

Complexity, Bureaucracy and the Information Space

By Lam Chuan Leong

In an increasingly complex world, success will depend not just on the acquisition of knowledge but on how knowledge is structured and shared. Lam Chuan Leong introduces Max Boisot's concept of the *Information Space* or *I-space* which maps the degree to which knowledge is codified, abstracted and diffused. Mr Lam uses a version of this framework to analyse the evolution of Singapore's bureaucracy. He applies it to the idea of networked government to highlight the various forms this might take, and the trade-offs each would entail. Finally, he applies the I-space framework to the development path of nations to discuss their possible trajectories and the implications this might have for Singapore.

This is an edited excerpt of a paper presented at the first *Strategic Perspectives Conference* held on 30 August.

Defining Complexity

Complexity can be defined as those situations where the link between cause and effect is weak or non-existent. This is the non-ordered domain in the Cynefin diagram from David Snowden (Figure 1).¹

A suitable metaphor would be that an Ordered Domain is a Zoo whilst an Un-ordered Domain is a Jungle. In a Zoo, the feeding times and environment have a certain routine or regularity. The Jungle is full of the unexpected.

Over the last 300 years, the success of science and technology has led us to think that the world is largely a Zoo. However, there is recognition that, increasingly, there is more Jungle than Zoo.

This is because economies and human society consist of human beings who can interact amongst themselves and also influence their environment in a large variety of ways. Such

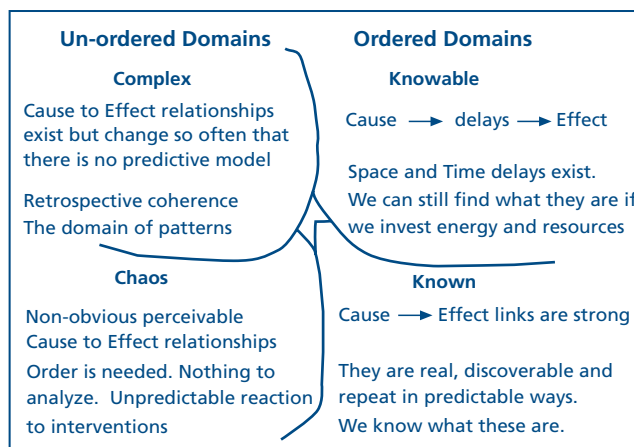


Figure1: Cynefin Domains. Source: Snowden and Kurtz, 468.

¹ David J. Snowden and C. F. Kurtz, "The New Dynamics of Strategy: Sense-Making in a Complex and Complicated World", *IBM Systems Journal* 42(2003):462-483.

systems can “learn” and eventually produce outcomes or emergent behaviour that are impossible to predict ahead of time.

Knowledge Codification and Abstraction

Man­kind’s ability to cope with complex­ity is highly dependent on its ability to codify in­for­ma­tion and use ab­stract knowl­edge. Codification is the process of capturing knowl­edge in the succinct form of a code. Abstraction is the extension of this code to more categories of phenomena and thus generalises the application of the code.

An example will make this clearer. For thousands of years, the motion of planets in the skies was a source of marvel, speculation and even fear. Astronomers in ancient Greece and China devoted vast resources to measuring and plotting their motions. This knowledge was treasured as a source of philosophical wonder and divination. It was an occult art known only to the initiated who spent years mastering this arcane knowledge.

In the seventeenth century, the Copernican-Kepler Revolution swept aside this stupendous amount of study with a single sentence: that planets go around the sun as an ellipse with the sun at one of its foci. This is a most elegant example of codification: An entire study is condensed into a one-sentence code.

But that is not the end. Newtonian mechanics subsequently established that this principle applied not just to planets. Any object, from comets to asteroids, would go around in the same way. Furthermore, the force that constrains planets to move this way is the same as that which causes objects to fall to the ground. This is an example of generalising the Kepler code across different categories of phenomena.

This example also illustrates another important characteristic of knowledge, namely, how easily and how far it can be diffused. It would have taken an astronomer in antiquity years if not decades of study to understand the heavenly movements of planets. Today, any secondary school student with a rudimentary

knowledge of geometry or algebra can easily learn this in days. Thus, codified and abstract information or structured knowledge is more easily transferred across societies.

The key point to note, therefore, is that structured knowledge and its easy diffusion are essential for reducing complexity. This is the essence of learning and knowledge management.

The Information Space

Max Boisot has developed an interesting framework for examining knowledge management by examining the codification/abstraction of information against the extent of its diffusion.²

Various types of transactions, organisation structures and national cultures can be mapped into what is called the Information Space or I-space.

