Modelling the Transition to Electric Vehicles

Active
Structure

Active Structure provides a means of modelling the logic structures naturally represented in bodies of text.

The text is interpreted not just through word-by-word translation, but through whole-text conceptual mapping. The relationships existing between ideas are extracted and embedded in a complex network representing the meaning behind the text.

This method has endless applications ranging everywhere from project planning to customer service to fraud detection.

Importantly, the models created exist entirely in English.

Why model in English?

- Any initial plan is written in English, complete with already-defined logical, existential, and temporal connections ready to be built into a model. By modelling in English, the usual intermediary steps of translating the plan into a computer-interpretable program specification can be skipped
- No special training is needed on behalf of the planners in order for them to understand the model. All connections are fully transparent and readily interpretable to anyone with a grasp of the English language
- This removes the barrier that usually exists between the initial plan and its technical implementation

Project Planning Application: The Transition to Electric Vehicles

- Internal combustion engine (ICE) vehicles have overwhelmingly dominated vehicle sales for the last century
- Electric vehicle (EV) technologies have now developed to such a point so as to provide a viable alternative to ICE vehicles
- Pressures to meet government-mandated carbon emission goals has sped adoption of the new technology

Changing Regulations

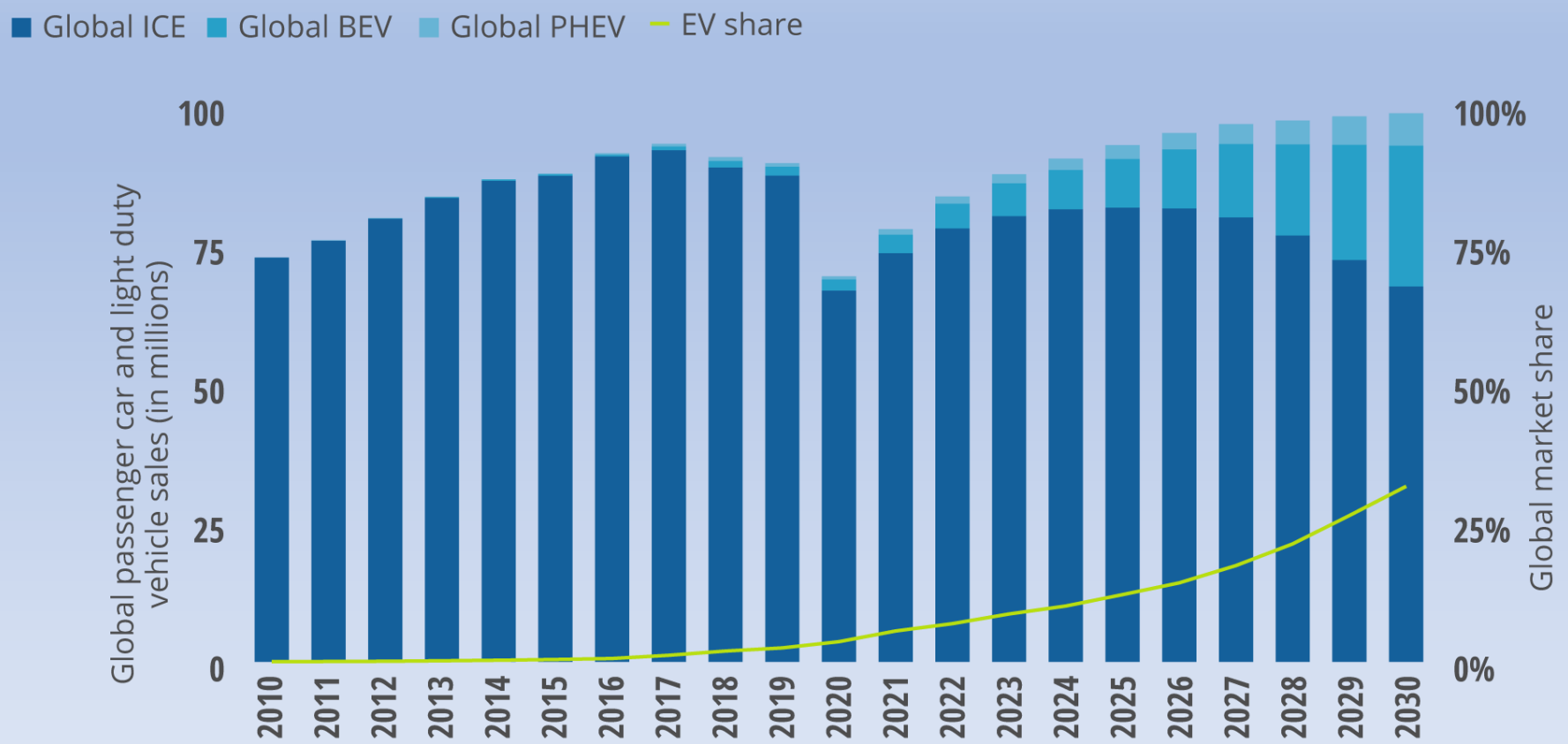
- The UK, Japan, and Washington state have announced the target date of 2030 for the ban of petrol and diesel cars
- Canada, China, California, and New York state will follow shortly after with a proposed ban for the year 2035
- The EU has has laid out an ambitious proposal to phase out the sale of ICE vehicles by 2035 across all member states in addition to investing heavily in charging infrastructure and imposing tariffs on imports from countries with less stringent environmental policies
- New EU regulations in 2020 mandated a limit on CO^2 emissions across all cars sold
  - Volkswagen was recently fined over 100 million euros for failing to meet EU targets on CO^2 emissions

