

A review of George Siemens' *Knowing Knowledge*, 2006.

Background

In October 2006, George Siemens spoke at the ['Global Summit 2006 - technology connected futures'](#) conference about his theory of learning called 'connectivism', alerting us to the forthcoming release of his self-published online book [Knowing Knowledge](#). Its publication is generating quite a bit of discussion. This review aims to capture the main points in this substantial piece of work. I add some comments along the way.

Siemens' fundamental proposition

Lying at the conceptual heart of this book is his theory of connectivism. Siemens calls this 'a theory describing how learning happens in the digital age'(2006:30). Key elements of connectivism are considered in detail later in this review. Siemens begins by arguing that the nature of knowledge has changed, from categorisation and hierarchies, to networks and 'ecologies'. He says that this shift has profound implications for 'everything' (2006:v) and he emphasises the need to change the spaces, practices and structures of our organisations.

He then sets out three key questions for investigation:

- What is knowledge?
- How is it created?
- How is it shared?

Changing worlds-changing knowledge

Much of this first section is his attempt to demonstrate that, when it comes to understanding knowledge and its relationship to learning in the 21st century, things are out of kilter. The 'old' perspective, grounded in the structures and practices of the industrial revolution, sees knowledge as 'product', something that is 'static', 'hard' and 'organised and defined by experts' (2006:3). Compare this, he argues, to our emerging experiences of knowledge as, 'dynamic and multi-faceted' (2006:3). Moreover, knowledge as he puts it, 'has broken free' (2006:3) and it's the transformative power of the digital technologies that are largely driving this change. This meeting of the old world with the new, according to Siemens, places us in a dilemma, as we are trying to accommodate both worlds and perspectives-an unsatisfactory situation. Siemens illustrates this contradiction with various examples, metaphors, diagrams and quotes. A summary of one such scenario follows.

In the past the flow of knowledge was largely one way and overwhelmingly text based; for example from author to reader-learner. What we now experience, say with blogs, wikis etc, are flows of knowledge and information created by the many for the many - it's no longer a linear pathway, but one with multiple authors, multiple pathways images and text. Therefore, the organisation and production of knowledge in this context and time is vastly different from that of the previous era.

Was the process of knowledge generation and acquisition in the 'old' world as one-way and as linear as he suggests? For me, the 'getting of wisdom', means I draw on multiple sources of information and knowledge in the hunt for what I want - and what I want to learn. Nevertheless, there is potency in his recognition of the significance of 1) the input of the many, in the creation of things like Wikipedia etc. 2) the emergence of the user as producer and 3) the implications of this trend for the production of knowledge resources of all kinds. Figure 9, with the following text, illustrates the concepts of the old and the new.

Each of these processes is currently being reshaped and changed as knowledge changes. Technology is providing new affordances for individuals

to become involved in publishing, knowledge exchange, and to access experts. (2006:19)