Boisot has identified four main types of organisation structures, namely, fiefs, clans, markets and bureaucracy.

Table 1: Characteristics of Organisation Types. Source: Max Boisot, *Knowledge Assets*, 127.

	Bureaucracies	Fiefs	Clans	Markets
Information Diffusion	Limited, under central control	Limited by lack of codification	Diffused but still limited	Widely diffused, no control
Relationships	Impersonal & hierarchical	Personal & hierarchical	Personal but non-hierarchical	Impersonal & competitive
Submission to super-ordinate goals	Yes	Yes	Shared goals through negotiation	No, each for himself
Coordination	Hierarchical	Hierarchical	Horizontal through negotiation	Horizontal through negotiation self regulation
Necessity to share values & beliefs	No	Yes	Yes	No

He has also plotted these organisation types onto the Information Space (Figure 2).

² This paper presents a modified version of the Information Space described in Max Boisot in *Knowledge Assets: Securing Competitive Advantage in the Information Economy* (Oxford, Oxford UP: 1998) and *Information Space: A Framework for Learning in Organizations, Institutions and Culture* (London, Routledge: 1995). Boisot’s I-space has three dimensions: codification, abstraction and diffusion. This paper focuses on two dimensions of the I-space: codification and diffusion. Figures 2 and 3 are adapted from Chapter 6 of *Knowledge Assets*.

One notable property of this I-space is that the space is not empty or neutral. Social learning dynamics can be modeled as trajectories through the I-space. In particular, a south-easterly movement along the I-space implies an increase in complexity (Figure 3).

Evolution of the Singapore Bureaucracy

The I-space can be used to analyse the evolution of bureaucracy in Singapore (Figure 4). Over the last two decades, Singapore’s bureaucracy has spun off many activities towards the east in the market direction. Examples include the liberalisation policies, spinning off companies like Singpower and Singtel, and a more disclosure-based regulatory regime in the banking sector.

Another portion has been spun off in the southeast direction in the form of statutory boards, NGOs and lately, PPPs or Public Private Partnerships. A move in this direction is a move towards more complexity.

PPPs are more complex than traditional procurement. Over the lifetime of a PPP project, negotiations would be needed over expected and unforeseen changes. This lower degree of codification or rule-based process is seen by some as an impediment to PPP adoption.

Networked Government

The I-space framework can also be applied to networked government. In thinking of networked government, it is useful to consider it as divided into four levels.

Level	Example
Communications	Intranet
Processes	eGovernment
Knowledge	KM sharing, sense-making, horizon scanning
Mindset	Project work, workshops, training

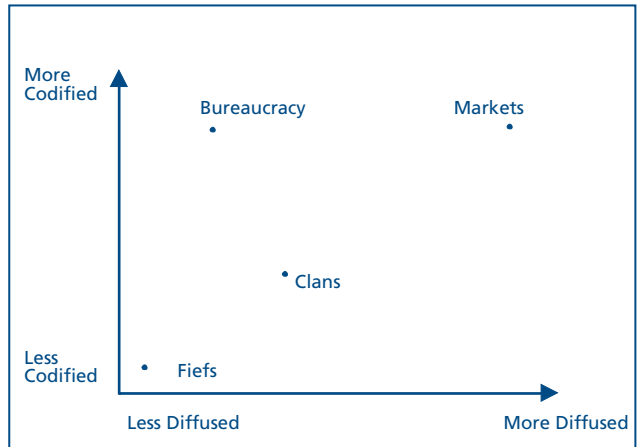


Figure 2: Organisation Types in the Information Space. Adapted from Max Boisot.

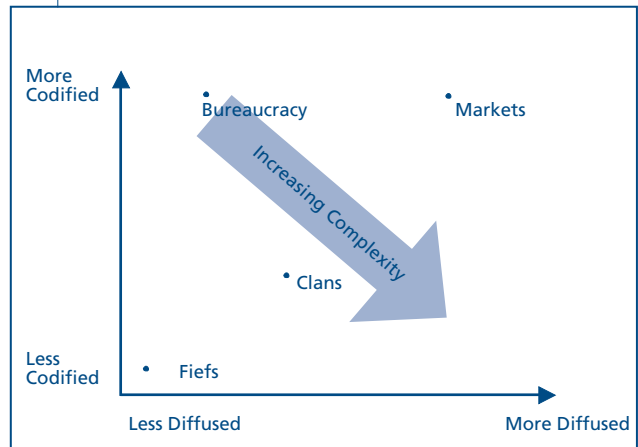


Figure 3: Complexity in the Information Space. Adapted from Max Boisot.

