

Utilisation of Artificial Intelligence and Machine Learning Application in Construction Project Controls

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Agenda

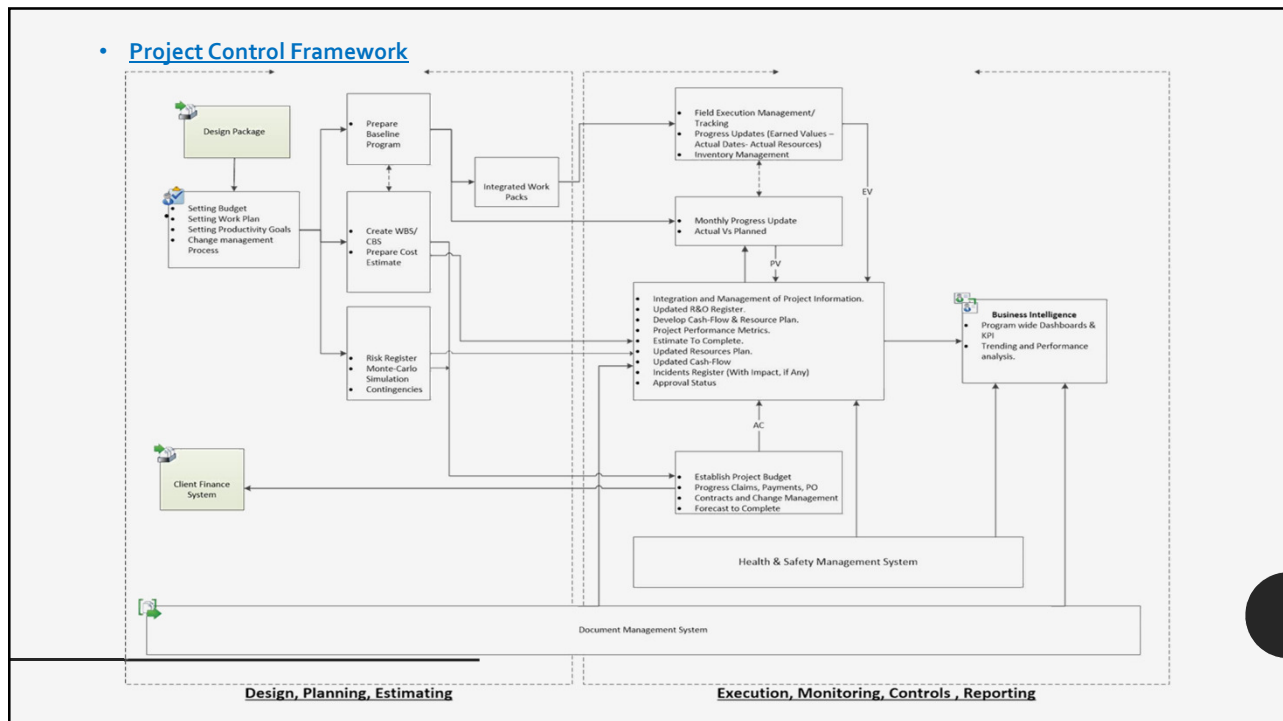
1. Project Controls Framework
2. Machine Learning Framework
3. AI/ML in Construction Industry
4. Machine Learning Applications in Project Controls

• Project Control Framework

Project controls defined as collection of information, Analyse data and build the prediction based on the status, Forecast and direct the project decisions in terms of time and cost. This is done by a implementing a process to integrate data to drive the decision.

The process of project controls required to integration between many systems from different discipline;

- Delivery progress.
- Planned and actual Duration.
- Planned and actual cost.
- Risks and control actions from risk register.



