BIM model.

Researcher (1):  
Do you already have an idea what kind of information they might meet?

Interviewee (A.3):  
Yes, we have fit because we can manage from the BIM model in the [MOP] … We have 50 basic elements we can put in a model, and then you have the plans for the quantity of painting that you need, the building year of the installations… For example, for the rental, we have the floor plans with the number of square meters.

Researcher (1):  
What kind of information you would need for the new construction?

Interviewee (A.3):  
For new construction, outside of the buildings, façade, how many square meters…

Researcher (1):  
So these sound like more of the things you might need for the maintenance work. For instance, how much space do you need to repair or to meet a paint after 10 years or so? So, you need that kind of information already prepared today so you can use it easily. But now, we talk about BIM, and you somehow said you don't have BIM models of your building stock, but how do you store this information? In what form? Do you already have some kind of BIM?

Interviewee (A.3):  
Yeah, we already have BIM for the new building in renovation projects and we store it in the cloud.

Researcher (1):  
Ah OK, you still keep it. So you get it from the architect and uh, have your own version there. Do you keep updating it if there are changes?

Interviewee (A.3):  
Not yet, because we have a BIM protocol, and not every BIM model is compatible for maintenance. If we make it compatible, it costs more money and more work. So that's why I must make the protocol wider for what we want from the architect or from the contractor to make the BIM model easier for us to use it.

Researcher (1):  
I see. So, I have lost two questions come hopefully. I'm curious about your plans on the “data in order”. I don't know well how we could really translate into English, but it sounds like data architecture. You know you create an architecture so you can easily find stuff for your employees. I'll call it data architecture for better communication.

Interviewee (A.3):

Yes, that’s a good word.

Researcher (1):

So, do you have any plans to include circularity in data architecture? Do you have any plans to, for instance, create some kind of datasets or data requirements for circularity?

Interviewee (A.3):  
Yes, that’s the plan and we are going to be in the workgroup of circularity. So that we have more experience about what they do, and what data they are collecting and how can we store it? That's the next step.

Researcher (1):  
My last question-- so thinking about your organization, the data you have already at the different sources and also the demand from your colleagues from the circularity group--What kind of a tool could support you to implement a circular economy? You can think of an existing tool or a tool that will be invented for you.

Interviewee (A.3):  
That's difficult.

Researcher (1):  
Yeah, just think about it, you don't have to answer right?

Interviewee (A.3):  
I don't know. I think we don't have that tool yet. Maybe it must be developed for us.

Researcher (1):  
What would that tool do? You can define the functionalities as well.

Interviewee (A.3):  
It must be a tool for reuse. A product that we use for the dimension, the quality and where and which project from it came from and later where it is put back in other projects… And the dates from when it's put back in a new project, so we have that data so we can analyse from how long did that product last.

Interviewee (A.3):  
OK, I understand. That's a clear answer. I'll stop recording.

Interviewee A.4-coding

|  |  |
| --- | --- |
| **Code** | A.4 |
| **Organization** | Case Alpha |
| **Role** | Project developer |
| **Date** | 19 Jan 2021 / 13:00 |
| **Duration** | 42 mins |
| **Language** | English |
| **Interviewer** | Researcher (1): Sultan Cetin |

Interview transcript

Researcher (1):  
My first question is about your role. Could you briefly explain your role at <<Case Alpha>>?

Interviewee (A.4.):  
So as a real estate developer, I'm responsible from the beginning of the project till the end. That means once we decided to do something with the project or a building or more buildings, multiple buildings, we will decide if we are going to renovate it or if we are going to demolish it and build something new. So, if we decide to renovate it, it will go to a different department. Not to me, but if they decide to demolish it and build something new, then it will come to our department and a guy like me will take responsibility for the project and from there on we are responsible for making the plan with the architect, with the municipality, with the builder eventually to find the builder. And we're responsible as well for the realization phase.

Researcher (1):  
You're a coordinator of the entire process from the beginning until the end.

Interviewee (A.4.):  
Exactly. Yeah, so I'm also the responsible coordinator for internal as well as external and to take everybody along with it and to eventually have the end product like we wanted to.

Researcher (1):

So, you said in the form that you were involved in a new circular construction project. Could you briefly explain that project? Or have you been involved in any other circular projects?

Interviewee (A.4.):  
At the moment we only did one. We did a few with the renovation but only one with a new building. Actually, we didn't have really a process for it, so we try to follow the normal process, and, in the meantime, we try to scoop in some circular ambition. And that didn't work out well. Mostly because of the cost of the financial reason for circular ambitions. We found out it costs a lot more money for us to build circularly.

Researcher (1):  
Can you explain that project? Was it a single building or an apartment? These kinds of details…

Interviewee (A.4.):  
We demolished 50 houses divided into 4 strokes, so four different strokes. And the new development was 69 houses and also the four strokes. So divided into four strokes and it was with an open green garden between the strokes.

Researcher (1):  
What is the name of the project? -just to locate me better because I investigated all of your projects as well.

Interviewee (A.4.):  
It's <<project name>>.

Interviewee (A.4.):  
I can better type it in the chat.

Researcher (1):  
Yeah, it is helpful. Sometimes, I Google and find information from the architect’s website etc

Interviewee (A.4.):  
Yeah, exactly. So, this is the name of the street of the project as well. So yeah, we have hired a lot of advisors that are common with circular buildings and to help us out to find together with the architect and the builder to solutions of circularity.

Researcher (1):  
You define it as new circular construction, but as I see demolition is also there. So, it's a combination of two projects, right? Perhaps I should have asked-- did you demolish circularly?

Interviewee (A.4.):  
We did actually, so that came true. We demolished actually three buildings, so also two other projects besides this project, and we gave the contractor the mission to use those products that came free from the demolition to build with it. So also, the architect did an inventory about all the stuff that came free from the demolition to use in the new builds.

Researcher (1):  
But were they from other locations including the demolished three blocks?

Interviewee (A.4.):  
Yeah, not only the place where we wanted to build new, but we also had two other projects at the same time, so we had more volume. So, we find one party, one demolition party, for those three projects. And to do simultaneously so we could use the products that came free from them.

Researcher (1):  
How do you measure the circular level of all these projects? You call it circular, but what makes them circular? And did you use any kind of calculation method or process that could define this project circular?

Interviewee (A.4.):  
Yeah, we use a BCI so from <<consultancy company>>. But we only used it as just a measurement to know in the beginning what would be better so we researched about should we build in steel and concrete in woods and what we will do with BCI. But the building still needs to be built, and maybe it's nice, eventually, in the end, to do the index measurement again, and then find out what it will be.

Researcher (1):  
So, as I understand, you use BCI for decision-making to understand these different material alternatives and their impact on the design.

Interviewee (A.4.):  
Exactly.

Researcher (1):  
Eventually what materials have you chosen?

Interviewee (A.4.):  
For the head construction, we had an actually more hybrid variant- so not only steal not only concrete but the combination of it. And we tried to build also one of the blocks with wood, CLT. But that was way too expensive. So yes, we saw it much better on the BCI method for the score. But the financial impact of the cost will be way too much for us.

Researcher (1):  
So do you remember the figures with the one with the higher BCI score? You know, I'm not really familiar with BCI, I want to get an understanding of you had one, perhaps a very good circular alternative which was expensive and done with timber, and you have chosen and hybrid model. But was that still circular?

Interviewee (A.4.):  
It depends on … I mean it's not only the construction where you're looking at but also the skin, of course, of the building, the facade and the layers of the floor-you will put after. So, we try to make them lose (demountable). So that will give him a higher score.

Researcher (1):  
Let me ask you another question then. You mentioned that you reuse some of the parts that become available from the existing sites, also from your other operations. You applied design for disassembly in the design stage. What other circular strategies did you apply?

Interviewee (A.4.):  
We also looked into what kind of new products can we use in the building which is based on biobased materials. And for example, inside walls, not constructive walls, but just the inside walls… And we also looked at the bricks to use circular bricks. We did a study with <<circular brick company>>. They could make a brick of 60% of recycled materials. We also tried to find not only the waste we had from our own buildings but also look for bio-based materials to put in. When we finally found out that at the moment the market is not that big for these materials, so you also pay the price of it.

Researcher (1):  
Yes, I know what you mean. In one of the interviews that I gave, I said housing corporations have a really huge impact on the market. So, if everyone demands the same thing then the prices will eventually come down. Obviously, at the moment only the forerunners are asking. […]

Interviewee (A.4.):  
Yes, this is what we also discussed with all the other corporations we are together in a group. We have to be, you know, we have to unite and to ask these kinds of materials for so that the market will change as well.

Researcher (1):  
Yeah, exactly. Any other strategies you might think of, for instance, when you think about a circular economy. It's a broad concept. I know that it's sometimes it's hard to, for instance, include energy efficiency in there, but it's usually there. But for housing corporations, you have to kind of separate them. You have energy transition on one hand and new development like circular economy on the other. How do you see that difference when you develop the projects?

Interviewee (A.4.):  
I'm not sure we mean the same thing. For example, we were thinking about putting in every building a washing place. So that we could put a couple of washing machines and the ownership […] They don't have to buy their own, but they can use this mutual washing machine. And so, we were in more thinking about a sharing economy. We didn't go through with it on this project, but still, in the background, we are thinking about maybe participating or doing it in another place, other projects at any other time.

Researcher (1):  
Was there a green roof or green facade? Because mentioned something like this for this project in the beginning, right?

Interviewee (A.4.):  
Not the green facade but what we want to do is the so the circular bricks that are replaceable as well.

Researcher (1):  
Is it is a standard roof then?

Interviewee (A.4.):  
Yeah, we didn't plan to do something special on the roof now.

Researcher (1):

So, thinking about all these strategies like reuse, disassembly, reaching out to biobased materials, what kind of information or data did you need when making decisions on that?

Interviewee (A.4.):

And well, the most important was the financial consequence of it. Because to get approval from internal management, I finally needed to explain to them what it will cost if we go through with it. So, actually, the board wasn't that really want to know about like the BCI or something. I tried to convince them about how important that is, but that's just a number for them and we can't compare it to other buildings of ours. Or because we don't have buildings with this measurement method. So, the only information we needed is to find out what will be the extra cost of it. Besides traditional, if we want to do traditional.

Researcher (1):  
So you reused some of the components from other sites and you said the architect made an inventory about it, right? So, in that inventory, what information did you need to see? It could be dimensions, quality or whether you could you know those doors or windows whatever you wanted to reuse, it's compliant with the building law. This kind of information I am also trying to find out from this question.

Interviewee (A.4.):  
So, what you're describing- we did. Uh, which is we did an inventory about all those old donor buildings: The three buildings, three projects. And we try to measure them. I don't know if you know << material passports & consultancy company>>.

Researcher (1):  
Yeah, I know it's similar to <<material passports company>>,I think.

Interviewee (A.4.):  
Exactly, yeah, correct. So << material passports & consultancy company>>, we hired them to do this inventory and they made a dashboard of all the materials and the quality of it. Together with the architect, they looked at, for example, the timber- How long would that be used, the timber, what kind of formats, where can we use it for et cetera, et cetera.

Researcher (1):  
Oh, they gave you the guidelines as well? I just know their website. I haven't used that tool so just to understand it better; I will ask a few more questions. They went to the demolition site, and did they make scans like point cloud or something? Or is this just a person who takes pictures? What kind of data and how did they collect that data from the site?

Interviewee (A.4.):  
So, I wasn't on the location myself, but they try to, I think, just from the eyesight and take pictures, and sometimes they had to do some deconstruction work to get the information. But yeah, they try to figure out how much of all the elements are in the building and which were usable.

Researcher (1):  
Sorry for interrupting, but do you get the dimensions as well? Do they measure by hand?

Interviewee (A.4.):  
Yeah, I actually don't know how they did this just scanning.

Researcher (1):  
OK, I can connect them and ask what they are using; perhaps they are using some scanning tools or something. I'm really curious.

Interviewee (A.4.):  
Yeah, I think my contact person <<person’s name>>.

Interviewee (A.4.):  
And then, actually, I don't know it has already been like three years ago. So, I don't know if they developed their product more because it was the beginning of << material passports & consultancy company>>, the tool, the dashboard. So maybe they are developing more now.

Researcher (1):  
So then they go and scan the buildings, and then they come up with an inventory of the available materials, and they provide you with the dashboard so you can see what materials are there together with the architect you can make decisions on that. And also, if I understood you correctly, they tell you about the quality of the products, so you have an idea where to use them.

Interviewee (A.4.):  
Yes, for instance, some product elements weren’t useful anymore because it was too old or timber that was too wet or rotten. For example, some bricks were with asbestos. Some things weren't reusable anymore, so they took notice of that as well.

Researcher (1):  
That's cool. So, you used << material passports & consultancy company>> and then if you need to talk about design for disassembly. So, your architect probably delivered that design.

Interviewee (A.4.):  
Yes.

Researcher (1):  
Were you involved in the design stage as well together with them?

Interviewee (A.4.):  
Yeah sure.

Researcher (1):  
How did you get then get data? Is it probably they're using BIM, but I'm not sure?

Interviewee (A.4.):  
Yeah. So, the whole development of the design it’s supposed to be in BIM. But also, in 2D, we still use 2D a lot to talk to one another. But basically, the architect used all the information << material passports & consultancy company>> to make some suggestions. Actually, we, as <<Alpha Case>>, let the architect free for making his own adventure to see where he can go.

Researcher (1):  
Yes, I understand so then, you use drawings and also the BIM model to communicate design. At the end of the project, where information is stored, if you want to go back -there was once BIM model a beautifully done by the architect. What happened to it? Do you store it?

