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Information sculpting

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Abstract

In this paper, I propose sculpting as an analogy for information use. I provide a background to the use of metaphors and analogies in Information Science, propose five analogical mappings between sculpting and information use, and then discuss the benefits to this analogy for thinking about how we use information.

1 | INTRODUCTION

Information Science is still a relatively new discipline. Marcia Bates marks 1968 as its origin point (Bates, 2022) and, even though we can point to earlier influencing traditions, notably in librarianship, Information Science has a distinctive form, one that has been stimulated by the study of modern information environments.

Information Science however seems rather restless as a discipline. It has proliferated many metatheories, paradigms, and perspectives (see, e.g., the discussions in Bates, 2005, 2022; Hartel, 2019), without coalescing on any. It has absorbed theories, ideas, and empirical results from almost every other discipline and, perhaps because of the newness of the field and the omnipresence of information, almost anyone can conduct "information science" research without reference to central literatures or theories. Bates sees this plethora of metatheories and paradigms as an advantage; by inventively presenting Information Science as a meta-theory, she allows for different information sciences to co-exist with information as the core (Bates, 2022).

For new disciplines, and especially ones that deal with rather abstract concepts such as information, metaphors and analogies can be a useful way to conceptualize activities, to present intuitive descriptions of core ideas, and to provide scaffolding vocabularies to structure emerging theories and models.

This paper proposes that the process of sculpting offers a fruitful analogy for information use, especially the process of creating information solutions.[1] Information use

has seen little metaphorical exploration compared to other information behaviors, but the argument developed here is that sculpting is not only rich in metaphorical potential for understanding information use but, with a core in evolutionary behavior, both sculpting and information use share a common foundation. Through an exploration of sculpting and information use, I hope to demonstrate the value of this way of thinking about creating information solutions.

I shall describe some of the background to metaphors and analogies in information science, then summarize earlier arguments about information use being a shaping process, then describe a series of mappings between sculpting and information use, followed by a discussion of the possible implications of this proposal.

2 | BACKGROUND

Metaphors are ways in which properties of one area of knowledge or experience (the source domain) are used to help understand another domain (the target domain) (Lakoff & Johnson, 2003). The source domain is more familiar and this familiarity helps us understand the less familiar and often more abstract and complex target domain (Savolainen, 2006). Ideally, there should be epistemic correspondences between the source and target domains and these correspondences would allow for predictions based on knowledge from the source domain to the target one. This specific characterization of metaphor may be more precisely termed analogy (Savolainen, 2020). A common analogy for

example is to compare water flowing through a hose with electricity flowing through a wire. Most of us can easily visualize water flowing through a hose so we can use our experience that squeezing a hose increases the pressure within that part of the hose (squeezing causes resistance to water flow) to explain how electrical resistors cause electrical resistance (they cause resistance to electrical flow).

Metaphors can take on different forms. As VanScoy observed, metaphors can be explicit comparisons that suggest correspondences of the form described above, they can be the use of figurative language that have some connotative power, or be the use of metaphorical jargon, that is, terms that were originally metaphors but have translated into new terms in the target domain (VanScoy, 2016).

As metaphors emphasize similarity rather than dissimilarity (Savolainen, 2006; VanScoy, 2016) they can mislead by distorting the relationship between two domains. They may also have different emphases for different audiences and lack universality. However, powerful metaphors can reveal hidden similarities and become the way that people think about the world and how they think about their actions within that world (VanScoy, 2016).

2.1 | Metaphors, analogies, and information science

Information Science researchers have used many metaphors to aid the understanding of complex information ideas. Figure 1 shows some—and I stress only some—of the many metaphors that have been proposed for Information Science concepts.

The most popular by far are metaphors based on the natural world. These fall into three broad groups: metaphors based on ecological systems, spatial metaphors based on geographical phenomena, and metaphors based on our interactions with natural elements.

In ecological metaphors, information environments and their actors are mapped onto the idea of a physical environment and the organisms which inhabit that environment. These are particularly popular in workplace information studies suggesting interacting systems of entities within an institutionally bounded environment. In these metaphors, flows of information are analogous to flows of nutrients or energy, implying inter-dependencies of organisms within a specific time and space. More advanced metaphors bring in ideas of niches, resource competition, eco-diversity (Nardi et al., 1999), emergent properties, and cooperative behaviors (Lauri et al., 2020). Examples of these metaphors include information ecologies (Nardi et al., 1999), ecosystems (Marrow et al., 2001), cultures (Lauri et al., 2020), environments, and climates (Widén & Steinerova, 2018).

Spatial metaphors based on natural landscapes are especially popular when talking about how information is organized, or how its availability is understood by an individual. Maglio and Matlock claimed that a main attraction of spatial metaphors is that their "power lies in the fact that people *naturally use spatial metaphors*—that they cannot help but use them" (Maglio & Matlock, 1998). That is, having evolved to interact with a three-dimensional world, our first point of reference is the natural world. These metaphors are typically based on natural spaces rather than constructed ones such as libraries even though libraries are often used as metaphors in other disciplines or as an early metaphor for the Internet (Savolainen & Kari, 2004). Some of the most famous spatial metaphors include information horizons (Sonnenwald, 1999), information grounds (Pettigrew, 1999), information worlds (Burnett & Jaeger, 2011), information landscapes (Lloyd, 2006), and information deserts (Lee & Butler, 2019). Unlike ecological metaphors which emphasize living organisms, spatial metaphors emphasis arrangements, distributions, and co-locations. This may facilitate discussions about reality and perception as regards information sources, for example, as Cox and Fulton note in their exploration of space in information behavior "[w]e know that what feels close may be different from what is close in terms of objective distance" (Cox & Fulton, 2022). Specific metaphors may indicate how one interacts with a spatial landscape, for example, desire lines (Burnett & Lloyd, 2019) or information pathways (Ogundeji et al., 2022).

