Knowledge Games and the Information Revolution

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Abstract

Unlike other revolutions, the information revolution is not routed in ideology but rather science and technological developments. The episteme of science has an historical legacy that is well documented by contested and often conflicting accounts. In this paper a thesis for the dis-aggregation of scientific knowledge (meta narratives) is adopted to tease out a framework for contemporary analysis of social spaces and the self.

The sub-text is a testing of knowledge acquisition, validation, and representation claims, against the inferences, explanations, and uncertainty beliefs elaborated in recent Textbooks used in the teaching of information systems. The problem is the present.

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Introduction

The term revolution has become associated with accounts reporting systemic change in the deep structures of established organisational patterns and belief systems. The term is often overlayed with emotion and passion, indicative of the engagement of the text with social and political contexts. An association of the term revolution with information is frequently used to identify distortions in social spaces and radical changes in societies apparently caused by the introduction or application of computers. In a more general sense the phrase, information revolution, is a banner under which many antecedents for change are grouped, and rightly or wrongly, associated with socio-political consequences. The reported information revolution in New Zealand (Beardon, 1985) is one such account that links the growth of computer usage and socio-political change within a nation state.

The information revolution is distinguished from other revolutions by its origins, and may be similar in nature to the industrial revolution of the 19th Century, (Beare, 1989). Other major revolutions in human history, such as, the French or American Revolutions, the Russian or Chinese Revolutions, were the creations of political revolutionaries, sparking action and the overthrow of the established socio-political order. Their goals were ideologically driven. The information revolution, however, springs from scientific and technical developments and the economic, industrial and social initiatives these made possible (Hughes, 1999).

In this paper the characteristics of the information revolution are revisited to focus on the problem of the present. That problem is specifically knowledge creation and management. The notion of games is adopted from Lyotard's thesis (1979) to tease out mastery as a possibility for progress. Attention is paid to current progress in artificial intelligence (as depicted by IS text-books) and attempts to train workers for the Knowledge Economy. The future, which is advocated, visualises the integration of systems, knowledge frameworks, and communities, for the creation of personal spaces of meaning in the larger cosmos of global community.

The Information Revolution Revisited

The nature of the information revolution is insidious. We know things are changing, rapidly and continuously, but it is usually the consequences of hidden change that are visible. For example, unemployment, and new employment requirements, new types of employees, with higher levels of education, different skills and different expectations for their involvement; new organisational and management structures as part of a different work culture; and, new possibilities for the location of work. In day-to-day practices, the ways we may communicate, bank, obtain services, buy or sell have changed, and keep changing. Plastic Credit / Debit Cards are taken for granted as a means of transaction payment, whereas Internet OnLine trading and Web-Enabled (WAP) mobile phone technology are still gaining trust as means for buying and selling. Underlying many of the current changes is the digital capacity to store and rapidly retrieve digital identities. The transfer of personal identity into digital forms raises issues of ownership, mobility, and security. The case of one AUT Lecturer, who had his digital identity stolen, and the three-year legal battle to reclaim his identity and ownership of social space, revealed much of the deep structure underpinning contemporary

changes. The surface visibilities often obscure ruptures in meta-structures and the techno-logics of systemic change (Cusack, 1994). It is not until we go through the distraction of surface phenomena, the absence of former relational structures, that the extent of change becomes apparent.

Progress in the information revolution has been characterised by repetitive and relentless incremental change at the micro-levels of social order. The processes and practices of an industrial society have progressively (and at times ruthlessly) been displaced or replaced by different ones. This revolution is different than ideological revolution where the ideologues and their agents explode into view at a macro level — usually by forceful means — to transform social order and establish hegemonic control, top down. The information revolution works by displacement and the colonisation of traditional socio-cultural practices (Lyotard, 1979). Some practices are included, and some practices are excluded (Foucault, 1975). The effect is coercive and ontologically oblique (Cusack, 1994). A consequence of this bottom-up change is a slow alignment and realignment of macro socio-political structures with new preference maps, and a net effect is the globalisation of preferred social practices (Dryden, 2001). At the current stage of the information revolution (Year 2000 data) convergence of interests are occurring on a global scale, for example, the airline alliances, University alliances, and the AOL merger.

