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Jones, Peter ORCID logoORCID: https://orcid.org/0000-0002-9566-9393 and Wynn, Martin G ORCID logoORCID: https://orcid.org/0000-0001-7619-6079 (2023) Artificial intelligence and planning. Town and Country Planning, 92 (5).

Official URL: http://www.tcpa.org.uk/

EPrint URI: https://eprints.glos.ac.uk/id/eprint/13233

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artificial intelligence and planning

Peter Jones and **Martin Wynn** outline some of the main characteristics of—and some of the widespread concerns about the use of—AI, and associated visions for the future role of AI in planning

While some perhaps might see Graeme Bell's assertion[1] that 'Artificial Intelligence could help planning departments restore service levels of 30 years ago' as a pipe dream, or as a threat, among many local authority planners who currently feel overworked, undervalued, and under-resourced, there is certainly growing interest in the potential future role that artificial intelligence (AI) might play in the planning process.

In simple terms, IBM notes that 'AI leverages computers and machines to mimic the problem-solving and decision-making capabilities of the human mind'.[2] This short article outlines some of the main characteristics of—and the widespread concerns about the use of—AI, reviews the various visions for the future role of AI in planning, and offers some discursive reflections on the potential use of AI in the planning system.

Artificial intelligence

Jyoti[3] has argued that 'AI is the most disruptive technology innovation of our lifetime' and that 'enterprises are embracing AI/machine learning (ML) and leveraging a variety of data types […] in all lines of business and industries'. Further, NetApp[4] has claimed that 'the amount of data that is generated, by both humans and machines, far outpaces humans' ability to absorb, interpret, and make complex decisions based on that data', and that 'artificial intelligence forms the basis for all computer learning and is the future of all complex decision making'. Enholm *et al.*[5] recognised AI as a wide-ranging set of technologies, and they suggested that there were two main ways of defining AI. The first 'defines AI as a tool that solves a specific task that could be impossible or very time-consuming for a human to complete', while the second 'regards AI as a system that mimics human intelligence and cognitive processes, such as interpreting, making inferences, and learning'.

At the same time, there is growing public interest in, and increasing concerns about, the impact of AI on economies and societies. Elliot *et al.*,[6] for example, suggested that 'such concerns are revealed in public perceptions and uncertainty surrounding AI's future in society from technology executives overseeing the development and implementation of AI to the general public'. More specifically, in March 2023 a call, supported by Elon Musk, one of the founders of the Open AI Research Laboratory, for a six-month moratorium on research into AI received massive public attention. Furthermore, Raja Chatila, Professor Emeritus at the Sorbonne and a member of the working group of the French National Pilot Committee for Digital Ethics, observed 'everything that is currently happening in AI is taking place with no real ethical or legal controls. Companies are deploying tools on the web that have harmful effects'.[7]

AI and planning

Although the results of Batty and Wang's online survey, published in 2022,[8] revealed that the majority of the 34 local planning authorities in the UK who responded, reported never using AI or machine learning, a variety of visions for the role of AI in planning can be identified. In reviewing some of these visions, the aim is to provide some insights into the potential range and flavour of the role of AI, and not to offer a definitive picture of the ways in which AI might be introduced into the planning system.

Robin Barber,[9] Product Owner of Built Environment at Arcus Global, a UK-based software service company that looks to enable public sector organisations to transform their service delivery, explored how AI can play a role in town planning. He argued that the prospect of becoming involved in copious administration and data entry, at the expense of project work or complex planning issues, was not why planners were attracted into the profession. With that in mind, Barber argued that AI can lift

administrative duties off a planner's shoulders, thus freeing up time and harnessing planners' intellectual capabilities. He suggested, for example, that if planners are able to devote more time to stimulating planning challenges, this would reduce stress and provide higher levels of job satisfaction and personal development.

More generally, Barber argued that automation is essential both for local authorities themselves and for the public, not least in that it will streamline the customer journey from initial queries, through to planning applications, consultations, responses, and final agreements. For Barber, the benefits of automating the planning system are obvious, in that:

'AI helps deliver insight by gathering data over time, giving us answers, guidance and reducing the need for planning officers to deal with the mundane. If all of the information they need is to hand and made available through AI, the entire process runs more smoothly.'[9]

Moon[10], writing under the banner of Place Changers, a digital planning consultancy, recognised that town planning is complex, not least because it is process-driven and is reliant on an ever-increasing number of stakeholders and substantial amounts of data and evidence, but claimed that 'artificial intelligence in town planning can be hugely transformative', and looked at 'some of the key areas of focus in the coming years'. These areas included creating project inspiration, more responsive and personalised consultations, improving public consultation summaries, better risk analysis, summarising planning documents, and quicker planning documents.

