



FIG WORKING WEEK 2023

28 May - 1 June 2023 Orlando Florida USA

Protecting
Our World,
Conquering
New Frontiers

Some considerations on the potential impact of Artificial Intelligence for surveyors' work

Hartmut Müller, Germany

hartmut.mueller@hs-mainz.de

TS03J: Advances in GeoAI

Monday, 29 May 2023, 16:30-18:00

Broadway/Carnegie, Hilton/Waldorf



Organized By



Diamond Sponsors



Contents

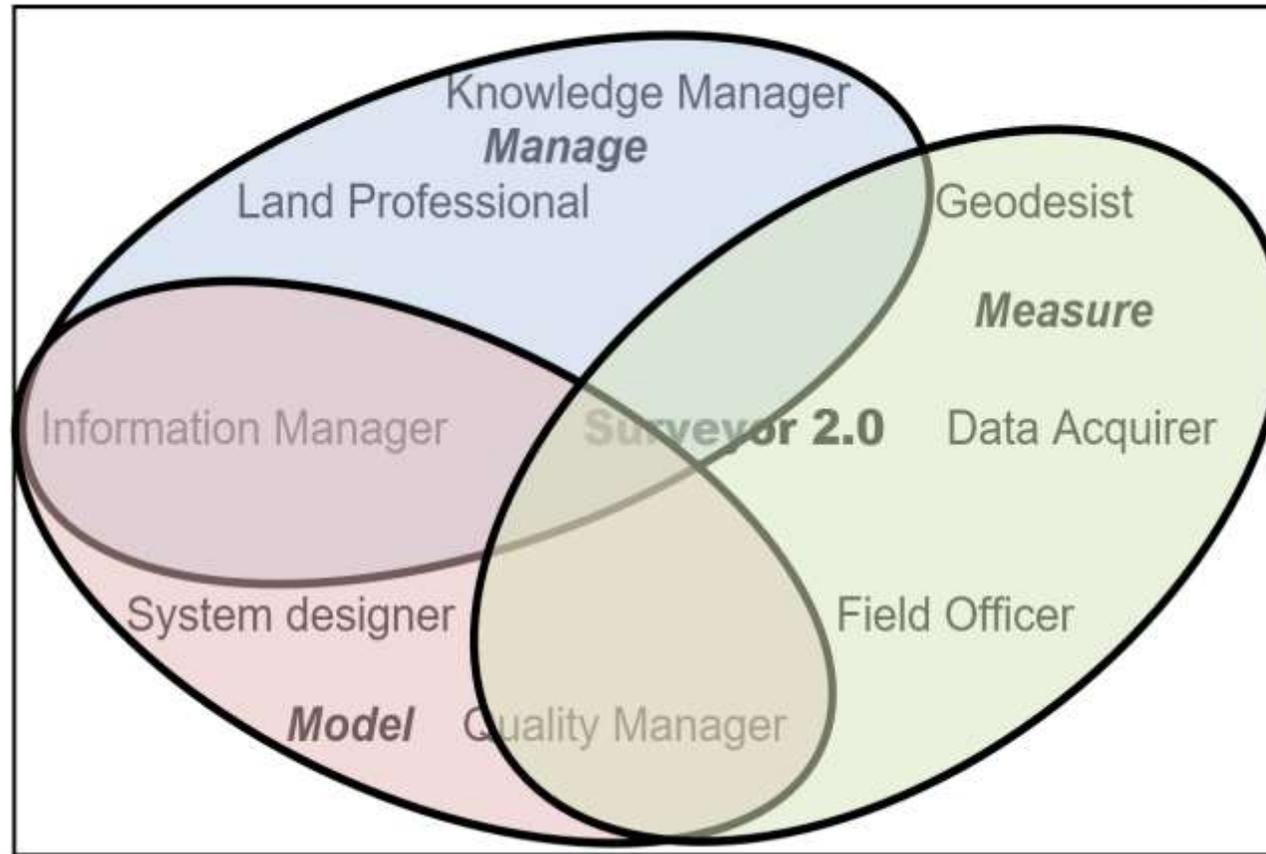
- What is a surveyor?
- What is artificial intelligence AI?
- What is the potential impact of AI on a surveyor?

