

Transcript: Attention economics, artificial intelligence, and the future of the planning profession

Speaker: Jonathan Metzger (KTH)

Keynote #3

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- Jonathan Metzger, KTH

Olivier: We're going to start out with our third greenery session of the morning. So Jonathan is going to talk to his title and address the theme of the day around legitimacy again from the particular perspective of the work I think he's doing at the moment. So I'm not going to say more, I'm just going to hand over to Jonathan to speak and in about time. Yeah, wonderful.

Johnatan: Okay. All right, Olivier, I want to thank you. I want to thank the organizing committee to for having invited me here. I'm really grateful to be given this opportunity to speak to you all about something I believe to be to be honest, urgently important for the future of the planning profession and for planning education in a way that to be honest, scholarly, early topics aren't always always. In the spring of 2023, not a municipality in the Stockholm region became the first ever public authority in Sweden to automate decision making regarding a planning related issue. Applicant seeking permission to install a fireplace could submit the necessary documentation digitally, after which the automated AI assistant Louvisa would respond in a matter of minutes whether the permit was granted or not, a procedure that previously would have taken weeks it handled by trained municipal staff. The case of Louvisa, the Swedish fireplace permit granting AI may at first come across as an innocuous curiosity, but we shouldn't be too quick to dismiss it as such. To the contrary, I suspect that Louvisa heralds in an entirely new era for planning practice and education, which will entail a fundamental reshuffling of the conditions of planning work that we need to begin to deal with right now or preferably already yesterday. In relation to the use of urban planning AI, I would argue that Louvisa and Naka is just a foreshock, a tremor foreshadowing a more cataclysmic event. I think that what we are currently witnessing is a coyote moment, that moment in the cartoon when the antagonist has run off the side of a cliff, still smiling, not realizing that in a split second rock hard reality is going to hit him in the face, really hard. Therefore, planning practitioners and educators need to begin to reflect already now about different ways in which we can grapple with this past changing present and to try to figure out which theoretical resources we can draw upon or need to develop to try to understand what are the potential implications of this emerging development for the future of the planning profession. The remainder of this presentation, I would like to suggest, can you mute your microphone on the Internet? I would like to

suggest one such possible theoretical resource, which is attention economics. I will do this by arguing that we may be putting too much emphasis on understanding what AI offers as artificial intelligence, and that another way of thinking about it may be that it supplies abundant and relatively cheap, synthetic, competent attention, which can be used as at least a partial substitute to, comparatively, more expensive human competent attention within planning work. The expectation expressed by public servants and politicians in NACCA is that AI will assist by alleviating planners from repetitive, boring, stupid work. Work that no one who has put the effort into achieving a university degree wants to do anyway. Now, they suggest, planners will instead be able to focus more efforts on the creative advanced problem solving work that AI could never perform. Or couldn't it? Perhaps the situation is a little less clear cut than this, which means that the impact of AI on the profession may indeed also turn out to be quite different and perhaps slightly less attractive for human planners. Maybe there is even a risk that what will actually unfold is a development in a completely different direction, one in which AI acts as the expert problem solver while the human is allocated a role more akin to a quality assurance officer or compliance manager. However, before delving into the details of these different possible scenarios, I first have to introduce what I understand to be some of the current fundamental challenges for contemporary planning practice, challenges that also explain why that which recent innovations in AI has to offer is potentially so valuable to contemporary planning practice. More than three decades ago, John Forester pioneeringly suggested that to understand what goes on in planning practice, we need to look closely at how attention is generated, organized and channeled in planning processes. Recent work performed by myself, Maria or Kansong, and Jean-Line Blas, takes its cue from Forester to look at how attention is allocated in a specific type of planning context, the Swedish detailed development planning process. A conclusion from our analysis is that many Swedish urban planners feel that lack of knowledge or information is seldom a problem in their daily work. On the contrary, there is often a sense overflow of information that needs to be considered in process. The bottleneck is rather the capacity to deal with innumerable issues and related pieces of information that could potentially have a bearing on a particular project. The situation produces a need for a strict economicization of attention, sifting need to do issues and items of information from nice to do, that is those which could be considered important but are not necessarily which therefore tend to fall to the side. Consequent to the above, in our analysis, we arrive at the conclusion that contemporary Swedish planners generally labor under a work regime that can somewhat tongue-in-cheek but described as an attention deficit order. Someone might interject and ask why we are so obsessed with defining this as a question of scarce attention, isn't it just about a structurally conditioned lack of time on behalf of the planners, that they are too understaffed and therefore lack the necessary time to process all the available relevant information. However, we would only partially array to this since crude time itself is only one of the missing components here. The question is who's time, that is the time of people have the necessary competence to navigate the process and the technical know how to deal with involved issues. Therefore time is too blunt a concept here we suggest. The question rather has to do with a scarcity of competent attention, that is available processing power, which to some extent also involves time, but

