Time and the Internet at the Turn of the Millennium

Heejin Lee and Jonathan Liebenau

ABSTRACT. Recent reflections on the possible changes which the Internet may have on our concept of time have focused on notions of 'timeless time' (from Castells), 'absolute time for everybody' (from Negroponte), and 'virtual time'. A more considered view of temporality, drawn from sociology and anthropology, as well as the history of the establishment of consensus on time keeping, can provide more insight. We take a view informed by research on six dimensions of temporality which govern organizational practices to show how the Internet can be understood in terms of temporal behaviour. KEY WORDS • information technology • Internet • social time • temporality

On 23 October 1998, Swatch, the Swiss watchmaker, announced that they had invented a new way of measuring time, one that they claim is most appropriate for the age of the Internet. They believe the frequent communications at the global level, which have been further facilitated by the Internet, now require a new universal time. Suppose an international conference is held in the cyberspace. To synchronize all the participants' attendance from all over the world with their own local times, a sophisticated timetable has to be made beforehand. Say the opening ceremony is to be held at 10 a.m. GMT, 7 p.m. in Seoul, 5 a.m. in New York, etc. 'Internet Time' created by Swatch will relieve this inconvenience. There is no time zone in it.

Internet Time is based on a new unit of time called the 'beat'. The day is divided into 1000 beats. One beat is the equivalent of 1 minute 26.4 seconds; 12 noon in the current time system is the equivalent of @500 beats in Swatch's new system. According to the company's press release, we can meet someone on the Internet or at the airport at @500 beats.[1] How is this possible? Internet Time is not only concerned with the new way of measuring time, it is also based on the creation of a new meridian in Biel, Switzerland, home of Swatch. Biel

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Mean Time (BMT) will be the universal reference for Internet Time. A day in Internet Time (@000 beats) begins at midnight BMT (Central European Wintertime). It is the same all over the world, be it night or day. In the opening ceremony of BMT, Negroponte said:

> 'Internet Time is absolute time for everybody. Now is now and the same time for all people and places. Later is the same subsequent period for everybody. The numbers are the same for all.'

At the outset of the new millennium, interest in time among both academics and the public is increasing. The new millennium is characterized and shaped by the power of information technologies. They are, and will continue to be, affecting every facet of contemporary and future society. Time is not an exception. Internet Time is a good example of how the Internet, at the forefront of information technologies at the turn of the millennium, can affect and change time, people's perceptions of time, and the way time is organized.

In this article we examine how time can be affected by information technologies and the Internet. For this purpose, we will first discuss the social nature of time. Then we consider the relevance of the history of the mechanical clock. This leads us to an analogy for our argument on time and computers. In section 3, we address the question by reference to some studies on temporality and organizations and show how an analysis based on six temporal dimensions can help us to understand the effect of the Internet.

1. The Social Nature of Time

This article starts from a historical and sociological insight: time is socially constructed. It is not natural and given. It is as social and cultural as anything else: rituals, customs, diets, and so on. Heavenly bodies move regularly in fixed periods of time; the earth revolves around the sun and rotates on its own axis completing regular cycles. However, it is human affairs that interpret and measure those movements into the calendar year and the 24-hour day. Despite the fact that most calendars are based on the heavenly movements, there have been different calendars in various places through history. For example, the cycles of the heavenly bodies led some people to believe that time is circular because the sun, the moon and other stars have their own cycles in their respective movements. Time was inseparable from the circular movements of the heavens and therefore they believed that history was also cyclical and repeated. This cyclical idea of time and history can be seen in the sexagenarian cycle in the traditional Chinese calendar, a nomenclature system of years, in which each year is given its own name that returns every 60 years.

