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## Human-AI Collaboration in Design: The Role of Sense-making

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### Abstract

*Self-learning autonomous technologies known as artificial intelligence (AI) are changing management actions and choices in organizations and their consequences for the organizational world and society. Whereas it was once seen exclusively as a growth technology AI is now considered to assume many forms. This work introduces a theoretical integration concerning the triplet of human cognitive faculties, design originality, and artificial intelligence within the “organismic economy” as a sphere of highly automatized organization. Today, more operations take place through autos, but creativity, problem solving, and intuition belong only to humans. This work focuses on the process of sense-making within the AI-enforced decision-making process, arguing for the limitations of the technology’s reliance that does not take into account the human cognitive assets in design and management. Employing the example of a study on sense-making in design, the paper is an example of utilizing AI technology to unlock organizational productivity and overcome designs’ limitations. However, the results also show the perennial significance of the human factor in the formation of efficient, friendly interfaces. This research contributes to the literature of the role of AI in supporting human cognition in a practical way, shedding lights on how organizations can sustain and develop the ability to remain relevant in volatile environments. The study enhances design and innovation management knowledge by providing insights regarding how Artificial Intelligence might support or become integrated with decision-making processes. The latter implications suggest that the approaches should be adopted synthetically, incorporating the decentralization of AI and human creativity as co-generation mechanisms for continuous development.*

**Keywords:** *Sense-making, Artificial Intelligence, Design innovation and management*

## **Introduction**

Artificial intelligence is being applied in scaling education, architecture and design as well as management among other fields at a very high rate. Since being pursued by complex algorithms and leveraging the power of big data, AI is revolutionizing non-traditional human-centered approaches. For instance, generative design platforms and predictive analytics solutions are slowly becoming integrated in architectural development and product design where designers and engineers get to discover new possibilities within a certain design scope quickly and effectively. When decision making is enhanced and automated AI comes into the stage, designers are overlooked as observed by Verganti, Vendraminelli, and Lansiti (2020a, 2020b) where machines are now driving innovation.

This shift requires more attention in how designers and organizations can make sense of these changes as a way of addressing them. Cognitive frames which Weick (1995) defined as sense-making is a process that involves making meaning out of confusing data coming from the environment of a given organization or network. In the terms of reference of AI Designing, where there is a synergy between decision-making algorithmic and human-crafted creativity and imagination, sense-making is vital. Despite the potential of proposing solutions within a set of parameters, it is worth remembering that AI outputs need to be applied and integrated by human designers into larger field of strategy and organizational propositions.

Centering this paper's discussion, it becomes possible to assert that it is crucial to explicate and build the sense-making process to understand the contradictions and possibilities of AI in relation to design innovation. In particular, the research focuses on the role of sense-making for decision-making in AI-supported design applications and on maintaining the use of cognitive abilities in the process of designing while using intelligent technologies. Through an analysis of AI, sense-making, and design practices, this study offers a new insight into the interrelated field of organizational studies, leadership, and innovation. In this case, the research gives a clue on how to incorporate AI in organizations' design and development activities while remaining focused on individuality of creative human mind and leadership.

## **Sensemaking in Initial Starts**

Over the last few decades, leadership qualities and core competencies have changed drastically, mainly due to those technology trends such as AI. In conventional leadership theories, power and assertiveness in decision-making and problem-solving abilities as major values. But as problem solving becomes increasingly effective in AI applications and even surpassed human capabilities, the role of a leader is moving away from being a problem solver. On the other hand, modern leadership stresses sense-making as the concept, which is more concerned with interpretation and perspective in conditions of a bewildering environment.

As the appropriate meaning of Sense-Making for Leadership, One of the major topics of investigation in the context of organizational culture and more particularly examined by Karl Weick (1995), is the sense-making process, which defines the way people or organizations make sense of a situation, and act by creating sense out of it. In organizational contexts, sense-making can help leaders to manage the situation making a cozy story of how the past affects the present and future affiliation. Weick likens sense-making to the art of mapping the unknown: co-designing symbolic of direction and confidence in systems and technological infrastructures. Not as a mere response to stimuli, but as an ability to interpret stimuli, thus producing comprehensible responses in terms of organizational objectives. This way, leaders are not conceived as individual problem-solvers; rather, their job is to enable organizations to collectively sense-make about problems, to move from decision-based, reactivity to storytelling. The first and the highest level of sense-making requires a leader to identify a novel, significant and/or complex event that affects his/her organization, or a subset of it; then, analyze it using various tools of sensible cognitive anthropology; and last, understand how the event has unfolded and impacted his/her organization or its subset for actionable knowledge. Hence the rationality dimension of Weick's theory also emphasize on the fact that sense making is a step by step process and is a continuous process which links the past with the present as well as the future. Since the process of decision making involves sense making, therefore, situation that confront leaders are analyzed and understood based on past experiences and knowledge, with respect to the future. This involves dialectic movement whereby leaders get involved with the organization's members, and their experiences form part of the knowledge base used in decision making.