Adapting to the Situation

- Ford Motor Co., Jaguar, Bentley, Volkswagen, and Volvo have stated that their entire range of cars will be fully electric by 2030, with GM following by 2035
- Carmakers are faced with the decision to shut, switch, or sell factories producing ICU vehicles to avoid being left with “stranded assets”
- Dealerships rely heavily on revenues from repairs and service. With the reduced potential for wear and tear in EVs, they may come to have a smaller role in car maintenance in the future
  - It may be necessary to adjust their business models in response to shifting demands

FIGURE 2

Outlook for annual global passenger-car and light-duty vehicle sales, to 2030



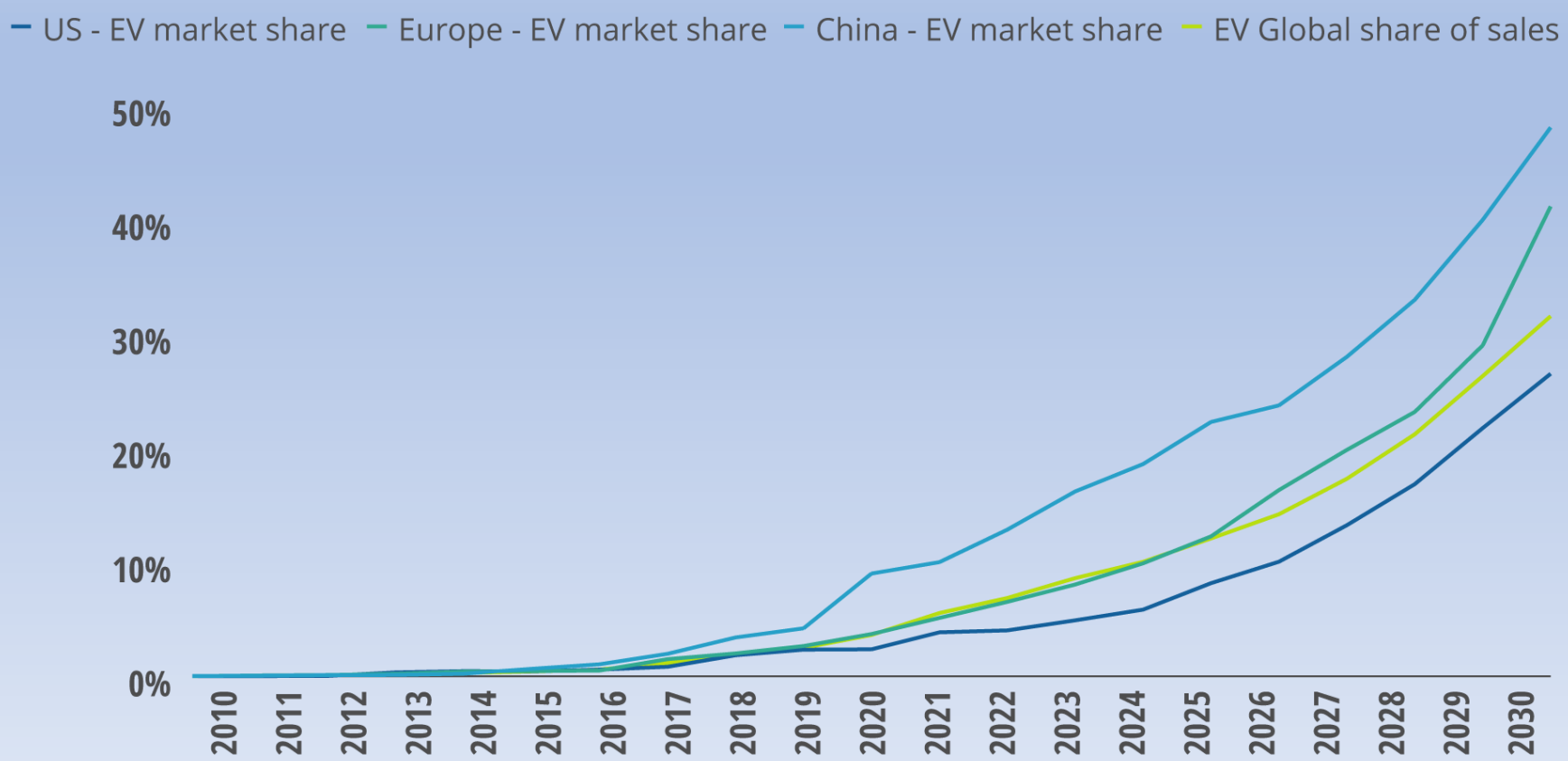
Source: Deloitte analysis, IHS Markit, EV-Volumes.com[16]