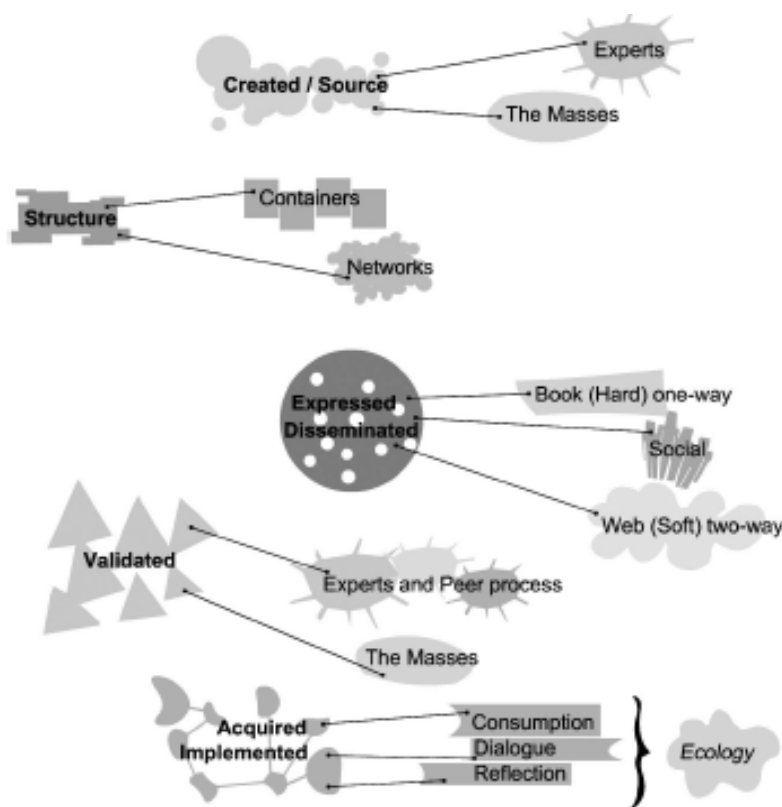


Figure 9. Knowledge Process/Elements

Connectivism

Having set the scene, Siemens then introduces his theory, 'connectivism', in more detail. He begins this explanation with an analysis of the defining characteristics of learning in the digital age - an age typified by a restructured global economy where knowledge, rather than commodities, has become *the* key economic asset. What else is impacting on our changed world? The following paragraph and Figure 29 identify additional influences (Siemens 2006:71).

Change is shaping a new reality under the fabric of our daily lives. Seven broad societal trends are changing the environment in which knowledge exists:

1. The rise of the individual
2. Increased connectedness
3. Immediacy and now
4. Breakdown and repackaging
5. Prominence of the conduit
6. Socialization
7. Blurring worlds of physical and virtual

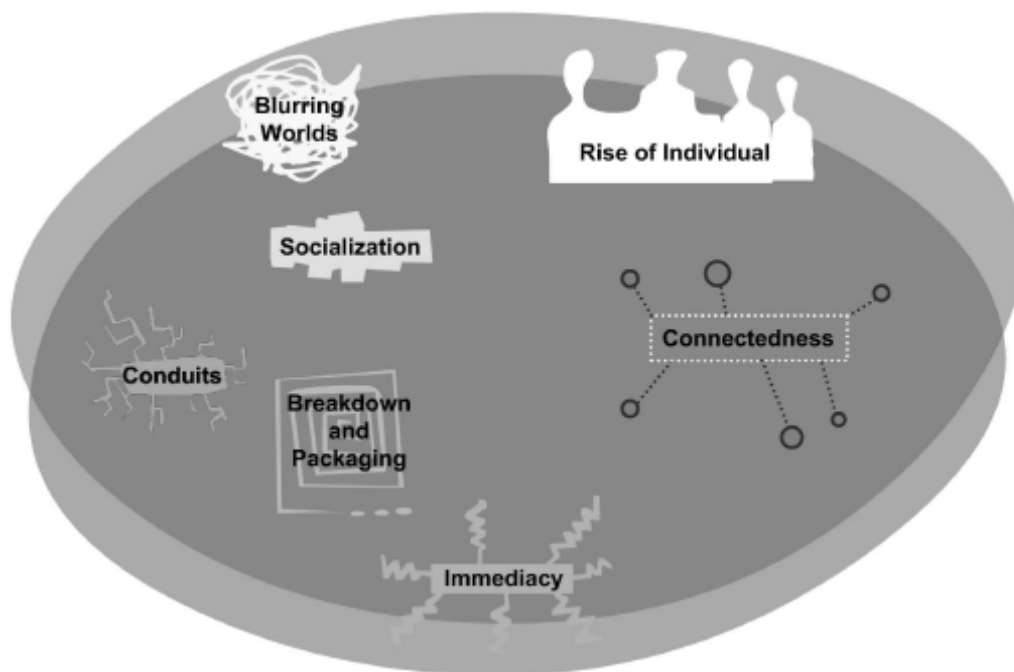


Figure 29. Changes in Environment of Knowledge

Given these changed settings, Siemens (2006:27) urges us to rethink our notion of learning and overhaul it to fit the demands of the times. Learning, shaped by the prevailing conditions of the digital age, is now:

CHAOTIC

Diverse and messy, not necessarily neatly packaged and arranged.