Interviewee (A.4.):  
Well, that is something may be the hard part of it. Because many things will be thrown away as well, for example, a BIM model will be rebuilt and rebuilt and rebuilt over and over until you have a realization product that will go to the contractor to build the building. But in the meantime, use you changed a lot those models. And actually, we only store the model at the end, so the one that got built is -as-built model.

Researcher (1):  
Yeah, right. Do you keep ownership of that model at <<Case Alpha>>? Do you have storage space?

Interviewee (A.4.):  
Not really, so actually, this model stays with the architect and the other people from the design team. Yeah, maybe we should do something with it. Of course, we have <<cloud software>> where all the stuff is stored.

Researcher (1):  
Do you mean perhaps certifications or documents? Not necessarily the architectural model…

Interviewee (A.4.):  
No, exactly. All the products that we need.

Researcher (1):  
Do you use perhaps any other software? It could be an ERP system or something like that, where all the information is stored for one building at one location.

Interviewee (A.4.):  
No, unfortunately, we have multiple programs that we use. For financial stuff, we use two different programs. And of course, we use a program to see the BIM models.

Researcher (1):  
Do you mean reviewer kind of program?

Interviewee (A.4.):  
Yeah, <<BIM viewer software>>.

Interviewee (A.4.):  
But we probably want to change it may be to <<another BIM viewer software>>.

Researcher (1):  
I think you need that kind of software in your daily job?

Interviewee (A.4.):  
No, it's actually at the moment we still we don't do enough with BIM, with the models. We have programs to make a review of the model that actually we don't use on a daily basis. We still look at 2D drawings.

Researcher (1):  
OK, even during the development stage?

Interviewee (A.4.):  
Yet its development stage, yes.

Researcher (1):  
Perhaps, later on, you don't need to go back, but it's important for me to understand when you need that data. So do you exchange data with other organisations? Because in your role, you said you have to communicate internally and externally.

Interviewee (A.4.):  
Yes.

Researcher (1):  
Do you exchange data? If so, how and what kind of data do you exchange?

Interviewee (A.4.):  
So it depends on the body. Of course, we use email, <<data transfer platform>> all that kind of stuff, but also with the team like the design team or the building team, most of the time we have <<cloud system>>. So, we used to share data through these programs.

Researcher (1):  
So now, thinking about your experience with circular projects, if I told you that I was going to develop a tool for you. What would that tool be for you for circular projects? You can think about the tools available like material passports, BIM, AI-driven stuff, … And also something that is not existing at the moment that will be invented for you. What would that be?

Interviewee (A.4.):  
Maybe a couple of things.

Researcher (1):  
You can dream about everything.

Interviewee (A.4.):  
Exactly, yes, it's about a dream, right? So, I think we need to look faster at the consequences are of circularity. So, like a BCI… it would be better if it's easier and faster to generate a score on a daily basis for us. At the moment, we need an external party for this.

Researcher (1):  
Do you maybe mean…? From my research, I come to notice some BIM application plugins for circularity. So, some researchers develop plugins for calculating the end of use recyclability or reuse potential of different design options- what happens if you design with timber, concrete, and then when you change something, it gives you immediately a score for it. So, this is something you explain, right? Something like this but for BCI… Not necessarily for reusability…

Interviewee (A.4.):  
Yeah, it's similar. I think the things you are mentioning is very important for architects so they can quickly make drawings and decisions and do proposals for us, for example. Well, what I think, for us, as <<Alpha Case>> is more important to have a financial insight but also about why we should choose for one or the other. What's the difference between one circularity and the other circularity? So, at the moment, we are not sure about it. How much circularity would we do, and why would it be? For example, why would we make bricks of 60% reusable materials, and against which cost it can be?

Researcher (1):  
Yes. So, you want to see at the end the financial and circularity performance of different design options before you invest your money.

Interviewee (A.4.):  
Yes, exactly. I think for us it makes it easier to make the decisions and where we put our money.

Researcher (1):  
Thinking about now the demolition processes and reusing materials… all the strategies you implemented. What kind of a tool would make your job make your job easier?

Interviewee (A.4.):  
So, the tool we use from << material passports & consultancy company>> is very helpful for us to know for the demolition part of what can we reuse. We also use information about second marketplaces.

Researcher (1):  
Oh yeah, I forgot to ask about it. It's good you mentioned it. Have you worked with a marketplace for this project?

Interviewee (A.4.):  
Yes, you need to know what kind of other materials, not only from our three projects that we demolished but also what is available elsewhere… So that's why we found out, for example, the toilets we could reuse from a hospital. So, those marketplaces can give us information as well.

Researcher (1):  
Do they give you sufficient information or do you need more information from the existing marketplaces?

Interviewee (A.4.):  
No, I think we only need to find out how we will put this in our process. So, when are you looking for the elements? How can you reserve them? For how long?

Researcher (1):  
Time issue.

Interviewee (A.4.):  
Yes, exactly. Sometimes the timing is very dependent on a lot of things, and it can change a lot. So, you can find products now, but maybe you don't need them now. But in one year you think. But after one year you still don't need them. And for how long can you keep them around?

Researcher (1):  
Yes, perfect. Have you used specific tools for circularity? You mentioned << material passports & consultancy company>> from that did you use any other specific tools?

Interviewee (A.4.):  
So, I don't know if the BCI is as a tool, but…

Researcher (1):  
Yeah, it's a kind of calculation tool and probably not really a digital tool, but like a calculation method.

Interviewee (A.4.):  
No.

Researcher (1):  
I am approaching the end. What are challenges do you face when implementing new digital tools for circularity?

Interviewee (A.4.):  
Well, new digital tools will be always difficult, I think, to implement because of the organization. We need to change the organization and sometimes that can be hard because many people are working with the same processes. So, if you want to change something in that, it will cost a lot of time for convincing people a lot of people. So there will be a chance I think.

Researcher (1):  
Yeah, I see. Any other challenge that you could define? For instance, experience with circularity tools… Have you faced any challenges when working with them?

Interviewee (A.4.):  
Well, not really, because it's all-new for us so. I think if you can compare it, maybe it with other tools or if we are going to do this more often… I mean we only did it once, so. It's difficult to compare what went wrong or what can we do better.

Researcher (1):  
Because it was a pilot project?

Interviewee (A.4.):  
Exactly, yeah.

Researcher (1):  
What do you think then what is necessary then to make such tools work? Is it a lot of talking and convincing people or do you think of any other ways?

Interviewee (A.4.):  
No. I think a lot of talking and showing about the necessity of it-- And why we need to change why we also need to pay more…. money for our projects to make it more circular. I think it's we are trying now at the moment to do this face. You know my colleagues with our circular group… Within <<Case Alpha>> we are trying to get more attention and spread the word.

Researcher (1):  
Yes, I know.

Researcher (1):  
My last two questions. I'm not sure if you could really answer them but I'll try my chance because that's a little bit beyond your responsibilities in your organization. How does your organization understand and use digitalization?

Interviewee (A.4.):  
So, at this moment, there's like a huge project at the real state department about it's about this. We have a lot of buildings, 60,000 buildings. We said last year we need more data for making better decisions with data. We have a lot of buildings. We have a lot of data but not on the right place. And sometimes we don't use the data we have to make decisions. They want to change the department (ICT) this year as well to improve the organization and to use more data and to use maybe also tools for this.

Researcher (1):  
I see. So then, the maturity of digitalization is a little bit lower in your organization.

Interviewee (A.4.):  
Yeah, I think so. We are figuring out the last couple of years new digital tools, but sometimes it doesn’t work or it's there, but we don't use it. We are still not common to use it or…

Researcher (1):  
This is my last question though, from your answers, I got the impression that <<Case Alpha>> doesn't have its housing stock digitalized. It's usually on paper and stored in the central database. Is that correct or do you have some kind of digital system?

Interviewee (A.4.):  
No, I think this is correct and we are trying for the last two years to find a way to get this done. More on data-in-order.

Researcher (1):  
OK, thank you very much. That was it! I'll just stop the recording.

Interviewee B.1

Last update: 15 March 2022

|  |  |
| --- | --- |
| **Code** | B.1 |
| **Organization** | Case Beta |
| **Role** | Strategic advisor |
| **Date** | 14 Jan 2021 / 12:00 |
| **Duration** | 48 minutes |
| **Language** | English |
| **Interviewer** | Sultan Cetin |

Interview transcript

Researcher (1):  
Could you explain your role in your organization?

Interviewee (B.1):  
I'm a kind of strategic advisor at <<Case Beta>>. I try to find out what's the best way to incorporate circularity and climate adaptation in our organization on the strategic level. And I try to implement that strategic vision into our organization.

Researcher (1):  
OK, thank you. Now, I'll ask a few questions about the circular economy objectives of <<Case Beta>>. When I read through the reports and websites, I saw that overall environmental sustainability objectives are … three themes in <<Case Beta>>: the first one is energy transition, the second one is circular economy or circularity and the third one is climate adaptation. So, these are the three themes that you focus on as an organization. And also, overall you have CO2 neutral goal by 2050, right?

Interviewee (B.1):  
Yes, 2050. Yeah, that's the overall goal.

Researcher (1):  
How is then circular economy incorporated into your sustainability objectives? How do you see circularity?

Interviewee (B.1):  
Now we’ve just started with thinking circular about 2-3 years ago or so it's rather new. Officially we are not that much farther than 2050 as a target. But in the meantime, we are trying to set some targets between 2023, 2025, and 2030. And for our new buildings, they're just before implementation. We have set some targets for the MPG and the BCI.

Researcher (1):  
Is it like the BCI from <<a consultancy company>>?

Interviewee (B.1):  
Yes, the building circularity index (BCI). We took them because in the MPG… aspects like demountable, biobased, and reuse are not that good implemented already. So if you want to follow the government, the law, and if you want to anticipate it, you have to include also those kinds of aspects otherwise you might get difficulties in the future work according to them. So that's why we said we're also going to use the BCI as an extra target for the future. They're just before implementation.

Researcher (1):  
How does <<Case Beta>> define or understand the circular economy? There are many definitions, and for instance, when you look at <<Case Alpha>>, they include biodiversity in there. They want to merge it with the energy transition that they don't want to think about separately. But how is it in your case?

Interviewee (B.1):  
Biodiversity is certainly not because we don't see that as for corporations. We are here for building houses and make them the cheapest possible. And biodiversity- That's not part of our targets... And of course, it would be nice when the energy transition goes circular. But <<Case Alpha>> has the same problem. They are targeting energy transition, and circularity is just a small aspect that they try to implement in that process. And we have the same problem. We are just at the beginning of that change to a circular economy. And that costs time for all the participants in that process.

Researcher (1):  
So my understanding is that then in your case circularity is something really different from the energy transition or climate adaptation…

Interviewee (B.1):  
Not really, because there's the point of the CO2… Carbon dioxide. You can put them together. So when you're thinking about monitoring CO2, we are thinking about using them [energy transition and circularity] together to monitor CO2.

Researcher (1):  
Yeah, I think I saw in one of the web pages of <<Case Beta>> that you want to look at the whole life cycle carbon rather than on the operational carbon. And then the circularity is a kind of embodied carbon in there.

Interviewee (B.1):  
Yeah, we have a kind of monitoring instrument developed together with <<a consultancy company>>

Researcher (1):  
Yes, I know them.

Interviewee (B.1):  
And that’s at the moment only energy transition. But it's a small step to put the circular CO2, embedded CO2 into it.

Researcher (1):  
Talking about monitoring and the goals for CO2-neutral housing stock. But does that mean is it operational CO2 or the goal of being neutral? How do you define that?

Interviewee (B.1):  
Now, we are planning to make energy-neutral housing.

Researcher (1):  
No, I meant are you looking at operational CO2 or whole life cycle carbon of the housing stock?

Interviewee (B.1):  
In my opinion, we do, but that's not been implemented in our organization yet. They are still on the step to start with, thinking that way—embedded carbon is just as important as operational carbon.

Researcher (1):  
But initially, when you said CO2 neutral housing stock by 2050, <<Case Beta>> thinks that it is operational carbon, right?

Interviewee (B.1):  
They are still thinking that way. They didn't see the light yet, but they can also do that by embedded CO2. That’s the part of it.

Researcher (1):  
I will go back to my question again about the circular economy: How does <<Case Beta>> understand the circular economy?

Interviewee (B.1):  
That's the big question. What do we mean by circularity in 2050? The target circular building. And you see just the making off or the maintaining of our buildings… they have to be circular. It's not that the housing stock itself is circular.

Researcher (1):  
Oh, processes you're talking about construction, renovation, and maintenance… Operations…

Interviewee (B.1):  
And the new buildings that they are circular.

Researcher (1):  
You already gave an answer to this, but I'll again ask, perhaps you will have another answer. What do you think is the level of maturity of the circular economy in your organization? You said you started a couple of years ago, but do you think is it mature or is it like the baby steps?

Interviewee (B.1):  
No, not at all. We are just starting with pilots. And we’re getting used to the subject by just starting with a kind of target. But how hard they are, these targets, still the question. Is it ambition or is it a target? So, we are really at the beginning.

Researcher (1):  
Yeah, I see. And now I'll ask questions about the circular economy in strategic decision-making and what kind of information is needed for that. The first question is how does <<Case Beta>> include circular economy in the portfolio policy?

Interviewee (B.1):  
It's included but just by a few sentences which are rather… that hard and meaningful. We had just in all those portfolio texts, the sentences come from “We want to be circular in 2050”. Maybe, we’re doing that by recycling or by biobased or whatever. That's it, at the moment.

