NAVAL PORTS AND VIRTUAL NODES: THE HISTORICAL EVOLUTION OF WORLD-CITY NETWORKS IN THE GLOBAL WORLD SYSTEM

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ABSTRACT

Most treatments of globalization view it as a relatively recent and unique process. Combining frameworks of political geography (world city and network analysis) with a long-term oriented IR framework, further evidence is provided for the emergence of an informational network economy, global in extent, cyclical in occurrence, and evolutionary in nature. The paper empirically traces the origins of today's global digital infrastructure (in the form of ICT networks) from the emergence of a commercial Phoenician system emerging 1000BC over the 13/14th century Italian city state and 16th century Dutch maritime commercial networks. The focus on networks and the re-emergence of global cities as central nodes in the world economy highlights the need to add data beyond the state as the level of analysis for studies of the international system. At the same time, however, it makes evident the need to view these nodes as an embedded part of a state-based international system.

Keywords: globalization; iNet economy; world cities; New Economy; world system processes; commercial networks

INTRODUCTION

The study of globalization as a conceptual tool for the understanding of our modern world system has been increasingly greeted with criticism from a multitude of directions. Originating in French and American writings in the early 1960s, the concept of globalization has been used to capture everything from the rise of global financial markets to the fall of the Twin Towers on September 11, 2001. It often provided, however, little substantive insights in terms of globalization as a theoretical construct. Most treatments of globalization view it as a relatively recent and unique process. This paper provides a world-historically based and interdisciplinary framework to study current transitions and the development of a post-Fordist or "New Economy" as an evolutionary process. A closer focus on the world-city system development allows us to gain a better understanding of the global system process as whole. The paper thus provides such a focus within the context of the Extended Evolutionary World Politics (EWP) framework. It argues that the rise of the Phoenician maritime commercial system provided an important nucleus for the evolution of a global maritime-based external network system now developing into an external network system based on digital communication networks. Combining frameworks of political geography (world city and network analysis) with a long-term oriented IR framework, further evidence is provided for the emergence of an informational network economy, global in extent, cyclical in occurrence, and evolutionary in nature. The focus on networks and the re-emergence of global cities as central nodes in the world economy highlights the need to add data beyond the state as the level of analysis for studies of the international system. At the same time, however, it makes evident the need to view these nodes as an embedded part of a state-based international system.

EVOLUTIONARY APPROACHES TO THE STUDY OF GLOBALIZATION

Although there are a multitude of evolutionary approaches we can identify a number of core assumptions that build the basis of the approach. The special emphasis on change is probably the most commonly associated factor of evolutionary approaches, so it is not surprising that assumptions regarding variation and selection are crucial concepts for the evolutionary paradigm. Change in this view is a constant phenomenon rather than a disruption from the norm. Rather than searching for some forms of equilibria, evolutionary frameworks aim to identify and understand the dynamics of the system and its subsystems.[1] Change appears in a variety of shapes and sizes. Whereas some changes can have large, immediate effects, other changes develop their impact gradually and more incrementally. Also, the interaction and feedback effects in the system have an important impact on the timing of change. Often a number of previously insignificant and incremental changes can suddenly grow in importance and scope and quickly diffuse

[1] It is important to remember the underlying argument, that change in this context is neither linear and constant nor completely random. This, of course, would render any study useless or at least highly speculative.

throughout the system when paired with new innovations. We can state that depending on the type of change, as well as the time point in which those changes occur, those changes are likely to lead to different outcomes. What becomes crucial from an evolutionary perspective is to uncover the pattern of change within the system of interest, in our case the development of the global world system.

This implies two other foci in evolutionary approaches: time and multidimensionality (Thompson 2001). It is rather obvious, that one cannot engage in evolutionary studies without engaging in historical studies of change. Evolutionary analysis weaves together the life-cycle analysis of various elements of the system, taking into account the ecological context in which those cycles unfold, since none of these processes do take place in an isolated spectrum. Thus, evolutionary studies of globalization cannot be limited to, say, changes in world trade, the change in actors, such as states, or the change in forms of political interactions. The complexity, interactions and feedback-effects, interdependencies, and coevolution of subsystems make it necessary for students of the globalization process to look at all these issues (and others) simultaneously (Thompson 2001). The evolutionary approach provides us with a better understanding of the implications of certain developments in certain moments of time because it provides us with a roadmap of the dynamics of systems.

A view often encountered in critiques of structuralist approaches[2] is the accusation that the structures directly determine outcomes, when in fact structures are merely generating impulses and possibilities that may (or may not), given a set of certain conditions, lead to certain results. Rather than arguing for an deterministic outcome through structure, evolutionary studies instead examine the "evolutionary drive" (Allen and McGlade 1987; see also Allen and Sanglier 1981; Allen, Clark, and Perez-Trejo 1992) inhibit in all systems, that creates what Allen et al. (1995) have called "possibility space," or the range of potential options for change open to the system and its parts.

If, as we argue in this work, globalization is an evolutionary process in the making for an extended period of human history rather than a unique occurrence that started in the latter part of the twentieth century (or 1945, or alternatively as a result of industrialization, or any other starting point in recent history), than we must show that the processes usually identified with "globalization" are part of a *longue durée*. We must demonstrate that these changes resemble past patterns of change and are but a part of a new cycle in the long wave of world politics. A powerful evolutionary theoretical framework[3] that allows us to

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[2] It is important to note that despite the great role of structure within the evolutionary approach it should be considered different from now "classic" Marxist and neo-Marxist structuralist approaches in the IR literature. This does not deny a at times great overlap if not in the analysis but in the questions asked and the data employed with structuralist IR approaches. One is also, however, able to identify traces of realist and liberal insights in evolutionary approaches, since it allows students of change to employ important and helpful insights from other paradigmatic schools without also being burdened with their limitations in terms of assumptions and levels of analysis and actors.

[3] Among the major advantages of the use of such a framework is the ability to unite various social scientific approaches. These approaches might have different foci in their inquires and can also be rooted in different (social) scientific traditions. Therefore, we can combine the insights garnered from evolutionary economics illustrating the problems of competition, innovation, and technological change (see e.g., Schumpeter 1989; Rostow 1978, 1952; Freeman and Louçã 2001; Freeman 1986; Perez 1985), with findings from evolutionary psychologists and their inquiries into

do so is the Extended Evolutionary World Politics (EWP) Matrix, based on the work by Modelski (1990; 1999; 2000; 2001; Modelski and Poznanski 1996) and extended by Rennstich (2003b).

The Extended Evolutionary World Politics (EWP) Framework[4]

The aim of the Extended Evolutionary World Politics (EWP) framework is to provide a way to look at the "big picture" of the development of the human species, yielding a periodization of world history as a phased evolution of the world system. The EWP Matrix enables us to analytically separate the overall process or world system evolution into four distinct, but interrelated, evolutionary processes whose temporal dimensions stand to each other in a relations of 1:2:4:8, each in turn composed of four phases. The evolutionary **world economy process**, defining major modes of organization of production and exchange in agriculture, mining, industry, and other economic activities, unfolds over a period of roughly a thousand years (separated into four phases). During this process, periods of productive development, and surge of new technologies (enabling new "technological styles"), such as bronze or iron, alternate with others that expand networks of interchange, pioneering new trade routes, and thus enabling the broader disperse of innovations.[5] A major shift (in terms of the general mode of organization) has taken place during the emergence of the modern era with a shift from a command economy toward a market structure, slowly covering the entire globe.

This process is nested in the process in what is referred to as the **active zone process**, defined as the spatial locus of innovation the world system, representing the political process driving the world system evolution, and unfolding over a period of roughly two thousand years (again separated into four phases). Since innovations (and their diffusion) are at the heart of social and cultural innovation, (subsystem-) environments that foster the generation of variety (or greater possibility space) become the "active zones" of the world system. Areas made up of autonomous entities, such as state systems, and intermediate political networks, characterize the political structures of these active zones.

