

Better Understanding Knowledge for Personal and Business Success

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1. Introduction

Learning, creativity, leadership and communities are all key to business success. All of these can be better understood in the context of data, information, knowledge and mental models. A first purpose of this paper is to make some of these links. A subsidiary purpose is to show how the additional understanding this gives can help in formulating solutions to common business and knowledge problems.

The paper starts by explaining the qualitative difference between data, information and knowledge and how they relate to each other, The importance of perceptual and conceptual filters in finding the patterns in data is identified as is the way that these patterns derive from our mental models. The ways that we change our mental models as we learn is then discussed and the importance of this learning to leadership is emphasised. Finally we investigate the way that communication produces learning, as data and information pass through our unique filters, and we identify the importance of common mental models to communities of practice.

The basis of this paper is a model of the learning process provided by Max Boisot. Like many models this one is a considerable simplification – in this case of the current understanding of cognitive processes, but is nonetheless extremely useful for understanding certain key business processes. We use this model and extend it to demonstrate the links indicated above. By using consistent language and diagrams in our descriptions it is hoped that the reader will be led to a new understanding of the knowledge concept and its relation to learning, mental models and key factors in business success.

2. Data, Information and Knowledge

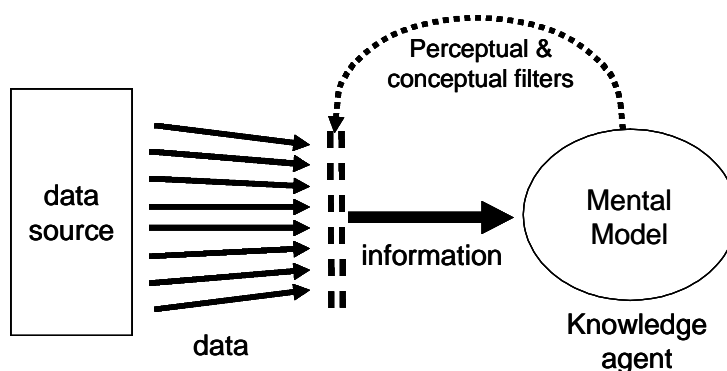


Figure 1: The original Boisot model

The Boisot model is an attempt to show the relationship between data, information and Knowledge. Data is the raw material of input; Information the pattern that we impose on or

extract from the data – enabling us to replace lots of pieces of data with one piece of information. An example would be looking at a spreadsheet of the last quarters financial data. A few minutes later we do not remember all the details but we would remember that a colleague had seriously overspent their budget – that is the information. The pattern we have recognised here is based in our understanding of what the numbers mean and knowing that budgets should balance. The translation of data into information is performed by a Knowledge Agent – us. This emphasises the active nature of knowledge; knowledge is always involved in doing something for a purpose.

This clarity in understanding the distinctions and relationships between data, information and knowledge can be invaluable in many areas – take for example a design for a web interface to a database: To deliver the correct information to the user we need to know what they – the knowledge agent – will use it for. This helps define the information they need to see, and what they don't need, and how they need to see it. This in turn defines many elements of the interface content and layout and puts requirement on the conversion of the data from the database into the required summary form – the information.

Although the Boisot model refers to data input, this data may be input from a variety of sources: It may be an observation – i.e. unsolicited data. It may be communication – i.e. information already structured by someone else – in the form of speech, a book, a database record, a TV presentation etc.. or it may be feedback - the results of a test designed by the knowledge agent. These cases are discussed in more detail below.

The filters on the data input which reveal the pattern, enabling the conversion of data to information, are imposed by the knowledge agent. These filters come in two forms – perceptual filters and conceptual filters.

3. Input Filters

Perceptual filters:

Perceptual filters relate to our perceptual input – how we perceive the world through our senses. Most people have little problem in seeing colours or in hearing sounds, but with the other senses – touch, taste and smell - perceptual sensitivity can be significantly developed through practice; the wine taster or the perfumer are examples of this. Sometimes our perception is enhanced or developed by related activities – when we have a new car, we suddenly notice all the similar cars on the road.

There is subtlety too in how we respond to sensory input – for example, some people are most receptive when diagrams are presented in bright colours, but some prefer pastels. In film and TV some like handheld camera work whereas some prefer the camera to be fixed. Some will respond well to the mood evoked by background music while others just find it irritating.

People also have preferences for which perceptual input they can best relate to. Some take data in best through a visual medium, others as the written word, others as sound – some like poems, others paintings.