Leaders need to manage the different requirements and dynamics in the highly competitive systems. Ancona (2012) identifies eight core habits of effective sense-making that leaders can adopt: As possibilities of big data analysis, it can be mentioned the following: (1) looking for a variety of sources of information, (2) building common understanding through discussions, (3) considering multiple perspectives that are not only predictive, (4) bypassing intermediaries and learning from those who are affected by the problem, (5) let context shape the framework for further actions, (6) employing such forms of information transmission that reflect meaning and Such habits indicate the increasing need for leadership in providing direction on sense-making activities at the various levels of the organization.

Moving from Problem Solving to Purpose Creation, The core of meaning making in the leadership is in the identification of the meanings of the decisions and the positioning of the decisions in the broader framework of the organisation. According to Nardon and Hari (2022), sense-making allows leaders to gain perspectives to understand the operational environment and processes in situations that are either very complex or have little structural clarity. This is not typical for other leadership frameworks that focused on the value of decision-making and problem-solving. Still, sense-making calls for cognition to be embedded in an interpretative framework, and it is relevant to leaders' argument that they provide rationale to their decisions and how they support the firm's strategic initiatives. The more AI assumes greater problem-solving tasks, the

more specialized human leadership's ability is to contextualize decisions to provide structure and purpose to organizational members. Therefore, the leaders must make joint sense-making a possibility by creating organizational communication structures that support such practices as meaning construction, discussions, and story-telling. This shift takes cognizance of the fact that decisions which are made do not cause change in organizations; it is the importance and sound positioning that creates the force.

In order to relating the design and innovation, sense-making emerges as a central issue in design and innovation. Although there are many practical applications of AI in design like creating prototypes, processing big data, or finding the best solutions AI is still incapable of interpreting these outputs on its own. Managers in design roles have to perform sense-making constantly to be confident that AI-driven solutions are useful in meeting end-user requirements and organizational objectives. It means that while developing a situation that can be analyzed, it is important to look not only at the choice of actually observed data, but also at the way in which these specified data will then be interpreted and contextualized to produce assignable meaning or value. To do so, this study strengthens the conversation about how leaders can manage AI adoption and drive innovation with a specific focus on sense-making as a leadership task. Conceptual lenses enable new understanding of how organizations can be flexible, innovative and aligned strategically in the age of artificial intelligence and machine learning rationale.

### **The Perspective of Leadership**

In real-world leadership, uncertainty comes from a lack of clarity regarding client needs and goals, from partially available information, and from uncertainty in the organization of the situation, so problems are often difficult to define and results are hard to anticipate. Compared to risk factors where the metrics involved are easily defined and measured, real problems are problems that cannot be measured fully. It is in this challenge that sense-making is most needed. In this dissertation sense-making is defined as the process of generating meaning where there was none or finding some sense when one could not easily make any; the ability to develop understanding in a context characterized by uncertainty or novelty, and it is becoming widely regarded as a core competence for leaders operating in environments that are more complex and unpredictable (Weick, 1995; Ancona, 2011).

In the management, especially for organizations that operate in dynamic environments that are characterized by uncertainty, dynamics and conflicts call for leadership skills that transcend intellectual prowess in problem solving and decision making. In the words of Peter Bevelin (2006) "I don't want to be a great problem solver. I just don't want any issues—stop them from occurring and I should do it at first instance. This active approach embodies the paradigm transition from reactive fixing to a predictive and strategic management style of the organization. Future executives today need to focus on sense-making as a distinct activity apart from decision making, though in most cases it precedes decision making. Generally, as elaborated by Ancona (2011) and

Sharma (2006), sense-making involves aggregation of data, framing, and evaluating a given real-life phenomenon. Its advantage is that described process is iterative and leaders are able to adjust their models on the basis of new information. The sense-making perspective is immediately useful and can be applied to routine organizational situations, change initiatives and addressing issues arising from globalization as well as simpler things like planning a holiday for the family. It re-emphasizes that good leaders not only can consider multiple viewpoints, question previous paradigms, and adjust course if presented with fresh information or new possible concerns.

There are two basic leadership competencies: sense-making and inventing, where sense-making is more basic according to research carried out at the MIT Sloan School of Management. This is because, as mentioned above, sense-making bears an imitative relationship to, and the potential to amplify, other leadership activities including the imagination of opportunities, stakeholder engagement, and the development of innovations. The leaders with high level of sense-making not only have better insights towards the environment but also help the members of the team to manage the situation because of which they are instrumental in forming the destiny of the organization as well in the long run (Ancona, Williams, & Gerlach, 2020). Another important activity in sense-making is what we term retrospective analysis. In the sense that, by analyzing prior occurrences, leaders are able to derive sophisticated nuances that improve leadership cognition, especially pattern matching and sense-making (Weick, 1995). This reflective practice is not an academic exercise; it provides a simulation environment in which a leader hones cognitive practical that are helpful in making sense of events in the future. Effective implementation of history knowledge to anticipate unpleasant circumstances prepares the leaders for eventualities they are not prepared to encounter in the future and to make informed decisions in situations that are not clearly defined.