ICE: internal combustion engine, BEV: battery electric vehicle, PHEVs: plug-in hybrid electric vehicle, EV: electric vehicle

EVs are projected to make up 32% of the global market share for new car sales by the year 2030.

FIGURE 3

Outlook for EV market share by major region

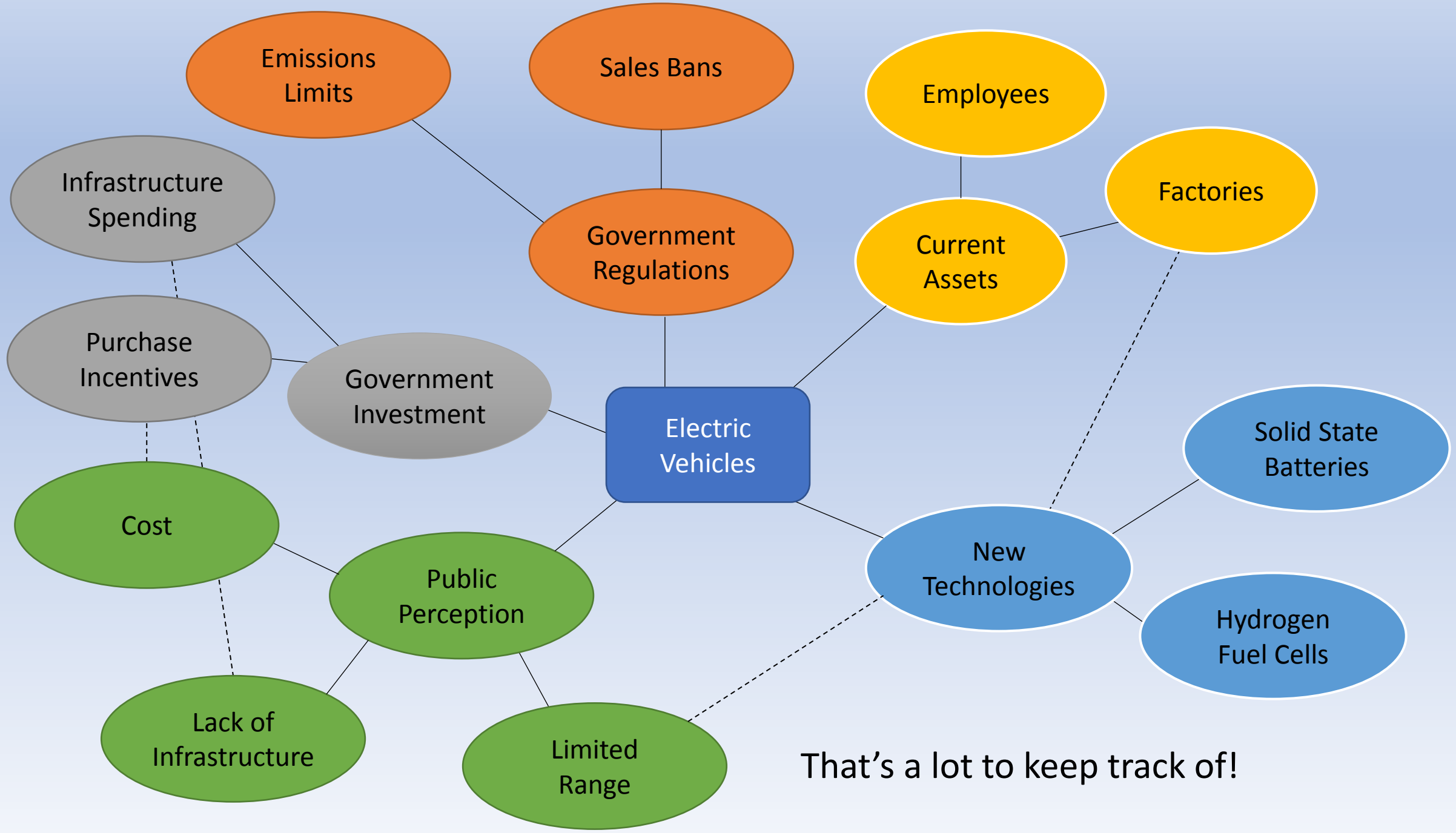


Source: Deloitte analysis, IHS Markit, EV-Volumes.com[17]

Sales are projected to vary by region, with China making up the largest proportion of the market. Newly implemented governmental bans will obviously have an enormous effect on regional uptake.

A Tricky Problem

- There are many different facets to consider when deciding whether and how best to switch from ICE to EV manufacturing
  - What proportion of your line of vehicles will need to be electric?
  - Will this transition be necessary for all vehicle types?
  - Are the factories you presently own capable of manufacturing EVs?
  - Can your present employees be easily trained for this purpose?
  - What new technologies may emerge in the coming years?
  - What new regulations may be implemented in the future?
- Small miscalculations may result in huge changes in market share


Emissions Limits
Sales Bans
Employees
Infrastructure Spending
Government Regulations
Factories
Current Assets
Purchase Incentives
Government Investment
Electric Vehicles
Solid State Batteries
Cost
New Technologies
Public Perception
Hydrogen Fuel Cells
Lack of Infrastructure
Limited Range
That’s a lot to keep track of!

The Old Way

- A team (or individual) within a company collects all the relevant factors, makes some projections, and proposes a plan of action based on those projections
- Some method of representing the plan is selected
  - Spreadsheets are a common choice
  - As are project management techniques such as plotting out a critical path or creating a Gantt chart
- The rigidity of these methods is an inappropriate fit for the problem at hand
  - A spreadsheet only works for static, simplistic problems where all variables and their relationships are known in advance
  - The critical path method doesn’t incorporate new information, everything must be known at the outset

The problem at hand is characterized by an abundance of rapidly-changing interconnected features outside of the control of anyone trying to plan around them, and any miscalculations may result in huge losses!

Given the complexities of the problem, would it be possible for a machine to model the situation for you, tracking things like new regulations and technological developments and updating its model accordingly?

What would be needed to accomplish this?