Awareness of this in business can have many uses: It is well worth taking into account that the executive who likes poetry but doesn't appreciate paintings may be more receptive to your ideas if you present her with a concise written report rather than a glossy presentation. If your audience are unknown to you, a balance of verbal explanation / written words and diagrams / illustrations is most likely to hit the mark.

Conceptual filters:

Data is also input through a set of conceptual filters, which are based in our understanding and experience of the world. It is easy to see how our understanding of a subject transforms our appreciation of it: For example, a doctor can tell by prodding us in various places and asking one or two simple questions, what is most likely to be wrong with us – whereas anyone else doing this would not get any useful information.

Our conceptual filters are also influenced by other factors – such as our beliefs, our environment, our experiences of life. Some of these will be common to people working in the same business and it is very easy to assume that attitudes and ways of thinking and working are universal – when really they are part of a company culture and may even be unusual in other businesses.

If we can step outside the business we can look at the corporate conceptual filters – this can often only be done with the help of outsiders, the consultants. How do the corporate filters affect business success? – for example, are business processes treated as hoops to be jumped through and boxes to tick or as valuable, operational aids?

4. Mental Models

Training and experience produce a set of mental models which are capable of managing and understanding data and information for a given field. The mental models provide the filters that extract meaningful information from the data that bombards us. Individual knowledge is the sum of our mental models and through it we – the knowledge agent - process data and information to produce action and change..

Our mental models determine how we react to all incoming data and information. The assemblages of mental models that makes up “us” are different because we all have different experiences. So our experiences and other factors determine our mental models, and in consequence we all experience the world differently - how differently can be truly staggering:

How often have you wondered if you have been watching the same TV program as your friends when you come to discuss it with them? You noticed one set of things, they noticed another. You thought it was brilliant and original - they thought it was boring and just like all the others. Even more obviously - a football match from the perspective of a supporter of each of the two competing teams is quite different - leaving one elated and the other despondent. But both watched the same game. This really confirms the thesis that we don't actually live in reality – we live in a world that we have created from our mental models and filters.

The awareness that some of our mental models are company specific can be very useful in preventing misunderstandings when dealing with suppliers and customers. Awareness of company culture is even more essential when trying to merge two or more businesses after acquisitions – there are many cases of mergers that fail because the executives don't believe in company “cultures” – others, notably GE, who tackle the issue head on, are far more successful.

5. Changing our Mental Models

We all have a different assemblage of mental models and hence we all have unique knowledge. Knowledge is "in the head" and not in documents - which contain data or pre-filtered information, or in computer programs – which can contain data, information and even

the “filters”. Knowledge is in essence a set of patterns stored in memory that helps us make sense of the world for a purpose. That purpose may just be recognition, or it may be learning or action.

To introduce an analogy, our knowledge may be thought of as a large jigsaw - with the pieces equivalent to mental models – often with pieces missing or fitting together poorly. Some of our mental models have the role of deciding where a new piece of information fits or if it cannot be recognized. In some people a new piece would be put aside for later incorporation if it doesn’t fit, while in others it would be discarded if it did not fit straight away. The former case might be of someone who is a good learner – the latter person may be more resistant to change.

Sometimes a new piece of information can be put together with other pieces of retained information to create a new piece (a new mental model) and this in turn completes a part of the puzzle and a new picture becomes clearer. Sometimes a new piece creates just enough of a picture for us to guess what it may be about - sometimes incorrectly. More pieces may then change the realization. Sometimes a new piece can make us realize that our interpretation of a picture has been completely wrong. Some people are happy for new pieces to displace old ones if they fit better and change other pictures entirely. Others would discard the pieces rather than try this - because there were no places left in the misconstructured picture. When a piece influences and changes our understanding of a picture – then it may be called an insight. It has changed our mental model. We have created new understanding – new knowledge.