Researcher (1):  
How are then these portfolio-level decisions translated into the tactical and operational levels?

Interviewee (B.1):  
We're doing it at the moment by looking for these targets in 2023 and 2025. Then you have targets for the near future. By informing our colleagues about circularity, we also plan to have the regular situation that every project has a circular target extra.

Researcher (1):  
What kind of targets are there?

Interviewee (B.1):  
For example, the facade has to be made from more biobased or recycled materials.

Researcher (1):  
Are you one of the signees of Amsterdam’s biobased building agreement?

Interviewee (B.1):

Yes, the wood agreement.

Researcher (1):

OK. Then you need to include it in your projects at some point, I think.

Interviewee (B.1):  
Yeah, we surely do. The first project is coming in Almere. I think they will start this year already. An apartment building in wood.

Researcher (1):  
One thing that is not clear to me is that—you said the portfolio policy is blurry and then you gave a few examples of how they are translated into tactical and operational processes. But for me, it is difficult to find tactical level, examples, could you perhaps give some examples?

Interviewee (B.1):  
What kind of targets do you mean? So, you have in mind.

Researcher (1):  
I'm not so familiar with this operational, tactical, and strategic triangle of housing management. Tactical means that you make decisions on the midterm and … on certain areas or certain building complexes.

Interviewee (B.1):  
That's not tactical in our view.

Researcher (1):  
Oh, how is it then at <<Case Beta>>?

Interviewee (B.1):  
Yes, that's a good question. I think what I just mentioned is that we are trying to have a pilot in every project about circularity as a tactical choice. When you implement in the program of projects that's the tactical moment. At the strategic level, you say you want to do that in every project. That's a strategic choice, but the moment you do it, in which project you have specific targets, that's the technical moment.

Researcher (1):  
And then the operational?

Interviewee (B.1):  
To do it, what you're actually going to do in a specific project.

Researcher (1):  
Clear. So, you already partially answered this question, but I want to discuss it a little bit further. You have the goal for being circular by 2050, and then how does your organization monitor and measure the circularity at the portfolio level? Not at the building level…

Interviewee (B.1):  
Not yet,

Researcher (1):  
Do you have any idea then how you could do it at the portfolio level?

Interviewee (B.1):  
Yeah, we could do it when with MPG. Or by the CO2 and the embedded CO2 in the monitoring system of the energy transition. And you have possibilities to measure circularity.

Researcher (1):  
But then, what well would you measure for circularity?

Interviewee (B.1):  
These two: Carbon, MPG and BCI.

Researcher (1):  
But BCI is for the building scale, right?

Interviewee (B.1):  
Yes.

Researcher (1):  
Then when you talk about the entire portfolio, can you use that as well?

Interviewee (B.1):  
You can use the BCI for your portfolio. Yes. Because it tells you something about the future. It tells how good you can make demountable buildings or about their worth in the future.

Researcher (1):  
So when you make decisions at the portfolio level, especially for the circular economy, what kind of information or data do you need?

Interviewee (B.1):  
That's a big question, what we need. Because, at the portfolio level, we are really at the beginning of thinking about that. So it's not that easy to mention them Because it's the big question, how accurate do you want to have those figures? How detailed do you want to have them? And that’s important to know before what you need to measure and your targets.

Researcher (1):  
But if it was up to you, what kind of data would you require?

Interviewee (B.1):  
Yeah, I don't know if you want to measure circularity all the time. Or that you only do it every year once… Because is it so important to measure circularity every day, every week, every month? I think when you measure the security of your portfolio every year. It's enough to make decisions in the coming years.

Researcher (1):  
So then the measuring could be done then using BCI.

Interviewee (B.1):  
Yeah, I think BC I could be a good instrument to measure the circularity of your portfolio.

Researcher (1):  
And then, to calculate BCI, what kind of information would you need.

Interviewee (B.1):  
That differs. You know that depends on how accurate you want to have it. Do you want to have a big thumb measuring or …?

Researcher (1):  
But, when you make strategic decisions, do you need really such accurate data or more yearly data?

Interviewee (B.1):  
I don't think you have to have them so accurate. But on the other hand, how do you get your information for measuring not that accurate? And then you have to do some surveys about your apartment building, your complexes. And that costs a lot of time to find out how they are built in the past.

Researcher (1):  
Don't you have information in your ERP system about when they were built? Perhaps this could give some indication about building type, certain materials, etc.?

Interviewee (B.1):  
Oh yes. That’s what we did. We have measured the expected MPG and BCI until 2050-- What would be the effect of our regular way of building and maintaining... We did that by building year and building types.

Researcher (1):  
Where did you get this data from?

Interviewee (B.1):  
<<advisors>> and a <<consultancy company>> did it for us.

Researcher (1):  
Yeah, but did you provide them with data from your ERP system?

Interviewee (B.1):  
We gave them our portfolio (data) in years and building type…

Researcher (1):

So, then this kind of data about building stock—Where do you get these kinds of information?

Interviewee (B.1):  
We have that in our system.

Researcher (1):  
What kind of data can you access about the buildings, like physical properties or so? Or do you have to know 3D models?

Interviewee (B.1):  
No. There are just charts.

Researcher (1):  
Your colleague told me that <<Case Beta>> wants to digitalize but there are currently no BIM models of your housing stock.

Interviewee (B.1):

I think a BIM is a big step. I don't think we are going that far with 3D models.

Researcher (1):  
Are you familiar with <<AI company>>? Your colleague mentioned to me that they use it for the entire building stock to scan.

Interviewee (B.1):  
Yes, of course. But, you don't have a 3D model yet.

Researcher (1):  
So then when you make decisions on sustainability, forget about the circular economy—Overall sustainability… It could be energy transition or climate adaptation.

Researcher (1):  
Then what kind of digital tools do you use? Because you need data right to make decisions? So where do you get that data and do you use some analytic tools?

Interviewee (B.1):  
Yeah, I don't know what applications they use. I don't think we use that much of applications. Mostly it's just Word and Excel.

Researcher (1):  
Yeah, good to hear. Sometimes Excel does the job.

Interviewee (B.1):  
There are some applications for your portfolio. But I don't think they use it for making decisions. Just to maintain your portfolio and that's it.

Researcher (1):  
For maintenance, right? Your colleague also mentioned a few of them, especially for planned maintenance or repairs.

Interviewee (B.1):  
She's better informed about that part.

Researcher (1):  
Yeah, I was more interested in learning where you get that data, what kind of data you need, etc. to make our portfolio circular…

Interviewee (B.1):  
Yes, I do know why you ask the questions. That's not the point.

Researcher (1):  
I understand it's sometimes difficult to answer it when it's not mature enough…

Interviewee (B.1):  
Now I think there is a clear difference between the way you want to observe your portfolio and the way you make decisions about circular alternatives. There are two different things.

Researcher (1):  
Can you explain the differences between these two?

Interviewee (B.1):  
Yeah, I think when you're talking about your portfolio, you don't need that accurate data to do it…. But when you want to make circular decisions in your projects, you need detailed information about alternatives. What's the effect of the alternative, on the environment, the MPG, and, the BCI? That's one thing that is what you want to know in your project.

Researcher (1):  
I see…

Interviewee (B.1):  
And OK, afterward you want to collect the information that you already did and put that maybe in a database or your portfolio. But that's always our problem—those projects are only a small part of the total. There's a lot of the total information in your portfolio, it's old or is not that detailed. And to get the portfolio information more detailed, you have to invest a lot of money to get it in your database…

Researcher (1):  
Yes, I see. You need a new data architecture and then have the mining techniques to find the right information for the right purpose.

Interviewee (B.1):  
Yeah, normally, our organization does not decide to do that.

Researcher (1):  
OK, then let’s dream about the future. Imagine that you have the power and come to create a tool for your portfolio decisions for circularity, what kind of digital tools would you use?

Interviewee (B.1):  
Yeah, the most important thing is always, I think, is to keep it easy for the colleagues but also for the building companies to deliver that kind of information. So, it should be incorporated into their own systems. In their calculating system, for example. So, they don't have to do extra handling. But every company has its own systems. They're not the same.

Researcher (1):  
No.

Interviewee (B.1):  
And at the end of the project, how can you transform them into our system, our database?

Researcher (1):  
So the tool should be easy to use by many stakeholders and also it should be easily incorporated into the existing systems. This is one of the features that you would like to have. But I'm more curious about what does it for the circular economy? How does it help? Do you, for instance, need material passports? Do you need a database where you could see all the material alternatives, LCAs, and all calculations?

Interviewee (B.1):  
Yeah, I think they should be incorporated into the systems which are already there. When you are making another system to make decisions about circular alternatives, they have to use two systems on their computer. It makes it difficult to decide…

Researcher (1):  
Would there be then a difference between the project level and the portfolio level of that tool?

Interviewee (B.1):  
Maybe in 50 years, not anymore.

Researcher (1):  
Why do you say so?

Interviewee (B.1):  
But in the meantime… As I explained before, you have these two situations.

Researcher (1):  
I don't get it. Why in 50 years they would be the same?

Interviewee (B.1):  
As I explained, our kind of organizations will not put that amount of effort into getting the information of our portfolio on a good level. That cost time.

Researcher (1):  
Yeah, but as I told you, you can dream about it, you have all the possibilities…

Interviewee (B.1):  
I know what you mean.

Researcher (1):  
Yeah, I'm trying to find here what a tool for portfolio level should look like… Because they are not many.

Interviewee (B.1):  
Of course, it will be very good to have when project information goes directly into the portfolio information database.

Researcher (1):  
Are you familiar with the digital tools that are used at the portfolio level for circularity?

Interviewee (B.1):  
But maybe when you mentioned one… I don't know them, no.

Researcher (1):  
You don't know, OK. Have you used any specific tools for circularity? Perhaps not portfolio level, but at the project level?

Interviewee (B.1):  
For new buildings, we have started with <<material passports platform>>?

Researcher (1):  
How was your experience with that?

Interviewee (B.1):  
I think they see it, I talked with my colleagues, and they see it as an extra thing to do. But no use at all.

Researcher (1):  
Really? So, they have, if I'm not wrong, they have another circularity index. So why don't you use the circularity index that this platform provides?

Interviewee (B.1):  
We have chosen the BCI.

Researcher (1):  
Just a matter of choice? I'm trying to understand…

Interviewee (B.1):  
We have talked with <<material passports platform>> about it, as an advisor as well for circularity. But they said that they don't see a role for them in advising. And that's why we have chosen other consultancy firms.

Researcher (1):  
I see.

Interviewee (B.1):  
But when talking about what my colleagues see about material passports is an extra thing to do, but not as something they can really use.

Researcher (1):  
OK, apart from material passports, did you use any other specific tools? It could be a BIM application… Sometimes, you know, there are tools that tell you about the reusability and recyclability potential of design options…

Interviewee (B.1):  
The point is, we don't do that ourselves, that's the architect or the building constructor is doing that.

Researcher (1):  
Yes, the architect.

Interviewee (B.1):  
And they are using their own software.

Researcher (1):  
How do you determine whether a building design solution is circular?

Interviewee (B.1):  
By the MPG. Yeah, because that's the law.

Researcher (1):  
But is it meant for circularity?

Interviewee (B.1):  
The MPG is meant for circularity as well, yeah. That’s the only thing we have at the moment from the government for circularity. And of course, that's not all about circularity, but it's a part of it. That law will change… Biobased (materials) will be put in the MPG, demonstrability will be put in the MPG, and reusability will be put in it.

Researcher (1):  
These are the four things actually about the circular economy concept.

Interviewee (B.1):  
They will be, in the near future, part of the MPG.

Researcher (1):  
For the existing buildings, do you use any index?

Interviewee (B.1):  
No, nothing.

Researcher (1):  
It is an underdeveloped subject, at the moment, in the academic world as well.

Interviewee (B.1):  
Yeah, you could use BCI for that. And there will be an MPG for renovation and transformation in the near future. The government is working on it.

Researcher (1):  
So we talked about a few tools… What are challenges did you face when implementing new technologies for circular projects?

Interviewee (B.1):  
Other things we already mentioned… The colleagues… it has to be easy… data exchange has to be good. The most important thing is that people have to be aware that we need to do it. That's the main point.

Researcher (1):  
…the urgency.

Interviewee (B.1):  
Because they don't see a need to collect data now. And it has to do with the fact that these data are not for now, but for the future. And people are not used to thinking about a collection in the future, they are thinking about now… And that's what circularity is about. It's about information for the future.

Researcher (1):  
And today as well, no?

Interviewee (B.1):  
No.

Researcher (1):  
How about then maintenance for the lifetime extension of the existing stock?

Interviewee (B.1):  
Yeah. But maintenance is something very common in the housing corporation world.

Researcher (1):  
I think I covered pretty much all of my questions. I was more interested in the strategic level and whether you're using any specific tools. So, if you have anything to add, you can add it now. Otherwise, I don't have further questions.