The Judaeo-Christian tradition gave rise to a fundamentally different concept

of time (Coveney and Highfield, 1990: 26). Christianity established the concept of linear (irreversible) time, which has since dominated ideas of time in western culture. The Christian belief in the birth, Crucifixion and death of Christ as unique, unrepeatable events made people regard time as a linear path that stretches between past and future. The Gregorian calendar, which was named after Pope Gregory XIII and which is the prototype of the modern western calendar, has no cycle. In this calendar, years progress endlessly. The year 2000, the new millennium, has brought a vision of a new century full of progress. Linear, irreversible time profoundly influenced western thought. Views of history such as the progress or development of society and Darwin's theory of evolution, which have been foundational in the unfolding of the western world, can trace their origin to the linear concept of time. In brief, the same movement of heaven produced different calendars and different concepts of time and even history.

Anthropologists have long shown that primitive societies have different time perceptions from western ones (Bohannan, 1967; Evans-Pritchard, 1940; Hallowell, 1955; Pocock, 1967). They talk about 'other times' which deviate from western ones (Adam, 1994) and report various time-reckoning systems within different cultures, societies and historical periods (Evans-Pritchard, 1940).

Contrary to a variety of time-reckoning systems, the fact that we have the international standard time (Greenwich Mean Time, or GMT) to which local times in the rest of the world are compared shows another decisive aspect of the social nature of time. The birth of standard time is attributed to the development of railway transportation and telegraphic communication from which the need arose to synchronize different communities and countries (Zerubavel, 1982). However, GMT was chosen in the International Meridian Conference (1884) despite opposition from a few countries, led by France; GMT can thus be seen as both the materialization of British hegemony and also 'the product of actual negotiation processes' (Zerubavel, 1982: 13). The political nature of standardizing time is also revealed by comparing the establishment of standard time in the Soviet Union, China and the USA. They all have a vast range of territories that cannot be reasonably covered by one standard time. While the USA has several standard times (Eastern, Central Mountain, Pacific Times and others), China has only one, Peking Time. We infer that one standard time in China is a reflection of Chinese history and politics. China has always been a centralized country, and Peking Time is the representation of centralized control by the Peking Government. In the Soviet Union, time zones were arbitrarily decided for the convenience of Moscow bureaucrats without considering the proportion to geographical distance. Significantly, the first defiant act of the Baltic Republics during Gorbachev's *perestroika* was the adoption of Finland's time zone as the official time in their territories (Castells, 1996: 433).

An investigation of the western seven-day week system also illustrates the

social nature of time. We keep the rigid time unit of seven days called the week. Whereas the day, the month and the year approximate the cyclical movements of the heavenly bodies, we cannot find any inevitability for the week; our only guide is the Bible. In western history, there were two periods when the weekly system was challenged: after the French Revolution and the Russian Revolution (Boorstin, 1983; Rifkin, 1987; Zerubavel, 1977). The leaders of the French Revolution established a new calendar system in 1793. One of the major reforms in the French Republican Calendar was the replacement of the seven-day week with the ten-day cycle called 'decade'. The major thrust of the calendar reform was against religion. It was designed to get rid of any religious remains from the realm of social life. The authorities also wanted to build a new society on the foundation of science and reason. The decimal system represented the spirit of science and reason. In 1929, a five-day week system was enforced by the Soviet Union, partly for an almost identical anti-religious purpose, and partly to allow a more constant use of capital (Boorstin, 1983; Moore, 1963: 122). The work week was 'staggered' to use fixed capital resources efficiently. All enterprises and offices stayed open every day, without a general day of rest. Workers had every fifth day off, so that one-fifth of the employees were normally absent on any given day, which led to chaos in the proper operations of banks, schools and offices. Families rarely enjoyed the same rest day for all members. In 1940 the seven-day week was restored with Sunday as the rest day. These two historical examples imply that the seven-day week is a social and historical product, but nonetheless persistent.

From a theoretical viewpoint, Durkheim (1965) argued that the origin of time is social. When he inquired into the sources of the categories such as time, space, cause, number, etc. caused by the human mind, he stated that 'it is the rhythm of social life which is at the basis of the category of time' (p. 488). He considered time as a collective phenomenon – as a product of collective consciousness. Time is not, as Kant's *a priorist* theory of knowledge suggests, a universal category inherent in the human mind. It arises essentially from the experience of the collectivity. All members of a society share a common temporal consciousness; time is a social category of thought, a product of society. Society provides a framework according to which time is arranged, and crucial elements of this framework in modern western society are work and the clock (Blyton et al., 1989; Hassard, 1989, 1990, 1996; Pronovost, 1989; Zerubavel, 1977, 1979).