- [Project Control Framework](#)

Problem with the current Project Controls Process

- Unavailability of real-time progress updates leads to delay in decisions.
- Project controls process done on a monthly basis with a recommendation for recovery actions and mitigations proposed for future actions.
- There is a lack in level of development between design outcome -Building Information Model- and tools and platforms used for project controls

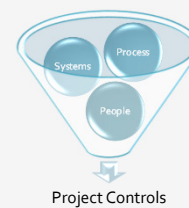
- [Project Control Framework](#)

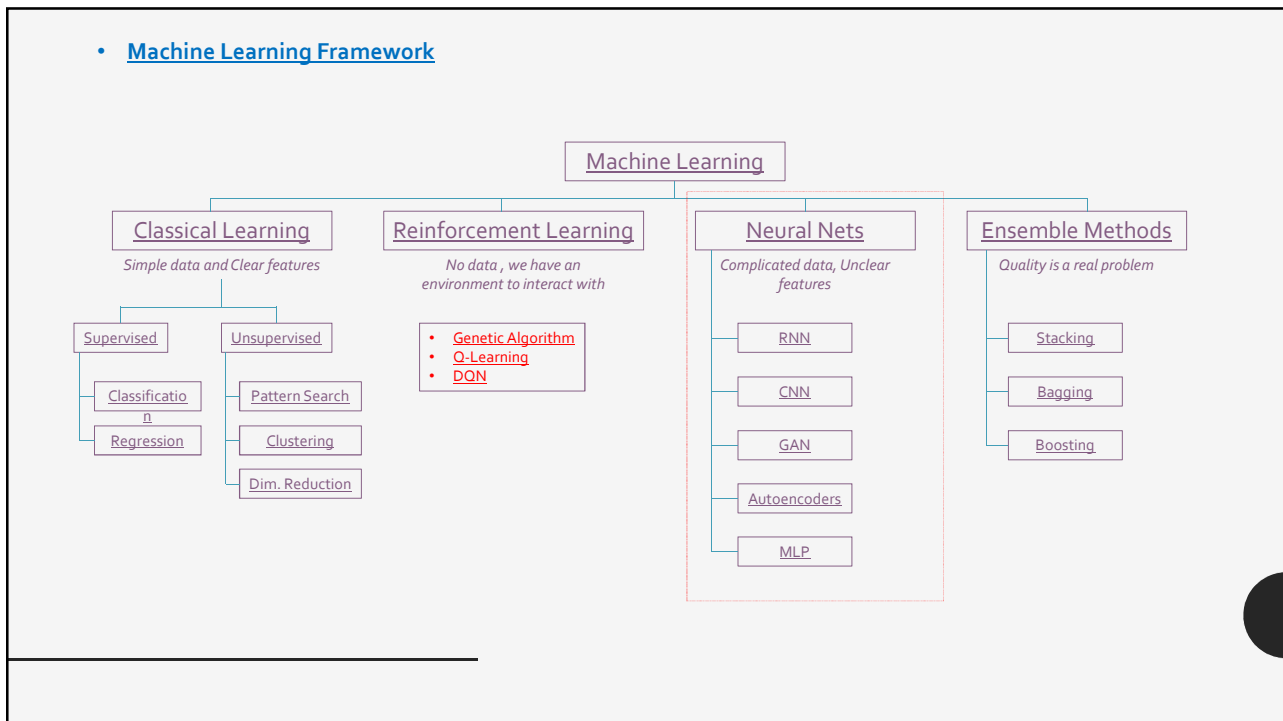
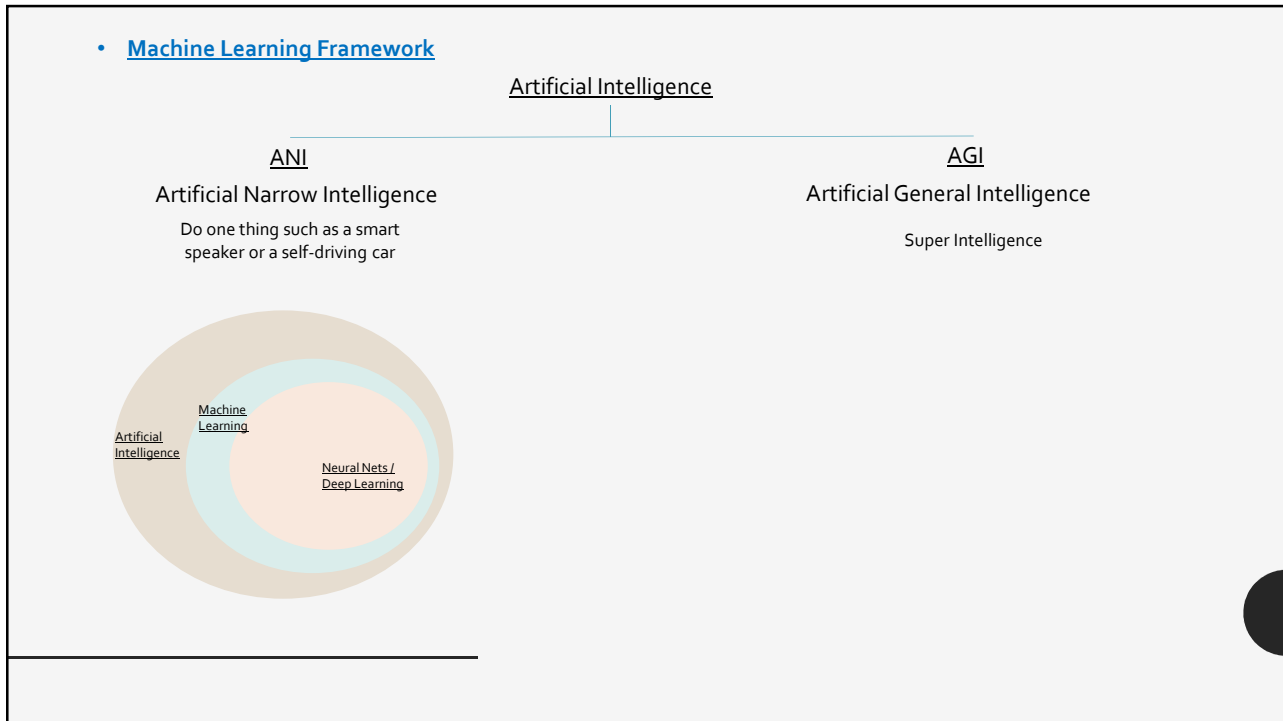
Challenges during project controls process implementation:

For each step on the project controls process there is a different system being used to deliver the function, the main issues for this proposed integrated system are:

- Different data set required for each system.
- Required too many manual adjustments and a lot of effort at the implementation stage.
- Special skills required to be able to manage the process with understanding of different aspects related to ICT, risk management, cost management and control, planning and time control with quality control understanding.

**Project Controls NOT just a software
it's a process, system and PEOPLE**





- Machine Learning Framework

Steps for Machine Learning Implementation

1. Collect Data
2. Train Model (Iterate many times until getting a good result) – A to B mapping
3. Deploy Model (get data back and maintain/update your model)

Automate Task not a Process

Steps for Data Science Implementation

1. Collect Data
2. Analyse Data
3. Recommend Action

What is the ML Can Do and Cannot Do

<u>Can</u>	<u>Cannot</u>
Forecast	Creating new things
Re-Plan	Get smart very fast
Select from alternatives	Go beyond their tasks
Memorize	Understand your intention

- Machine Learning Framework

Machine learning
(including deep learning using convolutional neural networks and recurrent neural networks)

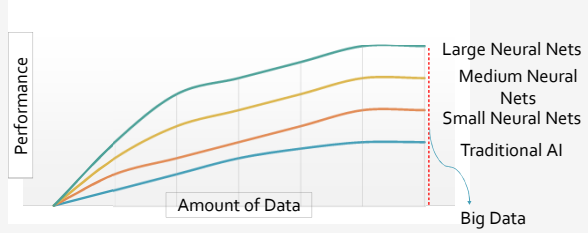
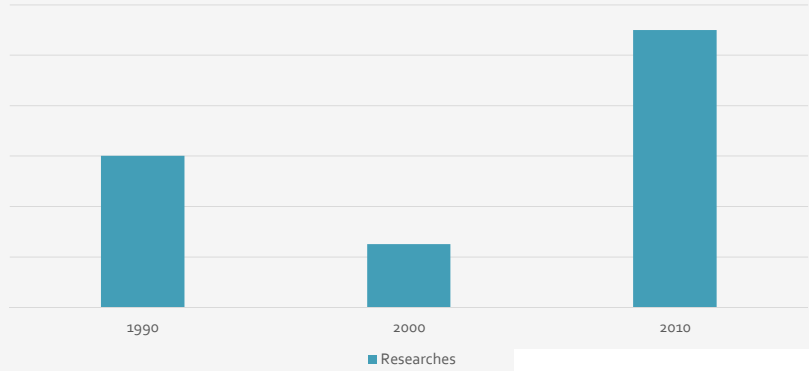
Supervised learning