only as a partial input. I would therefore like to suggest a tentative definition of competent attention, which would differentiate it from both time, it goes something like this, we can understand competent attention as composed of necessary processing time combined with relevant competence or knowledge, a necessary effort and engagement. My claim would be that all these three properties are necessary components of competent attention. If any of them are missing, you don't have competent attention, you may have attention without competence or competence without attention, but none of these latter features will contribute to productively resolving any relevant issues in a planning process. The management of attention as a scarcity resource is the focus of the developing scholarly field of attention economics. Attention economics is today a rich and multifaceted field, but for the purpose of this talk today it suffices to go back to what is often referred to as the very beginning of the subject. Herbert A. Simon's *Designing Organizations for an Information Rich World*, originally from a 1968 but printed in 1971. In the paper Simon directly states that in an information rich world, the wealth of information means a dearth of something else, a scarcity of whatever it is that information consumes. What information consumes is rather obvious, it consumes the attention of its recipients. Hence, a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it. Further, in an information rich world, most of the cost of information is the cost incurred by the recipient. It's not enough to know how much it costs to produce and transmit information, we must also know how much it costs in terms of scarce attention to receive it. And therefore, Simon argues the crucial question in an information rich world is how we can design organizations that operate efficiently under these conditions. First, otherwise, how can we productively handle endemic attention scarcity in an information rich world? In the second half of his long career, Simon in planning context is probably most well known for his early work on bounded rationality. But during the second half of his career, he largely occupied himself with questions regarding the possibilities and challenges related to computerization. Simon saw computers as potentially crucial device in the economicization of attention. However, whether computers would be able to fill this function would depend on exactly how they are put to use. In a very late paper from 1997, Simon enumerates some of the functions a computer can fill in an organizational context. The one possible application of computers that he sees as truly potentially revolutionary is by using the computer not as a memory or conduit for communication, which multiplies information. But rather as a processor which condenses information and through this conserves precious human attention resources. That is, using computers as a source of what I in the beginning of my tool referred to as AI as a provider of synthetic, competent attention. This opens up the question about the current potential for using computers in general and AI applications in particular as experts in planning practice to whom planners or decision makers can delegate complex work tasks, which the computer will resolve through thinking, problem solving, and potentially decision making. It regards to the potential for AI to provide supplementary synthetic, competent attention in planning processes. The existing scholarly literature contains a number of cautionary tales, generally concluding that the introduction into planning practice of AI tools has been slow and its impact has at best been limited. Coming at this issue from the

attention economics angle and thinking of AI as a provider potentially of synthetic, competent attention. It's important to keep in mind that the characteristic of being competent is generally relative. Competence is most often not judged as a general quality, but more commonly perceived as being competent at something. However, the challenge of being a judge to be competent is of course relative to the difficulty of the task. The more challenging the task, the more is demanded for someone or something to be recognized as being competent performer of that task. As noted by Frank Odengraff and colleagues, the overwhelming majority of the AI systems that have been applied within planning practice have been highly task-specific and often tailor-made systems to sign with a very narrow and particular scope of application in mind. This makes most of these systems potentially helpful in achieving only very specific tasks that are part of the planning process. But as many planning practitioners would attest, being a planner much of the time demands that you are both a generalist and a specialist and that you are able to quickly synthesize and integrate different types of knowledge and analysis, something which the AI tools that are generally described in the planning literature have not been designed for and are unable to do. However, just as a person's competence can be both narrower and broader and shallower or deeper, weaker and stronger in different aspects, so can an AI's. And something that the planning literature is yet to catch up with is the rapid and dramatic development of a new type of AI tool that has a potential to be both extremely broadly applicable, integrity, and at the same time has a capacity to be very deeply, technically competent. What I am referring to here are generative AI tools that are built upon so-called LLMs, large language models, the best known of which is probably open AI's GPT family of models. What distinguishes these new tools from the specialized AI tools discussed in the existing planning literature is not just their level of capacity in a specific field of application, but rather their extreme easiness of use in that they can basically be fully controlled through natural language prompts. That is, you can work with them through requests formulated in the formats that you would put them to a fellow human. Therefore, efficiently operating an LLM through a simple chat interface does not demand previous knowledge about AI or even about computers at all. I neither have the time today, well, really not, nor the competence to explaining detail the technology behind LLMs. However, what I do feel I must mention is that there are considerable, perhaps even monumental ethical and political challenges associated how these models are built, trained and can be put to use. So I don't want to bypass or obfuscate this fact, and I will be briefly returning to some of the specific challenges later, but I won't be focusing on this, and I, however, recommend everyone to study up on this because this is really troubling to some extent. The big game-changing difference between LLMs and the older expert systems of AI is their flexibility, speed and ease of use. This makes LLMs extremely easy to tinker with and opening up that way possibilities for creatively experimenting with new areas of application in relation to planning-related work tasks. What we now need to ask ourselves is, of course, how potentially competent are these models really at dealing with planning issues? To give one hint, the already outdated Model GPT-4 reportedly passed the United States multistate uniform bar examination with flying colors, and would theoretically have been allowed to practice law in most parts of the US. That may, however, say more about the US standards of

