Learning Organizations in the 5th Long Wave: Management, Innovation, Knowledge, and IT *

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Trade barriers both structural and cultural are waning, corporations produce and market their products or services anywhere in the world, small producers enter global markets and global markets attract local customers. The world is now too complex for leaders to figure it all out and impose their own views on the rest of the organization. Corporations that will be successful in the future will be those that understand how to gain the commitment of employees and continually expand their capacity to learn. Learning—as John Brown, BP CEO says—is at the heart of a company's ability to adapt to a rapidly changing environment. … to generate extraordinary value for shareholders, a company has to learn better than its competitors and apply that knowledge throughout its businesses faster and more widely than they do.

Organizational learning involves the detection and correction of errors, the (re)cognition and selection of opportunities, and the increase of capacities to create what organizations want to create. Malhotra, the Chairman of @BRINT, defines "learning organization" as one that has an ingrained philosophy for anticipating, reacting and responding to change, complexity and uncertainty. To achieve these capabilities organizations must actively engage in four key activities that are integrally linked to learning: *information and knowledge acquisition, information and knowledge distribution, information interpretation,* and *the maintenance and adjustment of organizational memory*. Information technology (IT) is involved in each and every one of these activities and can support or inhibit efficient and effective learning of people and organizations. This is not to say that learning is not a social process—to the contrary—but it is also the process in which IT can either play active, even pro-active roles; it can play no role at all; or it can hinder learning and be an obstacle. Information overload, low productivity of information, ineffectiveness of information management and other terms used to describe the current state of IT do not suggest its positive impact on organizational learning. There are multiple reasons behind this situation some of which are considered here.

Major changes often start outside an organization. For an organization to succeed it has to continuously search for opportunities and be able to utilize the ones that contribute to its strategy. This requires continuous expansion of the organizations' knowledge base and thus learning. As Arie De Geus, head of planning for Royal Dutch/Shell, says "The ability to learn faster than your competitors may be the only sustainable competitive advantage." Reality is made up of interconnected circles hence learning about the organization and the world, and search for opportunities cannot follow well-defined and straight paths. Nonetheless, learning has to be focussed and oriented on the creation of value in future. This orientation has to be provided by the executives who create the learning culture, give the purpose for learning, and provide leadership and guidelines for change.

Context of the current trends: the 5th long wave

In the 1930s the Russian economist Kondratiev formulated a theory according to which free market economy moves in fifty-year waves. Since economies of different countries move at a different pace, the theory is hard to verify and considered controversial. Nonetheless, many economists have been expanding the long wave theory and using it to interpret economic growth on both global and national scales. This theory is used here to highlight the changes that characterize the previous and present waves. Kondratiev wave introduces a new innovation system and leads to the emergence of a new innovation paradigm. We use Kondratiev's model as the common basis for the discussion on organizational learning, knowledge production and management, and IT.

The 4th wave that started in the 1930s was based on a scientific approach to production and the development of new technologies. Established but largely unexploited markets characterize this period. The innovation processes and the resulting corporate development were driven by technological developments in which the innovation agents were engineers and technocrats. The technology-economics innovation paradigm, with its focus on process and product innovation, is an explanation of the development of technology, division of labor and new organizational forms including the emergence of large R&D departments.

The long wave theory suggests that in the 1980s we entered the 5th fifty years wave. Corporations in the 5th wave face saturated, complex and rapidly changing markets. Industries use multiple technologies, corporations of all sizes have a multidisciplinary technology base, and general-purpose technologies are increasingly pervasive. They have to accumulate technical competencies outside of their core business and diversify their knowledge base. Corporations' growth in the present wave requires the exploitation of marginal potential, search for opportu-

nities in markets of all sizes and effective utilization of internal resources. These resources are now primarily knowledge workers and the knowledge itself.

The key determinants of innovation are strategic behavior and market-oriented strategy. The organizational and strategic processes, which are of social character, now replace the technological development process. The agents of innovation are executives and professional managers rather than technocrats. Thus innovations need to be guided by corporate strategy that the management tries to control.

Strategy is a well-known and long researched concept. However, today strategic behavior requires understanding that corporations need to create value rather than control cost. It also requires that managers not only know their enterprise but also the entire economic chain, markets, and present and future competitors.

The implications are that corporations and their managers have now to look outward in addition to inward, have to collect and process information and create knowledge about their environment at large, be flexible and learn. As Drucker states, "For *strategy,* we need organized information about the environment. Strategy has to be based on information about markets and noncustomers, about technology in one's own industry and others; about worldwide finance, and about the changing world economy. For that is where the results are. Inside the organizations there are only cost centers. The only profit center is a customer whose check has not bounced."