In addressing creating project inspiration, for example, Moon suggested that:

'applying better automation to create new content, including audio, code, images, text, simulations, and videos, generative AI can enable town planners to more readily produce tailored content, visual inspirations, or photomontages of potential changes. This can enhance interactions with stakeholders and create unique insights for projects.'[10]

In focusing on more responsive/personalised consultations, Moon claimed that:

'Town planners could generate chatbots and virtual assistants to help engage stakeholders, answering frequently asked questions and providing information about a town planning project, ensuring stakeholders access relevant information at their convenience, including diverse, disadvantaged, disengaged residents.'[10]

By way of summarising the vision of the future role of AI in town planning, Moon argued that:

'The planning application process is often slowed down by the time [needed] to run community engagement consultations and quick geospatial analytics on communities [and] the capacity of local social infrastructure assets […] Adding AI tools to existing platforms provides levels of efficiency that most town planners could only dream of a couple of years ago.'[10]

However, Moon offered a note of qualified caution, in that:

'*While AI can improve project delivery and recurring tasks, town planners' input will always remain. However, combining machine learning with human expertise can unlock better experiences for residents, councils, and developers across different touchpoints while ensuring faster planning applications.*'[10]

Lawrence Turner,[11] a Director of Boyer, the planning and design consultants, noted that in recent years the impact of AI had been increasingly felt across many industries, and that the use of AI in town planning was 'an exciting development that could potentially revolutionise the way we plan and build our urban areas'. More specifically it was suggested that as the need to deliver more homes within the UK became ever more pressing, the use of AI in planning could be 'a game changer', and that 'AI can not only help speed up the planning process but also improve the accuracy and efficiency of the decisions made'.[11]

Here, Turner claimed that AI was well suited to predicting and measuring the demand for new housing development, in that it could analyse historic data and help planners to make informed decisions about the types of development needed in different areas, and about how the release of land from the Green Belt could play its part in contributing to that process.

Megan Forbes,[12] Planning Associate at law firm Dentons, argued that 'AI is undoubtedly going to take over time-consuming administration tasks and improve the planning system for the better'. More specifically, she identified seven areas where she believed AI could challenge planning processes and procedures — namely, planning application validation, data analysis, modelling, decision-making, legal agreements, Local Plan examination, and resourcing issues. In addressing modelling, for example, she claimed that 'AI will improve the way we assess the impact of proposed developments on the environment' and can, 'if properly trained, provide instant feedback on how a scheme will affect everything from air quality, to traffic, to wildlife habitats'.[12]

Under the banner 'Can we automate the UK's planning system using AI?', the Alan Turing Institute[13] reported on a case study challenge in which machine learning models were trained on UK planning application documents to classify and detect floorplans in applications, with the aim of speeding

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AI may offer benefits, but it also comes with challenges and responsibilities that must be addressed

up the process of validating submitted planning applications, using deep learning. The results showed that the model provided a successful method for the digitisation of planning applications and that the detection of discrete elements such as individual drawings could speed up the planning application process. In conclusion, on the basis of the case study the Alan Turing Institute argued that AI can speed up the evaluation of planning applications, and more generally that it offers a way to create a three-dimensional database of the UK's building stock, which could be seen as a step in the move to a centralised planning system in the UK.

Academic publications also offer some insights into the potential role of AI in the planning process, as illustrated by the following two examples. Drawing on a literature review of 91 publications, Son *et al.*[14] presented 'a comprehensive review of the areas of urban planning in which AI technologies are contemplated or applied', and 'analysed how AI technologies support or could potentially support smart and sustainable development'.

The review suggested that the relevant publications were clustered into four categories—namely, AI for urban data analytics and planning decision support, AI for urban monitoring and development control, AI for urban environmental and disaster management, and AI for urban and infrastructure management. However, the review revealed a heavy dominance of AI applications in the first of these two categories.

In focusing on urban monitoring and development control, for example, the authors reported that AI had been used to assist in the monitoring and analysis of land use and urban sprawl, to monitor and identify where road improvements were needed, and to monitor and predict crime hotspots in cities.

Elsewhere, Sanchez[15] argued that:

'Advances in artificial intelligence present planners with a ripe opportunity to critically assess their approaches and explore how new data collection, analysis, and methods can augment the understanding of places as they seek to anticipate futures with improved quality of life. AI can offer access to more and better information about travel patterns, energy consumption, land utilization, and environmental impacts, while also helping to better integrate these systems, which is what planners do. The adoption process will likely be gradual and involve significant time and resources.'

In conclusion, Sanchez claimed that AI holds transformative potential for planners, and that the integration of AI into the planning process can lead to smart, responsive and sustainable cities.