the US legal system than the capacity of the model, but in other subject areas, such as physics, biology, mathematics, the current state-of-the-art open AI-03 model already surpasses the ability of the vast majority of human PhDs in these subject areas. However, planning isn't low, and neither is it physics. Even if both those disciplines make up part of the matter of real planning work, which it needs to deal with in the often complex and contextually sensitive judgments that planning work tends to entail. In this regard, also coming back to the AI in Stockholm in NACA, I'm sure that some of you have already smirked a bit with the thought crossing your mind that perhaps the type of simple application work that the Swedish AI deals with, well, that might formally be a planning issue, right? But in reality, it's a very menial task demanding quite a low level of competence, the installation of a fireplace, yes or no. Real planning work you may be excused for thinking can never be performed by some stupid computer. Or, let's see, I've personally, for a while, been dabbling and experimentally exploring the capacity of what, up until a few weeks ago was the world's perhaps most potent publicly available LLM model, OpenAI's O1. To get a sense of the capacity of the model to engage in planning related work, I performed a very unscientific and perhaps mildly unethical but nonetheless illuminated exploratory exercise. I selected a 3D aerial perspective rendering of a planned park from the website of the city of Stockholm. I removed all the metadata that could give a clue to what part this is from the image and uploaded it into the model, because you can also upload images. I asked the following from the model, this is a brief summary of a some longer prompting dialogue. Present five types of design interventions that can make the proposed park depict an image more attractive to visitors, well also corresponding more closely to the septid principles. That's crime prevention through environmental design. I didn't write that out because if it's supposed to be an expert, you should know that. Discuss the pros and cons of the proposed changes. Then apply the suggested principles to the design proposal, suggest specific locations in the park that can be redesigned to better implement these principles and how. Suggest which of the above proposed redesigns, which may be achievable with a total additional budget expenditure of 100,000 euros or less. And then finally one edge of the proposed park contains a playground and an outdoor gym. There's also an interactive multiple fountain water play area located within the park. Based on the principles used above, septid and visitor attractivity, do you suggest retaining the placement of these features, features within the park or relocating them other locations if they are to be relocated to where provide pros and cons for different options. Even though I had removed all such clues, the first thing the model did was to correctly identify the development in question and position it correctly according to North South axis so that it in its replies could refer to part of the park according to their orientation. Overall, it produced very substantial replies, but quantity is of course no measure of quality. My initial inspection suggested that the replies were qualified, but the truth is that I am no expert in either urban design or septid, which is why I chose this subject area. Before I created a slightly edited and typographically altered version of the model's responses and sent this document to three experts in the field of urban design and septid, one PhD level, one postdoc and one full professor. I told them that this was material from a professional competence assessment in planning, although not mentioning that the author being

