

# HOW DO MANAGERS GET THEIR HEADS AROUND ARTIFICIAL INTELLIGENCE? EXTENDING THE NETWORK PICTURE DISCUSSION

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## **Abstract**

Artificial intelligence (AI) expects to increasingly transform ways in which business is conducted. With change follows a need to question current ways of acting and interacting. Yet, the past becomes the frames through which the future is understood. By drawing on Predictive Brain Theory, which shares the same fundamental underpinnings as the Bayesian brain hypothesis, but uses insights from machine learning and neuroscience, the paper conceptualizes that prospective sense making as a skill to update in-flux network pictures are increasingly required for business managers, which the paper reflects on in the light of AI. The paper provides a novel approach to business managers' mental capacity in understanding change and in their ability to adapt to structural shifts that require an update on gone-solid assumptions about the business environment, while linking this to AI both as a motor of change, and as challenging the human thought with machine learning.

**Keywords:** Artificial intelligence; Digitalization; Machine learning; Network pictures; Predictive brain theory; (Prospective) Sense making,

## **Introduction**

Artificial intelligence (AI), that is, machines' abilities to reason, plan, solve problems, associate, learn, think in an abstract manner, and understand ideas, languages and complex causalities (Makridakis, 2017; Pomerol, 1997), produces new meaning to human/non-human activities, while also having disruptive influences on how business is conducted, exchanges executed, and who-does-what in production processes and network structures. Interconnectivity demonstrated as hyper-connectivity increases social complexity (Veitas & Weinbaum, 2016), while technological singularity as a vision (Upchurch, 2018), suggests how machines can recreate intelligence in such a manner that they over-win human thinking.

As with any novel breakthrough, the emerging reality of AI does not resemble the past. The shift evokes "an impression of a chaos, 'crisis' and 'the state of emergency'" (Veitas & Weinbaum, 2016, 17) due to the loss of functioning mental and cognitive models primed for a reality that has passed. As a manager, it is not enough to think ahead and follow trends, but entirely new schemata are needed, while in the case of AI, the human mindset also needs to be extended to, inclusive of, yet also challenged by machines' abilities to think alike and even solve problems in better manners than mankind. While understanding the surrounding environment of the firm is pivotal in any strategic activity of a firm, where network pictures have been introduced as a research tool to grasp how managers comprehend their environment (e.g., Henneberg, Mouzas, & Naude, 2006; Öberg, 2012), these may well be caught in the present, or as strategic tools be linked to change processes introduced by the firm, while not being extensively related to capabilities of capturing breakthroughs or predicting future disruptive developments.

Arguably, in terms of AI and its consequences for business life, extant literature is still underexplored when it comes to connecting the dots between current developments and the resulting implications for consumers, businesses and society at large. This paper therefore aims to explore the connection between mental structures shaped by past events and managerial action targeted to manifest an uncertain future. In this quest, the object of study is network pictures as mental representations of the business environment as a sense-making tool (cf. Henneberg et al., 2006).

## **Network pictures and Predictive Brain Theory**

The paper integrates the notion of network pictures as a form of cognition with Predictive Brain Theory (Clark, 2016) with the intention to thereby capture network pictures at a time of change and managers' abilities to make sense of change and its network consequences. Practically, this focus is linked to the AI introduction, the consequent development in the business landscape, and the constant changes to business exchanges both on a content and structure dimension, along with the complexity that follows from these developments. Predictive Brain Theory uses the notion of Bayesian Priors to strengthen the predictive component of cognitive efforts. Bayesian Priors have been very fruitful in a plethora of research areas within social science. The Bayesian Theorem informs how a particular belief about something is updated in light of evidence. At any moment in time, the information about evidence – or data – is thereby induced by priors, that is, learnings from the past that interact with any new evidence exposed to the epistemic subject.

More specifically, the argument of the paper is with the help of Predictive Brain that managers need to be acutely aware of their underlying assumptions and cognitive priors that will inevitably interact with any new information they receive. This is especially the case in times of disruptive change where managers need to engage in the predictive capacity of their mind

to make successful managerial decisions. In other words, they need to take their conceptions about the past into considerations as well as their past conceptions of the future.

Just as the exogenous business environment is rapidly changing due to said advancements, so does new insights from neuroscience and machine learning challenge the notion of the mental capacity to make sense of the world and the cognitive interpretation of the environment. Going forward, and drawing on Clark (2016) this includes synergizing what has been learned from computational neuroscience and complementing the newfound notions with the traditional understanding of cognitive frameworks, thereby offering a concept grounded in both cognitive and technological disciplines that bridges the future orientation of humans and artificial agents. AI does not only create a breakthrough shift that challenges managers' awareness and current schemata, but also in its deeper effects means that human capacity of reasoning, planning, solving problems, associating, learning, thinking in an abstract manner, and understanding ideas, languages and complex causalities, becomes suppressed by machines thinking faster, more analytically and with less human constraints. By taking in the research stream on network pictures, this paper offers conceptual tools to allow viewing the respective and diverging roles of human agents and artificial agents. Thus, this conceptual paper is guided by the following questions:

1. Challenged by rapidly increasing capacities of AI, how can aware managers in times of constant change caused by disruption utilize their mental capacity to anticipate constantly changing network pictures?
2. How does the research agenda on network pictures need to be updated to reflect the growing requirement for managers to engage in a more a prospective mental capacity of an uncertain emerging future in times of continuous AI developments?