However, moving towards more formal definitions, sense-making is not an easy activity that one can learn. People like to have certainty in their lives, and leaders, in particular, may experience anxiety when it comes to decision making in times of risk. Any kind of delay in action is perceived as weakness and in organizations where fast action is expected it can be attributed to inability to make a decision. However, as Ancona noted leaders should know that “ignorance is the unknown,” and one should avoid making conclusions too quickly. Rather, such promulgations should afford one time, energy, and effort to acquire more information and achieve better understanding. Stress can cause people to revert to more rigid thinking processes, and so there is a strong argument that leaders must become more mindful when stress increases and attempt to ensure they reconsider assumptions.

## **In the perspective of Organization**

At the organizational level, culture is defined best by the process of making sense of what is going on. While the conventional view of organizational culture as established language, operating as a unification of shared meanings within an organization seems solid, the conception of organizational culture will arise through organizational member sense-making, interpretations, and organizational interactions which recur through the concepts of Organizational Culture as indicated by Weick (1995). Such fluid process leads to development of a shared and emergent organizational story as opposed to an organized and top-down manner. This results in enriching sense-making patterns at the individual level to make sense of organizational events while at the same maintaining public histories.

Sense-making as explained by Dougherty (2020), is the way through which organizational members comprehend and act on unanticipated information or event. It becomes even more important in organizations, groups, or communities where it is not clear cut what they are dealing with, as this way they collectively negotiate the meaning of such a state of affairs and develop pertinent conclusions. According to Nardon and Hari (2022), debriefing is one of the principal ways organizational members engage in sense-making. By structuring, reflecting on past experiences, and assembling the group's point of views to identify lessons learned and establish the group's current understanding of the situation. This enhances individual cognition whereby each scholar and staff also the organizational cognition thus making certain the lessons gained are fixed in the organization's tactical web. Weick's (1995) theory of organizational sense-making outlines seven guiding principles: Identity construction, retrospection, sensible environments enactment, interaction, continuity, extracted cues dependence, and plausibility. These principles alert about relativistic understandings of sense making processes pointing to the context shaped construction of meaning of people in social interaction. Basically, the purpose of sense-making in organizational contexts is not the pursuit of discovering the truth, but developing more and more realistic believable story that can be used to direct the activities in the organization. Of the many components of Weick's theory, the most important is the idea that sense-making is a constant and ongoing process. People in an organization are in a continuous cycle of action, selection and interpretation where they respond to environmental events, select data that are appropriate to the situation and then interpret this data in an attempt to understand the environment. We can see that this process is not fixed; indeed, it is cyclical and dynamic, which enables organizations to act in response to fluctuations and vagueness at later stages as well (Weick, 1995).

Concisely, sense-making prepares organizations for tackling complexity by creating a learning organizational structure. It assists employees in making decisions where there are no SOPs to follow, this brings confidence in handling situations that are hard to define. With sense-making integrated into the culture of the organizations, organizations can be better-prepared to address the uncertainties that characterize business environments.

### **Sense-making in the operation**

Of the stages involved in design thinking, sense-making is an important one, and its use can be well illustrated by the practice of IDEO, a design studio regarded for its seminal work on the design process. This paper highlights how IDEO's approach shifts away from practical problem-solving to become cornerstone to the design thinking approach, where there are calls for more imagination, and how to improvise. The process of design at IDEO that is grounded in making sense, occurs in three main phases (Refer to, Figure 1). First, IDEO shows that: sense-making activities are indispensable when it comes to making way through the sea of unknowns that characterizes design; and in particular, it asserts that design activities are improvised and require creative thinking. In contrast to structured and formal ways of solving problems, sense-making captures the shades of gray that always appear in designing. Due to a climate that is created in organizations which is encouraged to improvise, creativity forms the basis of sense-making that goes into developing solutions (Brown, 2009).

Second, IDEO's model of sense-making in design discusses the concept of a 'designer's sensibility' meaning talent as well as the temperament or psychological profile that is developed over the course of studio culture and life experiences. This sense of orientation is not in-born talent but an acquired skill through years of training and instant experience and encounter with reality. In a way, IDEO reasserts the notion of sensibility as important for designers in order to decode vague situations and to turn them into designable moments. In line with this, the designers are not simply problem solvers but that of interpreters who are always making meaning of their context and using their sensitiveness to steer the design process (Liedtka, 2015; Weick, 1995).

