

# Network Learning

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The ubiquity of information technology is profoundly altering the social formations that arose in the wake of the industrial revolution. These changes are result of 1) emergence of communication and computing technologies and 2) transformation of industrial appliances into information systems. These reconfigurations in the machines and societies—some visible and many invisible—are giving rise to a new Network Society whose key force of production is the information and the computer networks the means. For the first time in the history of human development the means of production and the forces of production are becoming one entity. Consequently, the network is emerging as the architecture for conducting business transactions, social interactions and individual communications. Education too is being displaced from its traditional confines of institutions to a generalized form of learning that can take place anytime and anyplace. In this regard, E-learning and M-learning have become the preferred means of characterizing digital mode of education wherein the information technologies play a decisive role. However, I believe that the terms E-learning and M-learning are too restrictive to adequately characterize the new forms of learning because they refer either to the delivery format of content (electronic) or the access devices (PDA). Because of “delivery-device” framework, E-learning and M-learning came to be thought as instances of traditional distance learning. This thinking has given rise to content and pedagogy for E-learning that is still informed by the traditional teacher-student paradigm. A more appropriate way to define the emerging educational process would be Network Learning or N-learning since both, E-learning as well as M-learning, are located in the global network of computers.

*The Network Learning can be defined as a form of education whose site of production, circulation and consumption is the network.*

In this paper, my purpose is to offer a theoretical formulations and practical mechanisms of Network Learning that mirror the flexible, adaptable and scalable conditions of the network. Furthermore, I will argue that knowledge (the content of learning) has undergone a conceptual change in last fifty years resulting in performatively judged “knowledge-events” whose fundamental character is Flow. My argument here will focus on three critical issues pertinent to the topic under consideration: 1) Network Society, an emergent global social formation; 2) Performative Knowledge, the contemporary conditions of knowledge, and 3) Reusable Learning Objects, an efficient and flexible form of structuring content for N-Learning. As my argument progresses I will lay out a grid with four layers: Form, Condition, Criteria and Space. The grid will unfold in three stages and at each stage; I will summarize the key elements of three critical issues and arrange them into the four layers of the grid. The objective of this exercise is 1) to demonstrate the affinity between the conditions of Network Society, Performative Knowledge and Reusable Learning Objects and 2) argue for the need to think about the structure and operation of N-learning in a radically new way.

## Network Society

A commonly held misconception about computers and the Internet is that they are tools. As a result of this general view about information technology it is positioned on the same level as other tools of instruction, such as overhead projectors, audio recorders, VCRs etc. A tool is an instrument or a vehicle for facilitating an action, which, without the tool would require considerable effort and energy. Globally networked computers, on the other hand, have created a new space: the Information Sphere. Learning, knowledge explorations or skill acquisitions are actions performed with the help of intelligent software tools in the Information Sphere. Although I use the term “tool” to characterize software it is unlike other instruments, which produce or facilitate actions other than the material they are made of. More adequate categorization would be to call software a collection of symbolic arguments. Unlike traditional tools, the symbolic assemblages (software) are applied to production of other symbolic groupings. Therefore, the knowledge production in the Information Sphere is the application of

knowledge for further knowledge. Since this space—the site of production, circulation and consumption—is unique and radically new, the learning and knowledge actions cannot be identical or similar to the actions performed in the physical space. On the contrary, we have to create new notions of knowledge and learning.

The information sphere brought about by the information and communication technologies is emerging as a vital component of society, transforming it rapidly into a global Network Society wherein knowledge becomes the critical productive force. The final configuration of the Network Society is still unknown to us, but certain trajectories have been opened by the information technology, and it is along these paths that society is traversing, opening lines of thought for us.

The globally connected network of computers is fast becoming the nervous system of an emerging social formation. The network increasingly mediates business transactions, social interactions, political organization, private pleasures and public entertainments. The architectonics of this network is rhizomic. Like the rhizome, the networked system of computers is a non-hierarchical space. In this space, each point is connected to the other with a multiplicity of connections; the connections have precedence over the points they connect. Because of this multiplicity of relations, the rhizomic network is indestructible. If a point ruptures instead of collapsing or affecting the whole network, it will continue through other connections. Cartographically laid out, the network has many entry points and, like a map can be read from any point or entered from any location. The unconstrained flexibility, unlimited scalability and the surface density gives the rhizomic network its attraction, enduring power and its capacity to diffuse into every aspect of human activity altering its very nature. Education as an important component for the well-being and growth of societies is permanently drawn into it. Therefore, educators have to urgently rethink questions such as, what is education? How is it produced? And, how is it transmitted? Because the very foundation of N-learning is a nonhierarchical and decentered rhizome, the content development, instructional design, and mechanisms of assessment have to be thought anew.