Interacting with natural elements is a third source of popular metaphors. A common one relates to food: information is something to be found and consumed as in the metaphors of berry-picking (Bates, 1989) or information foraging (Pirolli & Card, 1999). The metaphor applies to food and how it appears in the environment (berries, bushes, etc.) and our preferences for food (information diets). Less well developed as a metaphor is Pirolli's notion of information enrichment by which an information forager molds the environment to improve the gain of valuable information (Pirolli, 2007), which has strong connotations to agriculture and food production. Like Pirolli and Bates, others have found food diet to be a useful and widely understood metaphor (e.g., Chen et al., 2014; Massanari & Howard, 2011).

Once we go beyond the natural world, we see a dizzying array of metaphors. VanScoy, in reviewing the literature on LIS metaphors, saw libraries described as machines, brains, dreamhouses, fortresses, bazaars, improvisational theater, baseball, portals, and laundry. In her own research, she uncovers many metaphors used by reference and information service (RIS) librarians to describe aspects of their work, including bartender, cheerleader, counselor, detective, gardener, hairdresser,
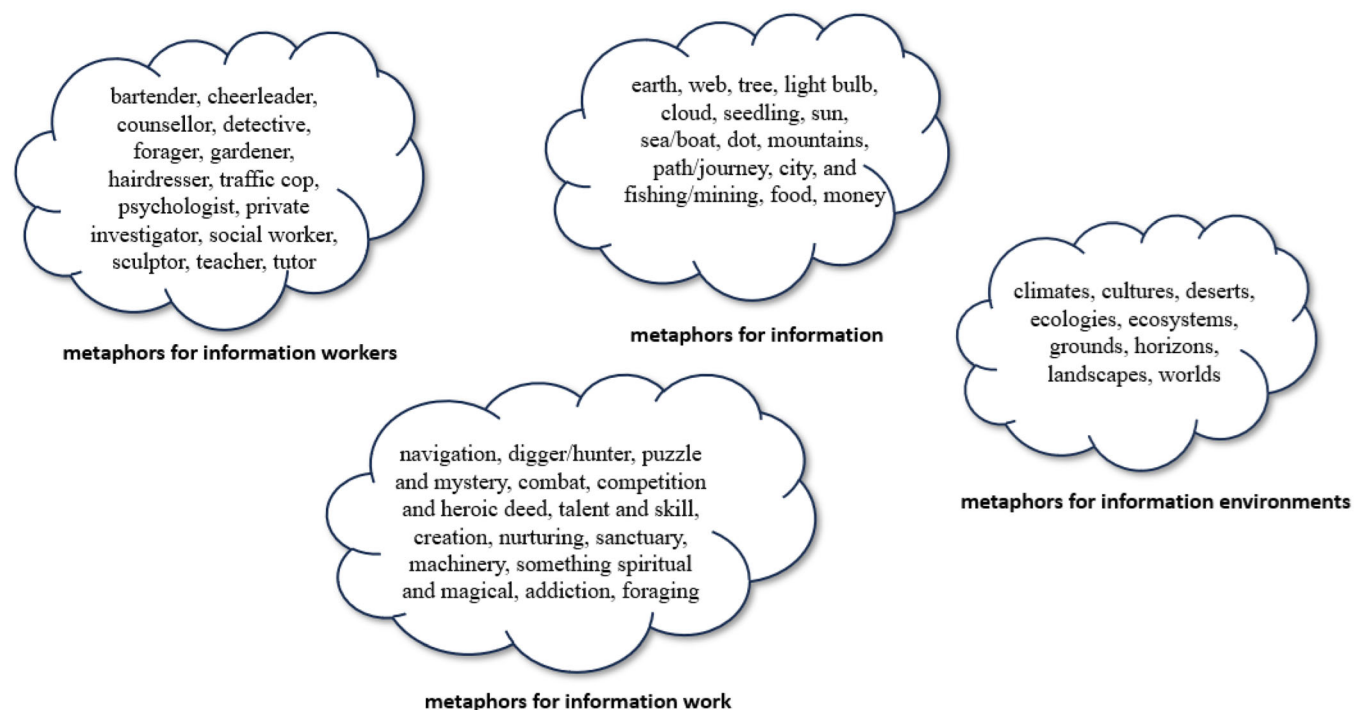
FIGURE 1 Metaphors for information, information environments, information work, and information workers.

traffic cop, psychologist, private investigator, social worker, teacher, tutor, and sculptor (VanScoy, 2016). She also presented metaphorical categories for RIS work: navigation, digger/hunter, puzzle and mystery, combat, competition and heroic deed, talent and skill, creation, nurturing, reference or sanctuary, machinery, something spiritual and magical, and addiction. The overwhelming majority of these metaphorical devices were to express positives about the role of RIS professionals (VanScoy, 2016).