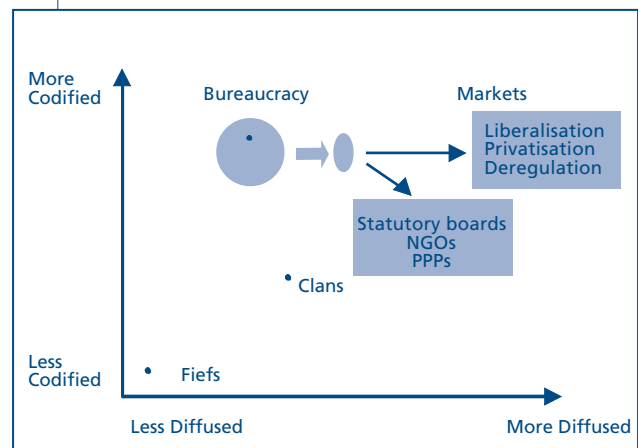


Figure 4: Evolution of Singapore’s Bureaucracy

The possible direction of movement of each of these four levels can be plotted on the I-space diagram (Figure 5). Networking of processes will tend towards more codification whilst networking mindsets will tend towards more information diffusion. Networking knowledge bases will be in between these two directions.

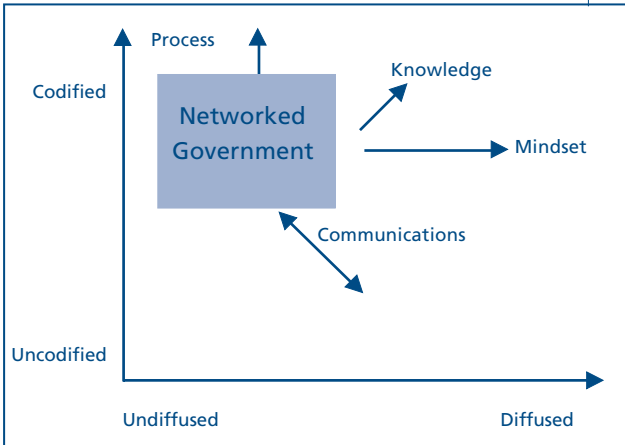


Figure 5: Networked Government in the Information Space – Possible Directions

An interesting example of codification of process leading to less information diffusion is that of the Tradenet system. I am told that many of the business rules were long ago encoded into the software so much so that the software is making decisions based on rules not known to the human operators. This is a situation of moving north-westerly. This is certainly more efficient but obviously at the expense of flexibility since human operators, not knowing the rules, cannot be expected to vary them. Fortunately, this situation is being redressed with the implementation of the new TradeXchange.

Networking of communications can be used to create greater diffusion of information and thus move towards the south-east. However, it can also move north-west if the implementation is towards the centralisation of processes or decision-making. The direction is a matter of policy choice.

Which Direction to Take?

The interesting question is, “What does the movement in the I-space mean for policy makers?”

On a general note, moving north-west is a complexity-reducing strategy and moving south-east is a complexity-absorbing strategy.

A north-west movement reduces complexity through increased centralisation, more codified rules and procedures and is thus usually associated with increased efficiency. However, beyond a certain point, the higher compliance and coordination costs and a loss of innovation and resilience or flexibility will start to offset the gain.

On the other hand, moving south-east (complexity-absorbing strategy) enables government to be more flexible in coping with complexity through greater recognition of exceptions and variations in the application of rules.

This brings with it some corresponding risks associated with less transparent rules and can give rise to favouritism, nepotism, special deals, and even corruption. This is not to say that any move towards the south-east is undesirable but rather than the government agency moving in this direction must develop the capabilities to handle more complexity and risk management and guard against possible abuses.

Development Paths of Nations in the I-space

Boisot has also positioned different national cultures onto the I-space (Figure 6).³

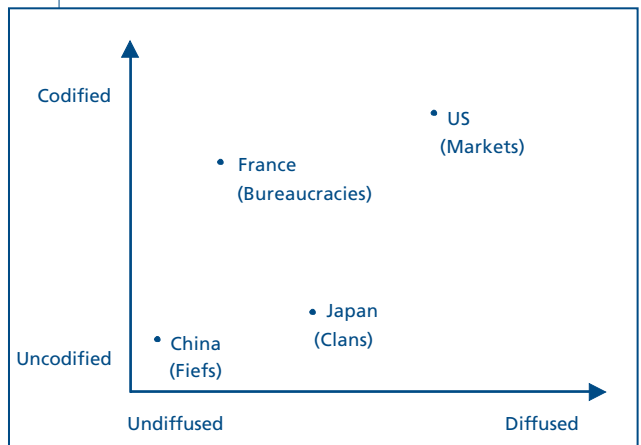


Figure 6. National Cultures in the I-space. Source: Max Boisot.