CONTINUAL

Ongoing in development and communication. The model of "go to a course" is being replaced with learning and knowledge at the point of need.

CO-CREATION

Instead of content consumption (or passive learners involved in knowledge acquisition), experts and amateurs are now co-creators in knowledge.

COMPLEXITY

Learning is a multi-faceted, integrated process where changes with any one element alters the larger network. Knowledge is subject to the nuances of complex, adaptive systems.

CONNECTED SPECIALIZATION

Complexity and diversity results in specialized nodes (a single entity can no longer know all required elements). The act of knowledge growth and learning involves connected specialized nodes

CONTINUAL SUSPENDED CERTAINTY

We know in part. An attitude of tolerance for ambiguity and uncertainty is required. Certainty is for a season, not a lifetime.

Learning is fundamentally about creating networks as follows (2006:29)

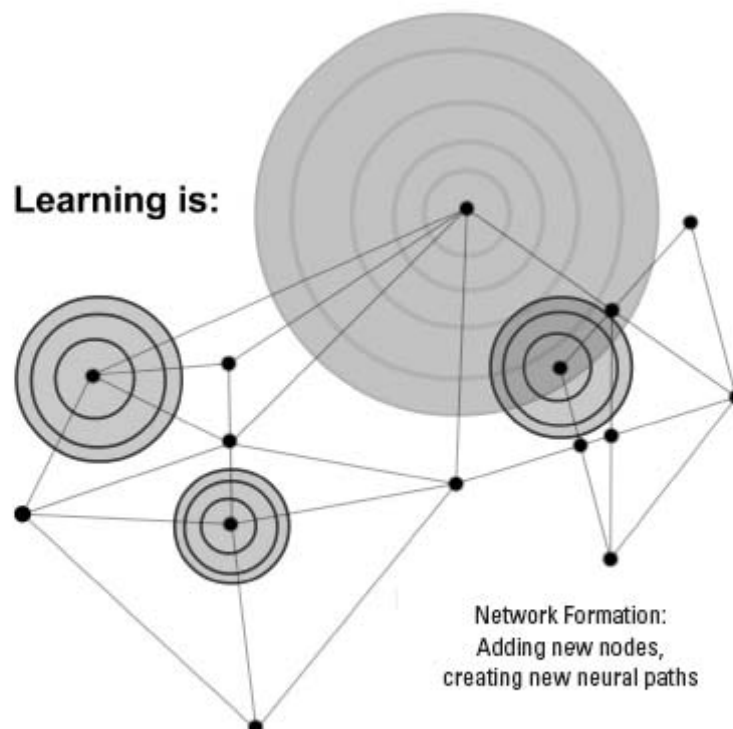


Figure 15. Learning as Network Forming

So connectivism emerges as the theory of learning for the digital age, and one better suited for our times, because traditional learning theories relate to an era when networking technologies were not as prominent as they are today. Moreover, these old theories cannot help us manage today's rapid and complex knowledge flows.

Connectivism is the '...integration of (the following) principles explored by chaos, network, complexity and self-organisation theories' (2006:30, my insertion in brackets), although he doesn't fully explain how these various principles have been integrated.

PRINCIPLES OF CONNECTIVISM:

- Learning and knowledge require diversity of opinions to present the whole...and to permit selection of best approach.
- Learning is a network formation process of connecting specialized nodes or information sources.
- Knowledge rests in networks.
- Knowledge may reside in non-human appliances, and learning is enabled/facilitated by technology.⁴⁰
- Capacity to know more is more critical than what is currently known.
- Learning and knowing are constant, on going processes (not end states or products).
- Ability to see connections and recognize patterns and make sense between fields, ideas, and concepts is the core skill for individuals today.
- Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.
- Decision-making is learning. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision.