Historically the social space was linked to geographical space organized as territories-regions, nations and continents. The power and gender relations that brought in social, sexual and economic differentiations determined the internal order of these territorial spaces. The Network Society transcends national and regional boundaries deterritorialising them and reterritorialising them into Localities and Globalities. The major cause of this transformation is the penetration of the Information Sphere into all dimensions of life. The information space is a temporalized space, wherein the moments in time, measured as Global Real-Time, create differentiated time-bound spaces. Since the network erases the differentiation between here and there, institutions are being transformed from vertically integrated, spatially located, hierarchically organized structures into horizontally dispersed, independent modular units. The very culture and identity of individuals is being transformed from one that is linguistically and territorial constructed to one that is loosely defined by Localities and Globalities.

The lifeblood of rhizomic network is the information. As the information space is a temporalized space whose basic state is motion, the information is in constant flow. Continuously added, enhanced, transformed, exchanged and altered, the information ceases to be a product to be consumed, instead it is characterized by the fluidity of Flows that are constantly circulated. The nodes of the network are the access points for information flows, and the access point is where information space is revealed in the interface. The Interface Space is the arena of performative actions of individuals and information alike. This Interspace comes into existence only for the duration the node is activated.

**Table 1. First Stage of the Grid**

	<b>Form</b>	<b>Condition</b>	<b>Criteria</b>	<b>Space</b>
Network	A rhizome. Distributed as nodes and multiple connections	Movement of information bits. Revealed in the interface and the interspace	Efficiency: measured as shortest duration in time.	Global. Distributed and dispersed horizontally. Configuration changes depending on the number of nodes activated and bits of information exchanged

## Performative Knowledge

Before the advent of the post-industrial age in the 1960s, Enlightenment and post-Enlightenment ideas determined the purpose and use of knowledge. The European Enlightenment defined the human being as a subject whose destiny is the realization of its full potentialities through reason. The goal of acquiring learning was the realization of spirit, life, and emancipation of humanity and the purpose of production of knowledge was the moral and spiritual guidance of a nation. Owing to this conceptualization of knowledge, universities were not expected to be responsive to society's needs. However, in the contemporary conceptualization of knowledge, its purpose is no longer to realize spirit or emancipate humanity but *to add value to human abilities expressed as labor*. Since learning has value, its valuation is determined by its utility and exchange. Thus, *the criterion for judging knowledge is its performance*.

The legitimacy of performative knowledge is no longer granted by the grand narratives of emancipation, but by the market. The market should be understood as a grouping of various forces such as public policy, industrial complexes, the financial sector, technology, business modeling, and so on. The character of the market at any given time is determined by the configuration of dominant forces that participate in it. The market, unlike the narratives of emancipation and speculative spirit, which are valid for long durations, is in a constant flux shifting rapidly from one configuration to the other. As a result, the knowledge requirements imposed by the market are also altering expeditiously. The only thing that is constant with the market is change. *Therefore, education should be redefined as preparedness for change, and the knowledge acquired through education, performative*.

The performative criterion has transformed *the knowledge space* into a flexible, adaptable and scalable experience. Removed from its traditional confines, knowledge is shaped under varied circumstances and situations. The situational knowledge is produced as modular "knowledge events" that come together from various contexts to form "knowledge programs" according to performatively determined programmatic objectives. Conversely, the knowledge event's ability to adapt to diverse situations determines its performative abilities, either enhancing or decreasing it.

*The knowledge events* arise in different contexts, in a chemistry laboratory under controlled experiment conditions, through the exchange of experiences between sales persons in a company or by aggregation of study tactics devised by a group of students. What is important under present social circumstances is that knowledge production has been expanding horizontally moving away from vertically integrated scholars and scholarship structure.

*The Knowledge programs* are diverse knowledge events sequenced with programmatic objectives. The programmatic relations between events are determined by the performative criteria. The knowledge events that constitute the knowledge programs can be broken up into its constitutive elements and analyzed independently, on the other hand same knowledge events can be integrated into other knowledge programs. In this regard *the knowledge economy or the information society is not a stable structure with definitive functions, but a flexible condition where diverse programs can be developed using fragments of knowledge from different fields*. For example Keith Smith in his paper on knowledge economy identifies 32 knowledge and technological fields that are incorporated into fishing and fish farming industry, which is normally considered low technology industry. These fields include,

"...new materials and design concepts in ships, satellite communications, global positioning systems, safety systems, sonar technologies (linked to winch, trawl, and ship management systems), optical technologies for sorting fish, computer systems for real-time monitoring and weighing of catches.... pond technologies (based on advanced materials and incorporating complex design knowledge), computer imaging and pattern recognition technologies for monitoring (including 3D measurements systems), nutrition technologies (often based on bio-technology and genetic research), sonars, robotics (in feeding systems), and so on (20)."