The political process is again nested in a process of **world socialization**, lasting about one millennium, and representing major phases of concentration of metropolitan power and the formation of (often) dependent hinterlands, that from time to time organize themselves to effect a system leveling (or dependency reversal). This process reflects the enormous and persistent tensions—or "evolutionary heat"—that the pressures for innovation (as a consequence of the various coevolutionary processes) and the demands for equality (the operative condition of every human community) produce. So far, we can

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cognitive decision-making processes (see e.g., Dark 1998), and the epistemological insights into scientific progress as steered by repeated trials and error-elimination procedures (see e.g., Popper 1979).

[4] This discussion is based on the various treatments on the framework by Modelski (1990; 1999; 2000; 2001; Modelski and Poznanski 1996).

[5] These intervals of the extensions of internal- and external-network structures are part of another important process in the development of the world system, discussed in greater detail below.

identify two such periods, here noted as a "crude structured world"[6] dominated by empires of major civilizations and characterized by attacks on this dominance in order to share in (or at times replace it completely), and a "fine structured world," resulting in a more complex reaction-counteraction process of the center/hinterland tension. In this environment, the tension fosters more complex forms of mutation.[7] All these processes are imbedded in the macro **world system process**, providing the overall (and fundamentally cultural) context in which the other processes take place.

World System Processes, Globalization, and the World-city System

In this view, the world system, especially in its more developed form beginning with the collective organization phase, is driven not only by political, but also economic, social, and cultural (i.e., "learning") structures. Globalization (i.e., the global world system process) thus is understood to be a set of coevolving processes: *global economic evolution* (of trading systems and world markets); *global political evolution* (of nation-state systems, world power competitions, and international organizations); *democratization* (i.e., the formation of a potential democratic community); and the creation of a *world public opinion* (through media and learning processes). The ultimate agents of these processes are individuals and organizations sponsoring and advancing innovation that results in the strengthening of the global layers of interactions.

/Table 3 about here/

From this follows, that the phase of the global world system process that comes closest to the most common perception of globalization (i.e., the idea of an interdependent "one world") has begun to develop around 903AD (see Table 3), developing the preconditions (global system process) through variation-generation and experiments during the build-up of a global community (global community process). This process is driven by the dynamics of the nested political and economic processes, extending the possibility space during each phase and moving the globalization process forward through the trial and error process of the evolutionary drive logic and the punctuations of a selection of the fittest organizational and institutional setting.

/Figure 3 about here/

Figure 3 graphically summarizes our model of the modern era globalization process as laid out in the EWP model. In this view, the global system process reaches hypercoherence during the nineteenth century and experiences a "punctuation" (i.e., "catastrophic change") around 1850, resulting in the end of the experimental phase in the

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[6] Modelski has argued elsewhere (Modelski 1987, 24-6), that this "crude structured" or premodern world, from an organizational structure viewpoint, resembles a relatively simple, two-tiered system, combining the world of "great tradition" based on imperial courts, cities, and temples, with the large number of widely dispersed "simple traditions" of the village peasantry.

[7] One example would be the greater variation in organizational structures, enabling and encouraging more forms of cooperative arrangements, as for example demonstrated in Spruyt's (1994) analysis of the evolution of the state system.

global community process and starting with the democratic phase as its selected fittest global social system. During this punctuation, the global system process changes from an external structure to an internal one (starting around the middle of the eighteenth century), manifesting the selected organizational and institutional structures, until a new phase of evolutionary dynamic sets in during the late twentieth century.

/Table 4 about here/

In this paper, our main focus rests on the evolution of the world-city system (see e.g., Bosworth 2000; also Chase-Dunn and Hall 1997). As pointed out earlier, adaptation to changing environments is a crucial factor for the development of the global system process. As Bosworth (2000, 279) argues, adaptive behavior in the case of the development of the world-city system emerges in the face of "blockages" brought about by military and political "choke-holds on world trade." Within our framework these "blockages" correspond with punctuations of the global system process, forcing active innovative agents to adapt in the form of circumvention and the development of new connections. These connections can either involve a recombination of existing nodes in the current system or even the development of new nodes and consequently a new system. Table 4 lists five blockages crucial in the development of the world-city system. The first two blockages mark the transition from a land-based Silk Road to a maritime-based Spice Route system. The third and fourth blockages represent important turning points of the system from a preindustrial Spice Route to an industrial Atlantic system. The fifth blockage marks the transition to an informational system based on digital communication networks.

The cycles of Silk Road and Spice Route alternation reflect the tension between continental (i.e., land-based) and maritime systems, where each represent a strategy for building an increasingly complex systemic structure, expanded connectivity, and thus higher differentiation of the system as a whole. This pulsating shift towards an external maritime network system is captured in Figure 4.

/Figure 4 about here/

Our expectation of the global system process as a learning structure (see EWP discussion earlier) is reflected in the shape of the curve in Figure 4. After an initial progress towards a crude external, maritime system, the development levels off (after the second blockage) into a crude land-based external system, until it slowly resumes its development with the rise of the increasingly maritime Sung China system (after the third blockage). It is important to note that each of these blockages represent punctuations of the system in form of internal network systems blocking the emergence of a global system process based on increasingly complex external networks (see discussion below).[8]

In the following section we shall discuss in greater detail the emergence of the evolution of the world-city system as presented in Figure 4, with a special focus on the

[8] For a discussion of the impact of internal network system versus external network systems, see Rennstich (2003a; 2003b).

three main points of its development: (1) the rise of a (crude) external, maritime network system as the result of the rise of the Phoenician city system; (2) the renewal of the system after its leveling-off period with the emergence of the (complex) external, maritime Italian city systems; and (3) the transition of the (complex) external maritime network system towards a new system based on digital communication networks.

The development surrounding the emergence of the fifth blockage (see Table 4) is the main focus of the following sections. It is especially significant for the further evolution of the global system in marking the development of a new external world city system. Rather than relying on oceanic port cities as the central nodes of the global system, the global economic shift towards an information-based system (see Table 3) marks the rise of digital communication clusters as the central nodes of the world-city system (see e.g., Dodge and Kitchin 2001; Townsend 2001a, 2001b; Wheeler, Aoyama, and Warf 2000; Mitchell 1999, 1995).

NETWORK TRAJECTORIES –MARITIME AND DIGITAL NODES

So far, we are able to identify the unfolding of a pulsating global process system, with periods characterized by internal network structures, followed by periods of external network structure dominance. Elsewhere (Rennstich 2003b) we have demonstrated in greater detail the development of three distinct network systems arising in the modern global system: (1) the commercial maritime system, (2) the industrial production system, and (3) the emerging new digital commercial system. As we have argued, both, the commercial maritime and the digital commercial system are characterized by their emphasis on external network relations, whereas the industrial production phase (as an outgrow of the "punctuation" of the global world system process in our model) is primarily reinforcing existing organizational and institutional patterns through internal networks.

External Network Systems: Commercial Maritime System

As laid out in our model (see Table 3 and Figure 3), we have argued that the formation of the modern global system—and thus globalization as we experience it today—has emerged roughly around 1000AD with the rise of complex and diversified organizations (including nation-states, as well as more complex business enterprises[9]) and the formation of networks of organization at the global level. As Modelski and Thompson (1996, 145) have argued, these organizations could not have taken place without significant innovation in the fields of information processing (e.g., printing; oceanic communication), military technology (e.g., gunpowder weapons), and economic innovations (e.g., media of exchange). Sung China is widely regarded as the geographic space where this inception (or emergence of "preconditions" in our model) has occurred (e.g., Reischauer, Fairbank, and Craig 1960; Elvin 1973; McNeill 1982; Jones 1988; Gernet 1996; Modelski and Thompson 1996).

[9] For an argument of earlier complex "multinational" enterprise organization, see Moore and Lewis (1999).