What is a surveyor? The FIG definition as of 2004

A surveyor is a professional person with the academic qualifications and technical expertise to conduct one, or more, of the following activities;

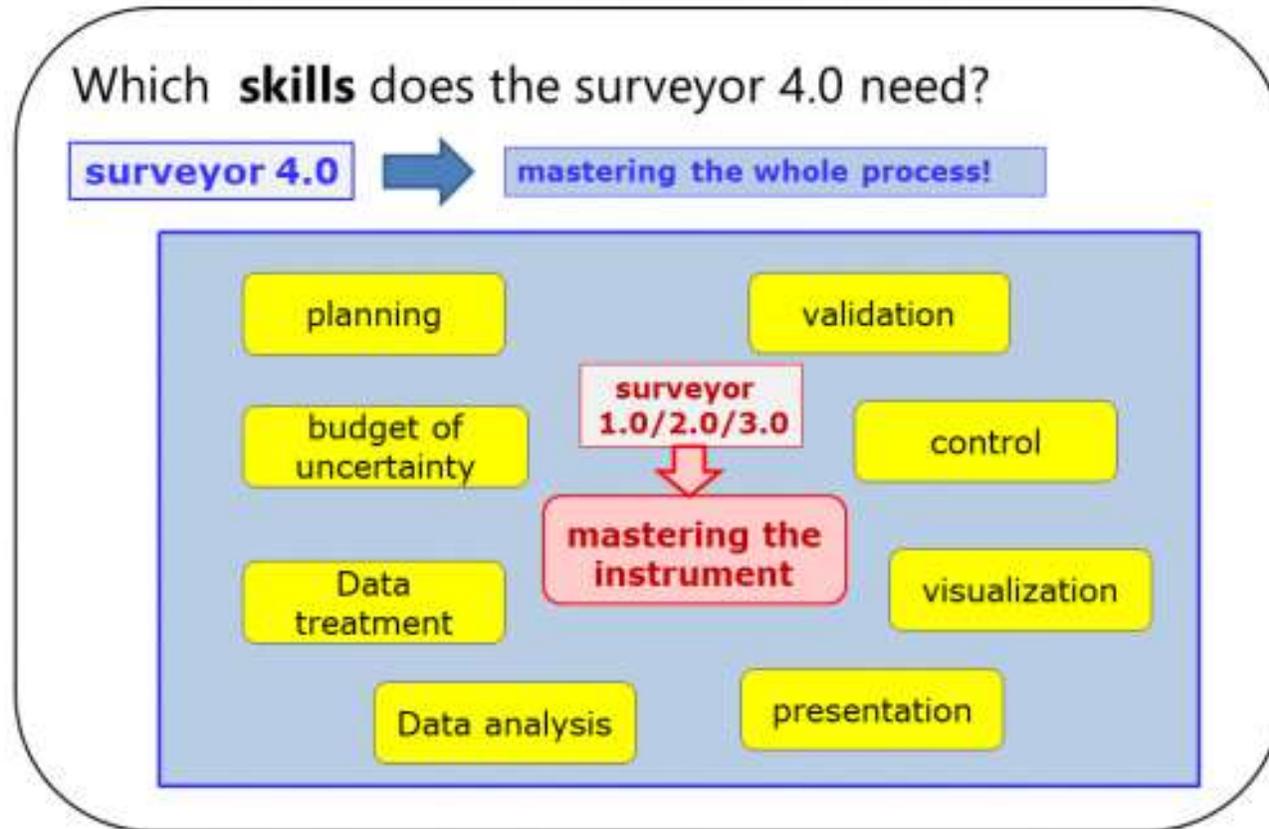
- to **determine, measure and represent** land, three-dimensional objects, point-fields and trajectories;
- to **assemble and interpret** land and geographically related information,
- to **use** that information for the planning and efficient administration of the land, the sea and any structures thereon; and,
- to conduct **research** into the above practices and to develop them.