Third, IDEO works practically demonstrating how sense-making and designers' sensibility complement each other in practice within a design thinking practice. This framework captures the rather cyclical process of design in which sense-making aids in making the problem as well as potential solutions more defined. Progressively IDEO enhanced its employee's experience and knowledge at the organizational and national levels, when it widened its research area from the product design to services, strategies, and social institutions the approach of ideographic sense-making appeared in various fields. what the above framework demonstrates is that sense-making is not only to create tangible artefacts, but also about ordering the world as users, identifying seemingly difficult experiences and processes, understanding the environment, and recognizing organizational needs that require persistent practice and interpretation (Liedtka, 2015; Micheli et al., 2019).

Even though sense-making within the design thinking process is decomposable into different elements, there is consensus on its three fundamental cornerstones: empathy, abduction of key patterns, and prototyping (Dell’Era et al., 2020; Verganti et al., 2020). These elements form a basis for a design process that is both user centric and incremental yet radical innovation based. According to Brown (2009), empathy is the acquirement of a view on the world and experiencing the world as other people do to the extreme. Such an approach is significant in design work since designing for the humans entails understanding the human’s needs and challenges. Abduction this type of reasoning linked to sense-making relates to the idea of the capacity to revert to “what could be?” more than “what is” or “has to be”. Envisioning pertains to the creation of new ideas on one’s mind and mind-creating that is at the core of design thinking in design (Martin, 2009). The third principle is experimentation: rather than knowing by studying, as in simulation and modeling, experimenting turn’s ideas into concrete processes that can be tested or literally tried out. This process encourages wondering and enables designers to navigate the unknown territories of design propositions improving the offers in cycles of feedback (Carlgren et al., 2016; Magistretti et al. Forthcoming).

<b>Perspectives on design thinking</b>		
<b>Design thinking as problem solving</b>	<b>Paradigm</b>	<b>Design thinking as sensemaking</b>
Design thinking as methodology for solving complex problems Reflecting management culture	Framing	Design thinking as open-ended exploration to imagine and express new futures Reflecting studio culture
Valuing concepts (design thinking nomenclature) Focus on <i>methods</i> ; cognition, artifacts, hypothesis	Disposition	Valuing qualities (design thinking vernacular) Focus on <i>sensibility</i> ; improvisation, senses, imagination
Outside-in <i>impression</i> Text-driven approach focusing on problem-solving	Locus of learning	Inside-out <i>expression</i> Experiential learning focusing on expression of ideas and skills
Reactive: <i>Tame</i> chaos through structure Psychological safety through trust in formal structures and methods	Relationship to uncertainty	Generative: <i>Embrace</i> chaos by making in the present Psychological safety through trust in <i>making</i> and social ties
<b>Focus on <i>Methods</i></b>	<b>Design thinking pillars</b>	<b>Focus on <i>Sensibility</i></b>
Focus on user experience	Empathy	Focus on embodied experience of the design thinker
Abduction as a form of reasoning for constructing a hypothesis Imagination as cognitive (disembodied)	Abduction	Abduction as a collective aesthetic experience for imagining new futures Imagination as embodied and improvisational
Problem solving as a cognitive act; methods essential Focus on visualization and representation	Experimentation	Sensemaking inherently improvisational and imaginative; sensibility essential Focus on expression and interpretation

Figure 1: The implications of the two paradigms for interpreting and theorizing design thinking; Theoretical framework of sense-making perspective on design thinking. (Rylander Eklund, A., Navarro Aguiar, U., & Amacker, A., 2022).

The best way to describe IDEO’s approach toward sense-making is indicating several steps within one project, namely healthcare design where IDEO has discovered an inefficiency in functioning of a particular hospital and offered to redesign the hospital’s emergency department.



This project involved the IDEO team in designing a way of observing patient experience in a different manner, specifically how the team strapped a head camera to a patient's head for 10 hours. What they discovered was transformative: much of the time, the patient sits facing a wall with no comprehension of what goes on in the environment. This realization helped to shed the light on a very important yet often unobserved part of patient journey, namely, disempowerment and solitude. Due to the adaption of sense-making structure into their design, their team was able to redesign the entire emergency department to include features that would help enhance patient awareness. This example shows that with the use of sense-making, IDEO was able to go beyond surface intervention which only addresses the symptoms of the problem and get at the heart of the problem before finding a solution (Brown, 2009).

It is in this light that the importance of sense-making is two-fold in this context. First, it attempts to present the enormity of the overall information collection and analysis process that often involves both numerical data and descriptive information. In the case of IDEO, the camera footage supplied was not only visual information, but the feel of beaming with the patient through the emergency department. This enrichment of the sense-making process allowed the design team to develop a more integrative and more humanly oriented one. Second, the IDEO case shows how [sense-making creates] situational maps – detailed descriptions of the given system. This way by mapping the journey of the patient the medical team was able to discover common areas of concern and make changes that would reduce or eradicate these concerns altogether. This approach is also consistent with Weick's (1995) sense-making framework, which posits that action selection and interpretation are cyclical and situated activities - people reconstitute the situation as they go along. We have seen that, in the context of design thinking, sense-making is a critical step in connecting to, and adapting the concepts above ground to be usable on the ground. ;As such, it allows designers to translate processes, manage the lack of clarity and systematically apply creativity in order to achieve the desired results. This makes the design process a dynamic one that is deeply informed by sensibility and creativity that then proceeds to translate their bodily knowledge and understanding of a problem towards designing functional but also meaningful solutions. In addition, the cyclical approach of design thinking facilitates learning in the course of sense-making and guarantees that the design is improved with awareness of the condition and the made new discovery (Kolko, 2015).