Siemens then argues that "know where" and "know who" are more important today than knowing what and how' (2006:32). This is one of the more contentious points in the book and one that is likely to provoke considerable discussion. If it doesn't, then something is amiss; as this claim, and its implications, strike at the heart of long-held views about the purposes of education, in particular such things as:

- the central place of the teacher as the 'expert' leading the learner to 'truth'
- the importance of discipline-based content - or predominately academic bodies of knowledge
- the acquiring by the learner of particular intellectual techniques or cognitive skills such as critical thinking.

If Siemens is correct in asserting that the skills of 'know where' and 'know who' are now more important than the 'what' and 'how', we must ask: what then are the implications of this position for the role the teacher, and the place of content/curriculum in education today?

To put it another way: what is the nature of the relationship between learning *about* things - the bodies of knowledge - and learning *how* to learn about those things? Perhaps the relationship between content and the learning process has always been a problematic one, but it does seem that the impact of the digital technologies in education is bringing this issue into the foreground like never before.

On the one hand, I agree with his observations about the changing nature of the world, the significance of networks, and so on, but I also feel rather uneasy about his point that the 'know where' and the 'know who' are more important today than the 'what' and the 'how'. For example, might we find lurking in the Siemens' position a tendency to over emphasise the technical wherewithal required to work with and manipulate digital technologies and data, at the expense of a learner acquiring a deep knowing about the world and his/her place in it? Obviously, becoming digitally savvy is a vital skill for all to learn, but I also

believe we need an informed citizenry that can also understand the world at a deep critical - interpretive level. How these skills can be fully realised in a context that privileges the 'know where' and 'know who', remains unclear. Moreover, teacher anecdotes seem to be telling us that this generation of learners don't need so much to be shown 'where' to find information - they are already experts at that. Rather, it's learning the skills required for assessing and applying knowledge that is becoming increasingly important.

In my view, what the learning process must develop, at the very least, is a toolkit of critical - interpretive skills that enable learners to sort through the dross, so they can assess the relative worth of one source of information over another and so on. And a deep knowledge of the world, gained through the study of the 'what' and the 'how', seems to me to be a skill, or a pursuit, that is as vital as it always has been.

To bridge the gap between my unease about this aspect of his argument, and my own position, consider the National Academy Press' (2000) view:

The meaning of 'knowing' has shifted from being able to remember and repeat information to being able to find and use it. More than ever, the sheer magnitude of human knowledge renders its coverage by education an impossibility: rather the goal of education is better conceived as helping students develop the *intellectual tools and learning strategies* needed to acquire the knowledge that allows people to think productively (2000:5).

- To develop competence in an area of inquiry, students must: (a) have a deep foundation of factual knowledge, (b) understand facts and ideas in the context of a conceptual framework, and (c) organise knowledge in ways that facilitate retrieval and application (2000:16).
- A 'metacognitive' approach to instruction can help students take control of their own learning by defining learning goals and monitoring their progress in achieving them (2000:18).

This definition of 'knowing,' and its underlying principles, especially its emphasis on the relationship between acquiring competence in an area of inquiry, and facts and knowledge organised in a conceptual framework, combined with Siemens' networking insights, helps to address some of my concerns about his 'know where' and 'know who' argument.

Networked learning

So course designers and teachers face a considerable challenge: how to keep course content up to date and relevant in the face of torrents of information and rapid turnover of knowledge? Siemens suggests a number of remedies i.e. the use of content management systems, aggregators and intelligent searches, but what is necessary above all else is *networked learning*. What is networked learning?

A network model of learning (an attribute of connectivism) offloads some of the processing and interpreting functions of knowledge flow to nodes within a learning network. Instead of the individual having to evaluate and process every piece of information, she/he creates a personal network of trusted nodes: people and content, enhanced by technology. The learner aggregates relevant nodes... and relies on each individual node to provide needed knowledge. The act of knowing is offloaded onto the network itself. This view of learning scales well with continued complexity and pace of knowledge development. (Siemens 2006:33)

Therefore, if we want content that is current, relevant and contextually appropriate then *connectedness* is the key, and participating in and learning from a network is, under current circumstances, the most effective means of achieving this. Why? Because any one individual is no longer capable of processing, interpreting, and deriving meaning from the deluge of information that comes his/her way. The flow of knowledge is simply too rapid and complex. Therefore, this networked model of learning enables the individual to 'learn and function in spite of the pace and flow' (2006:33).