Sung China's four consecutive K-waves and their accompanying leading sectors—printing and paper (K1); formation of a national market (K2); the development of an effective fiscal and administrative framework (K3); and the expansion of maritime trade (K4)—provided the basis of the emergence of the commercial maritime system, the first instance of an expanding, global commercial system characterized by its reliance on external network structures. Asia, however, was not to be the center of the development of the emerging commercial maritime system. Although Asia remained a crucial and integral part of the emerging commercial maritime system, it was due to the dynamics of leading sectors developing in Europe that the system fully evolved.[10]

/Table 5 about here/

It is important to note, however, that the modern global system process has evolved out of a previous set of economic, political, social, and cultural world system processes. The EWP framework thus includes an analysis of the development of the pre-modern system structure ("crude structured world") as the "community building" step in the evolution of the global world system. Table 5 lists the steps from a less complex set of world systems processes that provide the path (and evolutionary selection) of the systems providing the basis for the modern global system process (as laid out in Table 3 and Figure 3). Our focus on this paper will be on the innovations emerging during the Phoenician external and maritime-based network system as the basis for the following evolution of further external, maritime network city systems and ultimately its next step in the form of an external, informational based system.[11]

Phoenician Trade Network System

Arising in a relatively narrow strip of coastal land (and what is now Lebanon and Syria), the Phoenicians emerged around 1100BC as the leading trading and seafaring power of the ancient Near East, lasting until roughly 850BC, although the main system nodes in the form of world cities such as Tyre would continue to hold an center position for much longer.[12] With networks across the Mediterranean and into the Indian and Atlantic oceans, the sturdy longboats and galleons of Ugarit, Sidon, Byblos, and Tyre foreshadowed the ocean-going ships to be employed in the next major extension of a then global maritime-based external network system with the emergence of the modern global system two thousand years later. Further improving initial models of Mesopotamian managed enterprises, the system emerging from the networks of the merchants of Tyre can best be understood as an evolution of the Mesopotamian system, but remains unique in that

[10] For a discussion on the dynamics behind this development, see Modelski and Thompson (1996, ch. 9).

[11] It is maybe not a coincidence, that one of the major innovations with a far reaching impact on all coevolving world system processes occurring during this period was the complex "coding" of language in the form of an alphabet (see Bentley 1993, 23). This innovation in itself has of course like all such major innovations its roots in previous advancement in coding of language but stands out as important evolutionary step nonetheless (Hobart and Schiffman 1998, ch. 2). It advanced the creation of a more complex world system in a similar manner as the next stop of coding not only communication but indeed all elements of life in a single, binary (i.e., digital) code.

[12] The following discussion is largely based on Moore and Lewis (1999, ch. 5). See also Curtin (1984, 75-80).

it was the first truly transcontinental system with a set of central (maritime) nodes in three different continents.

Moore and Lewis (1999, 72-3) point out to an important similarity between the first and second step of the evolution of the world-city system (as discussed earlier and graphically captured in Figure 1):

> The similarities between the Near East in the late second millennium and Europe in the century and a half before the Industrial revolution were quite remarkable. Several major powers, Egypt, Babylonia, Hatti, Mitanni maintained a balance of power which was to be challenged by several new ones, Assyria and Elam in Mesopotamia, the Moschi and Tiberani in Asia Minor and the Aramean, Canaanite and Hebrew city states and tribal kingdoms of the Levant. Clear rules governed international trade during the Amarna period. The major courts treated one another as equals and all corresponded in Akkadian, the language of diplomacy. In Egypt and Babylon, court theologians and thinkers explored issues relating to the meaning of life, codifying epics of the gods and addressing problems of suffering and injustice. The old Mesopotamian models of mercantilist business endured. *Tamkâru* (merchants), both royal and private, continued to play a political as well as a commercial role. Private and public enterprise not only coexisted but were so interwoven as to be virtually indistinguishable.

Indeed this environments mirrors is many respect that of the world-city network system and mix of competing state systems during the next phase of commercial/nautical revolutions and the coevolving political, social, and cultural world system processes after 1200 (see Table 1).

From an evolutionary perspective, this description reflects the stage of "cooperation and segregation," followed by the "selection" process of the system best adapted to the environment in which it operates (reflected in the flattening of the learning curve pictured in Figure 2). It is characterized by the emergence of a common system with a common set of standards of interaction (in social, linguistic, political, and economic terms) and thus higher system complexity. This not only limits what Allen, Clark, and Perez-Trejo have (1992) termed the "possibility space" within the increasingly complex system[13] but also as result increases the "evolutionary heat" in the form of competition, ultimately driving a selection process.

In respect to the importance for the world-city system development, it is important to note that it was during this phase that the coastal cities, such as Byblos, Tyre, and Arward, took on a special role as central nodes of the new maritime external network system but remained firmly embedded in the Assyrian Empire (Buzan and Little 2000, 213). Their role as central network nodes was reaffirmed by the fact that their relationship with the empire was itself contractually based, allowing these nodes to maintain the needed degree of independence to operate within their maritime commercial system network while remaining locked-in to the greater socio-political environment of the world system as a whole.

[13] See Dark (1998, ch. 4) for an excellent discussion of the unfolding of the dynamics of complex socio-political and economic systems.

Featuring a dense and increasingly urbanized population, well-kept harbors, an ample supply of lumber, and ready supply of a highly skilled and educated workforce, the cities of the Levant were ideally suited to develop a commercial maritime-based external network economy not dissimilar to the Genoan/Venetian, Dutch, or even the first British system emerging in the second major "cooperation and segregation" stage of the evolution of world-city system (and ultimately the global system process as a whole). It is to this second stage that we briefly turn now, before we will discuss in greater detail the transition towards a new world-city system based not on maritime but digital informational networks.

Genoese and Venetian Trade Network System

Emerging from the Venetian and Genoese trade network systems, over the Dutch commercial network, to the British trading system, each long wave (of co-evolving two economic K-waves and one political leadership cycle) in the Modelski and Thompson (1996) sense, has witnessed an increase in complexity and geographical widening of the system as a whole.[14] By the tenth to eleventh century, after medieval Europe emerged from its "dark ages," European development and population growth was expanding again, and with it demand for luxury goods (such as spices and silk) and the ability to pay for them (Lopez 1987). Trade, or as Bernard (1976, 274) put it, "links with the outside world more over, the very essence of commerce" was to provide the dynamics behind Europe's progress. Similar to the earlier bursts of innovation in Sung China (see Table 1-1), this pattern repeated itself, however, now centered on the Genoese and later Venetian trading operations. Thus, the ultimate focus of leading sector trade for the European subsystem was the reordering of the flow of high value goods from Asia to Europe. Whereas Genoa led in the development and expansion of the commercial space, namely the development of the Champagne Fairs as a major trading platforms for the trade-network nodes, shifting later to an emphasis on the Black Sea trade, Venetian maritime advancements manifested and institutionalized this system, developing into a dominating commercial network node in the expanding world trade system (see Modelski and Thompson 1996, ch. 10).

Portuguese Trading Network System

In a further widening of the maritime-based network (over the less efficient land-based networks), the Portuguese were able to eliminate a layer in the distribution of goods, establishing a presence on the coast of West Africa, gaining direct access to the sources of gold in the interior. This turned out to be a crucial innovation in a century when all of Europe was suffering from a shortage of precious metal, creating in its turn a new leading sector (see Table 1-1). Even more important was the further expansion of the maritime network (opened by the voyage of Vaso da Gama, 1497-99) into a truly oceanic trading

[14] It is important to note, that our intention here is not to suggest, that only the Venetian or British trading networks existed. Far from it: what characterized the maritime commercial system was rather a vast multitude of local and regional networks, stretching, as in the case of Asia, vast amounts of geographical space (see e.g., Subrahmanyam 1996; Frank 1998). What remains crucial for the "rise of the West" (as McNeill put it) as a leading "trendsetter" or driver of evolutionary logic (in terms of the global economic and political processes) was the attempt of the network system described here to act as central nodes, connecting the divergent existing networks rather than replacing them.

network. Not only did it link the rich and complex maritime trade of Asia with the Atlantic, enabling a (relatively short-lived) monopoly over the extremely lucrative spice trade (pepper in particular) and thus in its wake a creation of a new leading sector, but also did it initiate the movement of the hub of European intercontinental trade away from the Mediterranean to the Atlantic (see Modelski and Thompson 1996, ch. 6).