Therefore, sense-making is not only a method for designing but a way of designing that allows designers to address complexity and manage uncertainty not as threats to the craft, but as opportunities to perform. The use of sense-making as demonstrated by IDEO for the redesign of a hospital's emergency department demonstrates the power of such an approach to bringing change that is as dramatic in terms of user experience, as it is in terms of efficiency. When incorporating empathy, creativity, and experimentation into the process of attaining sense, design can lead to meaningful strategies and implement them in ways that satisfy not only the customers' rationality but their affective self as well. Over time, literature on design thinking has grown and has

continued to incorporate sense-making as a framework for creating meaning out of the perceived chaos and problems when designing and creating interventionist solutions (Elsbach & Stigliani, 2018; Wrigley et al., 2020).

### **Sense-making is imperative in design crossing the AI revolution**

Advanced technologies that feature machine learning as a relevant component have become indispensable parts of our landscape of digital existence. Limitative artificial intelligence (AI) adaptations that are associated with language analysis, picture analysis, recommendation mechanisms, and a variety of other aspects are utilized by individuals in the utilization of a variety of tasks. The adoption of AI into everyday usage means that the execution of design practice is enriched when it comes to commercial viability. Yet it brings design a new importance and raises methodological questions that are as yet unanswered in design practice. In order to respond to these challenges, one has to rethink the role of non-technical reality in design in the age of AI – an element of design thinking known as sense-making.

Madsbjerg (2018) conceptualizes sense-making as how people in ordinary lived experience make sense of life through communicating with others. What he does is he contrasts sense-making against algorithmizing, which is good at making quick decisions within large complexities, but which loses out on the details of an actual context. However, sense-making provides a more significant and even more refined perspective despite the fact that algorithmic thinking loses sight of increased context and interpersonal factors inherent to the environment. This ability to capture all forms of interaction is what differentiates sense-making, enabling far more decision making to occur at a more nuanced and practical level. Therefore, Madsbjerg outlines five guidelines on how to use sense-making at the strategic and tactical levels when decision-making relies on AI (Figure 2).

## 5 PRINCIPLES OF SENSEMAKING

Principle	Factors	Examples
<b>Culture</b> (not individuals)	Social context, empathy, interconnectedness, holistic understanding, uncovering assumptions, immersion	Ford shifting to hybrid technologies and transportation services
<b>Thick data</b> (not only thin data)	Ethnographic meaning, relations to the world, situational sensitivity, domain mastery, practical wisdom	George Soros (speculative market calls)
<b>The Savannah</b> (not the zoo)	Behaviours, experiences, field reality, social networks, mental models, reframing problems	Framing questions for insurance customers and dinner-time shoppers
<b>Creativity</b> (not manufacturing)	Idea generation through non-linear abduction; creative reasoning that is messy; mood analysis; element of grace	Ford's Model T in an era of horse carriages, Bjarke Ingels' architecture
<b>The North Star</b> (not GPS)	Focusing on what matters, setting the context for data collection; narrative; courage, intuition and caring	Negotiation and conflict resolution; EU regulation of industries

Figure 2: Adapted from Sensemaking: What Makes Human Intelligence Essential in the Age of the Algorithm by Christian Madjsbjerg (2018)

The first theory focuses on the importance of culture. Organizations must understand and adapt to the cultural context of the regions in which they operate. For example, Ford has changed its business strategy in countries such as China and India. To prioritize the unique needs and preferences of drivers. Instead, the focus is on technological innovation. This shows that the design must use cultural nuances to resonate with local users and guarantee meaningful participation (Liedtka). , 2015).

The second principle emphasizes the difference between "coarse" and "thin" data, although big data can reveal patterns and relationships. But they often lack the insights needed to understand why these patterns exist. Anecdotal data—derived from ethnographic research and personal perspectives—provides the rich context needed to understand human behavior and emotions. For example, while big data can show that a certain product is popular, in a specific population. But dense data reveals the underlying motivations and emotional drivers behind consumer decisions. Both types of data must be combined to gain a holistic understanding of user needs in the design. This approach is broadly consistent with design thinking. It emphasizes problem solving and a compassionate context (Brown, 2009; Martin, 2009).