Corporations and their employees are already overloaded with information. Strategic behavior, market orientation and learning require even more data and information. However, data and information are useless unless they are easy to utilize and meet the needs of its consumers. They are useless if not organized and converted to knowledge. Two interrelated challenges have to be addressed. First, different users, foremost the *knowledge workers, require different information and in different forms*. The second challenge is the *production and use of knowledge* in learning organizations.

Knowledge workers and IT

Production of information and knowledge, as it is the case with any business activity, has to have its producers and customers. The difference between knowledge and other products is that it is mainly the customers themselves who produce most of the knowledge. To do so they require information. Although in the future a significant portion of knowledge will be produced by such IT systems as intelligent software agents, neural networks, learning systems,

and systems that integrate data mining and statistical methods, knowledge workers will remain, during this long wave, the key knowledge producer and integrator.

Today it is often IT people and accountants— the producers of data—who decide not only about the product characteristics and content, but also about customers needs. Data gathering and information production are driven by the increasing capabilities of IT; more and more data is collected stored and processed irrespective of customer demand. The producers identified the GIGO (garbage-in-garbage-out) principle and a typical response was to collect more data and let the IT customers make use of it.

IT is managed according to the principles of the 4th Kondratiev wave; technologies and technologist drive innovations, and efficiencies and values are sought within the IT. Its customers (knowledge workers) and markets are well established and identified but their needs are often unknown. Most MIS and DSS do not address managerial and executive requirements for information and knowledge. Recent IT systems, including EIS, OLAP and data visualization allow for varied data presentation, but do not produce new and different questions and new and different strategies. With knowledge management being en vogue, IT initiatives have focussed almost entirely on—according to Andersen Consulting—changes in tools and technologies such as Intranets and Lotus Notes. These tools, as well as many others promoted as state-of-the-art knowledge management systems, facilitate access and communication but have little impact on the production and organization of knowledge workers activities.

One reason for this situation is that the customers, i.e., executives and other knowledge workers do not show initiative and specify their own requirements. Many of them rely on IT people to decide on the content and organization of information. Not surprisingly, the information is mostly about the company and its operations because this is what the IT people know best and have been doing for years. If external information is required, they collect all available data and process it according to time, industry, product line, cost and other 'proven' dimensions. A change has to come from, and be guided by, executives.

Another reason is the necessity to organize and package information, and especially knowledge, in the form that meets the diversified needs of customers. Since at least Crock's time delivery, packaging and presentation have been recognized as at least as important as the product itself. This is even more important in the delivery of information and knowledge. Windows operating system, desktop metaphor and the computer mouse did not change the content of information but they made information accessible to millions of general consumers rather than to its producers only. The next steps are to provide these consumers with informa-

tion they need and in the form they want, and to augment it with the existing knowledge bases.

Knowledge, its production, and IT

Andersen Consulting researchers suggest that few executives would argue with the premise that knowledge management is critical—but few know precisely what to do about it (Outlook Magazine, Jan. 1999). One reason may be that to date corporate EIS and MIS, not to mention knowledge systems, only rarely satisfy the needs of managers and executives.

Having been involved for over twenty years with IT research and design of decision support systems, I must concur with Drucker and many others who maintain that IT for top management tasks has served as a producer of data rather than information. Many companies have implemented the latest IT technologies and then—according to Marchand—they realized that their investment did not improve decision-making and responsiveness. Being a product of learning, knowledge has its own value, producers and customers, and it contributes to the corporate wealth. As a product, it is obtained from processing of resources, hence it's production, delivery and use needs to be managed and integrated with the corporate strategy.

Knowledge differs from information. The latter provides relationships and associations between data and other information. Information depends on the context for it's meaning and therefore is static and linear. It does not provide answers why the data is what it is, what its implication are and how they will change in time and space. These answers require knowledge; information becomes knowledge when it is organized in patterns, put in its own context rather than being context-dependent and can be used to infer the consequences from information.

Databases, data dictionaries and schemas together provide information. Query, visualization and document retrieval tools help search for information but do not provide knowledge. Systems that generate patterns (models, rules, and syntheses) must have reasoning capabilities. Examples of such technologies include knowledge discovery from databases (KDD), intelligent software agents and machine learning systems. Although promising, they are not yet designed for managers and executives but, as is the case with MIS and DSS, for analysts and researchers.