Discussion

This article has outlined some visions for the future role of AI in planning. While it remains to be seen how this role will be played out in local authority planning departments within the UK, the pressures to introduce AI into a wide variety of planning tasks may prove impossible to resist. However, local authority planning departments face a number of challenges in looking to harness the potential power of AI in their activities, and five sets of issues merit brief reflective discussion.

First, a move to introduce AI into the planning system, and to increase its role within that system over time, has a number of implications for local authorities, and here both the financial and professional resource implications loom large. On the one the hand, savings in staff time and resources are part of the underlying rationale for the introduction of AI, but this would itself come at a cost. Such costs would include the financial investment in AI systems and tools, and in staff training to employ those systems and tools effectively; but it may also very possibly include reductions in the number of local authority planners.

'As financial constraints continue to bite into local planning authority budgets, planners may feel that they have little alternative but to use data and information supplied by developers as part of the planning application process, and to feed it into AI models'

At the same time, local planning authorities may look to contract out their AI operations to planning consultancies, and this would, in turn, effectively take resources away from the local authority's in-house planning operations and further fuel the commercialisation of the planning system.[16]

Secondly, another challenge in using AI in the planning system relates to the information and data employed to inform the AI tools, and to questions asked of this data. The planning process is complex, it often has to incorporate a range of competing perspectives, and it is political in that it can involve decisions about how land is used. The information and data which informs the planning process, and which, in the future, might well inform AI within that process, is increasingly generated by a range of stakeholders, including proposed developers. Here, as financial constraints continue to bite into local planning authority budgets, planners may feel that they have little alternative but to use data and information supplied by developers as part of the planning application process, and to feed it into AI models. The insights generated by AI might thus provide biased outcomes which favour developers.

Thirdly, and in a similar vein, there are general concerns that the 'risks and benefits of AI innovations are unevenly distributed across society'.[17] Such concerns might be seen to be highlighted in the role of the planning system in helping to meet demands for new housing development.

In his foreword to the Planning White Paper of 2020[18] Boris Johnson, then the Prime Minister, argued that 'thanks to our planning system, we have nowhere near enough homes in the right places', and three years later Samuel Watling and Anthony Breach,[19] writing for the Centre for Cities, claimed that 'planning reform is the key to ending the housing shortage'. Reforming the planning system has consistently proved to be a slow and thorny problem, but, formal reforms aside, AI may offer the politically powerful large housebuilding companies opportunities to successfully bring large-scale housing developments to market. While such companies have faced problems in the wake of the financial crisis and the rise in interest rates, they may well be better placed than most local planning authorities to harness AI to their own benefit, and this would effectively see AI serving the interests of the housebuilding industry more than those of the general public.

Fourthly, embedding AI into the planning process has major implications for planning courses in higher education. In the pre-digital era, a number of innovative formats and techniques were used in the education of planners, including case studies, games, and full-blown simulations of the planning and development processes. With the increasing pace of technology evolution, new approaches are now required to equip planners with the necessary skills to deal with the implications of AI, as well as digital twins, big data, and the metaverse, which will inevitably feature, sooner or later, in the town planning process. As Batty[20] recently noted with respect to the need for changes in planning education, today's planning challenges 'might be approached using new data sets, models and design methods that grapple with the evident complexity that most now recognise as characteristic of the modern urban world'.

Finally, if local planning authorities look to introduce AI into their work, they should also look to address a number of responsibilities, not least the issues of the privacy and security of information provided by, and about, planning applicants. Here it is important that local planning authorities design confidentiality and security into their AI systems and tools, and ensure that the data on planning applicants is collected, used, managed and stored both safely

and responsibly. At the same time, in deploying AI, local planning authorities will need to be mindful of a range of environmental responsibilities, including increasing greenhouse gas emissions and the large volumes of water used for cooling in data centres.

Conclusion

AI is playing an increasingly important, although often unseen, role in society and the economy, and, while it offers a wide range of opportunities and benefits to societies and economies, it also brings risks and responsibilities. This article reviews a number of visions for the future role of AI within planning; and these visions suggest that AI may bring a number of potential benefits, including, for example, freeing up planners from a range of time-consuming bureaucratic administrative duties, thus enabling them to work on more complex issues, streamlining the planning process for the public, improving the consultation process, and, perhaps most crucially, improving the accuracy and the efficiency of planning decision-making.

However, if local authority planning authorities are to adopt AI, they will also need to address the challenges and responsibilities that come with it. AI has been described as the most disruptive technology innovation of our lifetime, but it remains to be seen if it will disrupt planning as we have come to know it for over 75 years. In truth, however, parallels in other professions suggest that it may not be a question of if, but rather of when and how.

