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In this chapter I argue for cross-disciplinary perspectives on how we think about and manage '*information'* (in the sense of data that is not previously known, either by us, or by our intended audience), and link this to '. Common knowledge is a precise formulation of the everyday assumption that some parts of what we know are known to other people and so need not be made explicit to them. Those parts can be excised, as 'exformation' (parts of a message that can be removed by the sender, prior to transmission, without affecting the ability of recipients to understand the import of the message). In discussing those concepts and their implications, I consider the effects of some relevant human biases and social conventions on how we acquire, interpret, contest, discard, model and use information to inform *action* (in the formal sense of 'reasoned choice' as well as its everyday sense). To make this concrete, and to highlight the importance of disagreements, I use some brief case studies.

Introduction

The ubiquity of the term 'information' (and its kin, information *society*, *explosion* and *overload*) means that at a day-to-day level we risk taking information for granted. What we need is a way to *problematize* the notion of information, to view with fresh eyes our ways of noticing, sharing and interpreting it. That is one of the challenges we face in this chapter. Another challenge is that we are only human; and so our cognitive abilities are very limited; we are inattentive and easily distracted; we are poor at noticing things that we do not expect to see; and we misinterpret coincidences as causal relationships (e.g., Chabris & Simons, 2010).

Like the eponymous African child, whom it "took a whole village to raise", everyone and everything in our environment has an influence on how we think and what we think, both in general and in respect of 'information'. I am aware of – and indeed cannot fully escape – some of the influences I was subject to, as I was 'raised by', or exposed to, various 'villages' in my life (e.g., home, school, work, societal, academic disciplines). For example, I have a research background in Science, Engineering, Education, Psychology and Management, and look often at journals in those areas, but I rarely read journals from Arts and Humanities, limiting myself to coffee-table books. Inevitably, my familiarity with quantitative approaches, coupled with my relative ignorance of professional concerns in the Arts, introduces biases into my views about how information is conceived in the Arts. Additionally, like everyone, I am subject to various general judgemental biases, part of human decision-making, which have for decades been the subject of academic study (e.g., in the field of behavioural economics). Given the impact of biases and gaps, I devote part of this chapter to looking at how to reduce their effects, e.g. by sensitising ourselves to – then compensating for – any tendency we have to pay too much attention to some kinds of information (for example, expressed mathematically) and too little to other kinds.

The Von Neumann era

I begin with the early days of formalized models of information, and decision-making based upon them (e.g., economic-utility models and the theory of games and rational decision-making, as in von Neumann & Morgenstern, 1944). Not being an historian, my sense of the zeitgeist of that era is influenced by anecdotes from the 1940's, e.g. as recounted in the Television Series *The Ascent of Man* (Bronowski, 1973). They suggest to me that scientism (in the strong sense of belief in the universal applicability of science and mathematics and the lack of need for any other approach) was attractive to von Neumann and maybe other research pioneers. Their work was ground-breaking, so some arrogance (as in scientism) would be understandable, if unpalatable to people who found their work hard to understand. The latter group included many non-scientists at the time; a decade later, that lack of understanding was infamously characterized by C P Snow as the emergence of two cultures: science and arts.

The scientists, mathematicians and engineers of the time made major advances in machines and systems to transmit, receive and interpret data, and as part of that, to do some of the following to it: encode, decode, manipulate, codify. This yielded insights into ways to store and retrieve data securely and reliably, and ways to select and analyse data that yield high value information. 1940's examples of advances, influential today, include models of communication under noisy conditions (e.g., Shannon, 1948); identification of potentially loss-less ways to record information (the hologram: Gabor, 1948); and the Memex (Bush, 1945) with its imagined hyperlink-like mechanisms, useful for information retrieval, annotation, sharing and creating a collective memory.

Those remarkable achievements, and others (including ones that some of us might regret, such as the Atomic bomb), raised the status of scientists, and meant that their pronouncements were often accepted without question even when they were on matters far from the area of expertise of the speaker. Gradually that deference to scientists declined, partly as it became apparent that scientific advances brought social dilemmas that needed a humanistic perspective as part of a systemic perspective (e.g., today we see that medical breakthroughs enable old people to live longer but have implications for pension schemes; and that secure communications enable safe financial transactions but can be used by terrorists). Cross-disciplinary views on information might bring new insights into such dilemmas.