This paper wants to open up a debate around the manager's ability to think, strategize and execute 'out of character', that is, acting distinctly *not* based on old thought patterns around how business has been done in the past. This cognitive ability would be of importance when exploring business opportunities in times of heightened uncertainty and risk caused by technological disturbance, and not the least AI.

## **Discussion**

There is an interesting overlap between research already pursued within the IMP literature stream on network pictures and managerial sense making/cognition, and the Predictive Brain Theory as a form of "Bayesian flip". The focus on the predictive aspect of cognition might inform on the debate around managerial decision making on new levels. This again proposes a number of challenges related to managers' network pictures, specifically targeting how managers could update established priors, which below is interlinked with the introduction of AI in the business landscape.

*Firstly*, the awareness of being stuck in past though patterns would be an initial insight to reach for any manager, and also how this interlinks to other parties verifying previous network structures and contents in their ways of acting, let alone in how to communicate meanings and thereby create inertia not only in ways of acting, but also in ways of thinking and sorting the present into the past. AI as a tool for decision making (e.g., Moss et al., 1994), could help to free the mind from the past, provided that it is programmed to reach beyond the prolonging of present trends and also to separate behaviors based on feelings from those based on facts. Here, the technological advancement increasingly allows for AI as support systems of managers' decision making (e.g., Wilson et al., 2017).

*Secondly*, while the insight that the present is understood through the past may provide some initial guidance, there is still the challenge to be able to operate the unknown given this insight. This includes navigating without really having the compass to do so and utilizing the 'predictive' capacity over the past experience. Translating this to the network picture and network horizons (Holmen & Pedersen, 2003) would include 'flipping' the horizon, so that focus becomes on what happens beyond known regimes and mental borders of the network; what is relevant may be beyond any known horizon and to interact with this unknown, the manager can learn to improve skills of seeing different, questioning what was, and start considering what happens once new thought systems are applied to the present. Here, playing with different perspectives on the past may help to extend cognitive capabilities also to deal with the present, and even the future. In many regards, AI is still delimited to handling the data captured from the past, and while being able to handle and integrate large and complex data sets, the foreseeability has yet to provide solutions. However, as managers learn to distance themselves from the past (cf. Clark, 2016), computerization could easily be programmed to separate trends, and would not be biased by social reinforcements as are minds. Technological singularity (Upchurch, 2018) could expect to provide the answers here.

*Thirdly*, as complexity is a key characteristic of the emerging society (Veitas & Weinbaum, 2016), this means that replacing old with new is not enough to capture relevant network pictures of the present and predicting those of the future. Rather, managers would need to extend their capabilities to grasp structures and contents, blurred also by changes of borders between internal and external, human and non-human, and between within and beyond horizons connotations of relevancy. Such capabilities would be based on continuous questioning of what is seen, interpreted and handled not only by the organization, but also by interaction partners and non-interaction partners. The ability to learn and unlearn in these ways would follow different patterns to the known learning through interaction, and include the twisting of ideas, the learning and co-learning with machinery devices (e.g., Brauning et al., 2017; Kim et al., 2001) and the disconnecting from the past.

*Fourthly*, network pictures are not only managers' sense making tools, but also compasses guiding decisions and behaviors in the organizational and network space. This means that it is not enough that a manager insightfully manages to break away from past thought frames, questions present sense-making regimes, and nestles with previously undiscovered or unrecognized parts of the network, this consequence also requires those abilities of manifesting all these aspects to make the organization act accordingly (cf. Öberg et al., 2012). This would include the constant questioning as part of any intra-organizational and inter-organizational interaction, while trying to establish that the new way to navigate in unknown territories is the way to do so. Social predictive brain as coined by Brown and Brune (2012) indicate how peers would rather be used to accomplish changed schemata than parties reinforcing the present vis-à-vis the future. This comes with flexible solutions of stimulating the critical thinking, the negotiation between human and machine, and the ever-changing balancing of being heard yet requesting others to question what is, could and should be. For AI specifically, the human/non-human interaction and how the machine may help in human thought and the capturing of the future are important. Machine learning entailing critical thinking, creativity and emotions provides challenges, yet would also need to be integrated with the implementation, where machines need to communicate standpoints and give directions to others. Focus in computerization from early on has been the machine as the executor of decisions made by man, but shifts in the human/non-human interaction would thus introduce artificial agents, with humans following directions, or with the agents guiding other non-humans.