Interviewee B.2

|  |  |
| --- | --- |
| **Code** | B.2 |
| **Organization** | Case Beta |
| **Role** | Manager Partnerships & Innovation |
| **Date** | 14 Jan 2021 / 11:00 |
| **Duration** | 46 minutes |
| **Language** | English & Dutch |
| **Interviewer** | Researcher (1): Sultan Cetin |
| **Transcript** | The transcript of this interview is not available. |

Interviewee B.3

|  |  |
| --- | --- |
| **Code** | B.3 |
| **Organization** | Case Beta |
| **Role** | Senior area developer |
| **Date** | 17 Jan 2021 / 15:00 |
| **Duration** | 49 mins |
| **Language** | English |
| **Interviewer** | Researcher (1): Sultan Cetin |
| **Transcript** | The transcript of this interview is not available. |

Interviewee G.1

|  |  |
| --- | --- |
| **Code** | G.1 |
| **Organization** | Case Gamma |
| **Role** | Portfolio advisor (circularity) |
| **Date** | 19 Jan 2021 / 15:00 |
| **Duration** | 58 mins |
| **Language** | English |
| **Interviewer** | Researcher (1): Sultan Cetin & Researcher (2): Ad Straub |
| **Transcript** | The transcript of this interview is not available. |

Interviewee G.2

|  |  |
| --- | --- |
| **Code** | G.2 |
| **Organization** | Case Gamma |
| **Role** | Porfolio advisor (Maintenance) |
| **Date** | 21 Jan 2021 / 14:00 |
| **Duration** | 36 mins |
| **Language** | Dutch & Turkish |
| **Interviewer** | Researcher (1): Sultan Cetin |
| **Transcript** | The transcript of this interview is not available. |

Interviewee G.3

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| **Code** | G.3 |
| **Organization** | Case Gamma |
| **Role** | Asset manager |
| **Date** | 18 Jan 2021 / 10:00 |
| **Duration** | 42 mins |
| **Language** | English |
| **Interviewer** | Researcher (1): Sultan Cetin |

Interview transcript

Researcher (1):  
[…] So could you explain your role in <<Case Gamma>>?

Interviewee (G.3):  
We have one team of asset managers and we have two different levels: asset manager and fellow asset management. I am a fellow asset manager (medewerker). So that's one below and we work together in neighborhoods. So, we divided Rotterdam into different neighbourhoods. And what we do is we are the owner of our property, of all our dwellings, and we decide which dwellings we want to renovate, transform or build up again. We do some small things and the bigger things and there we give to the project managers instructions (opdracht) and we do some research together. We are the asset managers and then we have, in our team, the project manager and some other people and then we decide together. So, that’s my role.

Researcher (1):

So, you said you are responsible for a neighborhood or a couple of neighbourhoods?

Interviewee (G.3):  
A couple of neighborhoods.

Researcher (1):  
So approximately how many housing units are we talking about?

Interviewee (G.3):  
We have three regions. I'm from South of Rotterdam where we have about 20,000 dwellings. And we are three people, so one asset manager and two fellows (medewerkers). So for me, it's about 10 thousand.

Researcher (1):  
I see. So, you report to an asset manager?

Interviewee (G.3):  
Yes, but I am becoming a mediator, but that's now the role.

Researcher (1):  
OK. I am asking these just to understand the structure of how things work at <<Case Gamma>>. You actually explain this but let me ask you again. What does asset management mean in your organization?

Interviewee (G.3):  
In Dutch, we are intern opdrachtgever (internal clients). So, the portfolio says like OK we have a lot of bad energy labels, and we have a lot of foundation problems… And we need to take care of these problems and then we look at which buildings we need to go after first.

Researcher (1):  
So at the portfolio level, general decisions are made such as -we wanna be energy neutral by 2050- and then you take this task at the asset management level and look at your properties and seek ways to achieve that goal, is that correct?

Interviewee (G.3):  
Yeah, that's correct. They (portfolio) do it after the long-distance, and we do it at a middle-long distance and operational levels are doing it in the short term.

Researcher (1):  
And you naturally talk with the operational team, project managers, or so.

Interviewee (G.3):  
Yeah. We always say that it's like a rollercoaster, and we are in the middle of it. So we have context down at the operational level, and then we report it at the portfolio level and then come back and make it a project.

Researcher (1):  
What kind of decisions are made at this level?

Interviewee (G.3):  
A lot of different... We have very small projects and very large projects, so I have one project, which is six buildings in total and 250 dwellings. And then we have a big renovation because the energy level is really bad. And then we're going to look at what can we do, extra or the people living there with pleasure? Or do we need to do extra things? But sometimes we also do upgrades … The building is quite OK, but it looks like you've studied architecture as well, but it looks bad. So then we can do small things to upgrade the building a bit.

Researcher (1):  
So you were talking about 10,000 units housing units. How do you access data?

Interviewee (G.3):  
Well, we use Excel a lot. Sorry.

Researcher (1):  
Excel is totally fine, and I hear that a lot.

Interviewee (G.3):  
Excel, and we have <<software>>.

Researcher (1):  
What is it? Is it in an ERP system?

Interviewee (G.3):  
It's a program for more visualization of data.

Researcher (1):  
OK, from <<company>>, I see I haven't used it before.

Interviewee (G.3):  
Yeah, and we use <<software>>. That's a program where you can find the financial things of your buildings. Our buildings are there.

Researcher (1):  
<<software>> global financial analysis.

Researcher (1):  
Do you, for instance, have BIM models of your housing stock that the part that you manage?

Interviewee (G.3):  
Yeah, we have, but that's not my section. But at <<Case Gamma>>, they are working on it to put everything in BIM.

Researcher (1):  
Yeah, but you are not really using it yet.

Interviewee (G.3):  
Uh, not now. There are some buildings in there, but not everything yet. And it's more the project managers who are working with the architect... And they are using it more, I think.

Researcher (1):  
Do you see any value in using such a model when you manage your housing stock?

Interviewee (G.3):  
No, I worked at the architecture office before and there I used it a lot. But I never saw it at <<Case Gamma>>.

Researcher (1):  
OK, but again, imagine if the entire housing stock is digitalized with BIM. Would it be helpful for your decision-making at the asset management level?

Interviewee (G.3):  
It would be very helpful to see and find floor plans and drawings, what kind of doors and windows are there.

Researcher (1):  
I see.

Interviewee (G.3):  
I know that they're working on it. But what kind of detail level do we need?

Researcher (1):  
I'll speak with your colleagues from ICT, so I will find out to what extent they are digitizing your portfolio. But for me, I'm more interested in your needs for data weather at the asset management level. Would you need such information, or is it just excel fine?

Interviewee (G.3):  
I think for me, it would be really helpful to see the floor plans up and see what is on the walls and what’s not…. So to transfer a building, what needs to be up there at the end, and what can I switch…

Researcher (1):  
Is it more like energy renovation, right? You’re talking about, for instance, the window frames … to just confirm… My next question is about the circular projects or policymaking processes you have been involved in so far. Could you please briefly explain?

Interviewee (G.3):  
Well, we have now a project group with a <<colleague>>, whom I think you also speak to. Yeah, so we now have a circular project where we will make KPIs for our organization, so that’s where I'm involved. I have a project which we will demolish and therefore we will... I make the instructions, and in this program, we say we will research if the kitchen and the bathroom are still OK enough to reuse in another building.

Researcher (1):  
So, this is kind of a building scale, isn't it? At first, you were talking about like 10,000 units, right? And in my head, I imagined that you would look at maps and then you would have different kinds of buildings. But now we are really looking at the building scale. So in your role, you work within the scales as well, from building to neighborhood, right?

Interviewee (G.3):  
Yeah, we have some neighborhoods, and we know. They are really about the differentiation of our neighborhoods… We have some social housing here, but not too much because we want to spread it. That's our role and how we're going to do that. And then we make decisions on the building level… and in the building, there are the dwellings.

Researcher (1):  
So this project, the demolition project, is at the building scale. But do you have any projects at the neighborhood scale, like circular neighborhood or something like this?

Interviewee (G.3):  
No, that's more at the organization level. We have a climate adaptation program. Therefore, we have some neighbourhoods which are urgent, more urgent than others. Both share circularity is not at the neighborhood level, that's more organization-wide.

Researcher (1):  
We will come back to the project that you mentioned; however, now I want to ask a few questions about the circular economy objectives of <<Case Gamma>>. Because now, in your position, you work with different organizational levels. Probably you're familiar with the higher and lower implementation of circular economy, but whenever you feel like you don't have the information, you don't have to answer. I can ask later on another colleague as well. And <<Case Gamma>> has a broad vision for environmental sustainability. So you want to be natural gas-free, and CO2 neutral? How do you think the circular economy is incorporated in this?

Interviewee (G.3):  
So how is the circular economy in…?

Researcher (1):  
In these overall sustainability goals... Does it cover the material side or do you, for instance, talk about CO2 neutral… So, for instance, when you talk about the circular economy, do you consider that in your broad vision as well?

Interviewee (G.3):  
Yeah, for me, it's very wide. I think one side you have—Where are the materials coming from? Is it near Rotterdam, or do you, for instance, use wood or reused materials? But I think it's also really important that we're making buildings for people, which they appreciate and therefore they can live longer or maybe by making small adjustments themselves… and maybe when they have babies…

Researcher (1):  
Yeah, then make room for the baby…

Interviewee (G.3):

Yeah, that's also a circular for me because then the buildings last longer, and materials are used longer. In college, they told me something about demountability…

Researcher (1):  
Yeah, I think what you're talking about is the flexible design—designing d buildings in a way that if the users change or their needs change, they should be able to change their space easily. When they are doing that, if they use demountable connections, they can take it out as well. Did you mean this? This is what I understood …

Interviewee (G.3):  
Yeah, exactly, next to that, if you place a kitchen and you can easily take it off so you can put it somewhere else…

Researcher (1):  
So what do you think is the level of maturity in terms of circular economy in your organization?

Interviewee (G.3):  
Now or in the…?

Researcher (1):  
No, I know the goals.

Interviewee (G.3):  
We are working on it, and I think maybe a question for you. Do you see the city heating system also as something circular?

Researcher (1):  
I think personally, yes.

Interviewee (G.3):  
Because you will reuse, that's something we're working on very well, and it's really good integrated into our process. We are the start… We are now piloting with the kitchen. I told you that it is reused, and that's something we’re working on, but we have some steps to make.

Researcher (1):  
So now I'll ask you questions about the strategic and tactical decision-making for the circular projects, but I think I'll try to make it more tactical because you're staying in the middle.

Researcher (1):  
Uh, so how? How does <<Case Gamma>> include circular principles at the asset management level?

Interviewee (G.3):  
…In terms of the city heating, there are projects on their own, so we put it on the budget… and then it comes as a project. But other circular things, we put it as research questions…

Researcher (1):  
OK, research questions.

Interviewee (G.3):  
Yeah, research, we put it as research questions in our requirements… So we do research during our projects. And then we say to the project manager-- OK, we want something circular, SAY kitchens, or the windows, or we describe what we want to do on circularity.

Researcher (1):  
Yeah, but, here what I wanted to ask you is when you create your requirements for managers, for instance, do you define reused and biobased materials? Do you have them listed in your asset management?

Interviewee (G.3):  
Not yet. We are now, with the kitchens, are doing it, but, I think there should come a kind of a menu which we can choose—OK, we have a wooden building… so think about this and research it. Because we give some budget to the project managers and project managers, need to finish their projects in our budget. So if we say you need to use circular insulation, then they say sometimes—OK, but this is more expensive, so I need more budget so that you have to describe in your requirements. So they have that space to use it.

Researcher (1):  
So then, in your case, you include some part of circular decisions in your requirements, especially to be able to reuse some parts of the existing buildings, right? As you said, windows or you gave the example of the kitchen, is that correct?

Interviewee (G.3):  
Yeah, we will define what kind of circular things and which ambition there is.

Researcher (1):  
Do you somehow monitor and measure circularity?

Interviewee (G.3):  
No, except for the city heating. But that's also a KPI for the portfolio. So, but you say in 2030, we need to become natural-gas-free.

Researcher (1):  
2050 I think; you have still time.

Interviewee (G.3):  
Yeah, but 60,000 it is.

Researcher (1):  
So, let's take this kitchen example or the demolition project you mentioned that you're starting… What kind of information did you need to make the project more circular?

Interviewee (G.3):  
I think I need a kind of a menu… Well, if we talk about digital innovations, it would be really nice to see what kind of materials are in the building, and then the next step is what can I do so if there is a wooden floor… Is there a possibility to reuse it or this kitchen is only five years old, so then we can reuse it in another building … So I think some kind of material lists and then also what can I do with it? Or what are the possibilities?

Researcher (1):  
So, has this project started already like a demolition project?

Interviewee (G.3):  
Uh, almost.

Researcher (1):  
And how did you get data from that building? Do you have any data at the moment? Do you know what you want to do with that?

Interviewee (G.3):  
Well, we have our floor plans and a researcher checking the building, but it's the technical state of the building. And then you know some things that we were missing the link-- OK, I have this, and then we can do this. It was more about what is the technical state and can we still fix it… And what kind of quality level do we get?

Researcher (1):  
So if I understand you correctly… One person goes there, checks the quality, and notes whether the building quality is good enough or the materials are good enough to reuse.

Interviewee (G.3):  
Yeah, it was not a circular question; it was a technical question.

Researcher (1):  
I think it is called pre-demolition inspection. So, you talked about floor plans… how did you get them? Is it printed?

Interviewee (G.3):  
PDF's.

Researcher (1):  
Are you going to scan that building, or is it going to be demolished?

Interviewee (G.3):  
This one is going to going to be demolished.

Researcher (1):  
But then what are you gonna do with the waste?

Interviewee (G.3):  
Yeah, that's something that the project manager decides… We have no ambitions yet for this building. The project manager decides what's going to be with waste, but as an asset manager fellow, I can put something in the requirements that he or she needs to do something with the waste, but now that's not in yet.

Researcher (1):  
Do you work with a demolition contractor? Sometimes they handle the waste and reuse and make concrete out of it.

Interviewee (G.3):  
Now that's the project manager who's working with them….

Researcher (1):  
OK, clear. So then you didn't really use any digital technologies to collect data then. It's just emails, excel?