³ I would like to thank Max Boisot for permission to reproduce Figures 6 and 7.

In Figure 7, he describes how Western European cultures have historically moved upwards from fiefs to bureaucracy and thence eastwards towards the market.

An interesting question is whether this is an inevitable path of development. In the case of China, Boisot has argued that it has moved up to bureaucracy but will move south-east towards a clan-like structure rather than towards a market structure (Figure 8). A large part of this movement is due to embedded cultural preferences, such as the use of *guanxi* and trusted networks in economic transactions.

I would like to add an additional view to this I-space: that the distance separating one nation or culture from another is a measure of the *latent* tension between the two countries. It is latent because if two countries have no interest or relations or decide not to interfere in one another's "internal affairs", this tension will not be realised.

The repeated cries and pressure for Japan to reform its financial and market structure can be seen as reflecting the distance between the more clannish position of Japan in the I-space relative to the very market-oriented US position.

The privatisation of the postal service in Japan is a major issue because of the distance between the sectarian (or clannish interest in the status quo) versus an open market-style privatised postal service. This tension is less in countries or cultures with strong market cultures.

The friction between China and Singapore in the early stages of the Suzhou project in the early 1990s can be represented as the gap between the much higher degree of centralisation and rule-based structure in Singapore and what prevailed then in China.

Conclusion

The key conclusion of this survey is that structured knowledge and its easy diffusion are essential for reducing complexity for social learning. Today, much of the lower-hanging fruits of knowledge of simple systems have been harvested. More and more frequently, we are encountering problems that are too complex for the

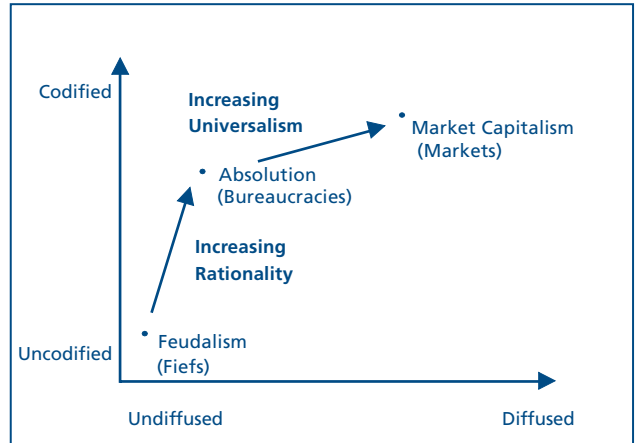


Figure 7: The European Enlightenment in the I-Space-Universal Rationality. Source: Max Boisot.

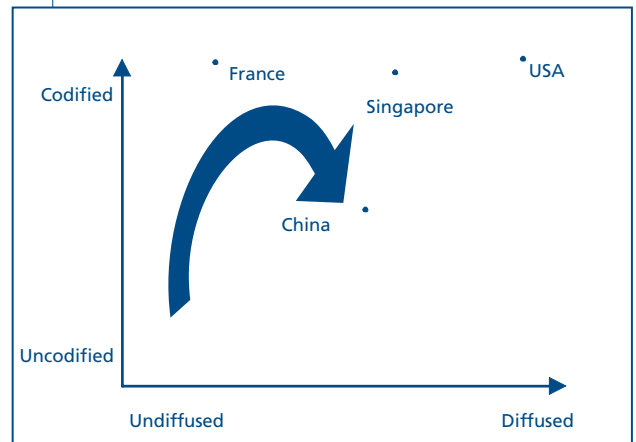


Figure 8: Movement of Countries in the Information Space. Adapted from Max Boisot.

simpler linear solutions of the past. Disruptive and unexpected changes and paradigm shifts have become more frequent.

Our ability to cope with this complexity will depend on increasing our ability to "learn" and manage our "knowledge assets." Hence it is not surprising to hear of the importance of Knowledge Societies. This is particularly relevant to Singapore which lacks many other physical assets.

The I-space, by providing a means of visualising social learning and the management of knowledge, is a valuable tool in analysing how to cope with complexity. It is by no means the only one. Other tools such as scenario planning, horizon scanning, strategic risk management and innovation tools are equally important. ■