What is a surveyor? The surveyor 2.0 – Manage – Model – Measure



The Surveyor 2.0 Model, adapted from G. Schennach et al. (2012)

What is a surveyor? The surveyor 4.0



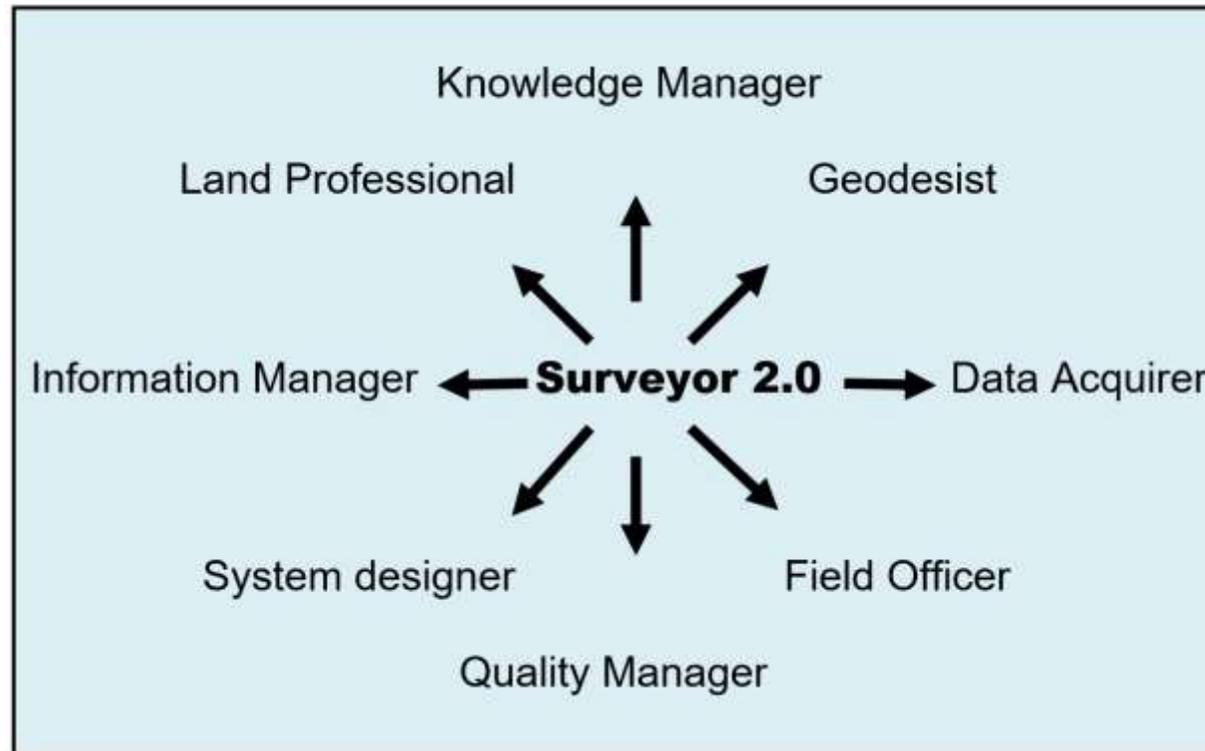
Rudolf Staiger (2023)
 The Surveyor 4.0,
<https://www.gim-international.com/content/article/the-surveyor-4-0>

What is Artificial Intelligence AI? A wide range of definitions

Artificial intelligence (AI) systems are software (and possibly also hardware) systems designed by humans that, given a complex goal, act in the physical or digital dimension by perceiving their environment through **data acquisition, interpreting the collected structured or unstructured data, reasoning on the knowledge, or processing the information**, derived from this data and deciding the best action(s) to take to achieve the given goal. AI systems can either use symbolic rules or learn a numeric model, and they can also adapt their behaviour by analysing how the environment is affected by their previous actions.

European Commission High Level Expert Group on AI (2019)

What is the potential impact of AI on a surveyor?



What is the potential impact of AI on a surveyor? Knowledge Manager

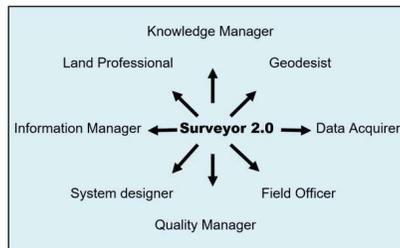
Self-learning artificial neural networks provide text/data mining, pattern recognition and natural language processing to mimic the way the human brain works.



Rhem, A, (2017). The Connection between Artificial Intelligence and Knowledge Management. <https://www.kminstitute.org/blog/connection-between-artificial-intelligence-and-knowledge-management>.

What is the potential impact of AI on a surveyor? Land Professional

'How long will it be until we see AI software available to purchase and apply to proprietary data located in lease and contract systems and to digital land documents that allows machine learning to draw conclusions and make recommendations based on all data available to it?'