Interviewee (G.3):  
No no. Yeah, Excel, PDFs, another <<software>> but that's just a visualization of a lot of Excel data.

Researcher (1):  
How do you keep this building data? Do you have like an ERP system? Are they saved in software, or how do you extract data?

Interviewee (G.3):  
PDFs that as well at floor plans or?

Researcher (1):  
You talked about 10,000 buildings. Probably they have a system where you store them… where they are stored? Is it like a central system or ERP system? Or perhaps you don't know…

Interviewee (G.3):  
Yeah, we have one system called <<software name>>. But I think it's not really a common program, but there's a lot of information..how many dwellings addresses the building year? But I never heard of it. But there's also a lot of information about the tenants.

Researcher (1):  
Ah, OK, I see.

Interviewee (G.3):  
And floor plans and pictures…

Researcher (1):  
Do you exchange data with others when developing new projects like this is in the case of demolition?

Interviewee (G.3):  
My job is, most of the time, internal. Sometimes data exchange with the municipality. And that's just by email, and in turn, we have shared space on <<communication software>>.

Researcher (1):  
So now I'll move to the last part. It’s, I think, the fun part. We asked our interviewees about a digital tool that could support them in implementing circular strategies at the asset management level. So think about the tools available or the tools that will be invented for you. You can take your time. Imagine that you are going to implement circular strategies at your 10,000 units. What kind of tool would help you?

Interviewee (G.3):  
But I think it would be really helpful to have something like BIM where I am still hoping that they're working. And then there's a lot of information: what kind of materials are inside the buildings? And then there should be something which is translating that to a kind of menu where it says OK; you have wooden floor if you will demolish this building you can reuse it … And I can choose which one is the most perfect…

Researcher (1):  
Yeah, it's more like a guideline to help you in your decision-making.

Interviewee (G.3):  
Yeah, it gives tips and guidelines.

Researcher (1):  
What else?

Interviewee (G.3):  
But that's maybe more for the project manager, so where you can find in the neighborhoods good materials or perhaps it kind of, but I think that's already there as shorts kind of data bank, where you can show up materials which you will need.

Researcher (1):  
Yeah, there are some initiatives I think you're involved in there and Rotterdam. Most at Rotterdam. I just saw news from a <<demolition company>>.

Interviewee (G.3):  
Yeah, <<demolition company>>.

Researcher (1):  
I think they're gonna do it for you.

Interviewee (G.3):  
Yeah, that's the one where we reuse the kitchen as well.

Researcher (1):  
Yeah, have you used any specific tools for circularity so far?

Interviewee (G.3):  
What are they?

Researcher (1):  
I think the most known one is material passports… These are actually what you just defined -- you want to know what materials are in, etc. These tools use BIM data and make a material inventory for your building, so you know all components, so you have physical properties or chemical properties. How do you need to take them out? That kind of information is stored… Currently, housing associations are experimenting with them, and I wondered if you have any experience with that.

Interviewee (G.3):  
No, not yet.

Researcher (1):  
So my last question to you is, what do you think are the challenges you would face when implementing new digital tools?

Interviewee (G.3):  
Those people who are going to work with it… We were implementing a <<tool>> years ago. And when I started working here I was not able to find my information and I now know. And you really need to start working with programs to get a profit. And I'm still young, so I will. But I know that some people won't do it that fast.

Researcher (1):

Yeah, it's interesting. I heard that from other interviews as well. You're not alone.

Interviewee (G.3):  
And I think focus ... Not do a lot of things at the same time, but just start somewhere people get used to it and then get through the next steps. But let them know what the end is.

Researcher (1):  
Do you have anything to add? These were my questions for you... We can end the session…

Interviewee (G.3):  
No. I hope it was useful.

Researcher (1):

Yes, absolutely. Thank you.

Interviewee G.4

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| --- | --- |
| **Code** | G.4 |
| **Organization** | Case Gamma |
| **Role** | Senior project manager |
| **Date** | 21 Jan 2021 / 11:00 |
| **Duration** | 43 mins |
| **Language** | English |
| **Interviewer** | Researcher (1): Sultan Cetin |

Interview transcript

Researcher (1):  
My first question is about yourself. Could you briefly introduce yourself and your role at <<Case Gamma>>?

Interviewee (G.4):  
I am a building construction engineer, I think it's the property and translation. I am currently a senior project.

Researcher (1):  
I am more interested in your experience with the project. So, in this part of the conversation, I'll be asking questions about your experience with the circular renovation projects. I know one <<circular building project>>, but have you been involved in any other circular projects in your organization?

Interviewee (G.4):  
Well, let's say I always try to see if there are any possibilities and I think in our team we are doing bigger real estate projects at <<Case Gamma>>. I think everybody has it in the back of their minds always. You know you have to go after it yourself as a project manager. There are no, rules or policies in the company and there's a colleague… we can involve her, who is more on the strategic level.

[…]

Interviewee (G.4):  
So we can then talk about this particular project <<circular project>>.

Interviewee (G.4):  
Well, maybe just to elaborate a bit… <<circular project>>, we call that a transformation, a renovation project where the original tenants are moving out and new tenants are coming in. […] Transformation is like the whole building is being transformed into a completely new function. Let's say I also do have a vertical demolition and building new housing project, which is about to be finished next week. And there you know what we do we, we have a contract with the demolishing company, and they know very well how to use reuse materials that come out of demolished buildings, so that's kind of we left it in their hands. We are just saying OK, do it within the most circular way. But that's the that's up to them. I'm doing now also a couple of projects, which are renovation, mainly renewing the foundation in an existing building which we are doing while the tenants are still living there during the construction.

Researcher (1):  
OK, I can group my questions into three projects or more or less, but they are probably so similar. Let's start with the transformation project first. My first question is did you measure the circularity level somehow? How did you do?

Interviewee (G.4):  
We started with an advisor that was going to make an …. In the beginning, we talked about like can we measure it? Can we give a grade it? But then we didn't really know what to do because I said yeah, I also don't know. I could say like oh give me a grade. But that wasn't so easy. So, we kind of let it go and we said we're just going to search for circular objects in the building and make it in different levels like the materials that are already in the building, we try to reuse them. So second hand let's say. And if we are adding new objects to the building, try to do it in such a way hum that we can reuse them also in the future.

Researcher (1):  
… in the design, you applied some kind of demountability or disassembly principles. So then you can easily take it out in the future.

Interviewee (G.4):  
Yeah, what was very apparent in this project was the steel structure had bolts instead of welding. We use bolts to connect everything so you can take it out again.

Researcher (1):  
So then in the end, you haven't measured circularity in this project.

Interviewee (G.4):  
No. If we would have some clear policy or whatever I can give a grade to it and I can ask the the the contractors like. OK, give me at least an A. Then it will be fine, but you know that's not the case. I think maybe it's more about the intention and about really pursuing it and doing it so. And I think that worked very well. So I guess if it could be measured we would have a very good grade. But we didn't do it ourselves.

Researcher (1):  
There is confusion about how we measure circularity. And in these interviews, I am trying to get tips as well from the practice. You already mentioned some of the strategies you follow like reuse…secondary materials… Were all those materials…where did you get them from? One of your colleagues told me they got some materials from the harbor? Or was it the case for you as well? how did you get the secondary materials?

Interviewee (G.4):  
Actually, we left it up to our contractor to acquire them (secondary materials) for the most part. We also did some research. We did a tender with four contractors, I think. But we were kind of wondering like OK, we are going to do the tender, but how are we going to make sure that the contractors are really going to do circular innovation. Traditionally, in a traditional tender, we are specifying all the materials that they have to use. But in this case, if it's a second hand that that difficult… So, we were struggling with that… So, for that part, we also hired an advisor, and he made a list of reusable materials. Before the tender, we did already some research and we had, for instance, the roof tiles…

Researcher (1):  
So, you looked at your stock and made a list of materials and listed them before you went to the tender…

Interviewee (G.4):  
Yes. It was part of the tender. And there were a couple of materials like the roof tiles, the bicycle racks, you know the metal structures ... we already had them before the tender…

Researcher (1):  
Were they in the same location where the transformation happened? Or did you look up other buildings in your housing stock as well?

Interviewee (G.4):  
Well, not only our houses but on the market, on the free market… You know there's a couple of websites or whatever that our advisor knew and he could search for them.

Researcher (1):  
Yeah, I think there are a couple of marketplaces and one of them is from your demolition contractor, <<demolition contractor>> has a website where you can really see what kind of materials are available. So then your advisor did the job, he looked for the alternatives but then you went for the tender, and then the architect is involved.

Interviewee (G.4):  
No. The architect was involved all the time.

Researcher (1):

All right. So, they were thinking along with us. It was a team effort.

Researcher (1):  
So when you think about reusing what kind of data or information did you need from the materials to be able to reuse?

Interviewee (G.4):  
Ah, well, let's say from materials in our own building, we need to know the quality. Of course, that's the general is the most important factor. Let's say if the building was in a bad condition, we didn't want to reuse any window frames. And, even for the roof tiles, we have to deal with the workflow of the contractors. We thought if we want to reuse roof tiles, we need to take them first outside the construction site. Because there's no space to store them during the construction time. So, are we going to clean them and select them? So we thought that it would be nice to reserve a party of the roof tiles in a circular trade kind of thing when we found a company, that was just as easy. We don't have to store them.

Researcher (1):  
Just one thing that's not clear to me—Did that party that you found, did they get the tiles and used them for their own operations, or did they just store them clean and return them to you back? What did they do?

Interviewee (G.4):  
The first thing. They got it from another building.

Researcher (1):  
What did you do with your tiles?

Interviewee (G.4):  
With our own tiles? Actually, I don't know. I have to make phone calls to find that out. I'm not so sure what happened to them. I assume, actually, that the same company that gave us the second-hand tiles also took them away. But because that will be the most logical thing, I don't know if that really happened.

Researcher (1):  
So then, who handled this transaction? Because you're talking about now. OK, I have available roof tiles and then at that specific time, somebody else needed that those tiles and they took it. And then perhaps after a couple of months, you needed new or secondhand tiles and they come back from somewhere else. And did you use a platform or how did you handle this transaction?

Interviewee (G.4):  
Well, the circularity advisor brought us in contact with the company that had the second-hand roof tiles. And I bought myself so <<Case Gamma>> bought them. But next time, I wouldn't do that. I would leave it to the contractor because you know, it has to be delivered on time and that's really the work and the knowledge of the contractor to do about those things. So I would not do it anymore, it was too complicated for me to handle because I'm not the contractor. I think we learn also from those experiences.

Researcher (1):  
Then you said you needed to know the quality of certain materials to be able to reuse them. So how did you then measure their quality? Did you use any specific tools? Or did you go send them to a laboratory or did they test the structural quality>

Interviewee (G.4):  
No, we used the materials, but actually what you're doing is you're taking them out. We are demolishing the building and we’re constantly monitoring. For instance, to be able to see the quality of the wooden beams, you need to take the ceiling out. In the case of the wooden beams, you do a visual control. There's no need for lab research because she can just see if there's any damage.

Researcher (1):  
So it's more like people go check in the eye and whether it's OK to reuse.

Interviewee (G.4):  
You know it's a 19-century building. There are very basic materials, so stone and wood, there’s not anything complicated about it.

Researcher (1):  
So when talking about now demolition site, do scan those buildings before demolition to be to make an inventory of the materials?

Interviewee (G.4):  
Yeah, that's what we did.

Researcher (1):  
So, is it a more digital scanning or perhaps your demolition contractor went there and made a list of things?

Interviewee (G.4):  
Well, we did like a pre-scan with the advisor I told you. He said—there are certain things that you can reuse and let's say 95% of the things that we reuse that were not demolished stayed where they were. We, for the part that was demolished, asked the contractor to do that. They made a more detailed scan because they needed to make a price for the demolishing. So they had to take care of that part, and we wrote down that they had to reuse it whenever possible.

Researcher (1):  
Yeah, talking about the advisor—can you share their name? Just to get an understanding of whether they are using a platform. Because, for instance, there are some groups, like <<material passports platform and consultancy>>, doing exactly what you're saying, but they kind of use digital technologies when doing the inspection for the demolition and then they provide dashboards for their clients. Did you work as such an advisor?

Interviewee (G.4):  
Yes, actually, it's called <<company name>>.

Researcher (1):  
OK, I know them. So, the last strategy that I want to discuss with you is the design for disassembly. Especially for the steel structure you mentioned. Did you use any digital technology? It could be BIM or something to design… your architect?

Interviewee (G.4):  
Yeah, our architects. Well without me asking for it, by the way, they used BIM as a tool. I don't think that so much has to do with circular activity because you know it's just what they use. What I know is that the steel structures are actually being designed in 3D by the producing company.

Researcher (1):  
How do you access data?...only looking at drawings? Then what happens to the model? Does your engineer or architect share those models with you and keep you keep in storage? How does it work?

Interviewee (G.4):  
Well, in this project, I didn't see much of it, except 2D drawings in PDF. But I don't check them really on the level of, say the steel structure… that's more for our structural advisor to check it. So for structure, we have architectural drawings, but of course, our structural advisor makes the calculations and draws the exact dimension of everything. Then it goes to the contractor and the contractor gives that to his subcontractor. In this case, steel structural company now.

Researcher (1):  
Do you exchange data with other organizations? or did you in that project?

Interviewee (G.4):  
I'm not sure what you're aiming for, because we always use drawings to communicate.

Researcher (1):  
OK, that's one of the ways I actually… So sometimes for data exchange, some organizations use BIM models, so everyone communicates on a BIM model. I was wondering how was it in your case when you need the data.