The various perspectives were familiar to Bronowski, as a polymath (biologist, chess contestant, literary editor, mathematician), and enabled him post-war to become a renowned radio and television presenter, where he expounded on science, ethics, philosophy and much else.

> "…science is also a source of power that walks close to government and that the state wants to harness…. It is not the business of science to inherit the earth, but to inherit the moral imagination; because without that man and beliefs and science will perish together." (Bronowski, 1973, p. 419)

Although a polymath, unlike von Neumann he was not a genius.

Communicating and Using Information

John von Neumann's rapid thinking created communication problems because no one could follow his reasoning unaided, or interpolate like him. Even when he explained each step in what for him was a pedestrian way, his colleagues could not keep up with him. Accordingly, early in

his career he made the steps easier, and spent time conceiving of, and developing and communicating workarounds for, ways in which his message would get transformed inappropriately when it was apprehended by particular individuals he worked with.

In terms of the transmitter-receiver model, he was able to introduce a modulation transfer function that corrected for errors and losses at the receiver end (his colleagues). When people did not understand, he could re-cognize (literally, re-think) how to adjust and re-present his message immediately, to ensure that it was received and understood by his audience as he wanted. He found simple ways to explain how he gained his insights. Thus, Bronowski (p. 433-435) says "…we once faced a problem together, and he said to me at once, 'Oh no, no, you are not seeing it. Your kind of visualising mind is not right for seeing this. Think of it abstractly. What is happening on this photograph of an explosion is that the first differential coefficient vanishes identically, and that is why what becomes visible is the trace of the second differential coefficient.' …I worked late into the night. [to find that he was right]".

Sadly, von Neumann did not document his success in anticipating how his slower colleagues saw things, and how he used that information to explain to them, as above, what to do to reach his conclusions. Eventually he seems to have dropped that compensatory approach to working with others, and restricted collaborations to a select few people, able to work at speed. One of his lines of research enabled him to study the consequences of variations in the capabilities of people and in their models of the world: he was a pioneer in game theory. Initially he was outgoing and engaging in relation to it, and ready to discuss some of the differences between the world of decision-making *as it could be* (according to his theory) and *as it is* (e.g., complete with human frailties, as per classic texts published since his time, such as Janis and Mann, 1977; Hogarth, 1980; Nisbett and Ross, 1980).

He worked in a way that seems to have been informed by humanistic perspectives as well as by science. Thus, Bronowski (p. 432) says:

> "I worked with Johnny von Neumann during the Second World War in England. He first talked to me about his Theory of Games in a taxi in London… And I naturally said to him, since I am an enthusiastic chess player, 'You mean, the theory of games like chess.' 'No, no,' he said. 'Chess is not a game. Chess is a well-defined form of computation. You may not be able to work out the answers, but in theory there must be a solution, a right procedure in any position. Now real games', he said, 'are not like that at all. Real life is not like that. Real life consists of bluffing, of little tactics of deception, of asking yourself what is the other man going to think I mean to do. And that is what games are about in my theory.'

In his research, then, he was well able to accommodate humanistic (human-focused) models of identifying and sharing information, the better to anticipate and handle individual differences in how people engage with and process data, and to anticipate how they turn data into information. Game theory as set out by von Neumann and his collaborators was of great potential value to decision-makers. The inability of many of society's decision-makers to understand that approach, and to use it to improve their performance, shaped von Neumann's views about how important decisions should be reached and by whom. According to Bronowski, he was 'in love with the aristocracy of intellect' (p. 435): he had an exaggerated trust in mathematics and science, and felt that key decisions on how to interpret information and how to make decisions based on it should be restricted to people familiar with the methods of those disciplines, since they were best able to

make effective use of the information available to them, in the sense of coming closest to the optimum outcomes predicted by game theory.

The issues that von Neumann tussled with are still with us:

> "One of the central issues in political philosophy is the problem of perspective: if there is a dispute as to how justice is to be defined, or a dispute as to whether a particular situation is unjust, how do we determine who is right? …all perspectives are ideological, partial, and rooted in interests." (Gordon, 1996, p. 85)

In the social sciences, there is much discussion of the conditions that make it possible to have a 'privileged perspective' on a topic, such as an insider's view, which is based on information not known to others (e.g., Martin, 2010). Research here indicates that it is very hard to become fully aware of the perspective we are taking, even though this may pervade our personal views on information (including how to think about it, what to include and exclude from our thinking, how to discuss it and how to reach conclusions about it). The more influence we have, the harder it seems to be to retain some objectivity:

> "The powerful are often accused of being …poor perspective takers... Indeed, perspective taking— stepping outside of one's own experience and imagining the emotions, perceptions, and motivations of another individual— seems the antithesis of the self-interested behavior often displayed by the powerful: …power is associated with increased difficulty in taking other individuals' perspectives. Individuals primed with power anchor too heavily on their own vantage points and demonstrate reduced accuracy when assessing the emotions and thoughts of others." (Galinsky, Magee et al, 2006).