Knowledge has become a barrier to progress in the information revolution. By the 1980s data was managed and standardised through the work of various standardisation groups, general agreements for the definition of terms, and understandings for methodologies. For example, language standards, such as ASCII and C, and transferable methodological understandings for mental modelling and data modelling, were established by control groups. In a similar fashion information standardisation (for example, HTML, WML, and, XML) has progressed towards different and evolving positions for standards in the 1990s. Knowledge has become a problem area on account of contested views on its constitution. It has numerous standards in conflict and unilateral definitions by dominant stakeholders are deepening the crisis.

Knowledge has an episteme as wide as life itself, and many of the ways of knowing are incompatible with those of the computer sciences. It may be argued that socio-cultural ways of knowing are missing or inadequately represented in the field of computer science and, hence, the field needs to grow or change significantly to fulfil the expectations of a knowledge-based society. The sticking point is control over the process (or processes) that may transform information into knowledge. Prevalent in the attempts to standardise information schema has been the exposure of the power component of knowledge (Foucault, 1977. Note: this reference elaborates a thesis for the pairing of power and knowledge, whereby one produces the other seamlessly.). Attempts to standardise XML, for example, has exposed preferences for particular frameworks (knowledge schema) and the influence of market dominant entities to persuade others to adopt their preferences. What is missing is a pragmatic schema for identifying the constitution of knowledge, and the process logics to choose between competing theories for knowing.

The information revolution is being pushed forward by a 'global capacities' agenda for wealth creation. Knowledge is the new key resource and the training of knowledge managers

and knowledge workers is the future. The agenda can proceed in fuzzy logic format where the more difficult questions of knowledge constitution and process logics can be left to the unmapped territory of human minds. People can make up solutions within the broad constraints of employment contracts and proceed with validation testing using broad and general measures. Knowledge workers are the people whose work depended essentially on the possession of a body of formal knowledge, such as doctors, lawyers, scientists, technologists, teachers, social workers, and priests (Hughes, 1999). It is the product of their labour that is to fund the knowledge society, although it is likely other control groups will manage the type of society to be developed. In the 1980s the number of knowledge workers grew dramatically in stark contrast to that of unskilled manual workers. Knowledge workers required a good deal of formal education and the ability to acquire and apply theoretical and analytical knowledge. They required a different approach to work and a different mindset. Above all, they required a habit of continuous learning. Knowledge work is not experience-based, as all manual work has always been. It is learning- based (Drucker, 1995). Knowledge workers also were deemed to require a different locus of control in order to separate them from the mode of production (hence the labour market reforms of the 1980s).

The characteristics of the information revolution reviewed above point to observable transition and change in the ways people go about their daily living. The nature of the change is different than that of previous revolutions but far reaching in its consequences for the way people may think and do. At the current place in time a juncture has been passed where information is no longer enough to sustain progress (particularly economic growth) and knowledge has become necessary to know what to do. Publicly acclaimed notions of a knowledge society have become synonymous with a future good life.