Interviewee (G.4):  
… I don't know if you talk to colleagues of mine who are our VIP projects (vastgoeed informatie projects).

Researcher (1):  
Yeah, I spoke to <<colleague’s name>>.

Interviewee (G.4):  
Oh yeah, he is the guy. Actually, I was also involved in that in the beginning, and since then I implemented BIM in our department, in our group. But we're still learning, so we do our first projects in BIM. So far we are using 2D and sometimes 2D drawings come from BIM models sometimes they come from Autocad. It's growing rapidly now, and we are really trying to make our 3D models more comprehensive, adding all kinds of information. And also, for tenders… so for instance, if we make a very detailed model, our contractors could see and OK, so this needs to be demolished and extract information and all the data is there, so I think that's for the future that could help us.

Researcher (1):  
Are you familiar with any circular tools for construction?

Interviewee (G.4):l

Let me see… I know <<material passport platform>>. The material passports …

Researcher (1):  
So you haven't used that kind of a tool in your work?

Interviewee (G.4):  
No, because I think maybe in the future if we would have our VIP program fully operational. Then at the start of the project, I would make a take take-off of all the materials and see if we can reuse them or not. But I think those things usually are not detailed enough to make decisions. If you know that you have wooden window frames that are 30 years old and then maybe even the type of wood that they made off. Then you still don't know if you can reuse it because you have to go they to see actually you can use them.

Researcher (1):-   
Just to confirm I will try to repeat what I understood from you. So for you, not too much detailed information is needed to be able to reuse. So, the year of the production and the material quality is enough to be able to reuse those materials.

Interviewee (G.4):  
Well, the thing is the tools don't say enough. It's good to know which materials there are and maybe when they were installed. But still, I don't know if we can meet all the regulations with those windows.

Researcher (1):  
Then what would you like to know?

Interviewee (G.4):  
Well, I have to know the quality in general so that involves the material quality. What is important when you are renovating… like the window frame is always a big issue because it needs to block the the the the heat… I cannot guarantee that when there's second-hand material. But if I have a new window frame, then you know it's guaranteed that it doesn't let the air transfer but with the second-hand, I cannot guarantee that. So that's usually the problem with circularity.

Researcher (1):  
So we have like 5 minutes left and I have two questions. We are really good on time. So, this question is about a tool that you might like to have for your circular operations or it could be demolition or renovation. Thinking about your experience, what kind of a digital tool could support you when implementing circular strategies? You can think of available tools or the tools that we will be invented.

Interviewee (G.4):  
Well, now I come to think of it, we are implementing BIM, so let's make it fairly concrete. Something like that could really use I think. If I have an information take-off from a BIM model with all the materials, I have to ask my architect to specify that as much as he can. Let's say in the case of renovation, it's the materials that you have there and materials that are going to be added to the renovation. I think that's easy … You can make like sheets to see what materials are being added and then make a link with like a database of available reusable materials. And at the same time, you can maybe make an extract of the BIM model of the materials that we're going to demolish.

Researcher (1):  
So it's like a kind of automated system of your housing stock. For instance, when something is going to be demolished, you want to see what you have in there and whether you can use it in your new project and with easy extracts.

Interviewee (G.4):  
Yeah, maybe a fancy visualization tool that says that like… Well, so I think if we can make the link between what is available already, what is available in the future, and what do I need in the future. So the problem is our projects take many years. So if I'm starting a project now, I'm not already going to reserve some roof tiles. Because nobody is going to do that for five years… My point is that would not be efficient. I can then also not guarantee that I can reuse my roof tiles because, you know, there's going to be in the future so I don't have any control over it right now. But maybe if we make it bigger and there's always a project that's being demolished half a year before which is perfect. Then you have some time to select it and to check the quality before it's going to be transferred to my new construction site. For me and the contractors to have a system that gives us enough confidence that we are going to receive the materials that we need on time.

Researcher (1):  
Clear. My last question…

Interviewee (G.4):  
Sorry just to add to that…

Researcher (1):  
Go ahead.

Interviewee (G.4):  
What is really important for contractors is that it's really there on time because we cannot stop the whole construction process because of materials that don't show up and you know then there's not going to be successful and we will not do it.

Researcher (1):  
Yeah exactly. So my last question is about the challenges. So you aware of some tools such as material passports and BIM. What are the challenges for you not to use them?

Interviewee (G.4):  
Firstly, because it's something new that we didn't implement, we are dependent on our advisors or architects who also contact us to use it. We are doing many projects that are either small or they involve contractors. You know they are very traditional. We always say for fun like oh, they already have a computer, or they have AutoCAD… which is, of course, a joke but you know they are not very technologically advanced, so we're always dealing with that, so it's also just a matter of people working with it.

Researcher (1):  
Thank you. These were my questions. I will stop recording now before saying goodbye to you.

Interviewee G.5

|  |  |
| --- | --- |
| **Code** | G.5 |
| **Organization** | Case Gamma |
| **Role** | Real estate developer |
| **Date** | 20 Jan 2021 / 13:00 |
| **Duration** | 51 mins |
| **Language** | English |
| **Interviewer** | Researcher (1): Sultan Cetin |

Interview transcript

Researcher (1):  
My first question is about yourself. Could you introduce yourself and your role in <<Case Gamma>>?

Interviewee (G.5):  
My name is <<name>>. I'm a project manager of real estate development at <<Case Gamma>>. … Five years ago, I was involved with the habitants themselves, so each time we have a renovation or demolition or new building project. When people live there, there is a big need for communication and participation… That’s what I did before. And now, for three years, this is my new role, and I sort of grew into it because I am involved with a group of artists in <<place>> in Rotterdam in a squatting area. They lived there, and the houses were really old, and the maintenance hadn’t been there for decades. Like 20 years… there has to be something done. And together with those creative people or artists, or inhabitants from those houses, we decided that they unite within housing cooperation to stay there. And at the same time, we invited them to think with us about what the building will look like after the renovation. So, they had an influence on their houses and the floor plans of their houses. But also the materialization, and that's when circularity came in because one of the main goals of the total project was to keep the CO2 footprint of the total renovation as low as possible. So, from the beginning, together with the constructor and with the architects, we studied the whole renovation and at different levels or different materials, we made a decision like can we just bring in new stuff or other option is new stuff, but circular new stuff and the other option is like second hand. So, reuse or refurbish or… And that's how circularity came into this project.

Researcher (1):  
So this is the one that you actually mentioned in the form, right? You said you are involved in a renovation project. Are there any other projects in that you have been involved in terms of circularity?

Interviewee (G.5):  
Well, this is also for <<Case Gamma>> like the biggest project (circular). At the moment, for a few months, we have a contract with a demolishing company. They deconstruct everything and then they have a big building here in Rotterdam where they store materials.

Researcher (1):  
It is <<demolition company>> you talking about?

Interviewee (G.5):  
Yes, they are. That is how we try to work more circular because at the moment it's like sometimes we do, sometimes we don't, there's not like a real strategy.

Researcher (1):  
Yeah, I see that it's on the pilot level, the experimental level, right?

Interviewee (G.5):  
Yeah, definitely.

Researcher (1):

OK. I would like to now dive into that project. I ask whether you had other projects because I could split up my questions, but let's only focus on the one you had experience with. You said there were inhabitants there, artists living in that building. But is it the building neighborhood? What was the scale?

Interviewee (G.5):  
Forty-six houses and six social units.

Researcher (1):  
Yeah, the common places where come together?

Interviewee (G.5):  
Yes.

Researcher (1):

Is it an apartment building?

Interviewee (G.5):  
You can see it on Google Maps if you <<address>>.

Researcher (1):  
Thanks. I think I checked this project before.

Interviewee (G.5):  
It's like four floors, not really apartments, but also not traditional.

Researcher (1):  
Oh yeah. So, is it part of energy renovation projects or not?

Interviewee (G.5):  
No. I don't think so.

Researcher (1):  
My first question is, which circular building strategies have you implemented there? You already mentioned some of them, like reusing the secondary materials, but did you consider other things as well? Did you use bio-based materials, or did you change floor plans …?

Interviewee (G.5):  
Well, for the isolation, we used a lot of bio-based materials. And with the floor plans, especially for the social units, we really looked at how can we make those as flexible as possible… So, the thought behind that was if they don't find any renters because the social units also cost money, and they have gallery's over there a yoga practice… But when there is not enough interest in those units, it's very easy to switch them to a regular social home.

Researcher (1):  
And your strategy was to keep them as they…

Interviewee (G.5):  
What do you mean?

Researcher (1):  
As a social unit. You keep the ownership right as <<Case Gamma>>, right?

Interviewee (G.5):  
Yes.

Researcher (1):

So, you are the one who decides what's going to happen to social areas. And you could, for instance, turn it into new social housing or you could keep it as a social area as well.

Interviewee (G.5):  
Yeah, they, this group, they rent out the whole block so the whole building including those social units… And we have an evaluation each year. And when they say we can't find any renters for the social units then they can ask us to transform them back to social houses.

Researcher (1):  
OK, but in this case, you kept them as they are like social units like common units.

Interviewee (G.5):  
No, we transformed a lot actually—the floor plans but also the program of the different units. It's much different from before. And so some houses had two levels, and we made two houses out of them… They had a big influence on the total floor plan. And in some cases, people live on their own and they said I want a house of 100 square meters. But then we also, as as a social housing corporation, we said, well, let's be reasonable. So, the families, and people with kids can have bigger houses than people who live on their own. Because it's still social housing. And there will be a very weird signal that you give. If you can say, well, this artist, he's on his own, but he likes to have his space, so he has a house of 200 square meters and he pays like €500. I think they want it, but we didn't do that.

Researcher (1):  
Me too. I want that as well.

Interviewee (G.5):  
Yeah, I can imagine.

Researcher (1):  
After all these transformations are, did you make out new housing on top of these 46 or is it an equal number?

Interviewee (G.5):  
No. It was 42 houses and eight units like business units. That wasn't before, 42 and eight and now it's 46 and six. So we created 2 new houses within the same block.

Researcher (1):  
OK, that's clear. So, let's talk about what made you our project circular. Why do you call it circular? Bio-based materials, reuse, and you kind of created flexible space for your tenants. And also, there are there any other strategies you applied?

Interviewee (G.5):  
Yeah, well the reason that we call our circular project is mostly because of the use of materials. But if you look at the word circular and everything you can put in this container definition. And there is also that the inhabitants during COVID who a job because of festivals didn’t have weren’t active… They got some kind of a job as the contractor, so they helped build their own houses.

Researcher (1):  
Nice, that's great.

Interviewee (G.5):  
Uh, is that circular? I don't know, but.

Researcher (1):  
But it kind of covers the social side f circularity because you support your tenants financially as well by involving them… it in my opinion is also circular, depending on what frameworks you use. Actually, my next question is about that. Do you measure the circularity level of your projects somehow? If so, how? Some of your colleagues mentioned MPG and BCI…

Interviewee (G.5):  
Well, we asked the contractor, the deal was he has his schedule for renovating this building, and for all these materials were possible to reuse or refurbish, or and as five of them I guess… Together with the architect and architect was <<architecture studio>> in this case, they're famous because of the reuse of materials. So, for all these materials, they were looking for second-hand materials or biobased or in any other means circular… But there was a specific date and if they didn't have alternatives at that moment they just use the normal materials and what we have been spoken, at the end of the project, in February, they have an external company and they are calculating what would our footprint be if we just used all…

Researcher (1):  
Traditional methods, right?

Interviewee (G.5):  
Yes, all traditional materials. And what is this CO2 footprint at the moment with all the materials we have used instead of traditional materials. And then you have two different situations that we can show look, this is what we have contributed.

Researcher (1):  
Yeah, my understanding is that this study will be done, right? Still, this needs to be done? But you looked at the kind of embodied carbon that these reuse materials brought to your project, right? Because you're not checking operational CO2 as I understand.

Interviewee (G.5):  
I think I understand what you mean. I'm not sure if they measure both or just one aspect of the whole thing because we had, for example, one discussion about the freement…

Researcher (1):  
But is that?

Interviewee (G.5):  
It is a cement at such a level that it's free from CO2, I guess. So that's why it's called freement. There's only one company in the Netherlands that produces that and that's pretty far from Rotterdam. And we wanted to experiment with that. So we have an external staircase, which is funded on this freement right now, but during the whole process and we also saw that, well, it's much more expensive and there is no CO2 gain…

Researcher (1):  
Probably due to the transportation.

Interviewee (G.5):  
Yeah, transport. That's worse than just regular cement.

[…]

Researcher (1):  
But this is a learning curve, I think.

Interviewee (G.5):  
Of course, I also heard that about clothing as well…

[…]

Researcher (1):  
Now, I want to discover more about the information or data side of things. So, when you implemented circular strategies, you needed information when making decisions right? So especially for reuse, do you remember what kind of information did you need?—Just to give an example, you might need to know the sizes of the window frames which come from another site or the location, etc.

Interviewee (G.5):  
Yeah, well, as a project manager, my role is more abstract. So, like a bit more helicopter view over the whole process, so I was not involved that much in the process.

Researcher (1):  
But, from your perspective, what do you need?

Interviewee (G.5):  
Yeah, well I know some things. We designed the building and with the technical design, we had lists of stuff we need right like glass, wood, all those kinds of stuff. <<Architect studio>> as an advisor, they looked at a <<digital marketplace>>. I think that's their own platform, but I'm not sure.

Researcher (1):  
Yeah, that's what I know as well. But in the meantime, you have <<demolition contractor>>. Did they use this website as well?