Not "two cultures", but many

Von Neumann's ideas about power and decision-making influenced many people, perhaps including C P Snow. In 1959, Snow (in a talk reprinted in 1998) contentiously characterized scholars from the Arts and Humanities as ignorant of key ideas from Science, and scientists as well-read in counterpart areas in the Arts. As far as I can determine from a handful of internet searches, he had little firm evidence for his claim. He seems to have relied not on statistical data, but on very selective use of remembered conversations, not recorded at the time, with academics from different disciplines. Some of the people he talked to could well have fitted the stereotypes that he presented in his 'Two Cultures' talk. But finding some people who were like that did not justify a claim that most people were like that. He over-weighted information that favoured his views, and depended on rare cases (statistical out-liers) as his data points. This put him into Bad Science territory (Goldacre, 2008). Relevant here are 'salience' or 'availability' biases (e.g., Kahneman, Slovic & Tversky, 1982, p. 138).

Snow's stereotyping hit a nerve in his audience, got him noticed, and established the meme of two opposing cultures, arts and science. Intuitively, that division feels dated, far too crude, not of much help to us in our search for insights into 'information'.

For me, a more nuanced understanding of cultural differences (including how they arise, what their effects can be) comes from pursuing the metaphor of the African child, who benefitted from contact with everyone in the village. If lifelong learning is a journey, then a learner who takes that journey has the choice of depth or breadth.

Depth implies specialization: like repeating a route to a village with all possible variations, and living in the village under all possible weather conditions, until eventually they are an expert in everything associated with a village and can advise others.

Breadth implies experiencing life in enough villages not just to broaden horizons but to be able to compare villages and the lives that people live in them, and perhaps to be well-placed to choose a different life (or journey or horizon) for themselves or to advise others on doing that. By spending time with people from different villages, a learner may be better able to empathize, to see how each village sees, to view information in the ways that they do.

Some ways of experiencing information could differ radically from village to village. An example is experiencing where we are, relative to other objects. In English, we usually do this by reference to a coordinate system that starts with our body, e.g. Left, Right, In front of me, etc. Technically, these are called '*egocentric coordinates'*, since they assume a left-right axis on our bodies, plus a front-back axis. By contrast, I discover (by reading Deutscher, 2010) that there are languages which are completely different; they use *cardinal directions* (compass directions, fixed geographic directions, which are independent of our body position).

Metaphorically, a given village might correspond to a certain type of community, such as a community of purpose or practice. Each 'village' in a learner's life has its own perspectives, expectations, goals, resources, acceptable practices, and taboos; these may conflict with those of other villages the learner spends time in. Such a learner could have experiences that cause them to be either tolerant or intolerant of variations between villages, and to either wish to acquire or wish to reject the social skills, language skills and ways of thinking needed to fit into each village. Instead of choosing between Snow's imagined two cultures, and making that choice early in life (the school system, in the time of Snow), a learner today can use virtual worlds (like Linden Labs' *Second Life*) to experience hundreds of cultures online at any time, and can have a different persona in each of them, including personas that enable them to explore what it is like to be a fantastic creature, or someone with a different name, age, colour, religious belief, sex, ability, etc., and how those experiences affect their thinking and actions in other personas and the lives that go with them, including the life they were born into.

My contention, which I offer no evidence for, is that people who avail themselves of some of those Breadth experiences, using a range of personas, will think differently as a result, and this may affect their perceptions of, and attitudes to, each discipline's worldview regarding the nature of information. Anonymised analyses of the time that people spend online, and what they do online, show that a high and growing proportion of people with broadband connections now spend at least 30 hours per week online. The more experienced users have multiple online identities, in some cases running into dozens, which they use regularly and keep separate (e.g., reserving one identity per online 'village' they visit, which is revealed only to people from that village). The 'villages' in their online worlds may correspond to a range of purposes and forums for achieving those purposes (e.g., *Facebook*, personal social spaces and work-related spaces), with different communication styles (e.g., email, instant messaging, Twitter).