assessed was a language model and asked whether they could assist me in grading the replies on a five step scale ranging from amateur to senior professional. They all kindly obliged and all of their assessments suggested that the displayed degree of competence of O1 in septid based urban design was at a scale between a very talented recent master's graduate and a senior professional with a gravitation towards the junior professional level. Of course this is just a crude and minimal sample experiment, but it does suggest that with some trimming and quality assurance work of maybe an hour or two, this output from the O1 model could potentially have replaced a few days or even weeks of work for a competent planning consultant, and it did so in a total work time of less than a single minute. However, there are still great stumbling blocks in the potential for LLM work to fully replace human labor in planning practice. Some of those are ethical, other are practical, and some are even due to the fundamental technical structure of LLMs and the lack of a real understanding of how neural networks such as LLMs actually think. But out of all these problems, I will here focus on one specific such that has no less than a monumental impact on the potential function of LLMs as synthetic competent attention in planning work. Immediately after I conducted my small park experiment, I admittedly somewhat vainly asked O1 to provide a presentation of my own academic work. It gladly obliged and presented a substantial summary in a few seconds. It provided quite a good overview of my research interest and it was certainly well-written. Further, it suggested as an illustrated example of my work, the following paper. In urban ecology, knowledge, social order, and hierarchy in environmental sustainability planning in Stockholm, they also provided full reference and a link. Upon requests, it also provided a summary of said paper, which I include on the slide here. You can take a few seconds to quickly look at it. Must say, this looks like a really interesting paper. I could definitely have written it, perhaps I should have written it. The problem is just, I didn't. The truth is that I've never before heard of it in my whole life and the reason for this is that it simply doesn't exist beyond the mind or whatever we call it of the O1 model. Even though I prompted the model repeatedly asking whether this paper really exists and if I had really written it, it insisted that indeed it does exist and that I indeed have written it. That's worrying. That's worrying. In the AI community, this type of sometimes highly creative but fundamentally factually false claims made by LLMs is referred to as hallucinations and they are an expectable error resulting from the basic technical structure of LLMs. Hallucinations appear not to be evenly distributed in the replies, but occur more commonly in relation to certain types of prompts and knowledge areas and academic references appear to be a particular Achilles heel. Even if not completely avoidable, recent LLM models have become increasingly good at identifying and correcting their own hallucinations. However, the apparent impossibility of completely preventing hallucinations also functions as a guarantee of the continuing importance of human non-sympathetic competent attention. Because if LLM outputs will always need to be fact-checked before accepted face value, the problem, or perhaps blessing, is that LLMs are so good at lying or bullshitting, perhaps, that a human subject expert may always be necessary to have on hand to put in the loop to be able to identify when the model is outputting utter garbage and when not. This is perhaps particularly important in many planning-related work processes due to their heavy legal ramifications where erroneous analysis or statements can become

extremely costly both in the metaphorical and material sense. So one way to see this is that an LLM probably is a more helpful tool for a properly trained expert within the field who can competently evaluate the reliability of results rather than for the amateur or the doubler. Reasonably, for the expert, it will in the future be more time-efficient to let an LLM do parts of her work and then just fact-check it rather than doing all the work herself. But this is of course an empirical question of something that will need to be explored in practice in the coming years. All of this has bearing upon the question of exactly how and who LLMs can be expected to affect in their daily work lives within the professional planning community. And this is the question that I'll be focusing on the last part now of my talk. Oh, there's a hallucinations. Three decades ago, Herbert Simon noted that during the course of the 20th century, the division of labor between humans and computers has been steadily changing and can be expected to continue doing so as long as technology keeps developing and becoming more sophisticated. From such a perspective, the LLM revolution is but the next step, possibly a great such, in a long line of technological advancements impacting the overarching organization of contemporary work lives. Questions concerning the likely impact of AI on the dynamics of the labor market are also currently top of the agenda of international organizations such as OECD and is also a current topic of interest for the world-leading economist Daran Asemoglu. According to his current predictions, there is significant risk that the broad-scale introduction of AI will affect the labor market by aggravating inequalities, further tilting the balance of power between labor and capital in favor of capital. The reason for this is that the current focus of AI development is very much geared towards optimization and shifting our human labor, such as in the case of Louisa in Naka, rather than utilizing AI to enhance the productivity of human labor. Somewhat more specifically, the current state of the art of more detailed predictions regarding specific LLM job market impacts is a paper published last year in Science, the journal by Ilondu and colleagues. The analysis based on the list of occupations and related job tasks included in the U.S. own net occupational database, which are then categorized on the basis of how easily a task can be either automated or significantly effectivized through AI. The analysis clearly shows that we can expect that highly qualified and generally well-paying jobs, which require graduate or even post-graduate education, are those that are most exposed to AI effectivization. The paper doesn't specifically address the planning profession, but it does break down the data into clusters of professions, and one of those clusters that are expected to become most exposed to AI is the one labeled Architects and Engineers. Over here, and even more exposed Mindu, are researchers and educators. Zooming in more specifically on the planning profession per se, the small experiment that I recounted earlier goes a small way at hinting at some possible applications of LLM's. But the type of review that I performed is of course only a small part of planning work, which is indeed officially recognized as a very complex and multifaceted profession. If we go back to the own net professional database that the Alondo study built upon, we can find that the profession listed as urban and regional planners has no less than 25 in themselves very complex and variegated work tasks associated with it, and I would argue that that list is far from exhaustive. Here's just a few of those listed there. To get a sense of how the LLM revolution can be expected to impact planning more specifically, I worked with a new OpenAI-03