It is clearly evident from this example that constituent knowledge events of fishing and fish farming knowledge program are independent of each other, brought together through the performative criterion and they can be incorporated into other programs such as entertainment (3D imaging), travel (global positioning systems) networking (optical technologies) etc.

**Table 2. Second Stage of the Grid**

	<b>Form</b>	<b>Condition</b>	<b>Criteria</b>	<b>Space</b>
Network	A rhizome. Distributed as nodes and multiple connections	Movement of information bits. Revealed in the interface and the interspace	Efficiency: measured as shortest duration in time.	Global. Distributed and dispersed horizontally. Configuration changes depending on the number of nodes activated and bits of information exchanged
Knowledge	Situational: Knowledge Events that arise in different contexts without an overarching direction of a metanarrative. Horizontally dispersed.	Flows: Knowledge Programs. Constituted by events that arise in diverse disciplines and contexts. They can be broken up into elements and analyzed independently of each other.	Performative: ability to adapt to diverse situations beyond the context of its initial production.	Flexible, adaptable and scalable. Conditioned by Flows, the topology changes with the intensity of flows and the performative capabilities.

## Learning Objects

As the market requirements of learning are changing constantly, performative knowledge cannot be transmitted en block; instead, it should be arranged into up-to-date knowledge banks that can be accessed by individual learners. The traditional educational system, which is established in a geographical space with physical assets and which relies on the transportation of its participants, will not be able to live up to these new tasks. N-learning that is driven by information and communication technologies, which are inherently flexible and effective, is the appropriate form of knowledge production and circulation for the new reality of the market.

The architecture of N-learning should be conceptualized with two guiding principles: modularity and the linkage system. The fundamental requirement for modular architecture and the linkage system is the separation of content from the instructional use of the content. The content should be created as discreet, self-standing modules that are predisposed for reuse in multiple contexts<sup>1</sup>. In this regard, we should borrow the notion of object and its structure from object oriented programming and adapts it creatively to the educational content. With the modular approach, we can bring greater efficiency into content development. The ideational value of the content should be well thought-out to adequately fulfill the requirements of performative knowledge, especially rapid adaptability to the changing configurations of market.

Content developers traditionally have conceived content from the point of its use. Since use is context and instruction specific, content intended for one particular use is generally invalid for other purposes. The Reusable Learning Object—organized content for pedagogical purpose—is a new way of thinking about content creation and its instructional use. However the success of this strategy rests on the rigorous separation of the Learning Object and its use for instructional purposes. Although sound pedagogical principles should inform the creation of a Learning Object, it should not be coded by any specific teaching methodology or instructional theory. A genuine

<sup>1</sup> The Virtual Adaptive Learning Architecture being developed at Faculty Center for Instructional Innovation, University of Arizona, has taken this approach for creating content. The team is implementing a modular architecture and linkage system known as Reusable Learning Objects and Reusable Instructional Objects developed by this author.

reusability and optimum functionality of a Learning Object can be achieved only when the Learning Object attains a high level of abstraction. Abstraction provides the Learning Object independence from use and strong performative ability, enabling it to join other Learning Objects for instructional intentions.

Viennese philosopher Ludwig Wittgenstein's idea about meaning of words and language-games can help us clarify the separation between the abstract Learning Object and its concrete use I am insisting on. According to Wittgenstein in *Philosophical Investigations*, meaning of a word in a language is neither inherent to it nor is it derived from an object it stands for. Instead, the word becomes meaningful in its rule-governed use in a language. Varied uses of words and sentences are called language-games. Like games, language too is a rule bound activity. The rules of a game as well as language do not decide what move/usage will provide success, but instead what is permissible and what is correct. As a position has significance only in a game it belongs to, a word acquires its meaning only when used in a particular language-game according to the rules. Therefore a preposition is a move or a function in a language-game and it is meaningless without the whole system that supports it. The utterances in a language-game, like moves in a game, unfold as the game progresses and depends on the position of other players.

The Learning Object should be thought as a word or preposition and the usages of Learning Objects as language-games. Like a word, a Learning Object is abstract, but can be understood and shared among the users. Similarly, as individual words independently cannot produce meaning, the Learning Objects—self-standing and self-referential—in themselves are insufficient to generate significant instruction. Therefore, several learning objects have to be brought together in order to create an instructional situation. How many Learning Objects, how they are related, and for what purposes will be determined by the instructor's objectives, pedagogical methodology and instructional design theories. However, I would like to underscore the point once again that the efficacy of a Learning Object and its status as organized and sharable content depends on the degree of abstraction achieved through separation of content and its intended use.