The difference between the focus on technology and technocrats as driving agents and the focus on strategy and managers acting as innovation agents introduces changes to the ownership of general and scientific knowledge, and technological knowledge. Traditionally scientific knowledge was perceived as a "public consumption good" and technological knowledge

as "a private capital good". If knowledge is viewed as a product, the differences between different types become blurred and only its value to consumers and its ability to create value for the corporation matters. Knowledge becomes a "private capital good" irrespective of its type.

Learning, innovation, and IT

Learning organizations diligently pursue and constantly enhance their knowledge base in order to maintain and develop new competencies. Nevis, DiBella and Gould propose a three-stage learning model consisting of knowledge acquisition, dissemination, and utilization. Teaching is one means for knowledge acquisition and sharing. Nasses, Ford Motor Company CEO, leads the efforts to replace Ford's fiefdom mindset with a global and consumer-oriented perspective and to introduce the culture where employees think and act like shareholders. He says, "With the teaching programs we have used over the past two years, our people have delivered $2 billion to our bottom line." This implies that learning was effective and led to the utilization of knowledge.

Collaborative learning, continuous education, certification programs are different forms of learning efforts that corporations exploit. What is characteristic to these efforts is breaking the traditional boundaries within organizations. It is obvious that IT can, and already does, play different roles in learning through teaching and training. Learning activities range from linking trainers and trainees with teleconferencing and virtual classes systems, to virtual simulators in which teams learn decision making in real-life like situations, to multi-media systems for individual self-paced learning of individual employees.

Teaching and communication of knowledge are important ingredients for learning. Employee development, however valuable, is not equivalent to organizational learning. Organizations also learn as they produce. Nevis, DiBella and Gould note that learning is a function of production and report that successful firms view their well-developed core competencies as launch points for new products and services, support continuous improvements in the business's value added chain, and have the ability to fundamentally revitalize themselves. To achieve these three learning-related factors companies need to focus on promoting *multiple information interpretations*, creating a more *entrepreneurial culture*, and facilitating *knowledge maintenance and delivery*.

Learning involves processing, interpretation and generalization of information leading to new knowledge. Different interpretations of information increase both the depth and scope of learning, thus increasing the range of the organization's potential behavior. More learning occurs when more and varied interpretations are developed. Many existing information systems, however, focus on the convergence of interpretation rather than support for multiple

interpretations. They are often designed to identify and correct errors so that the job is done and the action remains within stated policy guidelines. While necessary, such systems can support only linear processes and have a very limited use in learning.

Learning can also be achieved through knowledge sharing via direct person-to-person contact with the IT's role limited to communication. Hewlett-Packard and Nortel, for example, successfully use direct knowledge sharing with managers and engineers who routinely visit other divisions and key customers. This mode also facilitates learning of different approaches to problem solving. Recently a team from Nortell realized that the approach to problem solving used by their partners in Latin America, although very different and seemingly inefficient, allowed creating new opportunities. This is an example of *extrapreneurship* that uses interdisciplinary and cross-cultural teams comprising members from both inside and outside of an organization. According to Andersen Consulting one of the core competencies is to develop mechanisms for forming and reforming of high-performance multidisciplinary teams to provide the breadth and depth of perspectives necessary in addressing today's complex problems.

In the search for additional internal resources and to foster learning, management invokes *intrapreneurship* that exploits entrepreneurial qualities of the employees and facilitates knowledge sharing. These qualities resulted in Ford Mustang, 3M Post-It NotePads, the IBM PC, the Master Charge credit card and many other innovative products. Intrapreneurship is about applying the values of an entrepreneur—learning, innovation, initiative, empowerment, ownership—to the task of running a leading-edge corporation. As Bob Haas, Levi Strauss CEO, says, "We are not doing this because it makes us feel good, although it does. … We are doing this because we believe in the interconnection between liberating the talents of our people and business success."

The maintenance and delivery of both learning and knowledge are—in learning organizations—a system-level phenomenon because learning and knowledge stay even if individuals leave. The answer to this from some large consulting companies, such as Andersen Consulting and Ernst and Young, was to codify knowledge and store it in databases, e.g., the server-based Knowledge Xchange system. This is considered a knowledge management strategy which, in contrast to a person-to-person approach, is very IT intensive. This strategy, according to Hansen, Nohria and Tierney, is based on electronic document systems that codify and disseminate knowledge to allow its sharing and reuse. The question is: Are these systems containing knowledge or information?