model to extract the methodology from the Alondo paper and its extensive supplementary material and made the model apply this likely modified framework to the own net profile for urban and regional planners specifically. I had to spend maybe 30 minutes experimenting with alternative prompts before it came up with a good solid analysis, which can be seen part of it in this slide. I mean, the list was too long. There was no room for it, but I hope to publish this soon so you can look at it. There's a lot of extremely interesting material here that we could spend hours digesting and discussing, but to summarize it extremely briefly, one could say that the conclusion is that urban planning practice consists of some tasks that require a great deal of exercise of situated synthetic judgment and contextual knowledge, which cannot be so easily automated by LLM. But it also involves numerous routine or semi-routine tasks relating to survey analysis, drawing and writing, for instance, which are more clearly possible to automate or radically affectivize through LLM delegation. The overall conclusion is that around one third of planning-related work is exposed to optimization through LLM. This of course sounds ominous, but is it inevitably a one-dimensionally negative development for the future of the planning profession? Not necessarily. As I've already mentioned, much of contemporary planning practice is blighted by an endemic sense of limiting attention scarcity. However, I would suggest, this scarcity doesn't only have to do with a quantitative lack of attention, but also has a qualitative dimension. All types of attention are not the same, and one characteristic of the attention deficit order of contemporary planning is that it doesn't only limit available quantitative supplies of attention, it also demands constant tasks switching. Thus, particularly generating a lack of what neurophilosopher Catherine Hales has called deep attention, which requires long and persistent engagement with a task to materialize, and which is necessary to solve unique and complex tasks creatively. One possibility is therefore that if less challenging and more routine-type tasks can be delegated to synthetic attention provided by LLM, the attention resources of human planners will be released to instead better cultivate deep attention to the really important and challenging issues that current pressing work conditions do not allow them to engage with on satisfactory terms. This is also the picture conveyed by the more optimistically inclined existing scholarly literature on AI and planning, as well as the picture conveyed by the municipal executives of NAFTA municipality. However, we must also keep in mind that an alternative possibility, the one flagged by word commentators such as Daron Asimoglu, is the manifest risk that around one-third of all currently professionally active planners may soon see themselves replaced by AI, and that the future labour market demand for planners will be structurally and persistently much weaker than it currently is. Just a few years ago, even the stoniest of AI enthusiasts doubted whether complex professional tasks such as urban planning could all be amenable to replacement by AI. Even the groundoyen of AI within the field of urban studies, Mike Batty, wrote in 2018 that, quote, there are some hard choices involved in producing any plan for the long-term development of the city, and it is difficult to see the kind of design and decision making involved in such planning being replaced by an AI, the sheer range of factors and the uncertainties involved cannot be automated using any available AI technology. However, in the few years that have passed since then, the unexpected so-called LLM revolution has really changed the playing field dramatically. And