Dutch and British Network Systems

As Curtin (1984, 179) has pointed out, maritime trade, in particular, has constituted the leading sector of commercial growth in the world economy, perhaps as early as the ninth century, but certainly between the fifteenth and nineteenth centuries. The emergence of The Netherlands' trading supremacy was founded on its strong role in intra- and intercontinental trade. It rooted in its success in the transportation of bulky, low-priced commodities (e.g., grain, herring, salt, and timber) to and from the Baltic region. This enabled early Dutch specialization in inexpensive but numerous freight-carrying ships and the development of an efficient shipbuilding industry. As a consequence, the Dutch were able to move into, and in the end control, the richer trades of Europe and the world namely with the capturing of the Eastern trade routes after 1580 (Israel 1989). Together with its function as a distribution center of Spanish-American silver to the northern-European area (including Germany, and the British Isles; see Braudel 1972), The Netherlands developed into the central node of the world trading network, both in terms of trading activity and finance (Table I-1; for an extensive review see Modelski and Thompson 1996, esp. 79-83; Arrighi, Silver, and Ahmad 1999, esp. 97-109).

Again we witness the now familiar pattern of the establishment of a superior network infrastructure, followed by an extension of this advantage in the advancement of superior organizational capital accumulating[15] and enterprise structures. The development of cheap yet reliable freight-carrying ships such as the *fluyt* and the build-up of an efficient shipbuilding industry clearly fit our description of technological innovations that enable the creation of extraordinary growth and the evolvement of a new leading sector. Only through the clustering of various innovations in sixteenth-century Netherlands were the Dutch able to create their expertise and advantage in transportation necessary for the generation of their trade routes and shipping dominance. It is thus in seventeenth-century Netherlands where we can find the first and most successful example of a worldwide corporate business organization, the Dutch joint-stock chartered companies. A prime example of the manifestation of this organizational form was the Dutch East Indies Company, or in its original name, the *Verenigde Oost-Indische Compagnie* (VOC), established in 1602 (for a discussion of the VOC as an institutional innovation, see Steensgaard 1982; see also, 1974; 1981; Meilink-Roelofsz 1986).[16] Together with the

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[15] During the high time of Genoese and Venetian trade, it was in Italy where the first systems of "high-finance" emerged (Arrighi 1994, ch. 2). It was in Amsterdam, however, that the first stock exchange in permanent session developed, with a volume and density of transactions that outshone all past and contemporary stock markets (Braudel 1992b, 1992a; Israel 1989). This feature of a combination of leading sector development and center financing node has characterized all following systems, in external as well as internal network environments alike.

[16] Boxer (1979, 51) describes the VOC as a "colossal organization, comparable to one of the modern great multinational firms, when due allowance is made for differences in time, space, and demography." Arrighi, Barr, and Hisaeda

West-Indische Compagnie (WIC), founded in 1621, the Dutch not only dominated important parts of the Eastern trades, but also pioneered the Atlantic triangular trade, linking European manufacturing communities, with slave-procuring communities of Africa, and plantation communities of the Americas (Emmer 1981; Unger 1982; Postma 1990).[17].

This predominant position as a center node of the worldwide trade network was successfully contested by England, after its trade had went a substantial transformation (Richardson 1987, esp. chs. 4-5). As Scammell (1989, 232) notes, the major commercial focus for England after 1650 was largely on oceanic expansion, "with the impetus coming from a surge in Asian and American imports and the simultaneous growth of a lively market in the Americas (North, South, and Caribbean) for domestic exports and reexports." Another crucial factor became the advancement of production techniques, transforming former luxury goods into mass consumed goods by substantially lowering their price of production and thus increasing availability to a larger market (Mintz 1985; see also, Davis 1954). Thus, Britain was able to extend the Dutch trading network, not only in size but, maybe even more importantly, in "depth" (i.e., vertical integration/control of production), accompanied by the increasing importance of London as the major financial node of world capital.

As argued earlier, it is helpful for our understanding of the evolution of the global system as whole to focus specifically on the blockages of the central nodes in the world-city system. These blockages manifested themselves in the form of internal network systems with the explicit attempt to block existing external network system (either land or maritime-based). From an evolutionary perspective they acted as punctuations of the global system process (based on an external network structure), forcing a circumvention of these blockages and ultimately driving the global system process towards greater complexity. Here we shall argue that the fifth blockage (see Table 2) arrived in the form of the build-up of internal network structures, forcing the creation of independent communication lines connecting the dispersed patches of mainly the British but also other players in the empirial game. We have discussed this punctuation in greater detail elsewhere (Rennstich 2003b). Our focus here is rather on the outcome of this punctuation in the form of the

(Arrighi, Silver, and Ahmad 1999, ch. 2) note that unlike their twentieth century-style versions, join-stock chartered companies were business organizations to which governments granted exclusive trading privileges in designated geographical areas, as well as the right to undertake the war- and statemaking functions needed to exercise those privileges. Again, for an argument of earlier developments of "multinational" (i.e., cross-border active) corporations, see Moore and Lewis (1999).

[17] The Dutch were certainly not the only ones to launch enterprises in this new organizational style (in itself an evolutionary outcome of earlier trading enterprises in Genoa and Venice combined with the increased influence of political actors as exemplified in the Portuguese variations). In fact, the VOC's biggest rival, the English East India Company had been created two years before its Dutch counterpart, in 1600, with other English trading companies having been chartered even earlier. Several other states and cities of the Baltic and North Sea, within roughly two decades, followed the Dutch and English lead by chartering their own overseas companies, mainly to gain unmediated access to the rich trading networks of the East (see e.g., Blussé and Gaastra 1981; Tracy 1990, 1991). They were, however, the most successful Their Asian effort, however, dwarfed the rival English East India Company's attempts, displacing it to less desirable positions in the Indian subcontinent, which, later on, proved to be an advantage for the British (Modelski and Thompson 1996, 79).

transition from a maritime based external network structure to one based on a wholly new network: an informational external network based on digital communication networks.

Transition to External Network System: The Rise of a Digital Commercial System

With the increasingly apparent demise and unraveling of the Fordist model of the dominance of internal networks beginning the 1970s, the punctuation of the global system seemed to have given birth to a new phase of extending external network dominance. This holds true not only on the macro or world-systemic level but also on less aggregated levels as well. As Best (2001) has demonstrated in his study of production systems this process has entailed "moving from a closed network to a business model organized around the leadership and design dynamic internally and open systems externally" (Best 2001, 54). Whereas the Japanese manufacturing mastery in the 1970s and 1980s of internal network management through a closed network model of production provided the basis of increasing share over existing leading sector production, the parallel development, mainly in the high-tech regions of the United States, created a new "open systems business model (Best 2001, ch. 3).

A business policy of "focus and network" facilitated the implementation and diffusion of the principle of systems integration not only in the organization of technology but maybe even more importantly in the business organization as well (Best 2001, ch. 4; Miles et al. 1997). This created the decentralized environment for the emergence of new innovative clusters that allowed for the crucial diffusion characteristic of all previous new leading sector developments. Whereas initially these external networks remained mainly within the boundaries of national economies, with networking emerging as a means of coordination enhancing the resource creation activities of enterprises (Richardson 1972), these networks increasingly tend to extend across national borders and regions (Miles *et al*. 1997). Fostered by the rise of digital communication interfaces – most visibly so in the various forms of the Internet – lowering significantly the cost of access and creation of open systems and the availability of standardized and truly global logistical solutions, a multitude of cost-efficient organizational open systems have replaced previously closed systems or open national systems. As Dicken (1999; 2003) argues, in effect, the global economy is made up of a variety of complex intraorganizational and interorganizational networks intersecting with geographical networks structured particularly around linked agglomerations or clusters of activities. This emerging external network-based system is the focus of the following section.

THE NEW GLOBAL DIGITAL COMMERCIAL SYSTEM

Previous authors have focused on the close relationship between the expansion of transportation infrastructures and the expansion of industrial economies (e.g., Berry 1991; Hall and Preston 1988). Even a superficial study of this linkage makes it obvious, that the close relationship between communication and transportation networks thus makes it necessary to study the development of communication systems and their impact as well.

We agree with Hall and Preston's (1988, 187) argument, that the information infrastructure may be just as important as the infrastructure of physical transport or even more so. In the following section we shall identify in greater detail the institutional and organizational characteristics of this newly emerging external network-based global system. What differentiates it from the previous external network system is its digital nature with implications for its scale–both horizontally (i.e., geographic diffusion) as well as vertically (i.e., connected units)–and its impact on the creation of new leading sectors. A closer look at the network trajectories of this new system will help to make this development more transparent.