Hartel and Savolainen examined pictorial metaphors of information, going beyond language to understand how students conceived of information in visual terms (Hartel & Savolainen, 2016). The most common pictorial metaphors were the Earth, web, tree, light bulb, box, cloud, seedling, sun, sea/boat, dot, mountains, path/journey, city, and fishing/mining. Most, but not all, were inspired by natural phenomena. Hartel, imaginatively, used castles as a metaphor for explaining selected work by Marcia Bates (Hartel, 2013).

VanScoy and Hartel and Savolainen used metaphors as an elicitation device to uncover what others think. More commonly they are used to provide stimulus to thought and understanding. Typically, metaphors are being used as illustrative devices and the range of metaphors at play are rather superficial; less often, the metaphors have stronger and more precise mappings that allow for theoretical predictions. Rare examples of these include those that are based on theories from other disciplines such as Nardi's information ecologies (Nardi

et al., 1999), Pirolli's information foraging as an adaptation of food foraging abilities and therefore not simply an analogy but behaviors with common origins, and Azzopardi's economic approach to information seeking that sees the interaction between a search system and human searcher as analogous to economic decision-making (Azzopardi, 2011).

We are rich in metaphors for some information behaviors but we seem to be impoverished by powerful metaphors regarding information use. The most familiar metaphor for information use is perhaps Dervin's bridge metaphor in her sense-making theory by which information use serves as a bridge to overcome gaps in one's sense of the world (Dervin, 1998) but this seems underdeveloped as a metaphor (Savolainen, 2006).

This paper offers the theoretical proposal that sculpting offers a productive analogy for information use. This is based on the proposal that using information is a shaping activity, described in more detail below.

2.2 | Shaping information solutions

Ruthven proposed that the way we create many information solutions is through a process of shaping (Ruthven, 2022). Shaping processes are ancient ways in which early humans reworked elements from the natural world into a more useful form, the classic example is shaping rocks into stone tools such as hand axes. In

Ruthven (2023), it was argued that shaping processes have characteristic properties of (1) local optimization—we work with what is to hand in terms of materials but will expend more effort in obtaining better material for more important solutions; (2) solutions fall into general classes (cutters, scrapers, hammers, etc.) but individual solutions are often specialized for different purposes; (3) shaping solutions emphasize experimentation and allow for innovation to arise from individual trial and error; (4) shaping involves iteration and approximation, in part because the final solution may not be obvious from the original material and the material itself may be highly variable. Shaping processes therefore go from bolder, coarser gestures to more refined, detail-oriented gestures; and (5) shaping is highly perceptual. Our physical actions while shaping form part of a feedback loop: we act upon the world, perceive changes based on our actions, interpret, and evaluate these changes, then decide how to act next and therefore perception and action blend in experimentation.

Shaping works on approximations and iteration. Iteration is a key feature as it allows for solutions to be emergent, it allows for feedback (social feedback or feedback from testing the solution in action), and, as we get closer to a final solution, we gain greater predictability about the effects of our actions on the developing solution. Iteration can, especially in early stages, also allow for reversal and reshaping a solution. In Ruthven (2023), shaping was shown to be a general model for information solutions encapsulating models such as Kuhlthau's ISP and with wider applicability to creating information solutions that require a series of interactions with information to arrive at a solution, a solution being an artifact, or a process, or a series of decisions.

Therefore, shaping is a general-purpose way of creating information solutions of a certain type that can be applied to many situations. One of these is sculpting. Sculpting is a shaping process that has been used by humanity for thousands of years and, in that time, has built up a substantial set of ideas, methods, and vocabularies, that have potential to function as an analogy for information use.

Information use itself is a wide concept with a range of meanings (Kari, 2008, 2010), including searching for information. In this paper when I refer to information use I mean the broad range of ways in which we use information, when I refer to information solution I refer to what Kari labeled as "applying information" in which "the role of information is to function as a resource in some process" (Kari, 2010) and where information is being manipulated to serve some purpose or achieve some goal.

3 | ANALOGICAL MAPPINGS

Sculpting refers broadly to the shaping of materials such as wood, metal, or stone, into visual forms that serve some aesthetic, memorial, social, or religious purpose. Sculpting often defies such simple definitions: ephemeral sculpting involves the creation of short-lasting artifacts (sand, snow, or gas sculptures), newer forms of sculpting include sensory sculpting (sound or light sculptures) and living sculptures include art forms such as topiary, bonsai, or crop art. Sculpting appears to be as old as humanity itself and universal to human culture. The physical action of shaping raw material is a primitive and natural way of interacting with the world, even if the techniques used and final forms may differ widely and be highly influenced by local cultural conventions (Ruthven, 2023).

In this section, I shall provide five analogical mappings between the process of creating an information solution and the art of sculpting.

3.1 | Materiality

Sculpting is a material art that works with substances that have distinct properties. These properties afford the uses of the material, so hard stones lend themselves to being used for durable artifacts while sand, snow, and modeling putties are more suitable for playful exploration. Some substances are immediately easier to work with than others: children instinctively can mold soft pliable substances whereas other materials require tools and knowledge of how to use the tools.

We are highly developed to interacting with the material world and differentiating between materials and it seems natural that we use our existing sensitivities to material and apply them to information as well. Hence, we can talk about (in English at least), arguments being "woolly" or "coarse," information being "dense" or "clear," "thick" or "thin" descriptions, "blunt" critiques, or "sharp" prose. These tell us about the nature of information that represent more abstract and complex judgments on the nature of information and information objects. That we can differentiate between types of information and use metaphorical language to describe information's different natures also means we can share ideas about working with information. We are alive to such perceptual aspects of information—how it is to "handle"—even if dealing with abstract information forms. This corresponds strongly to Buckland's ideas of information as "thing" (Buckland, 1991).