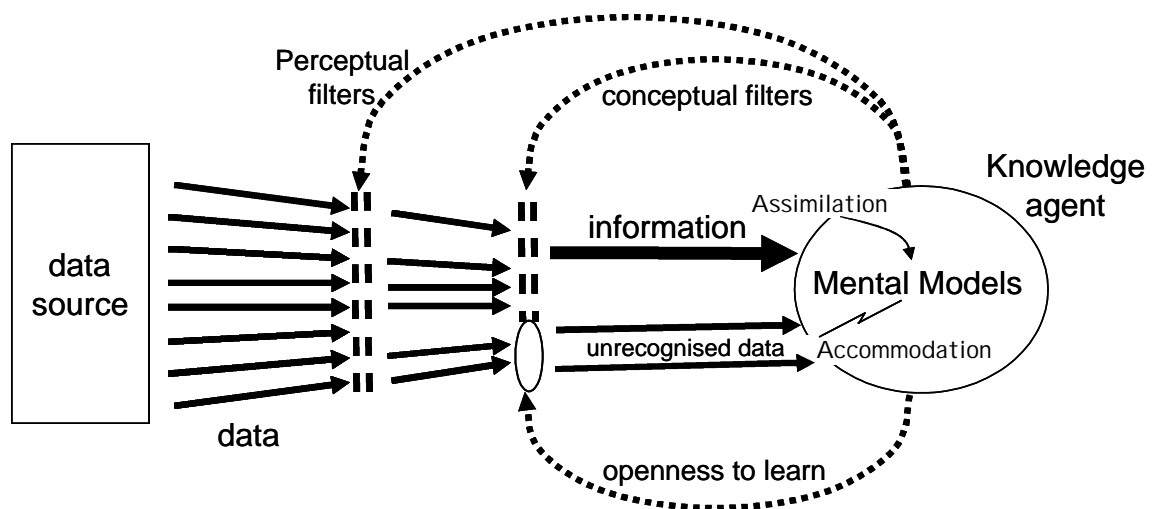


Figure 2: Learning through assimilation and accommodation

Completing the jigsaw is an aspect of our internal drive to create a coherent set of mental models, a consistent construct of the world and how it works. This intentionality was recognized by Jean Piaget. In his theory of cognitive development building the mental models proceeds through assimilation and accommodation. Assimilation involves the interpretation of events in terms of existing mental models. Accommodation refers to changing the mental models to make sense of the environment. Regulating the balance between these two is a process called equilibration.

Equilibration is an important regulatory mechanism that maintains a functional balance between assimilation and accommodation to facilitate cognitive growth. When children and adolescents encounter something reasonably similar to what they already know, it is assimilated into their existing knowledge. On the other hand, when they encounter something different from what they know, they either ignore it or change their way of thinking to accommodate this new knowledge. Hence the mental model is either modified or

fundamentally changed. The modification of the Boisot model to incorporate this concept (above) is perhaps a step too far, but it does help provide a consistent visual reminder.

6. Learning and Leadership

The corollary to “all knowledge is unique” is “all learning is individual”. Clearly if learning is the generation of new patterns "in the head", changing our mental models by assimilation and accommodation, then it must be individual.

Generation of new patterns, that allow data to be converted into meaningful information and the world to be understood in new ways, is knowledge creation. So, at the individual level, knowledge creation is the same as learning. The parallel inventions of a new technology can be virtually simultaneous, often resulting in patent battles in courts, but both (all) the inventions can be the result of genuine and independent creation of knowledge.

We have already mentioned the possibility that the filters can be "closed" or "open" in different individuals - whether they have a “you can’t teach an old dog new tricks” attitude, or a learning approach to the world. We all know people who develop closed minds in their early adulthood and are not remotely interested in changing their views. At the other extreme are the pensioners enthusiastically grappling with new technology, new careers, new relationships.