2. Mechanical Clocks, Time and Computers

The impact of the mechanical clock on western society in the 17th and 18th centuries provides another telling example of the importance of studying time in

social and historical contexts. It also gives a clue to understanding why information technology becomes an issue in relation to time.

The first reliable timepiece was arguably invented in 1657 when Christiaan Huygens successfully applied the regular swing of a pendulum to a clock. Next to its predecessors such as the sundial, water clock, hourglass, etc., the mechanical clock was incomparable in accuracy. Before 1657 clocks could not keep time more closely than to about 15 minutes per day; within 20 years they could be relied on to vary by less than ten seconds per day (Macey, 1980: 33). In addition, there is a fundamental difference between the mechanical clock and other types of timekeeping devices. Before the mechanical clock, time had always been measured in relation to physical and biotic phenomena, that is, to the rising and setting sun and the waxing and waning moon, the periodic movements of stars, the changing seasons, the growth of plants, and so on. Time was also associated with human activities and events such as daily work rhythms and harvest, which relied on nature. People woke up and started to work when the sun rose; they stopped working and began to sleep when the sun set and darkness fell; they enjoyed harvest festivals when crops grew ripe and trees bore fruits. Then 'time was not something fixed in advance and divorced from external events' but, with the appearance of the mechanical clock, time became 'a function of pure mechanism' (Rifkin, 1987: 85). People are woken when the clock strikes seven, not when the sun rises. They work nine to five, not while the sun remains bright. They eat when prompted by the clock, not when they feel hungry. They go to bed before midnight, not when it is too dark to do something. People typically enjoy New Year's Day on 1st January, which has nothing to do with harvest. Therefore some historians of civilization suggest that it was clocks that 'dissociated time from human events' (Mumford, 1934: 15) and 'human events from nature' (Landes, 1983: 16).

The clock is a tool for measuring time. However, its impact on human life and civilizations since its invention and widespread use is enormous. Mumford states that '[t]he clock, not the steam-engine, is the key-machine of the modern industrial age' (1934: 14) because the clock was 'a model for many other kinds of mechanical works, and the analysis of motion that accompanied the perfection of the clock, with the various types of gearing and transmission that were elaborated, contributed to the success of quite different kinds of machine' (p. 15). Thompson (1967) investigated the impact of the mechanical clock on labour disciplines in early industrial capitalism when the 'task-orientation' of time organization, in which work proceeded to 'natural' rhythms (think of labour from dawn to dusk in a farming community) gave way to 'labour timed by the clock' (pp. 59–60). Macey (1980) insists that English supremacy in the horological revolution of 1660–1760 contributed greatly to the English industrial revolution, which is usually considered to have begun about 1760. He further insists that clocks in the 17th century affected not only industrial organizations,

but also every aspect of the society: literature, philosophy, theology and therefore our way of thinking and our view of the world.

Moving on from the discussions of the mechanical clock and its social impacts, we suggest an analogy between clocks and computers. Bolter (1984) considers the computer as the defining technology of our age, whereas clocks and steam engines were the defining technologies of western Europe in the 17th–19th centuries. The computer is 'the contemporary analog of the clocks' (p. 10) in previous centuries. From the historical roles which mechanical clocks played in the past, we can reasonably infer that computers have an equivalent potential to affect contemporary society in terms of time. Information technology can change our time as clocks did. Rifkin (1987) argues:

> It is likely that within the next half century, the computer will help facilitate a revolutionary change in time orientation, just as clocks did several hundred years ago when they began the process of replacing nonautomated timepieces as society's key time-ordering tools. (p. 13)

For example, 'Minutes, and later seconds, did not normally appear on clocks until after the discoveries of Huygens' (Macey, 1980: 41), and therefore people did not have time consciousness of minute and second, at least in everyday life. Before the clock, there was no accuracy and punctuality such as we have now. Likewise, 'the new computer technology is already changing the way we conceptualize time and, in the process, is changing the way we think about ourselves and the world around us' (Rifkin, 1987: 13). How, then, can computers transform time in the contemporary and future society, that is, information society, network society (Castells, 1996), or whatever it is called?