Third, Madjsbjerg emphasizes the necessity of learning about and empathizing with clients, often through phenomenological tools. This disposition allows designers and organizations to move past surface attributes to appreciate the lifecycle of their clients – hence better interaction and more delicate solutions. Practically this means that even companies like insurance companies can have engaging interactions with different customers, not just by plastering them with market

segmentation but actually treating them as human beings. This enables designers to design products that are more personal such that users would be more empathetic towards the design and its process resulting to more user centered design solutions (Kolko, 2015).

The fourth principle emphasizes the fact that there are different ways of viewing any problem and defining its solution, including bottom-up and top-bottom approaches as well as creative thinking. Madsbjerg advises that design practitioners should take risks and explore unorthodox ideas when solving problems particularly in periods of turbulence. Therefore, in this respect, creative thinking becomes a necessity for innovativeness because it enables a designer to approach problems from different angles and come up with innovative solutions. This also illustrates the flexibility and open-mindedness that one should have in design as the specific designers on the ground who adjust to the emerging new conditions stand a better chance of coming up with relevant and effective solutions (Elsbach & Stigliani, 2018).

The use of technology for decision making is another principle being focused on. When information is vast, leaders should be informed discerning at the data they pursue. It involves both algorithmic capabilities and accurate reading of social situations by humans. In corporate settings, it is important to grasp not just the words spoken, but the context in which they are situated, the ethnography of the workplace. Leaders termed appropriately may achieve better outcomes because employees are willing to work hard for and be engaged in more challenging tasks. This principle highlights where technology is able to complement the human mind and vice versa in the interpretation of information so that decisions can be made (Weick, 1995; Cooper et al., 2009).

The relationship of sense-making and AI, point to a far greater paradigm: that the use of tech is at its very best when it only supports, rather than replaces human decision. The principles of Madsbjerg emphasize that no matter what AI redefines throughout sectors such as healthcare, whose quality cannot be only about efficiency anymore, an awareness of empathy and compassion is required in the procedure of a decision. In other words, empathy or human understanding is crucial when designing systems that solve not just functional problems but overcome emotional and societal barriers in users lives. This makes more of an axial case in the discussion between AI and design — that the future technology is one which augments human capabilities, not duplicating or replacing them.

Here, sense-making becomes an essential capability to wield if designers and decision-makers want to continue operating in the rapidly-changing landscape of human-AI interactions. In the future, AI systems will continue to shape how we view ourselves and the world around us. Madsbjerg's precepts supply a framework designed to safeguard that human intelligence — empathy, cultural context, and imaginative analysis — guideline the procession of advancement. In this light, the humanities — too often dismissed as less pertinent in the racing-for-tech world — suddenly become a vital resource. In fact, by embedding sense-making into the AI-driven processes, we can build systems that are both efficient and profoundly resonant with the human experience. So, sense-making brings together the new technologies and human welfare, thus, to

ensure that design remaining as an essence of human-centered practice (Verganti, 2009; Magistretti et al., Forthcoming).

### **Discussion: Sense-Making in Design Practice At The Ai Revolution**

According to Verganti (2020), using AI requires a shift in perspective that embraces "Problem Finding" as an alternative to traditional problem-solving. He emphasizes the value of sense-making exercises and points out that, in contrast to AI, people might refuse to solve an issue for ethical, sympathetic, or internal reasons. Csikszentmihalyi and Simon's (1988b) discussion illustrates how humans might resist coming up with meaningless answers. This emphasizes how crucial it is to approach design practice in a balanced way, combining AI support with human sense-making. Whereas, Human intuition and critical thinking are based on experience and surroundings, artificial intelligence (AI) is based on data, facts, and algorithms. Unlike AI, which takes a data-centric approach, sense-making considers conditions, problems, and restrictions when assessing how effective a solution is. It represents points of an idea at the phase where sense-making is properly implemented followed by the principles and procedure before the decision from the initial to the next phase is decided (see Verganti, Vendraminelli, and Lansiti, 2020a, 2020b). This is accomplished by adapting the design practice framework to the context of AI factories. According to the framework, the only processes that are involved are the "problem-solving loops" that follow the designing process. In these loops, particular solutions that a user interacts with are discussed and determined by an AI engine using insights from user interactions or the entire ecosystem.

It explains how AI is integrated into the product, from prediction to conclusion-making based on data collection and continuous learning of improved solutions. Thus, the potential for loops will eventually lead technology to take the position of people in the creation of a particular solution. They can offer a range of solutions without requiring a significant increase in R&D expenditure, and they are simple to scale without redesign. As a result, this process flow may improve sense-making by including humans (in this particular instance, leaders and designers) in less repetitive and looping activities as the user would be the one who addresses the situation.