Interviewee (G.5):  
No, that was not in the meantime. What we saw is that sometimes, like we have that staircase and also the outside corridor, we needed glass for that, and we needed wood for that, and we needed metal for that. The wood we have found in the Rotterdam harbor. And it's usable as the floor.

Researcher (1):  
Did you use it as a cladding or as structural wood? Was it?

Interviewee (G.5):  
What do you mean by how?

Researcher (1):  
 The wood you mentioned that you got from the harbor—How did you use it? As a structural element or as cladding floor cladding?

Interviewee (G.5):  
Uh, the cladding. They were big bulk of the wood. For the fence, we used glass from the bus stops. A municipality ordered them but never used them; they had to be destroyed. Before we could use it, the structural contractor who calculates if it is possible to use…

Researcher (1):  
Yeah, I was going to ask how did you… Because that's one of the major issues when you want to reuse materials, especially if you want to comply with the building law, whether it is strong enough… How did you deal with that, and what kind of information did you need, and how did you get information?

Interviewee (G.5):  
Well, they had to calculate it.

Researcher (1):  
Have they done any tests, a structural test?

Interviewee (G.5):  
Yeah, with the sandbag, I guess, that's one of those tests. But some materials were pretty fast that the constructor said you could not cut it, so then we can't use it because you have to cut parts and it was layered glass, or sometimes it was some material that was too heavy. So then the constructor had to make new calculations to make the steel bigger for this. So, it slows down the process a little bit. And also we had, but that's more like a fault, we found a big stock of reused plates… those plates looked like there were enough of it, but then some other party came and bought a few of them, and then the rest of it was not enough for us. So now we have different colors with 1/3 of it being brand new and the other 2/3 of it being those party that was a second hand. It looks a bit of fantasy but quite OK.

Researcher (1):  
I see. But I think here your architect plays a good role. Instead of leaving that material out, they found the solution to mix with other materials probably… Just to confirm, you needed certain data for the materials, so you use this platform to reach out to those materials through your architect… Then you access all the data that you required, like the strength of the materials, quantity etc., through your contractors…it could be architects or engineers that calculated it.

Researcher (1):  
Did you access any other data apart from this? Do you remember?

Interviewee (G.5):  
Well, I didn't, and I think our advisors didn't as well.

Researcher (1):  
Did you use any digital tools to collect data? I know you use that platform through your architects, but you can think of like BIM models, etc during the design phase as well …

Interviewee (G.5):  
No, in this project, we didn't.

Researcher (1):  
You didn't have BIM. Was it only 2D drawings?

Interviewee (G.5):  
Yes. Since the past year, lots of new projects have been totally BIMed. But this was an existing building, and we have chosen to just measure it, but not put it in BIM.

Researcher (1):  
Do you mean scanning the building by measuring with a point cloud?

Interviewee (G.5):  
Oh, we didn't do that over here, I guess. But we do that at our other projects as well. With the <<project name>>, they scanned the whole building, and then you can see it with pictures and almost like Google Maps that you walk in those areas as well. But here, that part was pretty traditional as we were talking about it.

Researcher (1):  
I'm reaching slowly to the end. So, did you use any tools to exchange data between the project stakeholders or external parties?

Interviewee (G.5):  
Yeah, well, our own data about like the energy labels pictures, and floor plans… that we already had in our archive. Now it's almost finished, and the new data, and revision drawings, are being put back into our systems. And now we have some kind of system, and it looks a bit like BIM, but not so detailed. It gives information about what kind of glasses are in it, what have we used for the roof…

Researcher (1):  
Did you use material passports?

Interviewee (G.5):  
No, not that technology, only our internal system…

Researcher (1):

Ok, you have an internal system for that. So it is stored in a central data storage, and you have access to those data…. Last two questions… I would like you to think about a digital tool for your circular renovation project. What kind of digital tool could support you when implementing circular strategies? You can think of the available tools and also the tools that will be invented for you.

Interviewee (G.5):  
Well. I think it should be more open source. Like I told you, the building would be put back into our internal systems with all those elements and all this information, but when I have a new development or new project, well at first, we would start with BIM and then BIM would say we need for this project 40 big wooden elements with this dimension. If it's more open-source, you should be able to find it in the market. […]

Researcher (1):  
Yeah, I see. You're defining here a digital marketplace, where you could find the materials with the dimensions and quality…. then it will show you a map in the Netherlands where you can find that. What you define is kind of an advanced digital marketplace.

[…]

Interviewee (G.5):  
… and also I can imagine that not only the housing corporations, or housing developers, are interested in using these materials, but also other parties, other organizations perhaps. Because it would be fun, but not very realistic, I guess. At the beginning of a design process, you just push the button and you can see what the materials that are on sale are.

Researcher (1):  
….demand and supply.

Interviewee (G.5):  
Yes, thank you, and so a lot of supply and not as much demand… So you can build and design, if you know, OK, interesting, so we have a lot of these materials at the moment available. What if we did this in my head? I'm going to design a building or whatever because then you can do it a lot of lot cheaper as well.

Researcher (1):  
Yeah, you’re now defining a kind of decision support tool. OK, you have this and that material, and then you can do this and that with these materials, but it's a system that gives you guidance on how you could use these. Do you mean something like this?

Interviewee (G.5):  
Yeah, well, that's an even better solution, I guess.

Researcher (1):  
No, I try to understand… I don't want to impose any ideas about it.

Interviewee (G.5):  
No no. What I meant was like, when your work is done for today, and you go in your head, you think, for today I really like spaghetti. But instead of go to the shop and buy things that you can make spaghetti off, you go to your kitchen and you look what's what do we have? And you make a meal out of it. That's what I meant.

Researcher (1):  
You're talking about the material inventory of your housing stock. Right?

Interviewee (G.5):  
Yes.

Researcher (1):  
My last question… I exceeded time already. What do you think are the challenges when implementing new technologies in <<Case Gamma>> and especially for circularity?

Interviewee (G.5):  
Well, despite our ambitions, we have a gun to our heads up, and we have to decide what's most important, then it's money… What we will see in lots of cases is when you have… the building market is a very traditional market, so everything that's different than they always do it they it's going to cost you. I'm afraid that if we have very high circular ambitions and it's going to cost us, and we have a big task in the city at the moment with we have to build lots of new houses for lower prices than usual because we are a social housing corporation. We have to maintain a lot so all the choices that are made like circularity and sustainability and those are all kind of like flavors, we add to it, but in the end it we have to be able to pay it, so I think.

Researcher (1):  
My question was especially about digital tools.

Interviewee (G.5):  
Yeah, for digital tools, centric solutions… if I ask can I have Ms project, it can cost a few weeks, but if I ask can I have a program that isn't supported by our organization, it can take a year because of certificates and then the board has to find something about that… and so that might be a big risk… Also, the connection between already existing systems or programs. That's the biggest, I guess, we have a different board every eight years or something, and the winds blow through the organization every four years or something. And then we say, now this is an important issue. Let's focus on this and then a lot of money goes through all kinds of programs and new colleagues that are specialized in this topic…

Researcher (1):  
Yeah, thank you so much for your insights. It was really helpful. I'll stop recording now before saying goodbye to you.

Interviewee (G.5):  
No problem. All right.

Interviewee G.6

|  |  |
| --- | --- |
| **Code** | G.6 |
| **Organization** | Case Gamma |
| **Role** | Business Consultant Digital Innovation and Transformation |
| **Date** | 20 Jan 2021 / 13:00 |
| **Duration** | 45 minutes |
| **Language** | English |
| **Interviewer** | Sultan Cetin |

Interview transcript

Researcher (1):  
Could you please introduce yourself and your role at <<Case Gamma>>?

Interviewee (G.6):  
Yes. My name is <<name of interviewee>> […] Five years ago, I started at <<Case Gamma>>, so previously I was a consultant and I saw a lot of different branches, and industries, such as banking. But now I'm really responsible for all digital transformation, so that's the really exciting part. I'm now part of the department of digital innovation and transformation within <<Case Gamma>>. We started developing a digital strategy in 2019. So we want to be in 2040 as digital cooperation, we have three main themes that are digital customer, digital employee, digital and digital real estate. I'm responsible for the digital digitization of the whole real estate department, so asset management, portfolio management, and maintenance development.

Researcher (1):  
So, when you look at <<Case Gamma>>? How does <<Case Gamma>> understand and define digitalization?

Interviewee (G.6):  
So we would like to support all our processes with data and digital information. So our asset management, our maintenance, our predictions… And to do that we want all the data of our buildings over real estate. So we need digital information. So we need something like BIM or a platform or something where we can find all our real estate data. So what are the materials? What are the quantities? What type of building is it? How many rooms? The whole building- The whole digital twin.

Researcher (1):  
What do you mean by digital twin? Because it is a tricky word. Is it a real-time digital twin? I think it's kind of impossible to get it but you mean that like the digital copy of your housing stock, right?

Interviewee (G.6):  
Yep, so our ambition in the future in 2040 would be a digital twin with real-time information. Well, that will take some year.

Researcher (1):  
Well. But did put it all already on the agenda or is it a more vision?

Interviewee (G.6):  
Yeah, it's a vision, but you can start with digital twin-like BIM models and data with our vision, our end vision is a digital print with censoring with IoT with all with image recognition. So yeah, the whole package.

Researcher (1):  
That's really interesting to hear, because when you speak with other housing corporations, usually you hear our priority is getting housing done. That’s our vision. Digitalization costs a lot of money, so.

Interviewee (G.6):  
Yeah. It's a use huge investment, yeah.

Researcher (1):  
That's why it was interesting to hear from you that <<Case Gamma>> has already an agenda for the coming decades. So, looking at your organization again, what do you think is the maturity level of digitalization?

Interviewee (G.6):  
I think when we just started it, our department is now 2 1/2 years old, so before that, we only had an IT department. But that was only running the business, not really developing no, no innovation. It was really a running business. So then we started as in Innovation Development Department and I think now, we have business consultants, we have data scientists, we have technical consultants. So, we have really a department focused on developing innovation. So if you look at all the enablers, we do have some in place. We do have the people and the knowledge, the partners which whom we work with. So that's in place, but our organization as a whole is still at the start of developing digital transformation.

Researcher (1):  
How far is your housing stock digitalized?

Interviewee (G.6):  
This summer the whole stock.

Researcher (1):  
On BIM? What software do you use for BIM?

Interviewee (G.6):  
<<Software name>>. So, we started with them two and a half years ago. They were still, well, a relatively small company. And now a lot of housing corporations found them also because, well, <<Case Gamma>> is big. So if we use them, others are looking at us. And they really had an open mind. They are really based on the data and not on BIM, but on the data behind the BIM model.

Researcher (1):  
 When you say BIM I feel like you mean the 3D model. Is that so?

Interviewee (G.6):  
Not sure what you mean by that…

Researcher (1):  
I'm an architect and I used to build BIM models, but when you said we use data and not necessarily the BIM, that part up in my head BIM is the data model.

Interviewee (G.6):  
Yeah exactly yeah.

Researcher (1):  
Yeah, so that's why I got confused. What did you mean by BIM?

Interviewee (G.6):  
OK, we've got 3D models, 2D plans of housing plans and we've got the data. So we have all of them, but we focus mainly on the data, but the 2D plans are used by our renting apartments and the 3D models are used by co-partners in maintenance and data we use for all kinds of purposes.

Researcher (1):  
So you built everything on this (referring to BIM software). So could you, perhaps, let me know more about the process—How did it start? How did you decide to use their platform? How did you collect data? What kind of sources of data you have? I can imagine most of the floor plans were on PDFs or printed.

Interviewee (G.6):  
That is a huge, huge operation.

Researcher (1):  
And who has done it? Another question.

Interviewee (G.6):  
So there are a lot of questions, a lot of answers and where to start…

Researcher (1):  
How did it start?

Interviewee (G.6):  
The first thing we thought about was if we want to really digital transform, then we do have to do the whole stock. Otherwise, if we do only when developing new housing then it will be once in two years we have a new building digitalized… so that's not working. So our goal was to do the whole stock. If you do that, you get loads of data, so you really have to have a platform that has the data, which you can work with the data. So that was the main focus of our selection process. Some software parties only focused on the 2D or 3D models, so really the picture, not really the data. So, we finally took <<software company>> as a partner. Because they focus on the data. Second of all, you have to focus on your data quality. So if we have 1500 plus models BIM models, it has to be ecosystem data, so, at that time AEDES, you know AEDES?

Researcher (1):  
Yes, of course.

Interviewee (G.6):  
OK, they developed ILS information delivery specifications, so your digital contract focuses on what data is needed for the maintenance of your buildings. So we use debt as an underlayer for our BIM models.

Researcher (1):  
Can I just interrupt to understand? This ILS, I heard about it, but I don't know what it does. Is it more like standardization of the data?

Interviewee (G.6):  
Yeah, sure. It's a data model, so it says you should model these objects with these attributes for every model exactly the same. So we test all our models on exactly that data. And if there's a glitch or something doesn't add up the models go back and they have to model them again. Well, that's a huge investment, so we also looked at the possibilities to make it cheaper. So we have the PDF, the PDF plans, and all the old documents. But we don't have all the documents or sometimes the PDFs are incorrect. We already know they're incorrect. So we also scanned a part of our stock, so scanners went into the buildings…

Researcher (1):  
Not only the papers are scanned but the buildings as well.

Interviewee (G.6):  
Yes, papers, all PDFs are also scanned. But, so that's also a point. <<BIM software company>> scans the PDFs and with image recognition, they make BIM models.

Researcher (1):  
That's so cool that they use AI then.

Interviewee (G.6):  
Yeah, they use AI. We also use <<AI-based tool>>, maybe you know them.