Creating Learning Objects that conform to the conceptual definition advanced here requires that the structure of the Learning Object reflect the two basic foundational principles, Learning Intent and Reusability. This can be achieved by determining the granularity or the size of a Learning Object and its composition.

**Table 3. Third Stage of the Grid.**

	<b>Form</b>	<b>Condition</b>	<b>Criteria</b>	<b>Space</b>
Network	A rhizome. Distributed as nodes and multiple connections	Movement of information bits. Revealed in the interface and the interspace	Efficiency: measured as shortest duration in time.	Global. Distributed and dispersed horizontally. Configuration changes depending on the number of nodes activated and bits of information exchanged
Knowledge	Situational: Knowledge Events that arise in different contexts without an overarching direction of a metanarrative. Horizontally dispersed.	Flows: Knowledge Programs. Constituted by events that arise in diverse disciplines and contexts. They can be broken up into elements and analyzed independently of each other.	Performative: ability to adapt to diverse situations beyond the context of its initial production.	Flexible, adaptable and scalable. Conditioned by Flows, the topology changes with the intensity of flows and the performative capabilities.
Reusable Learning Object	Based on the principles of Learning and Reusability. A combination of elements, lend	A sequenced set of Learning Object events. Can be arranged according to methodological or	Reusability: Learning Object once created should be employable in diverse contexts. Intelligence to	A dynamic and highly interactive learning ecology that transforms and adapts to events and programs, and the

	themselves for reuse in different instructional situations.	pedagogical considerations or be left to user choice.	combine for instructional purposes.	exploration of knowledge by the learners.
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## Conclusion

The Network Learning can emerge as the most adequate for of knowledge production, circulation and consumption for the network Society provide de that we establish it as an independent field by opening up its own space of operation, developing a coherent methodology and logical procedures for creating and delivering knowledge objects. As I have argued, the information sphere located in the global rhizomic network is the open space for the N-Learning. The very structure, operation and methodological procedures, instead of being rigid hierarchical structures of traditional disciplines, should reflect the very topology of the network.

The Learning Objects are the most meaningful and effective way of creating content for N-learning. Unfortunately, the current definitions and practices of Learning Objects are confusing and arbitrary. Consequently, they will ever be able to avail themselves of the flexibility, scalability, and speed offer by Information Technology. In order to break from this impasse, a commonly accepted, accurate, and functionally effective definition of a Learning Object is an immediate necessity. The first step in this direction, as I have articulated in this paper, is to establish a concept of the Learning Object that clearly lays out the principle basis on which it is founded. Similarly, there is a need to reengineer the design and development process of Learning Objects. In this regard the developers—programmers, academics, graphic designers, and multimedia experts—should embrace a multidisciplinary and cooperative model of development to create knowledge that is appropriate for the emergent Network Society.

The Reusable Learning Objects are only mechanism for structuring content, but they in themselves would not constitute learning environments. The N-learning environments include various objects that facilitate communications, interaction, mobility, creativity and engagements. In order to produce such knowledge ecologies we should think beyond WebPages.

The web page has become synonymous with the web. The notion of a web page is a direct transposition of a printed page from a book or magazine to the digital format. Textual content drove the early iterations of HTML, the markup language for creating web pages. Although the current standardized versions of HTML incorporate various dynamic functions and external elements such as JavaScript, Flash animation, Shockwave etc. the web page continues to be embedded in the framework of a printed page. Additionally the HTML merges the content and style in its representation resulting in a paradigm of “one fits all.” Since the web is considered as an information source presented as pages, “search”, “retrieve”, “navigate” have become the major indexes of interaction with the information. The web page framework is extremely constraining for creating highly interactive and vibrant environments for knowledge exploration.

Learning is an active process of human agency, wherein the learner and information engage in an exploration through interaction resulting in an experience of knowledge and training. However, the learning agent cannot be left to his/her own devices or motivations. Even in the traditional instructional situations signing up for a course is not a sufficient condition for learning to actually unfold. A successful teacher initiates the learners in a path of exploration through various methods, that is, the instructor activates the agency in the learner. In N-learning the instructor is opaque, intervening indirectly through feedback via e-mail, bulletin boards etc. Therefore, the responsibility for activating the learning agency falls upon the environments themselves. In this regard the design becomes crucial because the design becomes the agent that invites and provokes the learner into action, and the environment an intelligent space that reacts, changes and adapts to the users as they progress through the learning ecology. This agency-endowed environment should have the capability to adapt, and engender a performative relation between the user and information, resulting in a transformation in the learner. We have to create active *agent-provocateur* learning environments, which instead of being simple objects of contemplation lying before the gaze of the viewer invite the viewer to think and act.

### References

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