Re-tribalization

Social Science's media theorists have commented upon, and theorized about, differences in the ways in which different cultures are affected by, and develop their own perspectives on, new media and information channels. For example, John Culkin observed that:

> "Each culture develops its own sense-ratio to meet the demands of its environment. Each culture fashions its own perceptual grid and, therefore, each culture experiences reality in a unique manner. It is a question of degree. All perception is selective. We are all experts at discerning other people's patterns of selectivity. Our own is mercilessly hidden from us. Our own personal experience sets up one grid between us and reality. Our culture adds another one. Our language and our media system tighten the mesh. No one man, no one culture has a privileged key to reality. This is merely descriptive, not good or bad, just there." (Culkin, pp. 42-43 in Stearn, 1967)

The internet hosts many online 'villages', homes for like-minded groups of all types and sanities. Setting up and belonging to such groups is viewed by society as *legitimate* if the villages are led by trusted individuals and groups, and as *desirable* if the goals of the group are to solve societal problems or to pool resources for widely-desired ends (e.g., community-based science, to help to find the data equivalent of a needle in a haystack). By contrast, 'villages' are viewed negatively if we do not like the lifestyles/beliefs/ideas/motives/actions of the people associated with them. This is the route to spying and censorship by power groups, and compensating behaviour by those not in power, e.g., minority groups who try to hide their existence and their activities using technology introduced for privacy protection.

Such developments are commonplace when people become aware of different views. The flow of information about who is different, and in what ways, may be a factor in feeding conflict. This was predicted in the 1960's by Marshal McLuhan. As he famously argued, new channels for information (in his day, the mass media; today, social media and the internet) have the effect of 're-tribalizing' the world – they allow us, at some level, to build communication channels and social groups that eventually lead to disputacious 'global villages':

> "The more you create village conditions, the more discontinuity and division and diversity. The global village absolutely ensures maximal disagreement on all points. It never occurred to me that uniformity and tranquility were the properties of the global village. It has more spite and envy. The spaces and times are pulled out from between people. A world in which people encounter each other in depth all of the time." (McLuhan, p. 314 in Stearn, 1967)

One challenge that emerges from this is how to avoid attacking people in other villages, and rejecting their ideas, when they are expressed in a way that we feel uncomfortable with, as "not how people in our village talk", or when they show a misunderstanding of our own position. Below, I give an example of one of the information battles that we see periodically between academics in the Sciences, Social Sciences, Arts and Humanities.

To set the scene, I shall first give an example of the approach to information of some non-scientists. They may use the methodological or analytical device of 'problematizing': they take a familiar piece of information, and interrogate it from multiple perspectives, as if it were unfamiliar. The kind of discussion that results is captured in this interchange between post-structuralist philosophers, Michel Foucault and Gilles Deleuze:

> FOUCAULT: 'The intellectual's role is …to struggle against the forms of power that transform him into its object and instrument in the sphere of "knowledge," "truth," "consciousness," and "discourse." In this sense theory does not express, translate, or serve to apply practice: it is practice. But it is … a struggle aimed at revealing and undermining

> power where it is most invisible and insidious. … A "theory " is the regional system of this struggle.
>
> DELEUZE: Precisely. A theory is exactly like a box of tools. It has nothing to do with the signifier. It must be useful. It must function. And not for itself. If no one uses it, beginning with the theoretician himself (who then ceases to be a theoretician), then the theory is worthless or the moment is inappropriate.' (Foucault and Bouchard, 1977, p. 208).

Through such devices, their followers claim it is possible to accomplish a degree of distancing from raw information, to begin to see the object of interrogation with fresh eyes, and thereby tease out and examine systematically its usually un-noticed or un-remarked-upon aspects and maybe be better placed to think about the difference between idealized cases (e.g., 'expressed' views, as in theories of information) and what people actually do (e.g., 'revealed' views, as in actual practice in collecting and using information); see eg (Dowding, 2008).

I leave to others the discussion of whether it is possible to distance ourselves from information. Here, my interest is in the reactions of some scientists to such pronouncements: they declare them as *devoid of value*, *information-free*, "*not even wrong*" (an insult used by the physicist Wolfgang Pauli to describe claims that could not be used to make predictions that could be tested – falsified, in his terms), or as "*wronger than wrong*" (used by the author Isaac Asimov of people who equate two errors, when one error is wronger than the other).