Network Trajectories

Information and knowledge are two separate although intertwined concepts and the centrality of both in the new digital external network system requires a closer look at the historical development of their organization and development. A classic definition of information (from a mathematic and scientific viewpoint) refers to the reduction of uncertainty in a communication system (Shannon 1948). It thus includes any pattern of energy or matter we can find in nature as a container of information. Knowledge, however, does not simply equal information, but rather refers to "ideas and facts that human mind has internalized and understood," (Headrick 2000, 4) often acquired and assembled in a complex fashion, a complexity that makes its nearly impossible to simulate in a mechanical fashion (i.e., "artificial intelligence"). As societies grow more complex and the amount of accumulated knowledge rises, the need for information handling becomes an important determinate of successful organization and mastery of this complexity. Rather than aiming to identify a starting point for a "knowledge society" that necessarily will be somewhat arbitrary it seems more useful in respect to the framework employed in this work to view the entire development of humankind as the development of a knowledge society. This, as our framework suggests, has not been a linear progress, however, but rather a process marked by periods of sharp accelerations in the amount of information that people had access to and in the creation of information systems to deal with it (Headrick 2000, 8).

To understand the evolution of the new digital network it is thus necessary to have an understanding of the forms of information systems that mark its development. Headrick (2000, 4-5) defines information systems as the "methods and techniques by which people organize and manage information, rather than the content of the information itself." Information systems in this understanding are supplements of the mental functions of thought, memory, and speech and thus the technologies of knowledge. Headrick uses five dimensions on which to categorize information systems, namely information (1) gathering; (2) classification; (3) transformation; (4) storage; and (5) communication. Employing these dimensions, he identifies the rise of a new information system, driven as the previous information systems by the combination of information-demand, -supply, and –organization, emerging in the period 1700-1850. This new information system ultimately provided the basis for the digital informational system that is now emerging as the main central nervous system of the global system. Rather than the result of new (mechanical)

technological tools, Headrick (2000, 9, 217) argues that it was a cultural change driven by social, economic, and political upheavals and transformations.

Similarly, Hobart and Schiffman (1998) argue for a dynamic interplay between technology and culture, shaping and being shaped by it, resulting in three distinctive information ages: classical, modern, and contemporary. Hobart and Schiffman also argue for the roots of the contemporary information system in the cultural (combined with the technological) developments in the eighteenth and nineteenth century. Whereas Headrick, as a historian, focuses more on the past evolution of the new information system, Hobart and Schiffman extend their analysis and identify in addition the rise of a distinct new information system based on its digital character.[18] In this system, they argue, information no longer acts as a universal, abstract model of the world, either classifying or analytical, but rather has become a world unto itself, in which abstract symbols can be assigned arbitrarily to any objects and procedures whatsoever. As an important precursor, the rise of relational mathematics in the modern age realized the information potential of number and organized it in a broad-reaching, reductionist hierarchy, digital information has elicited the information potential of purely abstract symbols, fabricating a realm of pure technique apart any foundation in knowledge (Hobart and Schiffman 1998, ch. 8).

Before we go on to discuss these changes, it is useful to identify the trajectories of the new external network-based system, looking at the information backbones of the system, its geographical development, and the forms of information processing.

Geographical Trajectories

This notion of a special emphasis on communication systems and its impact on political as well as economic organization has earlier been highlighted by Innis (1950). He also argues that "the subject of communications … occupies a crucial position in the organization and administration of government and in turn of empires and western civilization" (Innis 1950, 3). Innis differentiates between Type 1 (i.e., durable—heavy and very portable—communications media [e.g., stone, clay, and parchment] allowing cultures to control time) and Type 2 (i.e., ephemeral—light and easily portable—communications systems [e.g., papyrus and paper] allowing cultures to control space) cultural archetypes. Innis notes that none of these cultures are exclusive. Durable and ephemeral communications media frequently coexist, especially so in more complex societies. However, excessive concentration on one type of communications media usually elicits competition from the other. Similar to the argument developed in a more broader context of networks (not limited to communication systems) in this work, Innis (1950, 216) argues, that a crucial element of the interaction between cultures is their adoption and use of different communication systems to control space. In other words, Innis's focus on communication systems as a determinant for political and economic organization analyzes the same phenomenon authors such as Mackinder (1904; 1981), Fox (1991), Tilly (1989),

[18] For a similar argument see Robertson (1998). Robertson, however focuses more on the importance of the digital computer as the enabler of this information system transformation.

Rosecrance (1986; 1999), and Hugill (1999) have studied from a more socio-political organizational perspective.

What unites these authors is their perspective that control over space differs with the types of politico-economic organization employed (roughly a division between "trading" and "territorial" states), an argument of course further explored here in terms of the relationship between control over space and the network-structure of the global system. Especially Rosecrance's (1999) latest extension of his argument as well as Hugill's (1999) study of the relationship between communication systems and geopolitics bear great importance on the study undertaken here.

Taking Innis's analysis a step further, Hugill (1999) in his study of the relationship between communication systems, geopolitics, and the global system, also emphasizes the "two-way flows of information that predominate as mechanisms of military [i.e., political] and economic control" (Hugill 1999, 4). He argues, that the geopolitical interests from trading states (in the framework of this work, states that exert their power mainly in external networks) and territorial (i.e., internal network-based states) differ in terms of the military and communications systems they employ. Whereas trading states have an interest in exerting weak control over long distances, territorial states wish to exert strong control over short distances (Hugill 1999, 7). The former thus tend to invest in long-range military and communications systems, in other words they aim to establish external networks of control. Hugill's extensive study of the evolution of mainly four crucial communications technologies (i.e., telegraphy, telephony, radio, and radar) starting at 1844—our noted point of punctuation of the global system and ultimately the birth-point of the newly emerging external network system—demonstrates how especially long-range radio and the digital (i.e., programmable) computer both evolved from Type 1 communication technologies into Type 2 and thus enablers of external network establishment and control. The pattern of existing technology being transformed in innovative spurts and clusters again proves the breeding ground for the emergence of a new long cycle of global system development. As noted earlier, however, a crucial difference to the former cycle is that it marks the return to a global system based on external network structures.

Analyzing the historical trajectories of modern-day information systems from a an organizational perspective and with a focus on the information transmission dimension, Spar (2001) provides a study connecting the ventures of Portuguese explorers of the fifteenth century to the development of telegraph and radio in the middle of the nineteenth century, and the advent of satellite television and the Internet in the twentieth century. She identifies a common dynamic in the development of new information systems, with bursts of innovation at the beginning, creating new commercial opportunities, creating a gap between economic, social, and technological activity and political control, with economic and technological development driving political advancement of the system. Spar (2001, 9) argues that communication—or in Headrick's framework "transmission"—technology deserves special attention, "for communication is the sinew of both commerce and politics, the channel through which information—and thus power—flows."

From a more technological perspective, Hall and Preston (1988) make the similar argument that the origins of the newly emerging system must be traced back to the

transformations in communication system technologies beginning roughly in the around the middle of the nineteenth century, with the invention of the electrical telegraph (1830s) as well as the telephone and the typewriter and the phonograph (1875-1890). These new inventions marked the emergence of what the authors call "New Information Technology" industries, embracing the technologies—mechanical, electrical, electromechanical, electronic—that record, transmit, process, and distribute information (Hall and Preston 1988, 5). This, of course, is congruent with our own framework and consistent with the argument of a "punctuation" of the global system development around this period, resulting in a connected, yet new and distinct external network system based on the digital central nervous system.