3. Time and Computers

There is not much research that addresses time and computers substantially. However, the topic is already attracting the attention of researchers from various academic disciplines. Negroponte (1995) mentions the impact of electronic mail on work time. Electronic mail changes the rhythm of work and play:

> Nine-to-five, five days a week, and two weeks off a year starts to evaporate as the dominant beat to business life. Professional and personal messages start to commingle: Sunday is not so different from Monday. (p. 193)

Electronic mail also can make people less sensitive to international time-zone differences (Failla and Bagnara, 1992: 672). Negroponte gives another example (p. 49). The 'nine o'clock news' has a special meaning in everyday life over almost all the world. Some people are keen to arrive home by then, especially when a big issue is in the news. The time of 9 p.m. functions as a reference time

for them in organizing their day. Cable TV news networks such as CNN cause the time 9 p.m. increasingly to lose its meaning as a temporal reference point because they repeat updated news every 15 or 30 minutes. The Internet can accelerate this trend. On the Internet, one can retrieve and watch news when one wants, not when it is delivered by broadcasting companies. Once this practice is generalized among the population, 9 p.m. is no longer different from 8:17 p.m. Then the lifestyle which employs it as one of its important temporal anchors (e.g. 9 a.m. for starting work, noon or 1 p.m. for lunch, and 5 p.m. for calling it a day) will be transformed. In these ways both the seven-day week and the currently patterned day are weakened by the Internet.

According to Failla and Bagnara (1992), information technology causes profound changes in the time-frame patterns of the decision-making process. It also eliminates rigidity in work rhythms, giving flexibility. The organization of work is becoming less and less rigid in terms of time-patterns. This is especially true of professional work performed in offices with information technology support. The application of information technologies to knowledge-based activities

> . . . generates work methods that cut across the 'traditional' sequence of events, changing the durations customarily regarded as 'appropriate' and reducing the need to 'program' activities, and hence to resort to rigid timetables. The effect of these changes is to disrupt the traditional work rhythms. In this sense, information technologies help to eliminate or diminish the importance of time-frames generally accepted as appropriate for performing a given activity. (Failla and Bagnara, 1992: 678)

The impacts of information technology on time assume different patterns depending on the stages in the development of information technology. Failla and Bagnara classify its development into three stages: the automation of routine activities, decision support technologies, and virtual reality technologies. Each stage has a different meaning in terms of time.

In the automation of routine activities at the early stages of computerization, there still remains the same high degree of rigidity in work rhythms. Such high rigidity characterized the mechanical technologies of the first industrial revolution. In this phase users complain that computers dictate the rhythm of work. They are required to adapt to machine time. Some attitudes of resistance to computers can be attributed to the disorientating effect of the 'new' rigid time-frames imposed by the technology. The next stage is characterized by the proliferation of direct users of information technology generated by the advent of the personal computer. This phase sees the development of information technology for individual decision-making such as spreadsheets, databases and packages for statistical analysis. Although these technologies for decision support systems result in changes in decision-making processes, the most significant transformation is their disruptive effect on rigid time-frames. Due to the decentralization of processing capacity through the personal computer and

the subsequent development of specific applications to support individualized decision-making, a new relationship with technology has been generated. The relationship is no longer subject to the time constraints of centralized systems. When the technology evolves from supporting individual decision-making, to aiding organizational decision-making such as group decision support systems (GDSS) or computer supported cooperative work (CSCW), bigger impacts on time are expected. At present, information technology is experiencing another phase of development which is likely to have a qualitative impact on time. The new technologies make it possible to project a virtual reality environment, and help us to simulate the consequences *in advance*. The decision-making process has always been based on *past* experiences. With this technology, however, we can gain experience of scenarios or events that have never been encountered in real life. Virtual reality technology therefore allows 'future' or unexperienced experiences to be experienced. We can reconstruct the experience needed to generate alternatives with the help of information technology. It allows simulation of the future and thereby modifies the time-frames which are no longer relegated to repetitions of the past with little variation.