Academic tribes and their views of information

Practice varies widely across different academic disciplines, and their professional publications, regarding what counts as information; what pieces of information are worth sharing; what authors then say about that information; how they say it; and how they provide a context for it (e.g., how they relate it to the work of their peers; what they say about the assumptions they are making; what they say about the novelty and importance of their work).

As an example, the highly-regarded scientific journal *Nature* requires prospective authors to present their findings in a manner that is immediately very accessible to scientists who specialize in an area, but is condensed as much as possible (to maximize the number of papers that can be published in each issue of the journal). The result is that articles get submitted in an immediately recognizable style, familiar to and appreciated by the specialists it is intended for, since it allows a lot of precise information to be conveyed tersely and quickly to the people who need to read it.

The very practices that make a stylized publication efficient for its audience, may have the effect of reducing its usability for other audiences, including novices in the discipline, and outsiders (non-specialists). On the face of it, differences in practices have little or no bearing on our notions of information, but perhaps a subtle problem does exist, which pervades our attitudes to what counts as legitimate viewpoints about information: could it be that people who are familiar with practices and disciplines which are accorded high status (e.g., traditionally the sciences, mathematics, engineering) have reduced respect for anyone from 'lesser' disciplines who is unfamiliar with mainstream practices and ideas from high-status disciplines?

The Conservapedia and Sokal disputes

Information can generate heat or light in a debate, depending on the nature and trustworthiness of the information, and the backgrounds, beliefs and information-processing abilities of the people who are trying to use the information. More information does not necessarily change outcomes.

My first example is the creationist Andrew Schlafly. He is sceptical of scientific publications and research that run counter to the line he and his backers take on their website Conservapedia. He has no scientific background, so is ill-equipped to make the same kinds of judgements as professional scientists, and is therefore at risk of not being taken seriously by them if he does have a valid criticism to make. This led to a prolonged battle between him and Dr Lenski, a member of the National Academy of Science, who reported preliminary results from a decades-long study of mutations of the bacterium E. coli, which eventually captured hard-to-refute evidence of evolution happening. This was a hot dispute, as can be judged from this extract. While each mail provoked more information, neither side changed their position:

> Dear Mr. Schlafly: I tried to be polite, civil and respectful in my reply to your first email, despite its rude tone and uninformed content. …You wrote: "I did skim Lenski's paper …" If you have not even read the original paper, how do you have any basis of understanding from which to question, much less criticize, the data that are presented therein? Second, your capacity to misinterpret and/or misrepresent facts is plain… So, will we share the bacteria? Of course we will, with competent scientists… I'm confident that some highly qualified scientists would join the fray, examine the strains, and sort out who was right and who was wrong. That's the way science works. …I would also generally ask what the requesting scientist intends to do with our strains. Why? …we are continuing our work with these strains, ... I would not be happy to see our work "scooped" by another team ... (Lenski Affair, 2010).

My second example shows a scientist as an aggressor. His target was postmodern studies, whose followers occasionally comment upon the perspectives, practices, objectivity and findings of science. Their comments are not always informed. This leads to occasional battles with scientists. Each side ridicules each other's practices and conversations. In this case, a publishing hoax was perpetrated on *Social Text*, a journal of postmodern cultural studies, by Alan Sokal, a physicist at New York University. He submitted an article that he had designed to seem to echo the beliefs of the editors about maths and physics, but which contained nonsense (from his perspective) – *tainted information*, if you will. To create that nonsense, he intermixed scientific terms with phrases, quotations and references that were typical of articles in postmodern cultural studies. The article was accepted for publication, allowing him to claim that the journal lacked intellectual rigour. According to the Wikipedia account,

> Sokal wrote "Transgressing the Boundaries: Towards a Transformative Hermeneutics of Quantum Gravity", an article proposing that quantum gravity has progressive political implications, and that the "morphogenetic field" (a New Age concept by Rupert Sheldrake) could be a cutting-edge theory of quantum gravity. He concluded that, since "physical reality" is, at bottom, a social and linguistic construct, a "liberatory science" and an "emancipatory mathematics", spurning "the elite caste canon of 'high science'", must be established for a "postmodern science [that] provide[s] powerful intellectual support for the progressive political project."