Some materials may be chosen for convenience reasons rather than being optimal for a task; at other times we expend more effort for high-quality materials for

particularly important solutions (Boaretto et al., 2009). In Barry and Schamber's ground-breaking studies of how information is assessed (they consistently refer to documentary sources as "materials") we see how important is the choice of resources when tackling problems (Barry & Schamber, 1998) and how many ways we can differentiate between materials.

Some materials may come pre-loaded with associations (Irvin, 2020); in sculpting for example, materials such as jade or marble have cultural connotations that influence their choice (Penny, 1993). In information terms, issues of source, genre, author may also create associations that affect the final form.

The material that is sculpted becomes part of the sculpture's content (Irvin, 2020). This sounds trivially true, but the material can significantly alter the perception of content. In sculpting, this may be the "work's visual content," or appearance, by supplying "color, texture, and sometimes other aspects of form" (Irvin, 2020). The perception of the material may vary over time, for example, in discussing wax sculptures of anatomy both Penny and Ballestriero see wax as delivering very realistic representations but ones that are "repellent" (Penny, 1993) and seen as "repulsive" (Ballestriero, 2010) due to this realism. In informational terms, it may be judicious choice of quotes, examples, arguments, expressions, facts, that are being modeled into a document or way of thinking about the world. In both physical and information sculpting, what is chosen and how it is used creates intrinsic meanings (Froud, 2012) that represent the sense and significance of the material to the person using it.

3.2 | Plasticity

Sculpting is seen as a "plastic" art by which material is worked into a solution. Plasticity suggests the ability for potential through transformation. As Silverman explains "[p]lasticity is a kind of 'indecidable' between flexibility and rigidity, suppleness and solidity, fixedness and transformability, identity and modifiability, determination and freedom" (Silverman, 2010). Wormwald states that plasticity is "neither inherently progressive nor normatively positive" (Wormald, 2014): it is a state rather than a desired characteristic.

Some material may be more intrinsically plastic in the sense that it can be reformed more easily while other material gains plasticity through its capacity to be part of different outcomes. The classic example of the latter is LEGO, the pieces of which are hard and unmalleable but whose plasticity comes from the capacity of the blocks to be turned into vastly different final forms (Lee, 2020). This reworking is often referred to as bricolage, a form of

sculpture that is based on the "creative reassembly of already-significant elements" (Lee, 2020). Such mixing and remixing is a widespread phenomenon (Navas & Gallagher, 2014), in which material is transformed, reused and reconstituted to deliver new values, often through participatory processes (Munro et al., 2023).

Plasticity also has an interesting relationship to authenticity. In Ancient Rome, older statues were often remodeled into new forms, sometimes to replace a head, sometimes to alter features, sometimes simply relabelled to represent a new person (Varner, 2015). This happened in other cultures as well, for example there is a theory that the Egyptian Sphinx originally had a lion's head which was recarved to represent the Pharaoh Khafre (and hence explains why the head is too small—it has been cut down to a new form). Such remodeling leads into complex questions of what is original, copied, inspired by, modified, or outright fraud (Craddock, 2009).

Information use can be seen as having a plasticity in that we take information from various sources and work it into other forms to shape a solution. We blend, synthesize, gap fill, organize, arrange, and rearrange information. The key here is that information is being shaped through our use of it to arrive at a solution that feels right to us or meets some defined criteria. Like clay or stone or snow, we are provided with the material, but the shaping activities are ours. As with the principle of materiality, our language of information use often connotes physical ideas of modifying information to new forms. For example, in Bates' list of search tactics we find WEIGHT, SELECT, CUT, STRETCH, SCAFFOLD, CLEAVE, REDUCE, PINPOINT, REARRANGE (Bates, 1979), all suggesting physical interactions with material. As with both physical and information sculpting, perception and the "feel" of a solution is important.

The plasticity of information lends it to innovation and experimentation, to use the same material in different ways and to see the effect of using it differently (what if I start the paper this way instead, what if I change the punchline of that joke in this way, what if I organize my tax receipts this way instead?). Even when others have provided existing solutions, as a form of "sense-giving" process (Steigenberger, 2015), we often test out changes to the information solutions (what if I use vanilla instead of chocolate in this recipe, what if change my diet plan to eat before exercising?). As Hertzum explains, experimentation creates new information from within solutions and therefore helps us decide how to proceed (Hertzum, 2023). Information is often only evaluated when it is being used (Grant et al., 2016), and therefore the plasticity of information use means that we can adapt our information use to our emerging understanding of whether our solution is working or not. This experimentation and trial-and-error

working facilitates innovative solutions, sharing variants of solutions, and gradually increasing the quality of solutions.

3.3 | Modes

Sculpting can come in various forms reflecting distinct processes of shaping, including the major activities of carving, modeling, and bricolage. Each of these major forms have sub-forms reflecting different materials, end forms, and traditions. Similar principles of shaping and reorganizing material into new forms may also apply to activities such as landscaping. As with sculpting physical material, sculpting may require us to use different forms of sculpting for different solutions and these activities reflect different forms of information processes.