There are empirical studies on time and information technology in organizations. Barley (1988) investigated the impacts of computer-based radiology equipment on temporality and social relations in hospital radiology departments. He found a dichotomy in ways of organizing time: monochronic and polychronic ways (Hall, 1959, 1966, 1983). In the former, people do one thing at a time; in the latter, several things are done at once. Barley found that the new computer-based equipment increased the monochronicity of radiologists' work by restructuring the duration, sequence, temporal location and rate of recurrence of events. It in turn enhanced the symmetry of temporal organization between radiologists' and technicians' work. Furthermore the increased symmetry contributed to decreased conflict between radiologists and technicians.

Lee (1997, 1999) further developed the points made by Barley. He suggested six dimensions of temporality in business processes: duration, temporal location, sequence, deadline, cycle and rhythm. They were used to describe and analyse temporal changes in the work under study. In his case study, information technology transformed temporal profiles of work and also created a temporal symmetry between work groups interacting with each other. Unlike in Barley's study, however, the main direction of change was polychronic.

4. Temporal Dimensions of the Internet and Corporate Intranets

We can simplify the features of the Internet and other networks such as internal corporate networks that can be analysed for a new temporal view. These features can be described in terms of the users (and uses), the publishers (and

their servers), and the powers (including economic powers and regulatory or governance authorities).

Users have the opportunity to alter their temporal perceptions by virtue of having access at any time. That access gives the illusion of being instantaneous. Users are assumed to have short attention spans, and this has influenced the design of much material. The experience of television holds strong sway over the style of presentation.

Internet servers are (supposed to be) always switched on. Their constant presence means that all materials are always available, and in aggregate the Internet is as accessible in the middle of the night as at the height of the working day. The burden of costs is shifted from consumers to publishers, the owners of infrastructure, and those who attempt to govern the Internet. This current state is not symmetrical with the distribution of powers, which is more difficult to assess, since they are spread among suppliers of hardware and software, other standards setters, and a small number of companies, including the largest Internet service providers and search engines.

We can apply the analytical dimensions of temporality to the Internet and other networks to discern a structure in the confusing variety of features. This then provides us with the opportunity to differentiate researchable features, some of which lend themselves to measurement or direct comparison across situations where different users or distinct uses can be assessed.

Duration

The notion that the Internet provides instantaneous access to a world of information is a useful fiction. There are, however, two ways in which we might regard the concept of duration as applying: in the ways in which users typically go about locating and browsing materials, and in the real experience of viewing identified sites. It would be better to recognize that there are lag times in accessing and downloading sought-after material and that this often causes frustration and sometimes expense. In that sense we can regard the experience of using the Internet as one of pseudo-instantaneous access.

The style of web surfing that is currently common is another sense in which duration plays a role. As we have learned from our behaviour with television, the shortening of attention spans and the preference for short bursts of superficial material have altered the way we regard material on the Internet. We are unlikely to feel the same need to sustain our attention for long periods, as we do when we read a book.

Temporal location

The Internet is 'always on'. We can access it at any time and real business can be transacted independently of any cycle or working period. This is not a unique feature of the Internet but since it is the case with all users, unlike, say, automatic trading systems, it stands out as a distinct shift. Increasingly, dedicated networks are also being used independently of their location and corporate intranets have been especially useful for geographically dispersed companies as well as temporally dispersed users. This has been interpreted by some to mean that employees will face 24-hour demands to work, but this is not yet discernible as a real trend.

Sequence

One of the most vexing problems of the early days of the world wide web was the confusion of sequencing which users experienced. The concept of 'navigation aids' was the means to address this problem of users feeling lost, and other common features include files which show the 'history' of a search. However, the fundamental problem of sequence appears mainly because of the facility of 'hypertext', which was designed to provide an alternative to linear reading. This loss of linearity is both a physical and a temporal change because, although searching is still temporally linear in a concrete sense, it loses that feeling of continuity for users much of the time.