It is important to realize that sense-making is considered to work best at the initial stages of the process when everything is just getting started. The phase before "design" is shown here to emphasize the point at which the first problem is genuinely encountered, sorted, and identified. At this point, it is "manually" managed by humans. Compared to the actual framework, the "research and discovery" and "ideation and conceptualization" phases were introduced before the "design" phase, as the image illustrates. Sense-making focuses on generating possibilities and predictions that could assist the organization solve its challenges. Additionally, it is representative to apply in the loops of problem-solving when it operates at the "Use" and "Data" phases when input is gathered and information is evaluated sensibly before moving on to the following phase.

Sense-making in this context of AI organization is illustrated in the study of Karl Weick, a well-known expert in organizational dynamics, who emphasizes how sense-making processes contribute to understanding and addressing challenges within organizations, those involved in the early stages of design practice can undoubtedly gain a deeper understanding of sense-making in the early phases of design practice and leadership roles. It has three main components and is frequently connected to his sense-making idea. The research and discovery phase was the starting point, followed by ideation and conceptualization, as the image illustrates. The following piece explains the application of Weick's basic theory of sense-making—which includes enactment, selection, and retention—through design practice concerning context.

As defined in the first point 1) Enactment, is the process of continuously forming and reshaping organizational reality by both individual and group activities. It explains Organizations are always being built by the activities of their members; they are not prior things. Enactment illustrates the continuing development of organizational structures and procedures as a result of people's activities and interpretations of those actions. For example, the members of an organization have to adapt to an unexpected shift in the project's requirements. Rather than waiting for official directives, team members proactively get together to talk about and clarify their responsibilities, acting quickly to adjust to the changing circumstances. The process of enactment is most effectively demonstrated by the act of coming together and redefining their roles on the spot. In this perspective of design practice, Enactment plays its role in 'taking actions' involvement and structuring the organizational environment. To apply, Design teams use iterative design methods, collaborative sessions, and prototype workshops to implement. Teams that actively participate in the design process can test assumptions, actualize concepts, and react in immediate response to new findings.

On the second from Weick's, the Selection is defined as organizing and identifying information process, which enables people and organizations to make sense of their surroundings. Deeper, People and organizations selectively analyze information to construct an integrated knowledge of their environment when faced with ambiguity and uncertainty. Selecting relevant signals and determining which data are necessary for sensemaking are steps in the selection process. For example, in competitive situations, an organization runs against a challenging problem. Leadership is the process of making sense of an issue by concentrating on certain parts of it. Depending on what they think is relevant, they could decide to give competition strategy, economic data, or consumer feedback priority. The process of deciding which facts to emphasize influences how the organization perceives the issue. Selection, in the design practice context, is making sense of the design problem that requires organizing and evaluating data. Significantly, Teams of organizations carefully consider input from consumers, relevant market trends, and results from user research while designing. To ensure that the design solution is in line with the most important practical aspects, designers improve their grasp of the problem by selecting necessary insights.

On third of Weick's basic theory of sense-making, 3) the Retention, it is work on the process of conducting certain information to memory to lay the groundwork for upcoming sense-making. During the sense-making process, information that is judged significant and chosen is stored and added to the memory of a person or organization. This body of information informs decisions and acts in the future, continuing the cycle of sense-making. As an example, upon a crisis that is well managed, a company evaluates what went wrong and records the most important insights. This knowledge is retained and added to the database. The organization uses the information it has maintained to help with problem-solving and decision-making when a comparable difficulty presents itself in the future, emphasizing the significance of retention in the sense-making process. In design practice, Selective knowledge is retained when it is stored in memory for subsequent use. Future design choices are informed by this collected knowledge, which is incorporated into the organizational memory. Successful design patterns, user preferences, and lessons learned. Design teams contribute to the continuous development and enhancement of design processes by using the information they get via user testing, design iterations, and project retrospectives.

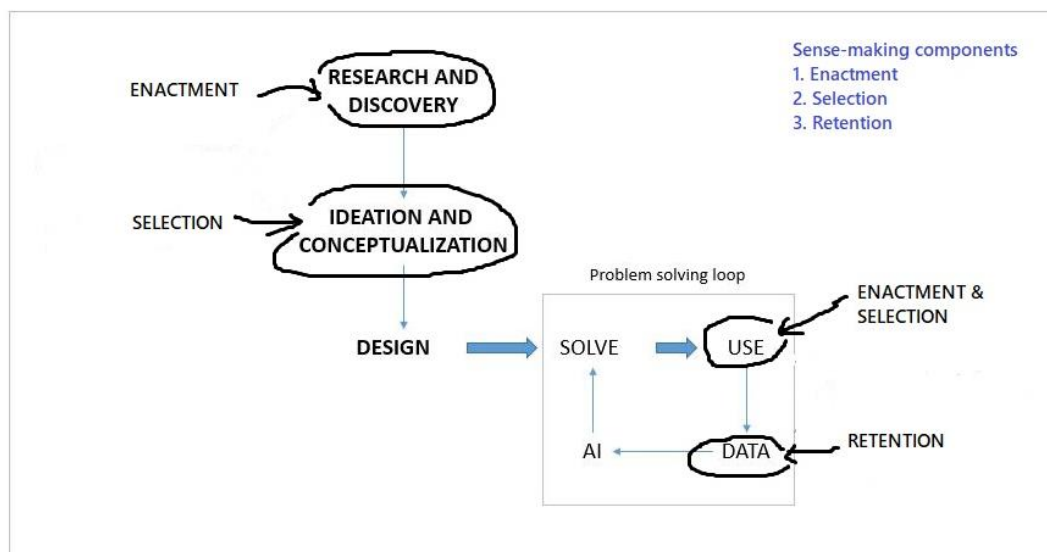


Figure 3: Sense-making approach at design practice in the context of AI-based organization system