Carving processes eliminate material to achieve a new form. Typically, this form of sculpture—also known as subtractive sculpting—is used for materials that are harder, such as stone, wood, ivory, or bone but can also refer to softer materials such as gourds or pumpkins. This process of eliminating material is analogous to the gradual process of going from general to specific as described by Kuhlthau in her Information Search Process (Kuhlthau, 1993). Here, the process starts off with broad shaping gestures based on gaining an understanding of a subject area, then, as they gain knowledge and a better idea of what the solution will look like, develop into using more specific terms and concepts representing finer-grained carving of the information space. The many types of literature review that can be conducted all contain a stage of searching the literature that be corresponded to eliminating useless material to focus on the relevant parts before assembling them into a final form (Grant & Booth, 2009).

Modeling is a highly popular form of sculpting in which material is added onto a developing solution. This is also known as additive sculpting. As described above, many of our information solutions are ones that emerge as we use information. That is not to say that we do not have some kind of solution in mind before we start but rather the variability of the material—and that we may not be able to assess it until we start using it—means that initial ideas of a solution can only act as a scaffold for the actual solution. There is much evidence to show that we engage in this kind of information use. For example, Florance and Marchionini showed that searchers pattern-build when interacting with search results by using initial search results to create a scaffold to interpret later ones (Florance & Marchionini, 1995). More broadly, the solution may only arise from a series of decisions that influence each other; choosing a new job for example, may

require a series of inter-related decisions about career aspirations, relocation, new housing, schooling, and so forth. The final solution may benefit from existing structures (akin to armatures, the wireframe models used by sculptors) in the form of guides or planners or recipes that help shape a solution (McKenzie & Davies, 2010). These scaffolds and models structure our thinking about new tasks and aim to short-cut the learning process by making explicit the methods used by experts to create solutions.

A third form of sculpting is bricolage, in which a diverse set of objects are put together, this being particularly associated with modern art traditions. Bricolage stands in contrast to more formal, planned ways of doing things (Markham, 2017) with the emphasis more on what works and what is to hand. Bricolage has been identified as a particular form of information use to express a "fluid" method of creating information solutions from what is available to create solutions, often repurposing information for new purposes (Lea French & Williamson, 2016). As such, the bricolage traditions are seen as suitable for studying highly contextual situations and heuristic ways of thinking (Nord, 2022) and studies of mixing and remixing information (Brennen, 2020).

The choice of which approach we use depends on the circumstances in which we work and the goal we are seeking to achieve. However, as these ways of working with material often fall into distinct traditions, people often specialize within these traditions and their experience and knowledge can provide the basis for both excellence and innovation (Lanteri, 2012). Sometimes traditions go in and out of fashion (Ballestriero, 2010) or materials change status (ivory carving, e.g., is illegal in most countries). As many sculptors did not record processes, especially if there were more artisanal, then it can be difficult to replicate older styles (Miller, 2022). We can see similar features in information sculpting: processes for many informational solutions are not recorded and what we value is individual skill, while robust, explainable processes are essential for other forms (e.g., patent reviews) and the outcome should be somehow independent of the person who created the solution.

3.4 | Tools

Sculpting involves the transformation of material from one form into another. This is accomplished using tools—including hands—in a coordinated process. Tools can be seen as "possibilities for human actions in cultural [and natural] environments" to enable change to that environment (Kaptelinin & Nardi, 2012, p. 973). Sculpting has developed a range of tools including hammers,

chisels, grinders, rasps, cutters, files, needles, sponges, gougers, combs, and scrapers. Tools diversify our abilities to work with material, allowing for more precision and sophistication in our work (Penny, 1993). These tools have co-evolved over time as sculptors understood how to use their materials. Some tools are best used in combination (e.g., hammer and chisel) and some are better suited for different parts of the sculpting process or for different materials (wood chisels and stone chisels are generally not substitutable).

In information work, we also have many tools including databases, search engines, classification schemes and classifiers, bibliographies, dictionaries, summarisers, text segmenters, translators, spell checkers, and topic modelers. These have different properties and uses; browsing is a good way to gain an overview of what is available, but querying is better for specific fine-grained information discovery, for example. As with sculpting, sometimes a new tool (such as databases or search engines) represent a new way to interact with material and become core to how certain tasks are performed (Penny, 1993).

Practice and experimentation at using tools in both cases gives us experience in how best to use them and helps us develop what may be seen as muscle memory where we do not need to consciously think about how to use the tools and start operating through cognitive heuristics or intuition (Savolainen, 2017). As Kuhlthau taught us, those who are more practiced at performing certain types of information task become more adept at the overall process of creating a solution and less anxious about uncertain stages (Kuhlthau, 1993). The way tools are used can be characteristic of communities of practitioners, demonstrating local conventions and traditions (Penny, 1993).

Like sculpting, we may create models (sculpting maquettes) to prototype or test out a solution. Models help sculptors define the final form, identify possible mistakes or possible problem areas and how to resolve them, and also how to work out costs and time-frames for the final form (Jantasri, 2013). In information use contexts, we often create drafts or outlines or initial solutions to think through, at a coarse level, what may be involved in creating a solution before trying to create the final solution. We may also engage in specific activities such as conducting scoping reviews. Models also allow for separation of tasks so that different people can tackle different parts of the solution and act as templates that others can repeat (Claridge, 2015). Sculpting itself is often collaborative, especially for large sculptures, even to the level of different people modeling individual limbs in ancient sculptures (Claridge, 2015); in information use, many information solutions are collaborative, systematic reviews being the classic example. Sculpting often involves interaction with

other practices, such as gilding, painting, and so forth (Claridge, 2015), and information sculpting may involve interaction with practices such as publishing, marketing, law, health, and so forth.