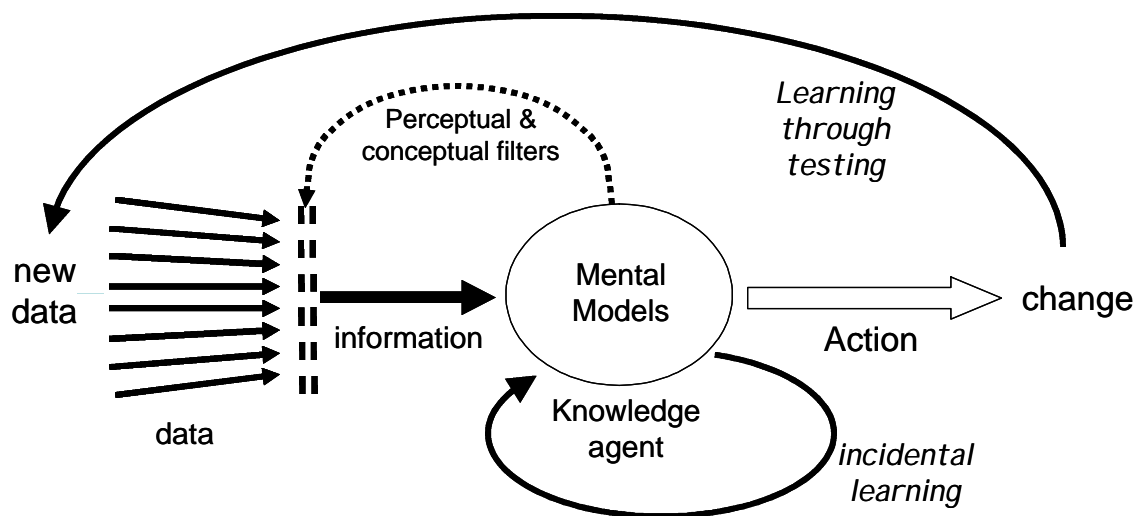


Figure 3: Learning loops modifying mental models

One might think that setting up tests to aid learning is a sign of a learning attitude, but this is often far from the truth. In R&D departments it is only too easy for testing to be designed to confirm a hypothesis, often unconsciously – perhaps to keep a new product development on course. The true scientific method requires that testing should attempt to disprove a hypothesis. Some corporate cultures extend the same patterns to all aspects: See the contrast between businesses which only promote “company men and women” versus those which encourage dissent and challenge to the status quo leading to new approaches, products and learning.

It is notable that in his classic work on leadership, (‘On becoming a Leader’), Warren Bennis identifies that one thing a selection of key leaders have in common is that each of them has

continued to grow and develop throughout their lives and that leaders are adult learners. The importance of mental models and the need to be able to change them, and even abandon them as part of learning is summarized as well: “as Satchel Paige is supposed to have said, “It’s not what you don’t know that hurts you, it’s what you know that just ain’t so””.

It is unfortunate that in many corporate cultures it is the highly directive managers who are most likely to succeed through their decisiveness and even ruthlessness. Doubtless this is because finding anyone who will even make a decision is still subject for jubilation in many organisations. However, a directive style is the antithesis of the questioning and learning leader advocated by Jack Welch. An eagerness to take a decision - any decision - and frequently the wrong decision, is undoubtedly the cause of many minor and some major business disasters. The problem of too many directive managers can be tackled by revised promotion priorities and sometimes executive coaching. Only in this way can learning organisations be built from the top down.

7. Communication, Miscommunication & Creative Teams

If all learning is individual, then communication is an individual knowledge creation process, because the “listener” is learning. Knowledge cannot be exchanged, on the contrary: Communication is a process whereby knowledge is codified into information in the form of speech or text or some other medium and that information is then reconverted (or not!) to new knowledge by the recipient. However, when knowledge is codified into words it is changed.

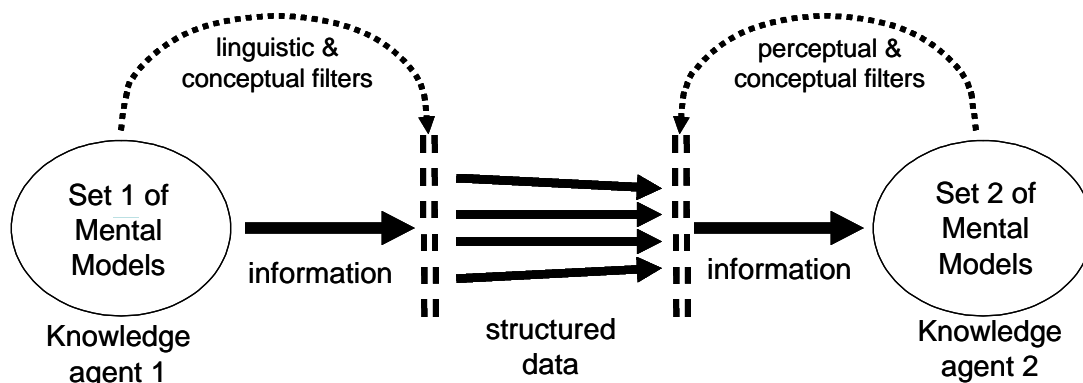


Figure 4: Communication as learning.

We all use the structure of language to describe our mental models, our models of the world. Three primary processes are used in this structuring: deletion, generalization and distortion.

Deletion describes a process of filtering out what we prefer to ignore – i.e. what does not fit with our mental models of the world. Using deletion in communication means that we either don’t refer to something at all, or we refer to it obliquely. e.g. “People know enough about it.”.