● ***Peter Jones*** *is an Emeritus Professor and* ***Martin Wynn*** *is an Associate Professor, both in the School of Business, Computing and Social Sciences at the University of Gloucestershire. The views expressed are personal.*

Notes

1 G Bell: 'AI could help planning departments restore service levels of 30 years ago'. *Planning Resource*, 4 May 2023. www.planningresource.co.uk/article/1821853/ai-help-planning-departments-restore-service-levels-30-years-ago-graeme-bell

2 'What is artificial intelligence?'. Webpage. IBM. www.ibm.com/topics/artificial-intelligence

3 R Jyoti: *Scaling AI/ML Initiatives: The Critical Role of Data*. Discussion Paper. International Data Corporation (IDC), Feb. 2022. www.snowflake.com/wp-content/uploads/2022/03/Scaling-AI-ML-The-Critical-Role-of-Data-.pdf

4 'What is artificial intelligence?'. Webpage. NetApp. www.netapp.com/artificial-intelligence/what-is-artificial-intelligence/

5 IM Enholm, E Papagiannidis, P Mikalef and J Krogstie: 'Artificial intelligence and business value: a literature review.' *Information Systems Frontiers*, 2022, Vol. 24, 1709–24. https://link.springer.com/article/10.1007/s10796-021-10186-w

6 K Elliott, B Price, P Shaw, *et al.*: 'Towards an equitable digital society: artificial intelligence (AI) and corporate digital responsibility (CDR).' *Society*, 2021, Vol. 51 (3), 179–88. www.ncbi.nlm.nih.gov/pmc/articles/PMC8202049/

7 A Piquard: 'Elon Musk and hundreds of experts call for pause in AI development'. *Le Monde*, 29 Mar. 2023. www.lemonde.fr/en/economy/article/2023/03/29/elon-musk-and-hundreds-of-experts-call-for-pause-in-ai-development_6021147_19.html

8 M Batty and W Yang: *A Digital Future for Planning: Spatial Planning Reimagined*. Digital Task Force for Planning, Feb. 2022. https://digital4planning.com/wp-content/uploads/2022/02/A-Digital-Future-for-Planning-Full-Report-Web.pdf

9 R Barber: 'What impact can AI have on town planning?'. *Open Access Government*, 23 Jul. 2020. www.openaccessgovernment.org/what-impact-can-ai-have-on-town-planning/91131/

10 S Moon: 'How town planners get ahead in the race to embrace AI'. Web Article. Place Changers, 8 Aug. 2023. www.placechangers.co.uk/blog/how-town-planners-get-ahead-in-the-race-to-embrace-ai/

11 L Turner: 'Revolutionising town planning: how AI could reshape our planning system'. LinkedIn Article. 2 May 2023. www.linkedin.com/pulse/revolutionising-town-planning-how-ai-could-reshape-our-turner/

12 M Forbes: 'How will AI change the planning system?'. Planning Law Blog. Dentons, 12 Apr. 2023. www.planninglawblog.com/how-will-ai-change-the-planning-system/

13 'Can we automate the UK's planning system using AI?'. Web Article. Alan Turing Institute, 2023. www.turing.ac.uk/collaborate-turing/data-study-groups/can-we-automate-uks-planning-system-using-ai

14 TH Son, Z Weedon, T Yigitcanlar, *et al.*: 'Algorithmic urban planning for smart and sustainable development: Systematic review of the literature'. *Sustainable Cities & Society*, 2023, Vol. 94, 104562. https://tinyurl.com/4hy46scd

15 TW Sanchez: 'Planning on the verge of AI, or AI on the verge of planning'. *Urban Science*, 2023, Vol. 7 (3), 70. www.mdpi.com/2413-8851/7/3/70

16 P Jones and D Comfort: 'Commercialisation in local authority planning.' *Town & Country Planning*, 2019, Vol. 88, Jan., 32–36

17 N Lawrence and J Montgomery: 'AI needs to serve people, science and society.' News Story. University of Cambridge, 29 Apr. 2022. www.cam.ac.uk/stories/ai-at-cam

18 *Planning for the Future*. Planning White Paper. Ministry of Housing, Communities and Local Government, Aug. 2020. www.gov.uk/government/consultations/planning-for-the-future

19 S Watling and A Breach: *The Housebuilding Crisis: The UK's 4 Million Missing Homes*. Centre for Cities, Feb. 2023. www.centreforcities.org/publication/the-housebuilding-crisis/

20 M Batty: 'Planning education in the digital age'. *Environment & Planning B: Urban Analytics & City Science*, 2021, Vol. 48 (2), 207–11. https://journals.sagepub.com/doi/full/10.1177/2399808321994936