Shaping using tools is a very common way of engaging with new environments or testing new information behaviors: we try things out, gain feedback or evaluate the information solution when it is applied in action. Experimentation of this kind can involve feedback from others which can then direct the next stage of the sculpting. The feedback can come in different forms: self-evaluation (does this solution work for me), external feedback from an expert (teachers or line managers giving feedback on initial solutions such as draft papers), or from wider social environments (societal feedback on our behavior). Shaping processes may be particularly suitable for activities where there is poorer predictability of actions: we take gradual steps to monitor progress and be able (if possible) to reverse our approach. In the case of many information solutions, we cannot predict what information may help until we use it so shaping offers a way to test out information in action.

3.5 | Representation, presentation, and curation

Sculpture traditionally emphasized representational art with sculptures representing some aspect of the real or imagined world: political leaders, gods and heroes, or elements from the natural world. In modern art traditions, sculpting often has more conceptual aims but still represents some experience of reality, that is, they say something about the real or imagined world or attitudes towards this world. Sculpture is typically a very public art form, decorating public buildings or acting as a focal point for a political or social ideals. As such, they can be targets for opponents or new regimes, and "statue-toppling" is a recognized and classically old sign of regime change, taking place in many ancient civilizations as part of a broad process of organized removal from history known as Damnatio Memoriae (Wilkinson, 2011).

Sculptures are presented to us for a purpose and within a context (Curtis, 1999). They are vehicles for telling stories. Significant sculptures are not just presented but are also curated: they are preserved, and we are guided in how to view them. The latter is especially true when we have fewer ways ourselves to interpret a sculpture; we rely on experts giving us information on the sculpture and ways to think about it. Some sculptures transcend their specific time and place (e.g., Michelangelo's David, the Statue of Liberty, the Nefertiti bust) and take on new lives in adverts, films, tattoos, and are often remade in new
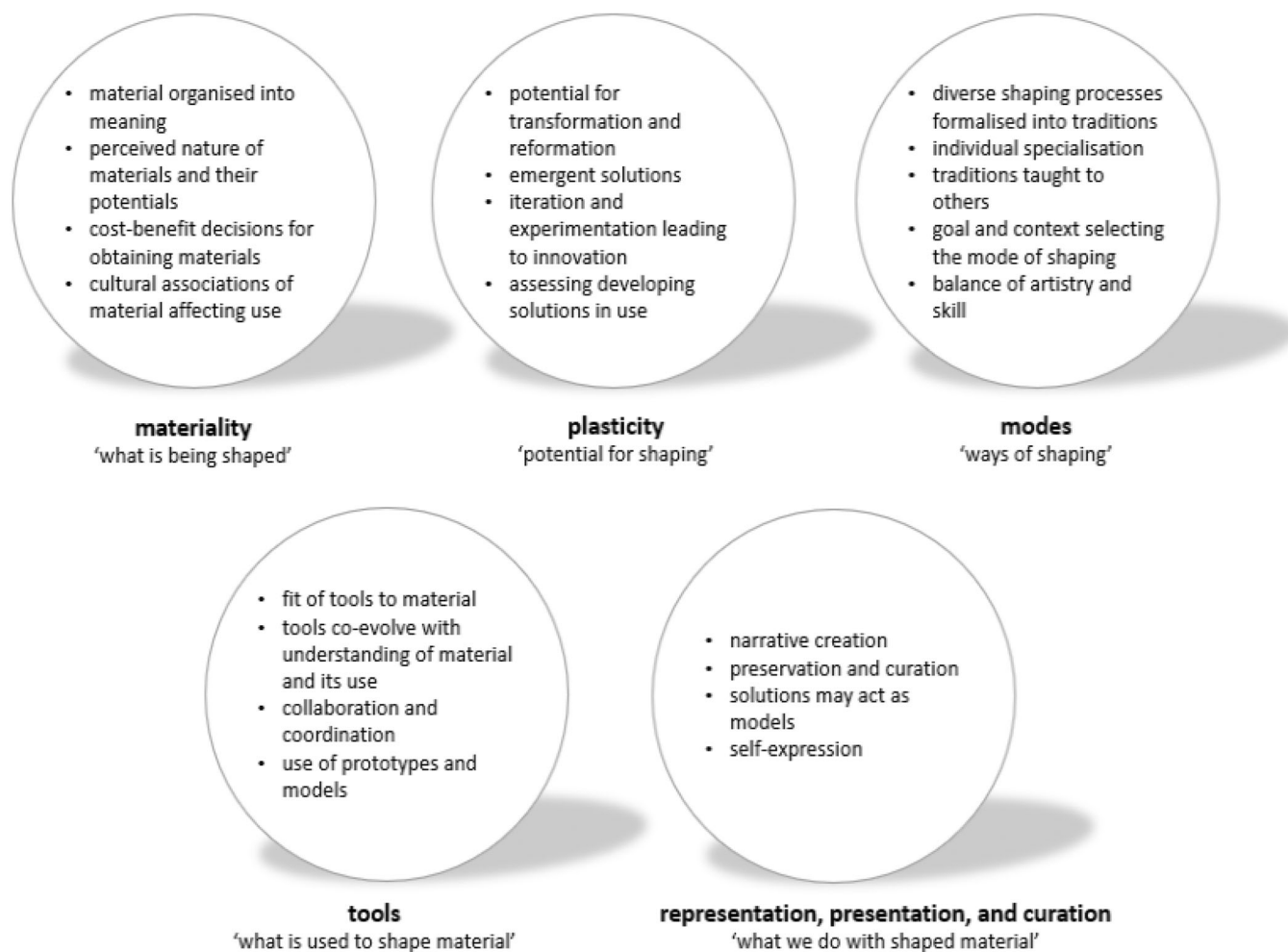
materiality
'what is being shaped'