Siemens calls this 'connected specialisation', whereby the individual increases his or her competence by drawing on, and in the process adding to, the intellectual mass and expertise of the network.

The network (or web) of connection is the structure which holds the knowledge of individuals in a holistic manner.(2006:33)

It is worth noting how closely Siemens' network/connected analysis tends to mirror the writings of another social science thinker, sociologist, [Manuel Castells](#), especially given no reference is made to this prior work. Castells' three volume work, *The Information Age: Economy, Society, and Culture* (1996-1998) begins with *The Rise of the Network Society*, his account of the economic and social dynamics that characterise the digital age: in particular the shift from hierarchies to networks. Castells notes that: '...[n]etworks are the fundamental stuff of which new organizations are and will be made' (1996:168). In a later work Castells (2001) restates his definition of a network. The parallels with Siemens are rather striking.

A network is a series of interconnected nodes. Networks are very old forms of human practice, but they have taken on a new life in our time by becoming information networks, powered by the internet. Networks have extraordinary advantages as organising tools as because of their inherent flexibility and adaptability, critical features in order to survive in a fast-changing environment. This is why networks are proliferating in all domains of the economy and society, out competing and outperforming vertically organised corporations and centralised bureaucracies...

Networks were primarily the preserve of private life; centralised hierarchies were the fiefdoms of power and production. Now, however, the introduction of computer-based information and communication technologies, and particularly the Internet, enables networks to employ their flexibility and adaptability. (2001:1-2)

One of Castells' (2001) main intentions is to unravel some of the cultural contradictions of the Internet. For example, he discusses how the Internet can build relationship amongst people, irrespective of time and place, while simultaneously isolating the individual in a virtual world of unsatisfying fleeting relationships. He points out that while the Internet can connect more people from around the world than at any other time in our history, it also divides or excludes more people than other communication technologies.

An analysis of this sort is something you won't find in Siemens' book. If anything, he seems an unabashed advocate of the benefits of the Internet/networks - with some cautionary notes being struck along the way about power and the new oppressed (2006:64). But, given the number of times reference is made to the increasing influence of the end-user, it seems that he believes the general evolutionary trend of the Internet will continue to tip the balance in favour of individual autonomy and control. On this point, Castells is rather more cautious.

Knowledge and knowing

Having laid out his case for networked learning, Siemens discusses the nature of 'knowledge and 'knowing' in the digital age. To 'know today means to be connected' (2006:51). Other knowledge principles found in this section follow.

- The new value point for knowledge is the capacity for awareness, connection and recombination/re-creation (2006:51)
- Knowledge is better seen as a process, rather than past notions that viewed knowledge as an object and learning as a product (2006:52)
- Instead of experts and others defining what knowledge is and how its is to be organised we can organise and create it in a manner that suits us (2006:54)
- The ability to organise knowledge as we want it is a defining characteristic of our age (2006:55)
- We connect more than we construct. (2006:57)

Figure 23 (2006:53) illustrates his concept of knowledge as a process.