current LLM models are already much better at analysing and integrating a wide range of information and knowledge, and to apply different frameworks of evaluation and reasoning to also fuzzily define problems, making them, to some extent, even able to, so to say, compare apples and oranges with a level of ability higher than many experts in the computer science field, will ever have thought would be possible. Following these dramatic technological developments, any claim that LLMs are just electronic parrots, only capable of spewing back in a different format, what has previously been put into them without any degree of originality, reasoning, or comprehensions, come across astronomically spurious. To me, skeptics who made such claims bring to mind the Swedish Minister of Communication who in 1996 dismissed the internet by suggesting that it's just a fad that will soon pass. I am myself far from an AI expert, I only have modest amount of experience working hands on with LLM prompting. I'm also a self-confessed technoscepticist, but nonetheless, I must say I find experience of dabbling with high-powered LLMs such as O1 and O3 in equal parts astonishing and disconcerting. Unless something dramatically changes in the coming months can be expected that LLM sooner rather than later will come to have a truly disruptive impact on how planning is practiced. Therefore, convinced that it's only as our own peril that we underestimate the potentially major structural implications that AI in general and generative LLM type models in particular will have on the organization of work within planning practice. So this is the time when planning practitioners and educators need to wake up and smell the proverbial coffee. With the coming broad-scale introduction of LLMs into planning practice, the current division of labor between human experts and computers can be expected to shift in somewhat dramatic ways. In the rosier of future worlds, each currently employed planner could soon have around one-third of their currently tied-up attention to invest in issues that at present cannot be awarded the attention they deserve. However, in a somewhat less attractive trajectory, an equivalent of one-third of the current workforce of planners could soon see themselves without a job because their work tasks have been taken over by LLM-based AI. The most probable development likely lies somewhere in between these two extreme polls. And importantly, where we end up is not preordained. One of the main points of Dharana Simoglu is that we are now in that narrow window of opportunity in which professional communities and labor organizations can still engage and have an impact on how these developments will pay out. Whatever way we can expect a near future in which the everyday work situation of practicing planners is radically different from how it looks today. Some job tasks will become completely automated and delegated to LLM's providing synthetic attention while others will be awarded more human attention. The planning education community therefore needs to prepare its students, the future professional, how to work productively with generative AI such as LLM's as a resource providing competent synthetic attention so that they can contribute to shaping the premises on which this tool is introduced into planning practice thus ensuring that this powerful tool will serve to strengthen the profession rather than weakening it. Thank you. Fantastic. You're five minutes early. Yeah. So we have got time for perhaps a couple of seconds. Let's say two because you have a yellow. Okay. Yeah. Thank you very much. I must say that was the best presentation I heard about AI and planning so far and I'm really glad to hear it. I think that

opened up a giant question that we would love to discuss now could be called. But I would say asking you one question. I don't want you to have said and I really share basically everything you said. And maybe that could be the opportunity that we see is also that right now, at least for Germany where I come from, we see a lot of positions that cannot be filled, lack of labor, cities travel hard to find trained climbers. And so that is an opportunity where you can really also build on this adding a positive aspect. But being a professor at a planning school, what would you say we should have to change in our education in the curriculum of our planning program in order to address the challenges that you have. I think, I mean, I'm just starting to think this through to I don't have all the answers. But my answer is I think we already now, I mean, the way most of us as planning educators come across these models today is by lazy students using them to cheat. But I think what we need to do is just like we've integrated GIS into our education. We need to now today in our project courses, we need to start integrating. So it's not that it's optional to work with these months, but it should be actually integrated into the description of the project instructions that we should be using this as a resource. So I think that's the first step to actually, you know, for face value, accept that this is here. And it should really be put into the courses to start practicing how to work with this product. And because it is a potent tool and it can also raise the quality of work to a lot, I think. And I agree with the research side, I think that this can be a marvelous thing for many, for the small municipalities in Sweden to today cannot even afford literally to think strategically or work strategically. They will be able to. And we're planning process right now where we see 300,000 statements on the plan draft to a planning office that is impossible to deal with without using AI. Let me just give I don't go for an example. I've been also playing around how to use this in research in an ethical and productive way. And the project with Maria and Janna that I mentioned, we had these transcripts of hours and hours of workshops, detailed transcripts. And we went through them more manually and was quite happy with the analysis. I uploaded them into GPT and asked to do a qualitative analysis. Actually, it came up with exactly saved analysis that we did, but it took us many, many weeks. So it was good to have validated. So I don't know. Am I choosing there are two questions? Yeah, we'll know. Yeah. Thank you very much, really. It was very inspiring speech. How much can these systems already consist of this political dimension of planning? We know that at the end of the day, it's not a rational, sometimes not a rational position. In fact, because of political issues. So can these systems also deal with that? I would say, I mean, and this, all these things need to be explored from my small experience of trying out. I would say their capacity of political reasoning is very high to understand the intricacies of political. What they don't have access to are the details of a specific political context. So it would be the question of how you would, you can of course, just like you can upload a data file. You can teach it the details of context, but it might be difficult. So this is where we're getting into the gray zones of maybe some of the things that are more difficult to automate. But it's not, I think there are probably ways you can use it as a sparing partner, for instance, in, you know, shaping positions and shaping statements, for instance. But I think this is all to be explored. Yeah. Great. I'm sorry. I think we have to go to work because the oldest technological invention, change the math of the invention of the technical clock. It's now just the addition form on my, like, my thing. So I'm sorry to be a bit

sticky to the real, but we will have a little bit of time at the end today to, you know, to wrap up on today's activities. So hopefully people can perhaps keep, I know all the key notes I think are here next, not here, but yeah. Okay. So thanks so much for having me. Thank you. Thank you.