New External Network Structure

Expanding on his identification of trading (as opposed to territorial) states, Rosecrance (1999) develops the concept of "virtual states." As an outgrowth of a shift towards the dominance of intangible factors for the development of leading sectors

> a new form of state is being born: the virtual nation, a nation based on mobile capital, labor, and information. The virtual state is a political unit that has downsized its territorially based production capability and s the logical consequence of emancipation from land. Virtual states and their associates would rather plumb the world market than acquire territory. … The virtual state relies on mobile factors of production … houses virtual corporations and presides over foreign direct investment by its enterprises … stimulates, and a degree even coordinates their activities. (Rosecrance 1999, 4, 6)

Rather than aiming to rely on and extend internal networks of resource exploitation and production capability (in Rosecrance's words, "seeking omnipotence") states vying for leadership aim to specialize in modern technical and research services and high-level production techniques, deriving income not from the manufacturing of products, but rather their design, marketing, and financing. The virtual state is thus simply the organization extension of a smaller socio-political (and ultimately cultural) unit, the "virtual cooperation." Just as these virtual corporations (discussed in greater detail later) mark an change from reliance on internal network structures to external one, so does the rise for virtual state mark the shift of dominance from internal to external networks in the global system.

From this perspective, what characterizes the current technological revolution that enables the basis of innovative clustering of K19 is not the *centrality* of knowledge and information, but the *application* of such knowledge and information to knowledge generation and information processing/communication devices, in a cumulative feedback loop between innovation and the use of innovation (Castells 1996; Hall and Preston 1988; Saxby 1990). Whereas the leading sectors of the former external network-based global system during LC6 (i.e., the Baltic and Atlantic trade routes and later the Eastern trades) were dominantly maritime-based, the leading sectors of this external network system are increasingly digital in nature. As in previous cycles, the development of a new infrastructure sets the "tone" of the following leading sectors. It is thus not surprising to

see the emergence of a "digital trade route" in the form of ICT-based digital networks as the precursor of a more complex digital-based external network system.

The Internet (i.e., the backbone of the digital external network system) serves as a trade route in the sense that the new commodity of LC10—information—is transported along its lines. However, information itself is not the only commodity. E-commerce, or the electronically enabled retailing of software, digital books, digital services (e.g., online-brokering and e-banking), and digital outsourcing (e.g., data-processing) are now common phenomena. It is reasonable to add the growing number of web-enabled transactions ("e-business") of non-digital items and services, both business-to-business and consumer-to-business, to this count. In sum, the Internet already constitutes a significant global digital trade route and is increasingly developing into the central interchange circuit not only for commercial exchange but also for almost any other form of human interrelations.

As argued earlier, however, its impact goes beyond a mere distributive advancement of external networks. Similar to organizational changes apparent in earlier external network systems, it enables dramatic organizational change as well. As Castells (2001, 102) points out, "e-Business is not the business that is exclusively conducted online but a new form of conducting business, by, with, and on the Internet." Digital networks thus develop into a truly commercial and organizational central nerve system connecting both, digital (e.g., the Internet, mobile communication networks, etc.) and non-digital (e.g., distributional networks, production facilities, etc) in nature. The digital nature of the system allows for relative ubiquity and low cost of provision and access to the system and thus for a qualitative and quantitative deeper integration than in previous external systems. This is a crucial difference from the previous maritime-bases external system: despite its use and availability as a "trade route," the wider impact of the digital nervous system spanning the globe must be seen in its facilitator of organizational and thus institutional change on all level of human interaction, ranging from individual peer-to-peer exchanges[19] to exchanges between states and the structure of the global system as a whole (see Singh 2002 for an excellent discussion).

Harvey (1989) goes as far as to argue that *all other* aspects of late-modern societies, including cultural transformations, are in fact residue effects of this restructuring of the socio-spatial logic of modern economies into a new socio-spatial axis: as capitalist systems of production mutate to take advantage of globalizing technologies and flexible modes of accumulation (i.e., in our framework the transition to an increasing reliance on external network relationships) in an attempt to find a new "spatial fix." As our framework lays out (see ch. 2), this is neglecting the importance of the coevolution of the dynamic processes laid out in our model. As argued in greater detail above, however, we do agree with Harvey that this change of the socio-spatial logic is an important factor and driver of this dynamic process. The main enablers of this change are ICT and the development of "cyberspace" or a digital external network structure (see e.g., Dodge and Kitchin 2001; Poster 1995).

[19] For a summary of peer-to-peer standards in progress, see http://peer-to-peerwg.org. For a summary of current technology, see http://p2ptracker.com. See also Oram (2001) and Lessig (2001, 134-8).

ICT

Shapiro and Varian (1999) argue that the main pillar of what is here referred to as the Informational Network Economy is not a fundamental shift in the "nature" or even "magnitude" of the information itself but rather advances in information technology and infrastructure. The crucial difference to prior paradigms is the dramatic increase in the ability to *manipulate* information (Shapiro and Varian 1999, 8-9). The changes that lead to the increased networking described above are rooted in the information technology infrastructure but also reinforce its development. As noted earlier, Borrus and Bar (1993) mark three major technological trends, that have had the widest impact on ICT as the infrastructure for the above described property of networking: (1) the digitization of networks; (2) the emergence of broadband transmission; and (3) the increase in the functionality, performance, and variety of the non-computer technology connected to networks. Increasing the system's intelligence permits increasing differentiation of network performance, of service (or application) choices, and ever more intimate management and control. Network digitalization (for OECD) countries has increased from 49 percent of main lines in 1991 to nearly 80 percent by 1995 (OECD 1997, 12). Increases in capacity, speed and digitalization, have provided possibilities to integrate graphics, text, video and sound (including voice) in applications, while the integration of computing and communication technologies has created possibilities of accessing and using interactively services and applications. Increasing bandwidth and speeds now permit transport integration and unprecedented flexibility and performance in network use as infrastructure to economic activities. The trend towards large numbers of highly sophisticated devices increasingly relying upon a network also constitutes a discontinuous transformation in the demands being placed upon the network infrastructure in terms of both the transmission volumes and the new pattern of use it will have to support (Borrus and Bar 1993).

Rapid innovations in communication and computing technologies have reduced dramatically the per-unit costs of switching and transmitting information on networks. On transcontinental routes investment costs per voice path have declined from $6000 in 1989 to $1000 and on domestic markets the price of ISDN connection which provides two digital access lines is approaching, in some countries, the price of access for residential customers to the public switched telecommunication network (OECD 1997, 12). In addition, developments in data compression techniques, and high capacity storage technologies complement these other developments. Convergence is taking place between technologies, infrastructures and at the content, service and application levels (OECD 1997, 12). As Andrew Grove, the chairman of Intel, describes it, information technology producing industries will soon be seen just as "the Web infrastructure industry" (quoted in Lohr and Markoff 1999; see Greenstein 2000 for a review of the structure of commercial internet markets).

The Internet[20]

From its root as a U.S. defense network to an international "virtual college" of scientific and academic researchers to the globally expanding World Wide Web, the history of the Internet has been one of exponential growth in both number of users and number of hosts connected to the network (Hudson 1998; Zakon 2000). In the late 1960s, the Advanced Research Projects Administration (ARPA), a branch of the U.S. Defense Department, developed the ARPAnet as a computer network linking universities and high-tech defense department contractors. Access to the ARPAnet was generally limited to computer scientists and other technical users. Its aim was to create a digital network that was capable of being flexible enough to reestablish itself in case of damage to one of its linkages (i.e., an attack by the Soviet Union).

In essence, the Internet is a "network of networks" (Berners-Lee and Fischetti 1999, 18). Its most important feature is a set of standardized protocols (i.e., "conventions" by which computers exchange data, sliced into little "packets," over various kinds of carriers). Central to the success of the Internet was the development of two main protocols governing this process: IP (Internet Protocol) and TCP (Transmission Control Protocol). Other protocols, such as the Hypertext Markup Language (HTML) or the domain name system governed by the Internet Assigned Number Authority (IANA) have proven equally important.

In its more than eight year lifetime, the NSFNET Backbone had grown from six nodes with 56 kbps (today's normal modem speed) links to 21 nodes with multiple 45 Mbps links (broadband speed). The Internet grew to over 50,000 networks on all seven continents, with approximately 29,000 networks in the United States (Leiner *et al*. 1998). By 1990, the ARPANET itself was finally decommissioned. However, after $200 million from 1986 to 1995 in U.S. funding for the NSFNET program, TCP/IP had supplanted or marginalized most other wide-area computer network protocols worldwide, and IP was well on its way to becoming the most important bearer service for the global information infrastructure (Leiner *et al*. 1998). While still heavily dominated by the United States in terms of numbers of both users and hosts, the Internet is now widely accessible in all industrialized countries and in major cities of most developing countries.