> On its date of publication… Sokal revealed that the article was a hoax, identifying it as "a pastiche of left-wing cant, fawning references, grandiose quotations, and outright nonsense …structured around the silliest quotations [by postmodernist academics he] could find about mathematics and physics". (Sokal affair, 2010).

Common Knowledge and Exformation

In our conversations in a metaphorical 'village', and our journeys to different villages, we may encounter information that cannot be trusted, and information that we cannot understand (maybe it requires background information that we do not possess).

If the sender and receiver of a message share prior knowledge that is relevant to the message, then it may be possible to predict which parts of the data in the message can be trusted, and which parts can be excised without harming the message.

'Exformation' is what is left in information after we have removed all the knowledge that the sender and the recipient have in common. The term was coined by Nørretranders (1998).

'Common knowledge' (Paternotte, 2010) is an idealized state of group knowledge, when the knowledge in question is transparent for everyone in the group and goes without saying: they all know about it; everyone in the group knows that they all know it; they all know that they all know that they know it, etc.

In theory, if a state of common knowledge existed, then we could minimize the data that we would need to include in a message, reaching a state of perfect exformation.

Onlookers who lack any common knowledge are unlikely to understand exformation. A classic example is the telegram reputedly sent from India to England by an Englishman to report the capture of Sind. It had just one word: *Peccavi*, whose significance was not understood by anyone who saw the telegram on its way across India, but was immediately clear when it reached England and its intended recipients. To explain: at that time, all officials in England would have learned Latin at school (so would immediately recognize peccavi was a Latin word, meaning "I have sinned"). In addition, they would have learned to make puns in Latin (hence "I have Sind", an elegant solution to ensuring the secrecy of the message until it reached England).

Personal judgement enters into what we count as exformation or information. On a particular day, the dataset for that day may be judged by someone as highly valued 'information' that they have found meaning in; at a different time, the dataset for that day may be judged by the same person as new to them, but of low value or even as value-less (e.g., they may no longer want or need the information).

Conclusion

Our experiences (including our education and training) and the company we keep (including online, in virtual 'villages') may condition not only how we use information, but what we *think* about the nature of that information, which may differ from what we *say* about it (e.g., what we say about our intentions, our preferences, our models of the world, our model of information). This mundane observation is so much a part of our everyday experience, and so conditions our thinking, that it is worth occasionally reflecting upon these mundane aspects of life, and checking the viewpoint of others.

Having access to information is not the same thing as using it appropriately. The Conservapedia and Sokal disputes showed that. Information models have been extended since the time of Shannon and von Neumann, to include human capabilities and limitations, and attention has shifted from developing normative models of idealized behaviour, to studying how people behave under naturalistic conditions, for example how they use real-world information to make everyday decisions. From such work, new insights emerged. An example is the outcome of psychological studies in the past decade by Daniel Ariely, Elie Ofek and Marco Bertini (recounted in Ariely, 2008), which showed that even elite groups familiar with mathematics and probably familiar with game theory (e.g., MIT students) often make choices that are irrational (e.g., because we have undependable intuitions) but are predictable.

Such factors affect (contaminate?) our formal and informal models of the world; the meanings we find in information; and our intuitions and reasoning about information, about how to inform action, and about how to compensate for biases. Our personal experiences (recent and long-past), coupled with the decision-making biases that vary from person to person and from time to time, affect not just the day-to-day judgements we make, but also our deeper and usually unexamined assumptions about information. This has a bearing on the following: our decisions about what counts as data that we should pay attention to ('facts'), and what counts as data we can discard; the patterns we find (or think we have found) in data; what we count as 'information' of a particular kind, and how we categorize that information so that we can share it; what personal notes or summaries of information will be adequate, to enable us at a later time to recall our current understanding of that information, and then make effective use of it; deciding, when sharing information, which aspects of the information are already known to the people we are sharing with; and what kinds of information are likely to be a reliable basis for informed action.

Finally, information means different things to different people, even in the same 'village'. With our current state of knowledge about the brain and about human communication, we cannot achieve quite the same understanding as someone else, although we may aspire to this. The science fiction author Robert A Heinlein coined the term *Grok* to represent the ideal. The Oxford English Dictionary defines *grok* as "to understand intuitively or by empathy; to establish rapport with". By blending insights from more areas of human knowledge, we may come closer to this.

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