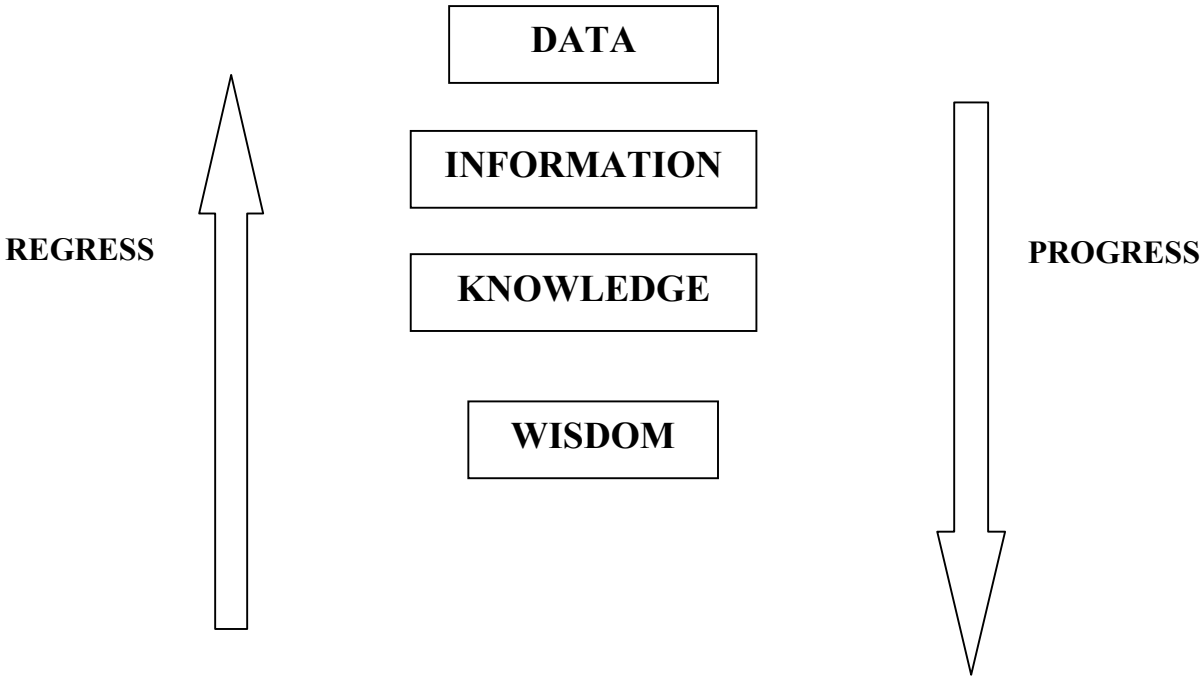
A Knowing Model

The incompatibility of living and models abstracting from life is a well-mapped theoretical domain. At risk of minimising some approaches to theorising, the following data model will be elaborated as one schema for abstracting from living into modelling. Data models may be methodologically distinguished, compared to other types of modelling, and preferred as a generalisation to represent human and non-human entities. The strength of a data model is the clear objectivity given to notions such as information, by definition, and the weakness is in the simplification of complex and often non-sense relationships. The information revolution has, in part, been possible on account of the growth of computer based technology to process data into useable units of information. The quantity of information produced by computers and the relative ease of access to all manner of information has created an information overload. This situation has been aggravated in recent years with the growth of web technology. The digital advantage has also improved the quality of information and the speed at which it may be accessed. Digital phones are better, digital displays are faster, and digital visualisations are sharper. Digitisation has become the leading edge of the information revolution (Prentice, 1999).

Information overload has pushed people in all walks of life into a search for knowledge tools and maps by which to make sense of the terrain. One such map is the knowing model (see figure 1. below) that postulates the separation of the objects data, information, knowledge and wisdom and allows various inter-relations between objects. Data is viewed as a

primitive-raw-object that, when processed, yields information. There is also regress in the model whereby one person's information is another person's data, and hence super structures build up to justify claims that distinguish data from information. In a similar sense, information may be subject to processes that produce knowledge or its regress. The case of progress from data to knowledge is less certain and the general schema of step-by-step sequential progress and regress is held by most commentators (Attempts to link data to knowledge through visualisation and visual languages are acknowledged, but are viewed as currently incomplete projects.). In the case of wisdom, progress from knowledge is achieved through cultural, religious, and cataclysmic experience (Por, 2000). The processes for making progress or regress are open for debate, but are a necessary constraint for coherence.

Figure 1. (Cusack, B., 2001)



The Present Problem

The problem of the present is finding pathways that lead between information based organizations and knowledge based organizations. The 'knowing model' reviewed above (see Figure 1.) provides a guide for progress. Attempts to solve the problem of the present in the computer sciences have included building Management Information Systems, Decision Support Systems, Expert Systems, and Artificial Intelligence applications. In scio-political

contexts agendas to train knowledge workers, and build knowledge economies are further attempts to solve the problem of the present. Attempts have been made by public (for example, The New Zealand Qualifications Authority), and private organizations (for example, international business computing qualifications) to define what constitutes knowledge. Many of these attempts define knowledge in a tension of content units, process qualities, and skills performance — and imply that knowledge is acquired or made in action, and is open to revision. Less has been publicly debated on the choice of theories to frame what constitutes knowledge. Preferred theories (often in conflict with other contenders) have been advanced by vested interest groups, with the assumption that others also view their framework as being the best.