Researcher (1):  
Your colleagues didn't know about it. I'm really curious because I saw your name on their website as well.

Interviewee (G.6):  
Yeah, we started with <<BIM software company>> and then we said what if we give the ILS to <<AI-based tool>> which does the image recognition and say to them deliver all the objects which are exterior objects. If you can do that and then add it to our BIM model from <<BIM software company>>.

Researcher (1):  
Wow, that's so cool. So you had planned on the paper, on PDF, one party built the models based on that data because which is usually interior information missing in <<AI-based tool>>. And then you got the drone images and everything from <<AI-based tool>> and you compiled these two models together. So then to monitor or check your models, what platform then do you use?

Interviewee (G.6):  
At first, we did it ourselves. We created an R script that checked the ILS and now we are using the dashboard checker from <<BIM software company>>, which is kind of the same. It's a <<data visualization software>>dashboard that checks all the rules if the data is matching the ILS and we validate it in real-time and not all of them, of course, but we validate some models by just going checking outside if it is really OK. We also modelled the traditional way, so we give orders, scanned 3D image scans, or PDFs to modelling bureaus. It also does part of our stock. So basically we have three ways, just the traditional way of modelling, scanning and modelling, and image recognition and modelling.

[…]

Researcher (1):  
<<Case Beta>> is a little bit far with <<AI-based tool>> because they have the entire 65,000 homes in their housing stock scanned and modelled. But it is an exterior model not from the inside. In your case, this is inside and outside and all the information seems to be there.

Interviewee (G.6):  
We started before them.

Researcher (1):  
So then you collected data through drones and image recognition and additional ways, a point cloud, I think the traditional way was. And how do you then store data? I kind of know the business model of <<AI-based tool>>. I think they have their own database and you just pay a monthly or yearly fee to access your data on their platform. But now you have a hybrid system. How how does it work with both?

Interviewee (G.6):  
So all <<AI-based tool>> data is transferred to <<BIM software company>>’s platform. But we also have our own data lake, so we transfer all the data from their platform to our data lake. Because in our data lake we also have sources from the renting system, the financial system. So we combine all these data in our data lake and with <<data visualization software>>, we do dashboarding and reporting.

Researcher (1):  
OK. So then you store your own data and not the other parties. Is that correct or do they have your data as well?

Interviewee (G.6):  
Yeah, so really the storing of the data is done by <<BIM software company>> and by <<AI-based tool>> because <<AI-based tool>> also has our data. But <<BIM software company>> has to the full set and we download the full set in our data lake so we also have the same data.

Researcher (1):  
Yeah, you mentioned this data lake and it has connections with your internal systems as well, probably matching the addresses with the tenant’s information, maintenance needs, etc. Could you a little bit elaborate on the internal systems? Do you use a special system for maintenance? Also, do you have some kind of an ERP system?

Interviewee (G.6):  
Yes, so our ERP is a is <<software>>. So that's what it's called, and it's basically which has older rented contracts, renting information, prices, etc. A financial system <<software>> which does all the financial administration. But then within maintenance, we have <<software>> that's our budgeting system for maintenance. We have a project tool, I think it's <<software>> for the product management of all the maintenance and the development projects. That's about it.

Researcher (1):  
Yeah, one of the value propositions of <<AI-based tool>> is actually building inspections for maintenance. How does the maintenance teamwork with <<AI-based tool>> data?

Interviewee (G.6):  
The <<AI-based tool>> data for the exterior is now purely outside objects and attributes. And, we're starting next month in February you're starting a pilot with <<AI-based tool>> to do the assessment of the condition of the buildings outside.

Researcher (1):  
Is it like they will use image recognition to find out if the roof leaks or etc.?

Interviewee (G.6):  
Yeah, or the windows, just to check that the outside of the building.

Researcher (1):  
So then you will define the criteria what the check and they will automatically do it for you.

Interviewee (G.6):  
They've made it based on NEN (Dutch standards) model on it, so they check like five major points regarding the outside.

Researcher (1):  
Is it because <<Case Gamma>> needs to comply with NEN standards the maintenance?

Interviewee (G.6):  
Yeah, you don't really have to comply, it's a method you can use that they've based their checks on the NEN method. So we're going to use that to have a quick overview of all our 1520 buildings. So, we can really pinpoint which are the buildings we really have to do the maintenance on, and then we can check in more detail these complex words are really bad, score really bad or unless bad in the in condition. Whereas now we do 1/3 of our stock every year. So save 500 buildings every year. We do it by hand so someone goes to the building. There are the checks. Which is really inconsistent, takes a lot of time, and is not efficient.

Researcher (1):  
Yeah, it's not on my list of questions, but I'm so curious—You have a maintenance team who does the job, goes and checks buildings. Probably every three years one building needs to be checked. This is something kind of standard so I don't know how many people work for this job. But if you automate this, what is going to happen to those people? Are they losing their jobs to drones?

Interviewee (G.6):  
No, there they're going to do the really interesting work. This is repetitive work. It's not really adding value. So we just want to have to do these checks digitally if possible, and they can perform more quality work.

Researcher (1):  
These people are actually the ones who repair those buildings as well?

Interviewee (G.6):  
No, they're inspectors, and they're all also project managers of the maintenance project.

Researcher (1):  
Do you have an in-house team or is it outsourced?

Interviewee (G.6):  
No. We do it in-house sometimes if needed some overflow by external parties, but mostly in-house. But the maintenance projects are done by partners. But those inspectors are also the project managers.

Researcher (1):  
OK, I see then no risks. Now, I'm at the last part of my questions about ICT and innovation for sustainability and particularly for circular operations. So, does <<Case Gamma>> use information from the housing stock in policy decisions in terms of sustainability or circularity? You can think of CO2 neutral by 2050, and circular strategies at the portfolio level.

Interviewee (G.6):  
Yep. I think we're starting to get there, so. At this point, not yet, so they're still doing it with the information they have, but not with all the data and the stock information we now have with all our stock digitalized. But we also see a lot of a possibility like which roofs have the best suitable place for solar panels.

Researcher (1):  
Do you provide such insights already ? or probably you have the data because you're digitalizing, having data and information something, but did you move towards the insights? Do you give insights to your colleagues?

Interviewee (G.6):  
I think we're starting to get that. But it's really a per-use case. So if there's a use case like for the exterior we made with a dashboard which says these are old objects which need painting. So we can with one click can give all the square meters of painted jobs to a co-partner. That's an example So it's really a use case-based to get those insights.

Researcher (1):  
Have you ever done it before? It's more like a plan to do it in the future.

Interviewee (G.6):  
No for sustainability and circularity, that's still a plan. I guess this summer we have all the data and I hope we can then do some predictive maintenance etc. But, the dashboard I just mentioned, we now have to dashboard, so it's also some things we’ve realized, but a lot of it planned to do.

Researcher (1):  
So then it's going to be a little bit broad question but what kind of information or data is required for let's say overall sustainability targets or circularity? for instance, you mentioned the roof and that one of the targets is actually putting a lot of PVs on the roofs and then insulating buildings. In terms of circularity, what I see is one of the main goals of <<Case Gamma>> is reuse, so if something needs to be demolished, you need to know what is there and then can it be used in the new building, for instance? So what do you think? What kind of information from the building stock which you need?

Interviewee (G.6):  
I think materials this is is by far the biggest one. But what to what detail? So that's always the question. So what we're basically looking for is if you've got these goals in sustainability and circularity, what would be the digital assets we need? So what does that need from us? Like data-wise, what do we have to register from now on to give those insights? Which data do we have to register? That's still not very clear.

Researcher (1):  
So then your managers or advisors should come to you and tell you they need what data. Then you can create those data or information for them.

Interviewee (G.6):  
Exactly, yeah, but they're also still looking. What do we need? Making plans? It's still, I think, a bit at the forefront. So we still have to get those discussions, and see what developments are there nationwide in the Netherlands? And it would really help if you would have something like an ILS for sustainability and ILS circularity which says you need to digitalize. If these things in order to get the insights for and…

Researcher (1):  
Well, actually that's what I'm trying to find out. Not for ILS, but it's more I want to define the information requirements for the portfolio level. OK, we want to be circular by 2050, so what information do you need or do we want to realize a circular new building. A new building is different from a renovation. Renovation is different from demolition so you need different data.

Interviewee (G.6):  
So what are the requirements we need? Yes.

Researcher (1):  
That is what I want to define after this study.

[…]

Researcher (1):  
So do you exchange data with other organizations, and if so, how? And what kind of data, especially think about circular economy and also sustainability.

Interviewee (G.6):  
Well, regarding maintenance which all the quantities, etc we provide to the Co-partners. But that's I don't think that's what you were looking for. So, we exchanged this data so we have these dashboards or just datasets with all the exterior elements and the square meters etc. That's a data exchange…Is there asbestos? In all these investigations, we collect this data from those parties.

Researcher (1):  
How how do they collect that data is it like somebody goes and checks or?

Interviewee (G.6):  
Yeah, they are really inspections. They register it and we ask for this data in the fixed data format so we can upload it in <<BIM-based software>>. So all this information comes in our platform so we do have all the investigations, and inspection data. And then in our platform, we would really like to exchange it. Fire system to system, web services, etc., but not every party does that. So then you have to work with these excel formats etc. So that's one. We did a pilot with <<material passports platform>>, I think you know them.

Researcher (1):  
Actually, I was just coming there… Did you use any specific tools for circularity?

Interviewee (G.6):  
Yes, we did one pilot with <<material passports platform>>. It really depends on the detailed information you have registered in your, in this case, you're BIM model. So, our materials are not really that detailed, so. What's the use?

Researcher (1):  
Can you explain that project? Was it a new building or was it a renovation? Because depending on the project type, the detail of the data might differ as well.

Interviewee (G.6):  
No. I think it was a transformation project. But we did two buildings and I think the other one was a new building, so new development.

Researcher (1):  
How was your experience in both?

Interviewee (G.6):  
Well, as a party to work with, that was OK. So, we had a good collaboration. I think there was about more than one and a half years ago, I don't know where they are, where they stand now, but then it was really depending on your IFC model and if you have all their materials right and it's still a bit theoretical. But I think the vision behind it is OK, so you have to know what materials are in your buildings, the value of your materials, and the marketplace they have behind to exchange your materials. And basically, it's just data you exchange. So what's the added value of such a platform?

Researcher (1):  
So it is still a question for you? So then, from a data creation and building material passports perspective—How was your experience? I heard from your other colleagues that it was difficult to create passports and it took a lot of time. Was it the experience you have as well?

Interviewee (G.6):  
Yeah, it's not that easy no. So, we have to define requirements back and forth to upload this model to their platform and that's the experience we also had with <<BIM-based platform>>. You really have to define exactly what you need to get good data out of it.

Researcher (1):  
It is not then only then <<material passports platform>>, but the other software you used for your real estate data was similar in terms of challenges.

Interviewee (G.6):  
Yeah, you're always translating data between systems like translation tables… etc. So, one language is always the best, but that's the utopia, I think. But you need standards data standards, so also for circularity materials you really. It would really help if you have an ILS, a data standard for circularity for sustainability for just maintenance for attachment.

Researcher (1):  
Yeah, I see. So my last two questions, what are the challenges do you face when introducing new tools? I'm asking this for circularity, but it's in the baby steps and you have only tried a couple of things, but again, you can think of your experience with other tools you mentioned as well.

Interviewee (G.6):  
No one talks the same language, standards, exchanging data based on standards, open systems,… Sometimes those systems are don't have open data policies which are really on their own data and don't want to exchange data… so that's one. But also, if you really want to make it work, you have to have your employees use it. You have to get some volume in using it. Not only one project to pilots is easy, everyone can do a pilot. How do you scale up to really using it? And then you have the whole chain. So not only us but also the party who has to use the data in a project, so the circular partners. And how do you exchange data? And so it's the whole information chain. Which need to be aligned, and that's really a challenge.

Researcher (1):  
Do you have any other challenges? Do you want to add?

Interviewee (G.6):  
Well, it has to have the management’s attention, it has to be a strategic point otherwise we dissolved in pilots and it will never get to scale up because it needs serious digital attention. It needs serious knowledge. You have to have the knowledge. If you do it with only external consultants. I think you really have the in-House knowledge to do these things. Budget. It's a big investment. I also think it sometimes lags, a digital transformation vision. So if we really want to transform with data on this topic on circularity or maintenance, which is your vision, what's your digital twin? How you're going to use it, etc.

Researcher (1):  
Thank you. My last question is a little bit fun. We would like to you think about a digital tool that you might want to have, which could support you in implementing circular strategies for decision making or it could be under the operational level as well. You can think of existing tools that are available or the tools that will be tools for you.

Interviewee (G.6):  
There are also some future tools in science fiction?

Researcher (1):  
Yeah, sure.

Interviewee (G.6):  
I'd really like some hologram buildings, cities, and digital hologram cities, which you can see all just review you want if you want to look at all the other wooden materials in your building, just click on your hologram and you will see 3D, walking around it, etc. But that's just the fun stuff. Definitely, really be nice.

Researcher (1):  
What is then your realistic option?

Interviewee (G.6):  
Well, data collection is still a really big thing. How do you collect this data? A digital twin is nice, but how do you get the data? So image recognition really helps. But how do we make that process very efficient? And how do we make it from data to insights? How do we make that process efficient? So those are the two big challenges. If there are some really user-friendly tools for, not spending hours on <<data visualization software>> reports, but really making it really fast to get from data to insights, that’s the major thing now.

Researcher (1):  
Yes, clear. Thank you so much for your insights. I’ll stop recording before saying goodbye to you.