Unsupervised learning

- **Commercial excellence**
 - Refinement of go/no-go ratios
Linear/quadratic discriminant analysis
 - Pricing of fixed price contracts
Simple neural networks
 - Future bids optimization
Reinforcement learning
- **Operational excellence**
 - Solutions offering refinement
Decision trees, random forest
 - Contractor segmenting and management
Logistic regression models
 - 3D twin modeling
Neural networks
 - Constant design optimization
Cluster behavior production
- **Stakeholder management**
 - Sentiment analysis
Naive Bayes

Machine Learning Framework

ML Researches in Construction

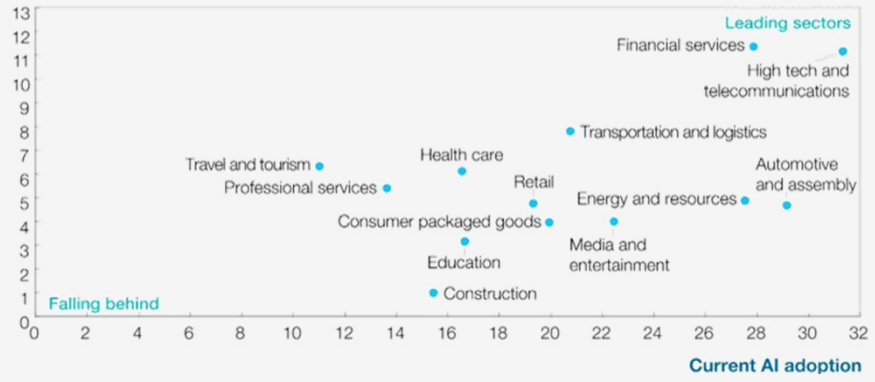


Sectors leading to Artificial Intelligence adaptation