One of the many examples of contested knowledge frameworks is found in the advent of the generic call centre. Generic call centres in their current form were made possible by the advancement and integration of telecommunication and computing technology, and illustrate the knowledge crisis of the present. A generic call centre is a voice site a customer may call into by telephone to access or transact a service. These centres are available 24 hours per day and 7 days per week to answer calls on behalf of contracted organizations. Many businesses outsource sales and customer services to such centres. The knowledge problem arises when a customer raises a legitimate question that is too complex for the centre to process. For example, the sale of hamburgers is usually processed without difficulty (level 1 operation). The correction of a systems-problem, where the hamburger is delivered with one wrong attribute, can usually be processed by the centre (level 2 operation). However, the correction of systems problems where a hamburger is delivered with a number of wrong properties, often cannot be processed at a call centre (level 3 operation). It is at this point (level 3 or higher), a knowledge based organization regresses to an information based organization. The complexity of operational requirements out-runs the epistemic framework of the organization, and the knowledge -based organization breaks down. The result is participants don't *know* what to do and the business processes are out of control. The regress proceeds by a search for information (possibly for similar previous cases), or external contact information to trace other people with the knowledge to solve the problem (that is, establish or enforce a new framework in which the business operations now make sense again).

The level of intelligence of a call centre is constrained by the preferred knowledge framework adopted by its instigators. Selling hamburgers should not usually trigger a level 3 operational complexity problem but the generic nature of these centres often means more complex operations (such as Banking) are being processed in the same local. Banking is a service that is engaged with a culture and histories, and complexities of an expert nature, and has the potential to out run any preferred generic call centre knowledge framework. The reduction of Banking knowledge to a simple service framework can generate many level 3-complexity issues, and regress to information based systems. Bad customer relations develop when simple transaction processes are initiated — which the customer knows are right (cultural ontology). The call centre, operating within its preferred knowledge frame, produces erroneous service, no service, or foolish obstacles to service.

The problem of the present is consequently one of knowing. Attempts to progress are now firmly engaged with strategies for the growth and management of knowledge. Leading

edges are found in the growth and application of artificial intelligences in the changes to teaching, learning and education, and in global leadership attempts to increase knowledge based skills for new knowledge economies. The central issue for schools, universities, businesses, governments, and other knowledge management enterprises, is twofold. First, there is the issue of establishing sufficiently general process methodologies for the legitimation of knowledge, and then, secondly, the issue of resolving what constitutes knowledge. The debate of what constitutes knowledge is as old as humanity itself, but what is distinguishing the present from the past is the urgency with which working solutions must be found if the momentum from the information revolution is to be carried forward into knowledge based societies.

Knowledge Games: Technological Knowledge

Technological knowledge has sprung from a mixture of disciplines, and principally from science and mathematics. Progress in the information revolution has consequently taken paths similar to revolutions in science. Thomas Khun popularised the notions of scientific revolutions and paradigm shifts (Khun, 1962). His initial proposition concerned the identification of achievements that were 'sufficiently unprecedented' (1962:10) and open-ended. A group of followers became adherents to a 'paradigm', its rules, beliefs and methodologies. Growth in scientific knowledge came about by development within paradigms (refinement under more stringent conditions, (1962: 23)), or the shift from one paradigm to another (a scientific revolution). It is still debateable if the information revolution has brought about (or will in the future) a paradigm shift. Until the present technological knowledge has been developed within various schools of thought that loosely cohere within the adherence groups of sciences and social sciences. The knowledge crisis has sponsored numerous and novel new theories, all of which may have the potential to usher in a knowledge-centred paradigm.