- material organised into meaning
- perceived nature of materials and their potentials
- cost-benefit decisions for obtaining materials
- cultural associations of material affecting use

plasticity
'potential for shaping'

- potential for transformation and reformation
- emergent solutions
- iteration and experimentation leading to innovation
- assessing developing solutions in use

modes
'ways of shaping'

- diverse shaping processes formalised into traditions
- individual specialisation
- traditions taught to others
- goal and context selecting the mode of shaping
- balance of artistry and skill

tools
'what is used to shape material'

- fit of tools to material
- tools co-evolve with understanding of material and its use
- collaboration and coordination
- use of prototypes and models

representation, presentation, and curation
'what we do with shaped material'

- narrative creation
- preservation and curation
- solutions may act as models
- self-expression

FIGURE 2 Overview of shared properties between sculpting and information use.

forms[2] while others need the context of their original setting to be fully appreciated.

Our information solutions can also be seen to represent an experience of interacting with the world. That is, information solutions are not neutral, rather they are emotionally and psychologically significant experiences of interaction that form the basis for understanding ourselves and how we relate to the world around us. Gabriela states that "[a]rt is born at the border of external and intrapsychic realities, through the human being's necessity of including pragmatic elements of his environment into his own affective system" (Gabriela, 2021) and we could say the same about information use in that our use of information blends external resources from our environment into our internal ways of thinking about the world.

In psychology, the process of self-making is one of telling stories about ourselves, to ourselves and others, to create a sense of self that is shaped by how we tell these stories (Bruner, 2003). These stories are not "playbacks of life events but require a point of view from where past events are tied together and are made relevant for a

here & now—with an eye on the biographer's future orientations" and so are functional (Bruner, 2003). The brain then can be seen as a narrative creating device rather than a recording one (Sedikides, 2021) and these narratives are being constantly created through everyday processes of "ruminating on experiences, fantasizing, conducting internal monologues and hypothetical dialogues, telling stories to explain actions and goals, comparing present and past circumstances, imagining hypothetical scenarios, and projecting into the future" (Sedikides, 2021). Autobiographical memories can be remembered differently depending on the situation (Josselson, 2009) and, as with physical sculpting, this shaping of self-narrative is culturally impacted (Bruner, 2003).

Deliberate rehearsals of memories serve different functions including maintaining memories of events, re-experiencing the emotions of an event, understanding an event, and for social communication, with social communication being the most common (Walker et al., 2009). Our information solutions can then be viewed as part of narratives about ourselves; they are

preserved as meaningful items. Memories associated with life transitions are especially vivid and long lasting (Pillemer, 2001). Some solutions may be more psychologically significant than others and their psychological and emotional significance means that they are used to help understand who we are—the stories we tell about how we dealt with illness, gained career success, moved house, etc. and their associated information behaviors—and these are often the ones that we present to others.

Analogous to sculpting, therefore, we can say that information solutions are curated. These stories we tell of our information solutions are selected, presented, they are brought out and shared. That these stories are told, retold, and contemplated speaks to the curation and preservation activities such as displaying, annotating, polishing, and so forth that applies to sculptures. This displaying of solutions—by telling them to others—means that solutions can act as models to others. Some solutions may become exemplary models to others on how lives can be lived (Adams & Peirce, 2013; Allard & Caidi, 2018).

Solutions that are particularly significant, perhaps representing noteworthy achievements or challenges, may be seen best as similar to free-standing sculptures that are named ("my cancer scare," "my PhD," "organizing our wedding") and thought of in isolation, whereas others are part of a wider panoply of sculptures like a frieze or bas-relief representing a set of solutions about an area of life, part of what Sedikides called our "narrative network" (Sedikides, 2021). In the case, solutions that are to be repeated or are ongoing, such as many work tasks, the sculpture solutions are maybe best thought of like living sculptures such as topiary where the solution has an organic quality and is continually being modified and developed.

Figure 2 summarizes these shared properties between information use and sculpting, including discussion points from the next section. Both information use and sculpting are highly dependent on the material we use (materiality/plasticity), how we use it (modes/tools), and result in outcomes that have the potential to be highly significant to us and others (representation, presentation, and curation).

4 | DISCUSSION

The starting point of this paper was that we lack powerful metaphors for information use and that the ones uncovered so far function more at the level of allusion than as powerful theoretical tools, compared for example with the way Information Foraging has benefitted studies of information searching. In this paper I offer sculpting as an analogy for studying information use. A primary advantage of sculpting processes is that they appear across all human cultures and seem to be a natural way to interact with the world. Even if sculptures usually reflect local traditions, often based on availability of materials, they are widely understood as a shared human activity.

Sculpting is a process of shaping. Shaping processes work on approximations and iteration: initially large, broad gestures to coarsely form a general solution, followed by detailed, fine-grained approximations to a specific solution. In Ruthven (2023), shaping was described as a general-purpose way in which humans have evolved to interact with the world and have adapted to work with information. Shaping is the "nature" explanation of how we interact with information; sculpting is an example of how "culture" has taken shaping processes to create a culturally significant area of human endeavor.