Knowledge differs from information stored in documents and other systems in that it is a future oriented ability. Electronic document systems do not disseminate knowledge but infor-

mation about the past that knowledge workers use to interpret new information and determine future actions. If IT and knowledge management systems are to facilitate learning they need to be equipped with knowledge bases and reasoning mechanisms. Such systems have been developed for the configuration of computer systems, formulation of financial plans, auditing and yield management.

Dell's success is largely due to its IT that allows customers to build inexpensive computers. The knowledge base allows for some 40,000 different configurations and obviously it would be nonsensical to ask customers to select one configuration. Instead, the information about the components and the relations among them is coded and linked with reasoning mechanisms (e.g. rules). This allows putting together a configuration that meets the customer's needs and that Dell can deliver. Thus, it is not the re-use of specialized knowledge that gives Dell its competitive advantage but its organization and integration with reasoning mechanisms.

Large corporations such as Chrysler, Dell and Scotiabank, and very small stores such as the Ottawa-based The World of Maps and The Dragonfly Toy Company Inc. in Winnipeg use IT and e-commerce to sell their products and services, attract new customers and gain advantage over their competitors. They exhibit a market-oriented strategy and search for new opportunities in response to the saturation of the existing market. Both are typical phenomena for the 5th long wave.

Market-oriented strategy and the search for new market opportunities stimulate—according to Torrisi, who studied innovation processes in the software industry, (p.158)—the development of major innovations. These include a new product for a new type of demand, a new form of delivery and increasingly providing knowledge in addition to a physical product or service. By contrast, he notes that technological opportunities arising from advances in technology, stimulate minor, continuous innovations in products and make the development of major innovations unlikely. Corporations like Microsoft and Cap Gemini show a converging pattern of innovation. They focus on system integration activities and their innovative activities are organized in accordance with formal methodologies and managerial systems. They creatively blend their different competencies and sources of knowledge to improve their response to market opportunities and changes in customers' needs.

Learning organizations will seek opportunities to bring new value to their customers. Knowledge is one of them as shown by Dell. Another example is Personalogic, a small virtual organization that was recently acquired by AOL. Personalogic offers a new type of service; customers specify their preferences and requirements and a DSS, integrated with databases describing a variety of products, selects those that most closely match customers' needs.

Management, learning, and IT

Learning organizations require local and team leaders who have business responsibility and line focus. They must, however, operate under the guidance of the corporate leaders who help to connect innovative local leaders with other innovators and instill the need for leadership throughout the organization. It is only the executive leaders who can build an environment conducive to learning and knowledge sharing. Senge suggests that this should be done in three ways: the articulation of guiding ideas, the attention to learning infrastructure and the realization that executives themselves have to inquire into their own thinking by challenging assumptions and judgements.

Executives of organizations that embrace the engineering culture often espouse the "captain of the ship" image of power-wielding hierarchical leaders. The power in learning organizations is derived from guiding ideas, imagination and inspiration. Organizations like the International Red Cross, Ritz-Carlton Hotels and Levi Strauss have, according to Anderson Consulting, forged new relationships with their employees guiding their everyday activities with a sense of, and commitment to, a higher purpose.

Successful corporations excel at creating value for their customers, employees and shareholders. To create value corporations need to articulate the pursuit of value explicitly and to determine the links between value, strategy and activities. To be successful executives need to lead and show paths for the corporation as a whole and individual employee. By linking value for all stakeholders with strategy, competencies and key activities they give the purpose for learning. They *linearize knowledge* in the sense of providing anchors and directions around which learning and innovation takes place. Knowledge and learning remain dynamic and nonlinear but the process of knowledge acquisition and use is given its meaning and purpose. As corporations switch their focus from value appropriation to value creation, the facilitation of a cooperation takes—as Ghoshal, Bartlett and Morton state in *A New Manifesto for Management*—precedence over the enforcement of compliance, and initiative is valued more than obedience. The executives' primary task becomes the creation of trust, leadership in change and the establishment of purpose. Successful Canadian entrepreneurs have recognized the new role of management by responding to the 1999 survey that the most important leadership practice is "maintaining an open-door policy for employees".

IT, information processing, and knowledge management have a purpose insofar they contribute to the success of a corporation and its competitive advantage. In a short term the contribution may be direct, in the long term it can only be achieved through learning and innovation. Leaders of corporations that will bring value to their stakeholders now and in the future have

to lead their knowledge workers in their learning efforts and provide guidelines for change. They also need to realize that knowledge is product of learning; a process that requires management and consideration equal to any other most important corporate activity. Knowledge has to be viewed as the core corporate resource that has to be organized and maintained. It's production never can be limited or restricted to any one topic but it has to have a purpose and be evaluated for its contribution to value creation.

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