Digital World Cities

It is important to note, however, the central position (not only in geographical terms) the United States takes within this new digital network. As a result of the emergence of the Internet as a global common standard of the digital network, the U.S. still maintains its central role of this global network. By the early 1990s, the United States not only possessed the most developed computer networks in the world, but also—due to the result of the telecommunications and later dot.com boom in this period—was left with the

[20] The history of the development of the Internet is well documented and needs no extended repetition here. For in-depth treatments of the development of the Internet, see Abbate (1999), Naughton (2000); for brief overview see Castells (2001, ch. 1), Rutkowski (1997), Varian (1997): for development of the world wide web see Berners-Lee and Fischetti (1999).

most widely dispersed digital infrastructure, making it a priority for other countries to focus on links to the U.S. rather than on links between themselves and thus reinforcing the centrality of the U.S. in the digital hierarchy. Cukier (1999) for example notes, that it is often cheaper for national service providers to lease high-capacity Internet connections (from U.S. companies) from any European capital to the United States than from one capital to another within the continent (and thus through European providers).

As Townsend demonstrates (2001b), whereas every region and nearly every country is now tied into the digital network in the form of a direct Internet connection to the United States, direct connections between other countries are less common. This is especially visible in the connection structure between different major regions, such as Europe and Asia, where direct connections are almost non-existent. As a result, the United States still serves as a central switching facility for interregional data traffic and thus as a the central node of the digital external network system.

In his study of the development of the modern international telecommunication network, Barnett (2001) also finds evidence for a network he describes as one large interconnected group of nations arrayed along a center-to-periphery dimension. His findings indicate, that

> as the world moves into the information age, the international telecommunications network has become more denser, more centralized, and more highly integrated. The fact that the network is becoming more centralized during this period [from 1978-1996] indicates that an increasing amount of information is flowing through the core countries rather than being exchanged directly among the more peripheral nations. (Barnett 2001, 1649)

Also recognizable is the reemergence of major cities as important nodes of the external network development. During the transition from an internal network-based system to an external-based one, so called "global cities" acted mainly as sites (or network nodes) where transnational flows of goods, capital, and people were tied into national and regional economies (Sassen 1997, 1991). In other words, they tied the internal network structured economies to the global system. As new studies (Zook 2000, 2001; Townsend 2001b, 2001a) focusing on digital communication networks—and thus primarily Internet-based—have shown, many large, dense metropolitan clusters of Internet activity exist outside the archetypical global cities of New York, London, and Tokyo.[21] Evidence thus exists to demonstrate that new telecommunications networks reflect a more complex system of interurban information flows than implied by earlier works centering on the global city hypothesis, connecting a wider range of cities in a more complex way (Townsend 2001a, 2001b).[22]

This renewed focus on a "centers and hinterlands" structure of the global system as well as the geographic centrality of the United States for the functioning (and control) makes it clear that despite its increasingly digital nature the global system is still very

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[21] See also Kotkin (2000) who focuses on the change of digital networks on the urban development; see also Fujita, Krugman, and Venables (1999) for a formal economic analysis of this development.

[22] Sassen (2001) in the second edition of *Global City* recognizes these changes and discusses the emergence of a new global urban system (ch 7).

much a geopolitical one in the traditional sense of the meaning. Far from creating a sphere of "space- and placelessness" (e.g., Cairncross 2001; Benedikt 1991), the new external network based system despite its transformative dynamics does not render the spatial logic of existing modernist societies obsolete. As Kitchin (1998; see also Dodge and Kitchin 2001, ch. 2; Mattelart 2000) argues, geography continues to matter as an organizing principle and as a constituent of social relations. It cannot be entirely eliminated because of the interaction of the virtual space with the world beyond ICT networks and cyberspace, which only in combination constitute the external networks on which the global world system is based. Thus, it is more useful to distinguish spatial logic—as both Castells (1996) and Rosecrance (1999) point out—between the "space of flows" and "space of places." As Morley and Robins (1995) put it:

> If we have emphasized processes of delocalization, associated especially with the development of new information and communications networks, this should not be seen as an absolute tendency. The particularly of place and culture can never be done away with, can never be transcended. Globalization is, in fact, also associated with new dynamics of *re*-localization. It is about the achievement of a new global-local nexus, about new and intricate relations between global space and local space. Globalization is like a jigsaw puzzle: it is a matter of inserting a multiplicity of localities into the overall picture of a new global system. (Morley and Robins 1995, 116)

CONCLUSION

For students of world history and the *longue durée* in the Braudelian tradition this is all too familiar. Braudel (1992a) identified so called "world cities" (i.e., single cities dominating the world economy in which they operate), notably Venice, Antwerp, Genoa, Amsterdam, as crucial drivers of modern social change in Europe. Later replaced by the sequence of what Lee and Pelizzon (1991) have termed "hegemonic cities," or rather economic centers of hegemonic states, these centers have experienced a three-phased development from adaptation to later integration (or nationalization), followed by the demise of this new focus on territoriality and the return of a network of central nodes of a global commercial, social, and cultural (and thus political) network (Taylor 1995). Here, however, we extend the *longue durée* far beyond Braudel's view and connect the rise of his world cities with the world city system emerging during the rise of the Phoenician commercial maritime network system aorund 1000BC. The blockages of world-city system networks—and thus ultimately the increasingly complex external network system as a whole—fits not only our proposed model of a punctuation of the global system before the rise of Sung China around 900AD, marking the beginning of the modern global system process. It also fits with our identification of the rise of internal network structures during the industrialization phase (with its focus on global internal networks and thus a stronger emphasis on territoriality) as a major blockage of the external global system, setting the stage for the emergence of a new, external network-based system with a renewed emphasis on world or rather global cities as its central nodes. In the same manner as the first stage of the codification of information in the form of the alphabet during the Phoenician system, the second stage of this codification, in the form of a binary (i.e., digital) code encapsulating every form of biological, social, and economic structure during the rise of the digital commercial system under U.S. leadership, has proven a crucial innovation for

the evolution of the global system. Although we cannot foresee the future, we can very well get a better understanding of the processes leading to its unfolding. If the far-reaching consequences that occurred as a result of the shift in network structure during the Phoenician system are any guide, the shift towards an informational digital system will prove to be a watershed in the development of the global system process far beyond the realms of organizational structures of firms or the hierarchical power distribution within the world system. The new digital network structure will, and to some degree has already started to, profoundly change all coevolving world system economic, political, social, and cultural processes.

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Table 3: Extended Evolutionary World Politics Model of Process of Globalization, 930AD-2080AD

Starting (≈year)	Global system process	Global community process	Global political evolution (long cycles)	Global economic evolution	Network structure
930	preconditions	**EXPERIMENTS** Reforming	**EURASIAN TRANSITION** North Sung South Sung	**SUNG BREAK-THROUGH**	build-up, transition external
1190		Republican	Genoa Venice	**COMMERCIAL/ NAUTICAL REVOLUTION**	external
1430	global nucleus	Calvinist	**ATLANTIC EUROPE** Portugal Dutch Republic	**OCEANIC TRADE**	external
1640		Liberal	Britain I Britain II	**INDUSTRIAL TAKE-OFF**	transition internal
1850	global organization	**DEMOCRACY** Democratic groundwork	**ATLANTIC-PACIFIC** USA	**INFORMATION** K17 Electric, steel K18 Electronics **DIGITAL** K19 Informational industries K20 Digital Network (?)	 internal transition external external (?)
2080					

Source: Based on Modelski (2000) and own additions. All years AD.