Deadlines

Deadlines are a constant, static presence in our working lives. Usually dictated by procedure and governed by traditional practice, they solidify our schedules. We can observe, however, that Internet applications shift the concept and allow us, at least, to renegotiate our structure of deadlines. It is largely the features described above, the differences in duration, temporal location and sequence, which provide the opportunity to place deadlines at different positions in the course of a task. This was studied in detail in the case of temporal shifts at the Korean electronic trading system, KTNET (Lee, 1999) where daily routines were radically shifted by the changes in deadlines that were applied to business procedures.

Cycles

Interaction among collaborators is traditionally cycled by a combination of day/week/month/year demarcations and task cycles. As duration, sequence and deadlines shift, new cycles are allowed to appear in using networks. These can

be constantly renegotiated as befits the task, and there are possibilities of charting and managing numerous simultaneously operating cycles.

There are also cases where the concept of cycle is radically altered, as when global organizations engage in the continuous production of products such as software. Some developers have structured production such that procedures are smoothly handed over from workers in Hong Kong at the end of their working day to their colleagues in London, who then hand over to colleagues in California. This allows for almost constant work on a single product, uninterrupted by normal daily work cycles (Gorton and Motwani, 1996).

Rhythms

The rhythms which guide us, the alternations between work and play and the ways in which we split the day, set up patterns which inculcate themselves into our lives. Such rhythms of 'busy-ness' also shift when we use electronic media to take advantage of the opportunity to condense or disperse our working effort. Since different people are 'busy' at different times, the collaborative character of electronic work can be controlled by each individual. E-mail provides a similar opportunity because it allows us to change our working rhythms. We can accumulate messages, or even messages of one particular type, and become 'busy' with them at a chosen time.

Conclusions

This article started with a sociological view that time is socially constructed. Ideas of time have changed in history (Whitrow, 1988), especially as the way of measuring time has evolved from sundials and water clocks through mechanical and electric clocks to electronic and atomic clocks. From the view that time is social, we infer that time is potentially affected by anything that makes up the social world. Information technology is one of the main players shaping the contemporary society. As such it can affect time. We believe that the invention of Internet Time is a good illustration of what we argue in this article. Internet technology has given birth to a new need at an unprecedented level for synchronizing activities of those dispersed, perhaps all over the world. Internet Time is a direct response to this need. Information technology, represented by the Internet in this article, could change time, its measurement, human perceptions of time, the way time is organized in life, and furthermore our view of the world, as the mechanical clock did in the 17th and 18th centuries. Castells (1996) had already noticed this change when he declared 'This linear, irreversible, measurable, predictable time is being shattered in the network

society, in a movement of extraordinary historical significance' (p. 433). He called the newly emerging concept of temporality 'timeless time'.

Our belief in the potentially huge impact of information technology on time in the new millennium should not be interpreted as meaning that we argue for the replacement by Internet Time of the current time system based on GMT. As seen in the historical examples of the week systems, the fact that neither non-seven-day week survived indicates that 'despite its arbitrary and conventional basis, the standard temporal reference framework is deeply rooted in the culture' (Zerubavel, 1977: 869). The current temporal system is deeply, almost completely, embedded in our life, not only socially but also biologically. For example, a baby from the moment of its birth is socialized or conditioned to live according to the hourly system by being fed or encouraged to sleep at regular intervals determined by clock time. We cannot get out of it easily.

'Internet Time' or BMT is a cute kind of game; we can enjoy playing with notions of alternative conventions. However, what is really important is the perception of time and the way time is organized, and we have provided a conceptual guide to how to assess where the Internet makes a real difference to temporality.

Note

1. Swatch is launching a new series of products loaded with the Internet Time function. To find what time it is at the moment of your reading this paper by Internet Time, visit the Swatch website [http://www.Swatch.com]

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