Shaping processes take place within social environments that encourage certain ways of thinking about our environment and how to interact with it (Ruthven, 2023). Sculpting and creating information solutions therefore arise from the same key set of human abilities to shape the world into a new form: shaping rocks into stone tools works on the same principles as shaping clay into a figure of a human and on the same principles as shaping information into a document or a solution to a problem. In all these cases, we are taking material in one form and transforming it into a form that is more useful for our current needs: we change reality into a new and more useful form.

Kari (2008) proposes three conceptualizations of information use: internalizing whereby the actor incorporates external information into themselves, processing whereby the actor transforms information, and externalizing information where the actor distributes knowledge or information objects to others. We can see all three at play in information sculpting: information workers obtain information, process it, and then (may) make it available to others in curated forms.

Information sculpting, like information foraging which also works on a principle of approximations, is best at describing our interactions with information in cases where creating information solutions is sufficiently complex or unfamiliar that we need to employ a series of information behaviors, evaluate solutions as they develop to gauge if we are developing a good solution, and where there is some recognizable endpoint that we can describe as a solution. This view blends with a view of information and information objects as being made or crafted (Huvila, 2022) and that information use is emergent and experimental (Hertzum, 2023).

Sculpting is not proposed as a useful metaphor for all information use. The metaphor itself may break down when we combine multiple approaches to using

information (e.g., carving information spaces then modeling information into a solution) as sculpting typically involves one approach for each solution. It may also be harder to investigate sculpting when the output is not tangible. More investigations from a sculpting perspective would help determine the limits and potentials of this metaphor.

Sculpting is an age-old and universal human activity, and it offers a rich history of traditions, professional and aesthetic criteria, and ways of thinking about trends, fashions, and practices. This offers new ways to think about the various ways we interact with and use information, for example, in the discussion between arts and crafts. Ancient ideas of art and crafts did not see them as separable, rather they spanned what is now seen as high art and practical arts; these ideas "unites the beautiful and useful" (Ludlow, 2020) and both are vehicles for self-expression (Pöllänen, 2011), both representing some way of thinking about the world. Far more recently there developed a range of distinctions between art and crafts (Cox & Minahan, 2017). The boundaries between art and craft are often blurred and say more about gender and social status than the forms themselves (Cox & Minahan, 2017; Markowitz, 1994).[3] However, that there *are* a variety of forms and practices may be helpful in distinguishing between information practices and their nature.

For example, sculptors typically work in certain forms and materials. Extended practice of working with a material can reduce the approximation process, resulting in less need for experimentation and increasing the ability to see a final solution at earlier stages in the process. We can predict that those who work with certain types of information solution and certain domains of material can also create solutions more quickly and "see" possible solutions before others who are less experienced or knowledgeable because they understand the material better. Like sculptors who work in genres, information sculptors often work with certain types of sculpting (creating systematic reviews, writing policy reports, writing technical manuals, etc.) and gain advanced skills in some areas but not others. They become specialists in certain forms. By analogy we can also say that some information solutions are a matter of fashion and culture. Some may be seen as classic and timeless, but many go out of style and may become culturally inappropriate or seem outdated. Similarly, we can explore how concepts such as maker spaces, art collectives, workshops, and so forth help us understand how people collaborate on information solutions.

Sculpting and information sculpting both offer a range of solutions from basic decorative forms to more complex and powerful forms. Like sculpting, the evaluation criteria we apply to information solutions range from simple functional ones (e.g., does the solution work?), to more complex ones that can be multidimensional, or require experts to properly assess their value. Some aspects of this evaluation vocabulary may invoke ideas of functional aesthetics or fitness to form (Markowitz, 1994).

Sculpting with its material implications also opens up a new emphasis on the world of sensual properties, sensual forms of knowing (Howes & Classen, 2013) and the realm of sensory values "the meanings and values placed on senses" (Kristensen et al., 2022). Sculpting as a metaphor also can help introduce a stronger sense of perception and materiality into our discussions of information behavior.

Hartel and Savolainen in their study of visual metaphors proposed that "[p]erhaps buoyed by the work at hand, metaphor may emerge as a new topic in information science and innumerable unexamined metaphors like berrypicking (Bates, 1989) and small worlds (Chatman, 1999) will be thoroughly and creatively problematized" (Hartel & Savolainen, 2016). In this paper, I hope to add to the discussion on metaphor by proposing a new source of metaphorical thinking.

5 | CONCLUSION

This paper proposes that sculpting offers a useful analogy to think about creating information solutions. I have offered a series of analogical mappings with which to think about information use as a shaping activity and how sculpting as an analogy for information use may help us develop new thinking about information use.

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ENDNOTES
[1] Some of the ideas presented here were introduced in Ruthven (2022). This paper presents significant new material and a much fuller account of the proposals made there.

[2] Such as the work of the French artist Alben who recreates significant sculptures using contemporary materials, e.g., Venus de Barbie (Venus de Milo recreated using Barbie dolls) or Victoire de Samothrace Tsing Tao (Victory of Samothrace made of Chinese beer cans) (Kiilerich, 2021).

³ That the activities of marginalized groups are often deemed craft rather than art may encourage similar questions about information activities and how such activities can form resistance to dominant cultures, see for example discussions around craftivism (Greer, 2007).

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