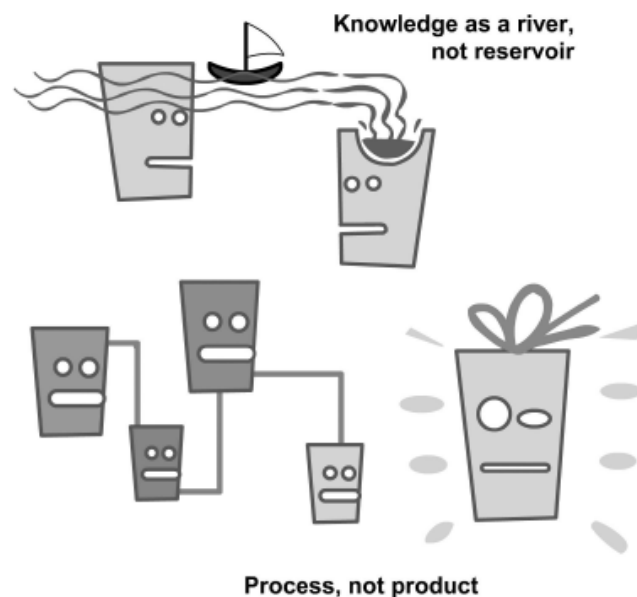


Figure 23. *Knowledge as a River, not Reservoir*

In the immediately following chapters Siemens tends to repeat previous arguments about networks, changed global conditions, flows of knowledge and so on.

In Section 2 however, he discusses implementing 'connectivism' in organisations.

Moving towards application

For connectivism to take hold and flourish, Siemens argues that the 'spaces and structures of our organisations' (2006:v) have to change. 'Spaces', such as schools and offices, are the places where we do our conversing, knowledge sharing and the like. While 'structures (things such as classification systems, libraries, hierarchies) provide the process and manner in which decisions are made, knowledge flows and things get done' (2006:86). Unfortunately, according to Siemens, our current corporate structures are

something of an anachronism, as they tend to 'generate product-based affordances' (2006:86). Rather what we need in their place are structures that 'ensure more relevant connections with the nature of knowledge today' (2006:86) i.e. 'affordances' such as 'innovation', 'adaptability', 'systems-view perception' and a tolerance of chaos - just to name a few.

For Siemens, the rigid organisational structures and relatively arid practices of the past must be replaced by the more contemporary and sustaining environments of networks and 'ecologies'. Only with these revitalised and nourishing environments will innovation, adaptability etc., have the best chance of success.

What is a 'learning ecology'? Siemens' description follows (2006.87).

Ecologies permit diverse, multi-faceted concepts...and meaning to emerge based on how items are organized or self-organize. Ecologies are capable of managing rapid growth, adapting to new competition, differing perspectives, and enabling innovative concepts and ideas to gain traction.

An ecology, a knowledge sharing environment, should have the following components:⁸²

- Informal, . The system should not define the learning and
Not Structured discussion that happens. The system should be flexible enough to allow participants to create according to their needs.
- Tool-Rich . Many opportunities for users to dialogue and
connect. Video, audio, text, face to face. Too much choice, however is not always desirable, as it can overwhelm the end-user.⁸³
- Consistency . New communities, projects and ideas start with much
and Time hype and promotion and then slowly fade. To create a knowledge -haring ecology, participants need to see consistent activity.
- Trust . High, social contact (face-to-face or online) is needed
to foster a sense of trust and comfort. Secure and safe environments are critical for trust to develop.
- Simplicity . Other characteristics need to be balanced with the
need for simplicity. Great ideas fail because of complexity in expression. Simple, social approaches are often most effective. The selection of tools and the creation of the community structure should reflect this need for simplicity.
- Decentralized, . Instead of centralized, managed, and isolated, the
Fostered, . ecology should allow individuals to define and form
Connected . .connections, functioning as separate nodes in an aggregated whole.
- High tolerance . . Innovation is a function of experimentation,
for experi- . accidents, and failure. To foster knowledge growth,
mentation . . innovation, and sharing, organizational processes
and failure . . must be supported by an environment of tolerance
and a spirit of inquiry.

How, in practical terms, does an 'ecology' or a 'knowledge-sharing environment', differ from his definition of a network? And what precisely is meant by 'ecology' in this context, and how does it relate to networks? His network definition follows.

Nodes and connectors comprise the structure of a network. In contrast, an ecology is a living organism. It influences the formation of the network itself. For example, each learner in an organisation possesses a personal learning network. The health of this network is influenced by the suitability of the ecology in which the learner exists. (2006:92)

A 'living organism': I'm not sure exactly what he is driving at here, but I suspect this notion refers to a set of workplace conditions that either enable or thwart the formation and growth of networks within an organisation.