Strenuous challenges have been made to the foundations of science by the articulation of new theories. Lyotard's, *The Postmodern Condition: A Report on Knowledge* (1979), is one such challenge. In this account Lyotard sees the paradigm of science as consisting of a set of inter-related stories, which together give a 'meta-narrative' (1979:xxiv), to both justify and legitimate knowledge. The logic follows that justification and legitimation within the one framework is illegitimate, and hence science is an ill-founded activity. Furthermore, the narratives of science and technology can be different because they are different 'games' (1979:40). Lyotard's adoption of the Wittgenstein notion of games (Peters & Marshall, 1999:124) is used to substantiate the thesis to disaggregate forms of knowledge associated with industrial societies, and to seek new possibilities for knowing in post-industrial societies. Lyotard's thesis is one persuasive account of alternative frameworks for substantiating technological knowledge, and finding alternative spaces for social activity. Implicit in the attack on science is a thinly veiled belief that, for example, the continuation of Habermas' modern project will foreclose the possibility for living in a personal space. The revival of narrative as a legitimating myth is synonymous with the revival of local knowledges and the dispersal of globalisation tendencies. The disaggregation thesis supports the cultivation of customary, cultural, and ethnic knowledges, in conjunction with knowledges associated with

computerisation and technology. Lyotard's later recourse to the *differend* (Marshall and Peters, 1999:125, 128) strengthens the case for plurality, and projects an alternative future for technological knowledge.

Other alternative frameworks are less accommodating of self and social space. To critique technology using a Foucaultian framework, for example, would result in an adoption of unquestioning compliance with technological requirements, a destruction of the self, and a reduction to a nil social space. A compromise would be the adoption of a neo-Marxist framework and the identification of self around points of resistance (group and individual) where the encroachment of technology on social space might be pushed back. The constraint of a neo-Marxist social space is, however, ideological and a non-compliant self may be subjected to coercion and other distortion by dominant ideologues. A disaggregation thesis, however, advocates the resurrection of local and popular languages and the emancipation of self through mastery. The master is able to tell stories — not just by verbal reiteration but by embodying the life and work of the story; to form new, local and popular, social space in which the self may reside. Disaggregation theories and story telling are a different approach to the problem of the present and post-industrial community building.

Information Systems (IS) Texts

The problem of knowledge and the issues identified through data modelling (reviewed above) are central to recent text books for teaching information systems (for example, Alter 1999; Turban 1998). Recent developments in information systems thinking point towards the use of patterning techniques to derive knowledge from information. This movement is a shift away from traditional scientific techniques and towards methodologies that are closer to those of story telling reviewed above. Knowledge management systems, designed to share knowledge rather than information, are seen as the future for information systems. This future is being developed around the notion of expert systems, the codification of knowledge (such as best practices), object-based retrieval systems, and training. The integration of human and cultural values are central (Alter 1999:169). Notions of 'knowledge warehouses' to store knowledge are also being used to build schema for future knowledge based enterprise, and languages, such as KQML, and K-VISION have been written for knowledge management (Turban, 1998:510,826).

By far the largest growth area in IS text books is that of artificial intelligence (AI). AI is an agenda that has grown out of a belief that machines can be taught to think, see, learn, understand and use common sense. With these capacities, knowledge rather than information, may be transacted by computer means. Many of the different methodologies of AI (listed in Table 2. below) are met in everyday life. For example, natural language is used on many telephone ordering systems, neural networks are used to make data sets in research, fuzzy logic is in cars and air-conditioning units, and intelligent agents manage many web and industrial operations. AI is at the leading edge of the knowledge revolution and constitutes large leap towards bringing human and machine intelligence closer together.

Figure 2. (Adapted from Alter, 1999:325)

Type of AI Application	**AI Issue**	**Approach to Intelligence**
Natural Language Processing	Understanding Language	Use dictionaries, grammatical analysis, statistical techniques, and situation specific knowledge.
Expert Systems	Understanding and reasoning about specific situations	Try to capture and apply an expert's understanding of a type of problem through a set of rules about reasoning.
Neural Network	Learning how to make a specific type of decision	Use statistical methods to learn how to make good decisions by weighting various aspects of a problem situation.
Fuzzy Logic	Reasoning method that avoids false distinctions	Performing reasoning by weighting multiple rules that can be posed using overlapping categories.
Case-base	Reasoning based on similarity of cases	Compare past cases to find the ones with greatest bearing on a current situation.
Intelligent Agents	Exploring across a network to find desired information	Generate automated processes that operate autonomously.