Adapted from the design practice in the context of AI factories (Verganti, Vendraminelli, and Lansiti (2020a, 2020b)

According to Weick, three central mechanisms include enactment, selection, and retention with which different components process information for decision-making when facing complexity. Use of these concepts in design within this framework brings another dimension to problem solving especially in accommodating artificial intelligence with human mindedness. In this case (refer Figure 3), *Enactment* in the “Research and Discovery” phase translates to the designer mobilizing himself or herself within the environment of the research and data gathering process. Designers do not just watch from the sidelines and wait; they seek out information and interaction with users and stakeholders, as well as the market environment to establish the scope of the project. The interaction here serves to organize the design challenge by placing the problem in a format of a conversation that is carried out with the environment by the designer.

This means then that in the “Ideation and Conceptualization” phase the concept of *Selection* or rather the process of selection gains importance. Designers rank and select which of the ideas created during the brainstorming phase are relevant to the project’s objectives and will be useful to the users. This process involving trends and revelations that the research undertakes help in the decision-making process of this action. The selected concepts are not just filtered according to feasibility but chosen in a way to avoid further future issues, which goes line with Bevelin (2011) and Dickson (2023) that “prevention is better than the cure”. Venture selection is another type of sense-making that only feeds the worthwhile ideas to the development process.

During the “Use”, *Enactment* and *Selection* dominate the process as designers employ some outcomes on how the design functions in use. Feedback is knowledge makers can reinforce sequentially; this means that the diagrams help in making sense of how users are likely to behave and respond based on the new designs. Verganti, Vendraminelli, and Lansiti (2020a, 2020b) explain that problem solving with the help of AI at this phase focuses on the processing of all the relevant user data which in turn helps to advance the design iterations. Lastly, in the “Data” stage, retention is important because designers record and archive knowledge that has been acquired throughout the project. In this context, retention means the documentation of knowledge and a dynamic practice that makes it possible to enhance the design practices of a project.

The incorporation of Weick sense-making elements of *Enactment*, *Selection*, and *Retention* into the design process provides an orderly cognitive model of solving design problems. Besides, this framework also focuses on the enhancement of the decision making at each of its phases, as well as integrates human-sophisticated based modes with AI-based steps for making decisions and providing a comprehensive, efficient cycle of understanding, evaluating, and learning. This form of cyclical repetition improves the general efficiency of design because flaws are discovered early and prevent in later projects of the same type, while encouraging advancement in the scenario.



## Conclusion And Future Research

Exploring sense-making in design practice acknowledge its centrality in bridging individuals and organizations to acquire insight to uncertainty. This process, mainly in view of the AI-supported innovations, sheds light on the reciprocal relationship between thought and technology. When enacted by designers, sense-making frameworks are used to make sense of the disruptions and antagonisms that designers encounter, and when done so systematically and tactfully, designers are able to conceive and realizing innovative solutions in tandem with both needs assessment and delivery technologies. Although it appears to be an instinctual cognitive function, applying sense-making intentionally in the design process provides organizational tools for operations and creativity.

However, this study found out some limitations which provide path for subsequent research. Hence, the ways in which emotional intelligence, ethical aspects, and problem searching can be systematically incorporated into sense-making in the design process, particularly in AI environments, should be discussed in detail further. Researchers in the future should also concern themselves with the likelihood of developing negative externalities on using artificial intelligence in decision making, including ethical issues that might arise, or other issues might bias the artificial intelligence choices and design frameworks to counter these. Furthermore, concentrating on contrasting sense-making processes at multiple levels, including the leadership and designers, may provide further detailed guidance on ways to improve a decision-making competency across scales. Furthermore, the impact of externalities of using artificial intelligence in the design process is still unknown, and may be problematic concerning ethical issues, especially with regard to bias. Subsequent studies should explore how to help avoid these threats, potentially by developing structures that guarantee ethical measures where biases in the effective decision-making supported by AI are observed.

Finally, future research studies should aim to compare sense-giving at different level of an organization such as at the leadership and design level of an organization to further develop competencies in decision making at these levels of the organization. By analyzing these processes simultaneously, it is possible to reveal more detailed practices for enhancing the integration of multiple organizational actors, and thus increase the efficiency of design-driven innovation.

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