Implementation challenges

Siemens gets straight to the point in this section by posing the following question:

How can an organisation adopt ecologies when their goal is to drive out chaos and messiness, not embrace it? (2006:90)

It's a good question, especially pertinent for those of us that work in bureaucracies and education systems, and he responds with a rather conventional solution - and one that's hard to disagree with: change the organisational mindset and re-frame the organisational structures around networks. His call for organisational flexibility and adaptability and the creation of a work environment that is conducive to learning, is a refrain that will be familiar to anyone who has kept pace with the literature on Knowledge Management and/or organisational change, for example, [Peter Senge](#) is one amongst many who have written about this.

Siemens devotes the final chapters of the book to his connectivism implementation model. The purpose of this model, with its multiple stages and impacting factors, is to act as a blueprint for 'system-wide application to corporate and educational structures' (2006:128).

His implementation model consists of five domains:

- analysis and validation
- ecology and network design and fostering
- adaptive learning and knowledge cycle
- system review and evaluation
- impacting factors.

An implementation schema provides the holistic overview, and then the five domains are unpacked and explained in sequence. The schema is useful, but I'm not sure how comprehensively the discussion in this section resolves the tension between entrenched organisational rigidity and the need to create adaptive and flexible work environments.

Conclusion-'All that is solid melts into air' (Karl Marx)

In the book's preface, Siemens defines his modus operandi, as follows (2006:vii):

I have intentionally left thoughts unstructured and unconnected, allowing readers to create their own connections.

It is not intended to be read as a comprehensive treatise on society's changes. It is designed to mimic the chaotic, complex, but holistic, nature of knowledge (and learning) in today's organizations— an attempt to duplicate knowledge in form, not only content.

I have mirrored the nature of knowledge today through text.

I have resisted the urge to extensively classify concepts.

Today, individuals stitch and weave their own networks.

I found this approach only partially successful. Creating ones 'own connections' is fine, up to a point, but the 'unstructured' and 'unconnected' form of the book tended to frustrate, rather than enhance, my reading experience. On the other hand, I believe he should be commended for putting this substantial work on the Internet - and at no cost. This is a generous intellectual act, and one in keeping with the democratic outlook and collaborative approach to the process of knowledge formation he advocates in the book.

Now back to the big question that runs through this work. How are we to make sense of a world of rapid and endless change? If we are facing a world where knowledge turns over at such a rate - where the relevant today, becomes redundant tomorrow - what then are the implications for schools and educators, in particular, and society in general? How are we to understand 'content' in this context? Siemens grapples with these matters, and there is a great deal in this book that stimulates one's thinking about these profound issues. His championing of the network, and certain networking skills, as the solution to the challenge of ceaseless and accelerated change warrants further discussion; an exchange he actively encourages.

Overall, there is much in his analysis that I find persuasive, but I'm not sure if the solution to the knowledge dilemma, as described by Siemens, lies in 'offloading' the 'act of knowing' onto the network (2006:33). This is not to underestimate the significance of the 'network'. As Siemens illustrates, and our experiences tell us, the network - in its various permutations (eg. virtual, face to face or combinations of both) is becoming increasingly important as the generator of, and mechanism for, knowledge creation and distribution. But the network is only part of the story.

Perhaps knowing when and how to be 'disconnected' – and knowing what to do when you are - is equally important in trying to understand the world. In other words, to critically interpret the world, we need, for at least some of the time, to stand apart from it. How we manage to do this, in a world where we're encouraged to be 'always on' or 'connected', remains to be seen. It strikes me that regardless of the knowledge 'value-add' of any network, first and foremost we, as individuals, have to make sense of the world ourselves. Either way, we seem to come face to face with an unsettling realisation; that with the emergence of the knowledge society we encounter a set of social conditions more fleeting and uncertain than ever before, where even the task of distinguishing the solid and permanent, from the transitory and shallow, becomes increasingly problematic.

Useful Links

education.au Global Summit website

<http://www.educationau.edu.au/jahia/Jahia/pid/305>

Knowing Knowledge

<http://knowingknowledge.com/>

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