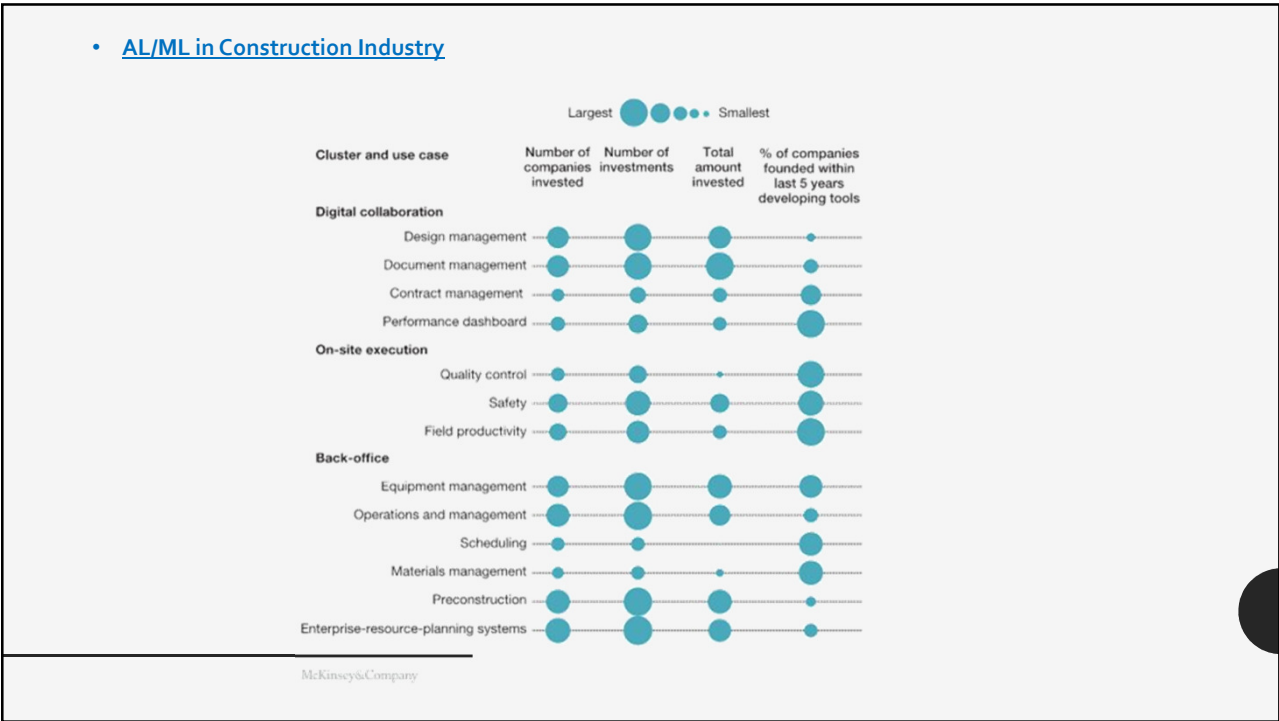
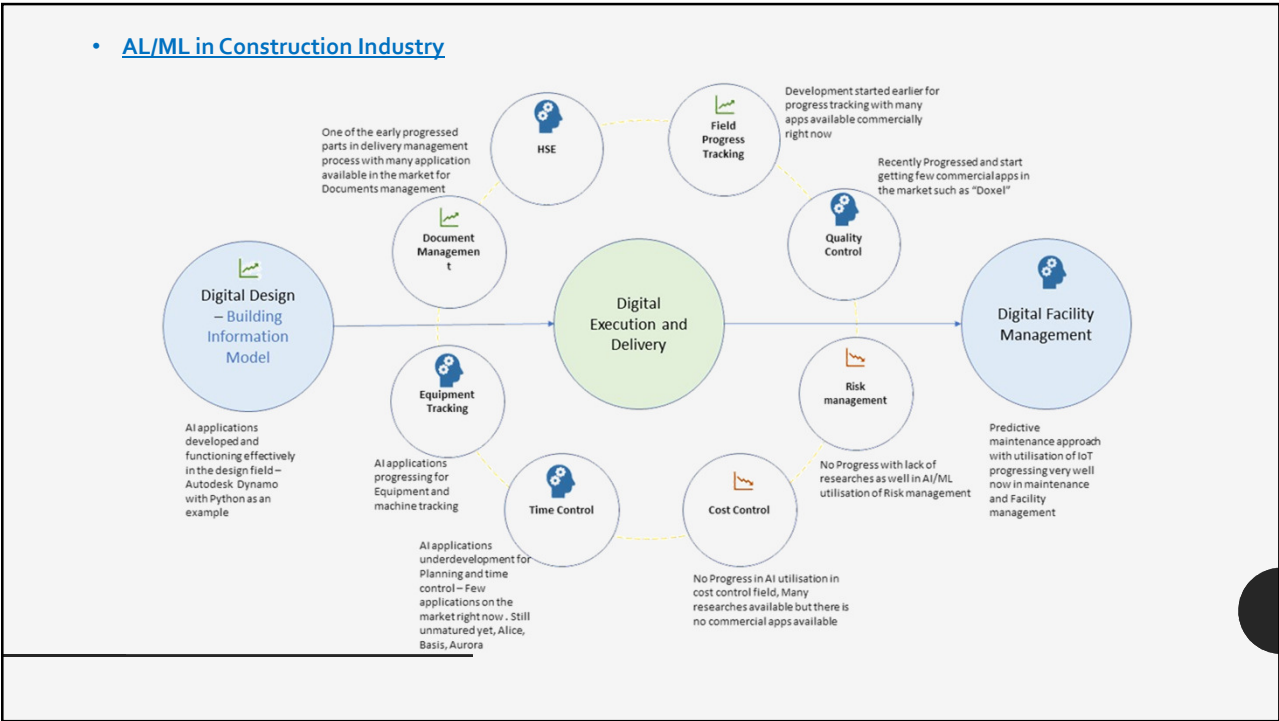
Sectors leading in AI adoption today also intend to grow their investment the most

Future AI demand trajectory¹

Average estimated % change in AI spending, next 3 years, weighted by firm size²



¹ Based on the midpoint of the range selected by the survey respondent.
² Results are weighted by firm size. See Appendix for an explanation of the weighting methodology.
 Source: Michael Chui, James Manyika, and Mehdi Miremadi. "What AI can and can't do (yet) for your business." McKinsey Quarterly, January 2018. McKinsey.com



- [AI/ML in Self-Driving Car](#)



- [AI/ML Project Controls](#)