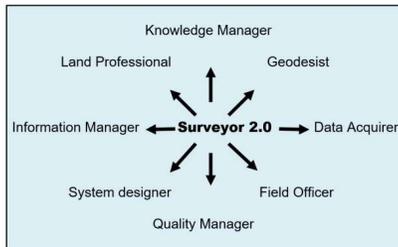


Bell, M. (2018). Will Artificial Intelligence Transform the Land Profession? <https://www.landman.org/news-and-blog/will-artificial-intelligence-transform-the-land-profession>

What is the potential impact of AI on a surveyor? Geodesist

Common ground between geodetic data analysis and machine learning
can be found in applications such as

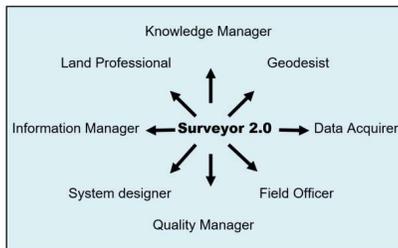
**optimal estimation, signal separation, hazard estimation,
and measurement strategy design**



Butt, J., Wieser, A., Gojic, Z. & Zhou, C. (2021). Machine learning and geodesy: A survey. *Journal of Applied Geodesy*, 15(2), 117-133. <https://doi.org/10.1515/jag-2020-0043>

What is the potential impact of AI on a surveyor? Information Manager

AI can significantly improve autonomous processing of disorganized or unstructured information.



Yadav, U. (2021). AI techniques in Information Management, Insights2Techinfo, pp. 1.
<https://insights2techinfo.com/ai-techniques-in-information-management/>

What is the potential impact of AI on a surveyor? Data Acquirer

The case of National Land Survey of Finland

Deep learning technology is one of the best solutions for reducing the labour-intensive tasks involved in updating topographic maps.



Zhu, L, Raninen, J., Hattula, E. (2023). How the National Land Survey of Finland is exploring AI technology. GIM International.

<https://www.gim-international.com/content/article/how-the-national-land-survey-of-finland-is-exploring-ai-technology>.

What is the potential impact of AI on a surveyor? System Designer

Can an AI system design creative solutions to problems?

- The designer has to provide valid inputs to the AI system.
- The AI system has to make the most of the inputs and produce the best output.

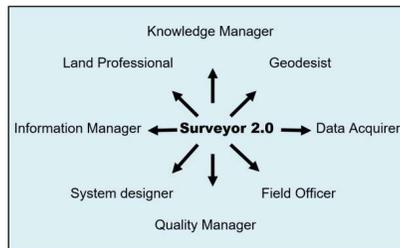


Daucot, N. (2018). Can an A.I. system be a designer?

<https://medium.com/@nickdauchot/can-a-i-be-used-to-design-317ed3d71e87>

What is the potential impact of AI on a surveyor? Field Officer

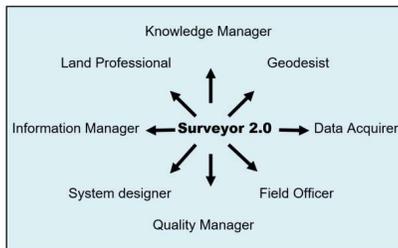
- Robots and autonomous technology will, and they already do, affect surveying roles.
- New robots will not only require automation of workflows, but will also change the face of the workflows themselves.



Coleman, J. (2021). Integrating Robotics into the Construction Surveyor's Workflow. GIM International. <https://www.gim-international.com/content/article/integrating-robotics-into-the-construction-surveyor-s-workflow>

What is the potential impact of AI on a surveyor? Quality Manager

- An ML/AI-driven solution is able to establish new data quality rules and perform sophisticated validation checks.
- ML/AI-based systems can reduce errors, identify duplicate data, fill in missing data, and validate data accuracy.



Reno, G. (2022). The Role of ML and AI in Data Quality Management.

<https://firsteigen.com/blog/the-role-of-ml-and-ai-in-data-quality-management/>

Conclusions

- Artificial Intelligence AI enables computers to perform tasks that normally require human intelligence
- Artificial Intelligence is on its way to establish itself as a disruptive force within the geospatial domain
- A Surveyor 2.0/4.0 will be able to expand his/her opportunities through the intelligent use of Artificial Intelligence