Integrative Solutions

Knowledge-tone frameworks (Kalakota et.al., 1999:269) are the result of recent attempts by developers to integrate information sources using intelligent tools. The frameworks integrate the worlds of the users, the computer software, artificial intelligences and information sources into a web capable of supporting a knowledge activity. Claims for knowing in this data driven model are grounded in the belief that mediated mutual responsiveness and collaboration between the distinct worlds is sufficient justification for knowledge claims. For example, when a manager sends a query to a data-warehouse regarding current sales volumes, the manager receives knowledge not just about specific volumes (number data) or

trends (information frames). The manager also incurs a schema of interpretive and referral statements that provide context and nuance of between-frames analysis, so the manager may know the situation. Embedded within this integrative proposal is a raft of assumptions concerning the capability of the preferred intelligences to deliver trustworthy knowledge. The manager may know what the sales situation is after receiving knowledge from a query process but has a nagging doubt that the known situation is in conflict with a different set of objects, known through another framework — possibly, past experience. Integrative frameworks are knowledge games that offer partial solutions to the problem of knowing and signal one possible path towards the knowledge society.

An Holistic Future

Integration strategies are constrained by space and the problem of justifying what may be included or excluded, or the proximity of one object to another. Alternative attempts to take the best from different world-views, to make something better, often suffer from unfair preferences and weak methodological rigour. Consequently, integration agendas are compromises that have the potential to facilitate entry into a knowledge-based paradigm and negotiate the dangers of bias or insufficient coherence for trustworthy knowledge claims. To conclude this paper, I shall now briefly review three plausible integration scenarios for the knowledge society by giving a short outline of each.

Systemic Integration

Systems place components in unique configurations for functionality and in particular relationships for optimal design. Systems have the potential to be integrated into systemic patterns for greater flexibility and comprehensive contextual coverage. Systems integration allows people to reach beyond the capabilities of single systems and create new or enhanced capabilities. Integration into systemic patterns is the corner stone of knowledge creation in intelligent systems, often called intelligent agents or BOTs. Plausible scenarios show the integration of intelligence from sub-systems for the creation of automated applications and the integration of many management support systems to create a global knowledge base.

Disciplinary Integration

Traditionally knowledge has been stored and taught in disciplines. For example, mathematics and the sciences are different but related disciplines. Knowledge retained by disciplines is characterised by its stability, its distinguishing methodologies for retention and dissemination, and the demarcation lines between the knower and what may be known (content). In recent years, fields of knowledge and studies (which have sprung from fundamental disciplines such as philosophy, science, and mathematics) have become prominent in defining new and emergent ways of knowing. For example, the advent of computer science, social science, and business studies. The 'touchstone' attempt to integrate different theories of knowledge proceeded by taking the best from competing disciplines, forming a valued centre (the touchstone), and subjecting the preferred touchstone to testing in practice (fairness adjudication) (Walker 1984). Such pragmatic approaches to knowledge creation allow for new theories and the testing of competing claims.

Community Integration

The notion of community integration springs from the belief that the world is populated by

communities of learners. Technology may facilitate the integration of communities to form larger and emergent communities of learners. Integration comes through the facilitated exchange of some unique and other shared characteristics of each community. The core qualities of community integration include: a common culture, common standards, knowledge sharing, coordination, and collaboration (Alter, 1999:87). Other attributes of community include shared mental maps for thinking, and the linking of mind schemas, habits of mind, brain patterning, multiple intelligences, natural networks, and systems thinking (Herley, 2001). Intelligent schema for visualising community integration include: self spacing, and the potential for a spontaneous self who is being and becoming.

Conclusion

Several ways forward have been discussed in this paper, to elaborate possibilities for the integration of technology into human life spaces. Public agendas have moved away from information based strategies to knowledge centred strategies, in the global thrust to build knowledge based societies. The new agenda may have dangerous consequences for human social life. The contestation and preference for different ways of knowing imply long-established differences for human organization. Such differences have created social and self-spaces where humans have meaningful being. The possibility for undesirable social and self-spaces that humans may not own are heightened by the encroachment of technologies.

In this paper a rethinking of science as a foundation for analysing contemporary epistemic change is advocated. The advocacy is for the separation of technological knowledge from its (computer) science foundations, and into its own language game. Once established as incongruous with other games, the rules of the technology language game may be identified, learned, and the possibilities for other games developed. The way forward is hence through mastery (learning), and the creation of new possibilities for a holistic future. Developing knowledges to integrate systems, disciplines, and communities, is a good starting point.

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