Generalization describes the process of applying the patterns in our mental models to a wider set of circumstances than may be appropriate. Typically generalizations use general words like “never, always, all” as in the example “All bosses do that after a while.” Sometimes these words are implied as in “Japanese firms are good employers.”.

Distortion describes the process of applying our mental model to misinterpret something said by another – who of course has their own, and different, mental model. From this, meaning can be inappropriately attributed. National cultural differences are a real problem in this area

– a good example is the contrast between the north American tendency to enthusiasm and overstatement against the European tendency to reserve and understatement.

So because the speaker (or communicator) has one set of mental models and the listener (or recipient) has another, the process of communication is often one of miscommunication. There are also opportunities for miscommunication from different levels of understanding of the subject matter. So, the more different the mental models of the communicator and the recipient (within reason), the more the new knowledge created by the recipient will differ from the knowledge held by the communicator. If the key mental models differ too much, or if the recipient does not have a learning approach, then it is likely that the recipient will just filter out the communicated information and move on.

This process has a positive as well as a negative aspect. This can be seen in the process of knowledge creation in teams. Creative teams need a clear direction and an environment and enablers to allow them to be creative without too much interference. Given these factors, for them to create as teams rather than individuals, there needs to be communication. In this creative team communication, information is thrown back and forth. As this happens it is continuously changed by deletion, generalization and distortion and reinterpreted by each individual's mental models – so there is continuous learning and knowledge creation, and through refinement, a common understanding of this new knowledge comes about. So creative teams rely heavily on the miscommunication that results from applying the filters of our mental models to the information exchange.

Self-awareness of these processes in communication and of the different mental models that we have can be developed through effective diversity awareness training and strong facilitation of teams and other corporate groupings. This can greatly reduce misunderstanding and improve decision making.

8. Knowledge Sharing and Communities of Practice

If all knowledge is individual, then knowledge sharing is not really possible, because individual knowledge depends on all the experiences which have contrived to produce the highly individual mental models that we all have. However, in many roles in business, it is necessary for more than one individual to carry out a task – as in a newspaper office, or in claims adjustment, or on a supermarket till. It is not always the case that everyone must carry out the task in exactly the same way, and indeed sometimes there is variety in the tasks required (e.g. the newspaper office). Despite the commonality of their practice, the individuals in a community will always have unique understanding and will make a unique contribution. However, the common approach and understanding to carrying out and completing tasks is essential to maintain the consistency that clients and customers expect.

Although knowledge cannot be shared, information can be. As we saw in the case of creative teams, the more communication there is, the more it is possible to build a common, shared, understanding – a common mental model. This is reinforced by the common experience of doing the job and shared information plus common experience produces a community of practice. The community of practice can operate at many levels: from a group of people doing identical jobs in the same place – frequently helping each other, to another group working on similar activities in different places, possibly even for different employees. The closeness of the communities of practice can be found from the degree of commonality in the mental models of the participants. The greater the commonality in the mental models, the more the knowledge is aligned and the greater the chance of getting the same result from the different participants. Assuming that a community produces work following a best practice, then this must be a good thing.

Mental models can be aligned at several different levels – these range from environment, through behaviours, skills and capabilities, beliefs and values to identity. These are known as the “logical levels” and Robert Dilts (“Visionary Leadership Skills”) discusses this in some detail. The higher the logical level at which a community is aligned, the more their mental models are aligned and the more they will think alike. This will enhance their ability to deliver work to a common best-practice standard.

9. Conclusion

Data, information, knowledge and mental models are closely related concepts that differ qualitatively from each other but have a known and simple relationship to each other. This is well-expressed by Boisot in the diagram which has been used, in various modified forms, as a metaphor throughout this paper. The additional understanding of the relationships between these concepts that this metaphor provides helps when managing individuals, teams and whole organisations more effectively, or even in areas such as designing a web interface.

Understanding the importance of mental models to how people learn (or don’t), how they communicate, how they interact during creative or day-to-day activities is also key to managing ourselves and others. Peter Senge shows clearly the importance of the nature and the alignment of mental models for building the learning organization. Wenger and others show the importance of aligning mental models for building communities of practice. Knowing our own mental models is key, as Warren Bennis says, to being an effective leader. Being able to change our mental models is even more important if we are to improve personal and business performance.

The growth in self-understanding that derives from insight into how we process data, information and knowledge can be key to the personal change that leads to higher productivity and self realisation.

10. Further Reading

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