Table 4: World-city Blockages and Circumventions

Blockage	Circumvention	Network Structure	City Rise
I. Parthia blocks Silk Roads (ca. 25BC)	Romans develop Red Sea route	Crude external network structure (maritime)	Rome, Alexandria, Anuradhapura
II. Persia blocks Byzantium (ca. 550 AD)	Byzantium develops northern steppe route	Crude external network structure (land)	Constantinople, Changan
III. Northern tribes in China (ca. 800-1100AD)	Sung dynasty expands maritime trade	Crude external network structure (transitory maritime)	Hangchow, Canton, Cairo, Genoa, Venice
IV. Muslim powers block Europe (ca. 1400-1500AD)	Europeans find Cape route, Atlantic crossing)	Complex external network structure (maritime)	Lisbon, Seville, Amsterdam, London
V. Colonial western powers block Britain (ca. 1850AD)	UK/US create independent communication networks	Complex external network structure (informational)	New York, San Francisco, London, Tokyo, Seoul

Source: based on Bosworth (2000, 280), with own additions and changes.

Table 5: Coevolutionary World System Processes, EWP Matrix, 3400BC-2080AD

Start (≈year)	World system process (eras) SYSTEM STRUCTURE → WORLD	World socialization SYSTEM STRUCTURE → COMMUNITY	Active zone process SYSTEM STRUCTURE → COLLECTIVE ORGANIZATION	World economy process SYSTEM STRUCTURE → PRODUCTION/COMMERCE
3400BC	Ancient	**CRUDE STRUCTURED WORLD**	**MID-EASTERN**	**COMMAND ECONOMY:**
		(center-building)	(Uruk) (Sumer)	BRONZE
2300BC		(dispersal)	(Mesopotamia) (Egyptian)	FERTILE CRESCENT
1200BC	Classical	(concentration)	**EURASIAN**	IRON
			(East Asian) Indian	
100BC		(dispersal)	(Mediterranean) (Mid-eastern)	SILK ROADS
930AD	Modern	**FINE STRUCTURED WORLD**	**OCEANIC**	**MARKET ECONOMY:**
		(reconcentration)	(Eurasion transition) (Atlantic Europe)	NATIONAL MARKET
1850AD		democratic base	(Atlantic Pacific)	WORLD MARKET

Source: Based on Modelski (2000, 40).

List of Figures

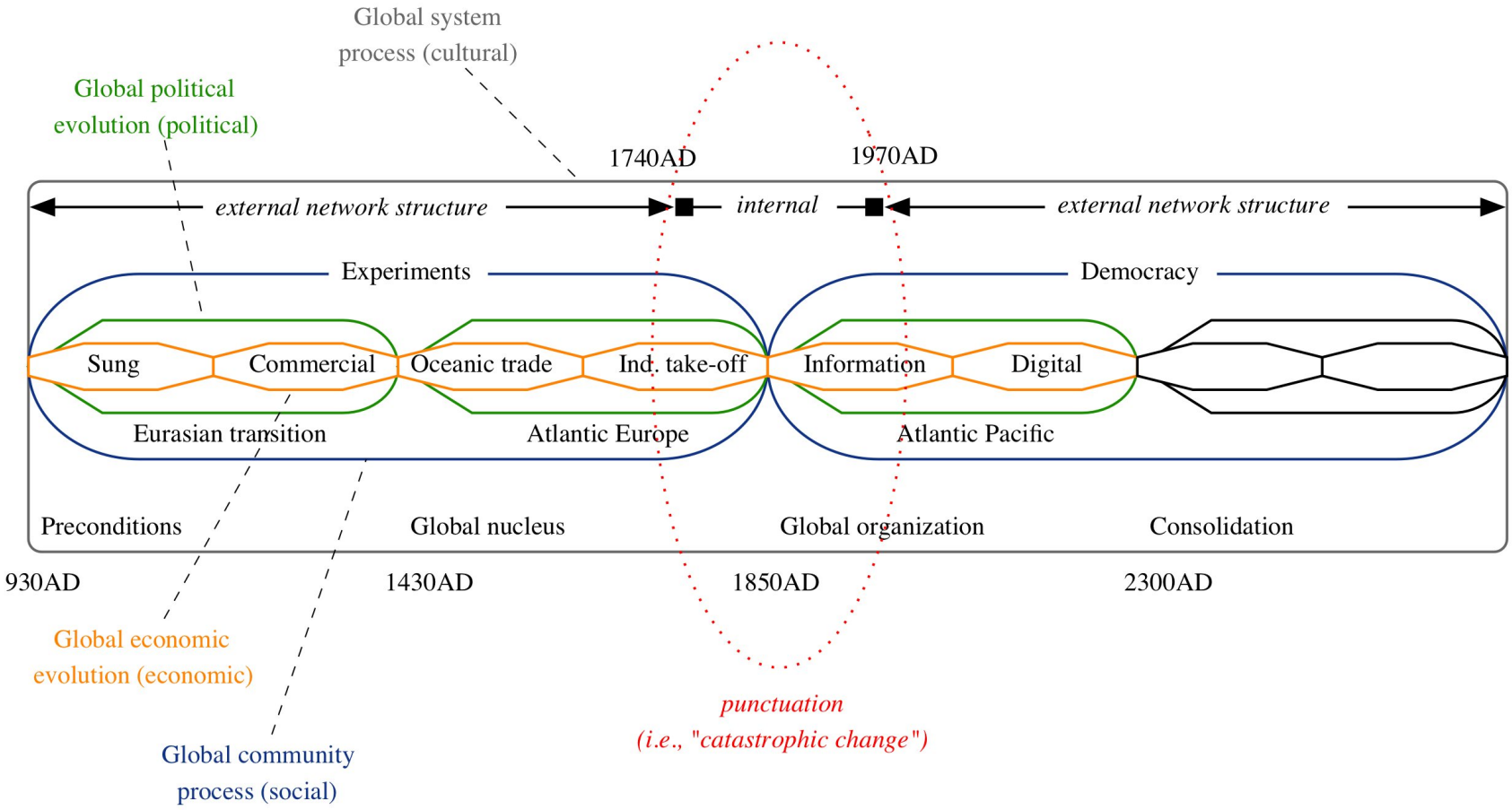

Figure 3. Evolutionary Model of Globalization, Based on the Extended EWP Framework, 930AD-2300AD

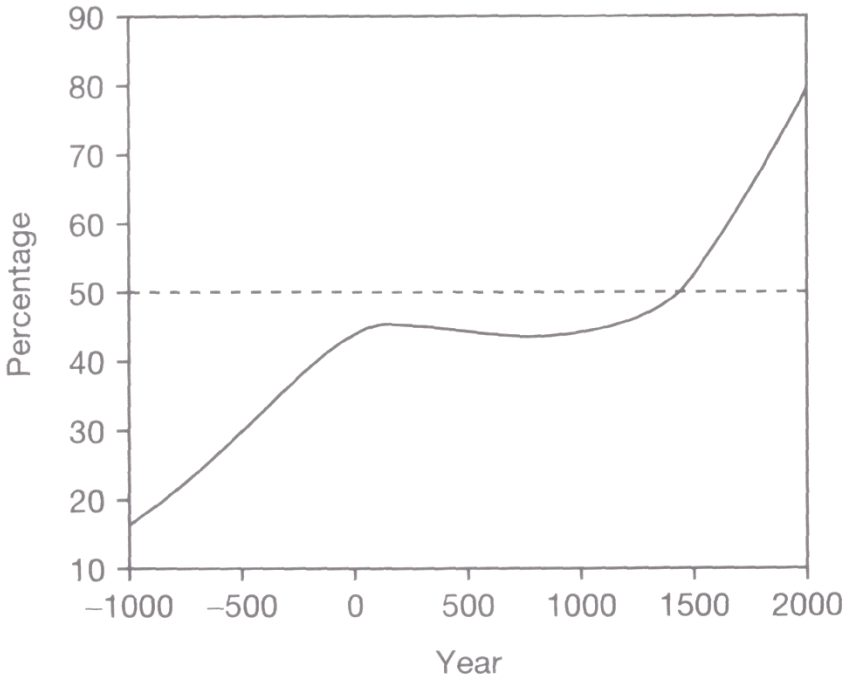

Figure 4. Maritime Shift of the World-City System Between 1000BC and 2000AD (Percentage Oceanic Port Cities of Largest 25 World Cities)

Source: Bosworth (2000), based on data from Chandler (1987) and McEvedy and Jones (1978).