- Rigid structures cannot readily accommodate the rapidly-changing circumstances surrounding the switch from ICE to EV. What is needed, is something flexible. Static models won't suffice for a problem this fluid.
- How will it go about collecting the information to update its models?
  - It will need to be able to *intelligently* sift through information to understand the meaning of the information it encounters—simple keyword searches will not suffice!

The answer to both these obstacles is a machine that uses the English language itself.

The English language represents a fluid system amenable to modelling and there’s no better means of sifting through new information than having an intuitive understanding of the language that it’s written in.

How to model it?

- Build a structure representing the relevant factors
  - The structure needs to be capable of self-modification so as to automatically incorporate new information
  - Other nodes linked to the updated structure will adjust to the modifications automatically
  - Full transparency of the structure means all modifications are identifiable and fully traceable
  - Relatively independent models can exist for different clusters so as to compartmentalize expertise while still allowing for exchange of information and operation of constraints between models (think of a group of human experts collaborating on a project)

But is it really a better way?

- What would this approach provide over and above the usual methods of planning?
  - The rapid evolution characteristic of this problem necessitates rapid adaptation. A machine can be constantly alert for relevant developments and update its models immediately.
  - Machines designed to handle a specific problem only work insofar as the problem stays within predefined boundaries. Only a general purpose machine is equipped to adaptively respond to the myriad of developments that may emerge.
  - Manually sifting through new information and updating models is a thing of the past and can be avoided entirely through implementation of this method.
  - When you're dealing with this many interconnected factors, a machine-process can better update an entire interwoven network simultaneously. That means less error when it comes to attending to all of the downstream changes that accompany any change within the model.

Technology evolves rapidly. Tasks once thought beyond the scope of automation now fall within the bounds of possibility.

Active Structure® is uniquely positioned on the border of this new frontier, and its applications are limitless.

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