This paper presents a first strand of exploration around the possibility to include theories such as the Predictive Brain (Clark 2015, 2016) into the network picture idea so as to theorize about how network pictures need to incorporate the awareness of thoughts being stuck in the past, how to disentangle thought frames from the past to grasp ever changes, and thereby build an idea of network pictures as understood during disruptive regimes. These thoughts being at an early stage means that the paper as such is limited by its scale and scope. Beliefs are, however, that especially in the setting of the heated debate circling the impact of such disruptive technologies as AI in business settings much work remains where contributions highlighting the perception, cognition and future prediction of changing business environments in times of transformation are welcomed food for thought. The anticipated continuous challenge between machine and mankind in terms of reasoning, planning, solving problems, associating, learning, thinking in an abstract manner, and understanding ideas, languages and complex causalities (Makridakis, 2017; Pomerol, 1997), could be characterized as a race against the machine, or one with it.

### **Conclusion**

The introduction raised two questions: *Challenged by rapidly increasing capacities of AI, how can aware managers in times of constant change caused by disruption utilize their mental capacity to anticipate constantly changing network pictures? How does the research agenda on network pictures need to be updated to reflect the growing requirement for managers to engage in a more a prospective mental capacity of an uncertain emerging future in times of continuous AI developments?*

As for the first question, this relates to processes of understanding how priors about the past control the actions of the present and network pictures of the future. Breaking free from past assumptions, and their reinforcing regimes caused by network interactions, exploring beyond known horizons and daring to live with the unknown and uncertain, while questioning such fundamentals as how networks can or indeed are structured or what they contain, with hyper connectivity of digitalization competing with transaction-based operations and disconnectivity interrupting not the least the social dimension of interactions as disruptive forces. While AI may prove as one of the challenges overshadowing the present and the future, the non-human creation of thought also allows the programming of such disconnections and may thereby become important tools for managers to grasp changes.

As for the second question, there are many theoretical challenges related to this, not the least since the network as a fundamental concept assumes to include those resources needed for the company's present and future development (e.g., Håkansson & Ford, 2002). There would be needs to disentangle priors and cognitive schemata (Anderson et al., 1994; Ford et al., 2003; Gadde, et al., 2003; Ritter, 1999) and to disconnect ideas on the network as the start, means and end of a business, to start thinking about it as constraining and enabling future developments through how it contains actual and cognitive limitations to deal with the coming and unknown. Thus, and to theory, this would, as argued in this paper, include ideas on prediction into current schemata and descriptions of network pictures, while also reflecting on what the current network horizon means as borders to freer thoughts and reinforcements among peers, and how this could be exchanged for social prediction as influencing new schemata and reshaping cognition.

The ideas presented in this paper provides an initiation for a research stream focusing more on the role of managers' cognition, networks, and abilities to contrast what is assumed to be with what may actually be. With the rise of artificial agents in business operations, managers increasingly face to be outmaneuvered by non-human agents. Recent exemplary studies in

business research on contemporary and future AI provide opportunities to understand the conceptual implications of how minds and machines share predictive features. Parallel years of research on AI and years of research on cognitive research has led to potent synergistic theories which now allow the reaching of a more viable perspective on network pictures. With the help of artificial agents, managers' awareness of priors, and the prediction of trends unconnected from the past, efficient future network pictures may be produced undisturbed by redundant past human priors. Therefore, it is paramount that future research continues on this line of thought and integrates predictive processing in reshaping network pictures as managerial cognition and as research tools.

### **Contributions**

The paper contributes to previous research through discussing and interlinking research on network pictures from the business-to-business research tradition, with research from neuroscience on cognition and sense making. Thereby, the paper provides new insights that would help develop understandings for network pictures during transitions and when reflecting disruptive changes, previous literature on network pictures having dealt with how managers comprehend the present network and how such cognitive ideas may drive company-driven strategies. The environmentally pushed change has not been part of that agenda to date. AI and its disrupting forces on business life and society at large creates an interesting empirical example to study, where focus (see the next section) has mostly been on various methods to create the intelligent machine, and more lately on the micro-level of human/non-human interaction. Less thereby remains known about how businesses become included in the developments, let alone how managers perceive - and need to reconsider - their current ways of operating to a predictive way of thinking.

To Predictive Brain Theory, the idea of managers' cognition of the surrounding environment as guiding their behaviors, while also adding to risks of remaining in the past through social reinforcement (the network 'confirms' present schemata through others acting based on them and as the resulting consequence of socially constructed network pictures), produces new insights to understand practical implications of the shaping and persistence of priors, yet also the role of others in cognitive processes.

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