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THE COMPETITIVENESS OF NETWORKED PRODUCTION: THE ROLE OF TRUST AND ASSET SPECIFICITY*

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ABSTRACT

The paper offers a synthesis of sociological and transactions cost economics perspectives on production networks. Sociological explanations of network effectiveness (competitiveness) stress the importance of trust, and transactions costs emphasizes asset specificity. The approach here is comparative, the capabilities of networks are assessed against those of the vertically integrated, managerially co-ordinated hierarchy. The argument is that the competitiveness of each form derives from different organizational capabilities. Neither is inherently superior – by supporting different strategies, networks and hierarchies can co-exist. A distinction is drawn between those networks that rely on communal support and trust and those networks whose dynamism relies on individualistic and autonomous entrepreneurship. The absence of trust (or the surfeit of entrepreneurial zeal) leaves firms reliant on generic assets. Trust creates the conditions under which communities of firms can develop industry-specific assets capable of delivering real services to network firms that are unavailable through market channels. The competitiveness of a production network is a function of the value adding activities undertaken by agents and the collective responses made to external threats or disturbances. The argument is illustrated with reference to the organization of watch (timepieces) production in Hong Kong.

SPATIALLY CONCENTRATED PRODUCTION NETWORKS AS AN ALTERNATIVE TO LARGE FIRMS

Economic geographers such as Scott (1988), Storper and Walker (1989) and Saxenian (1994) and political scientists such as Sabel (1989) argue that the emergence of regional economies, populated by networks of indigenous small firms and transplanted branches of multinationals represent an alternative form of industrial organization. Vertically disaggregated and spatially concentrated production networks (networks) are seen as a viable, and often desirable, alternative to the vertically integrated hierarchically co-ordinated corporation. Commonly cited examples of the phenomenon include American technopoles such as Route 128 in

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Massachusetts and Silicon Valley (Castells and Hall, 1994; Saxenian, 1990), the Hollywood movie and culture producing industries (Powell, 1990; Storper and Christopherson, 1987) and the craft-based industrial districts of north-east-central Italy and southern Germany (Pyke et al., 1990; Sabel, 1989).

The view that networks have outperformed larger, mass production-based firms has led to claims for the recognition of a new industrial organization. Based on the advantages of agglomeration, proximity and social cohesion, networks are seen as presenting an ascendant post-industrial structure and model for economic development (Amin and Robbins, 1990; Best, 1990). Yet the debate about the effectiveness of spatial organization has barely penetrated the strategic management literature. When management scholars adopt a geographical perspective (e.g. Kogut, 1990; Murtha and Lanway, 1994; Porter, 1990) the focus is largely at the national level. Generally, trust and proximity do not feature prominently in national accounts of new organizational arrangements.

The critique of networks as a development alternative centres on the power of multinational firms to exploit the new industrial spaces. Large firms' access to resources enables them to dominate the production and market environment and occupy favourable points along industry value chains; small firms can be relegated to low wage and low value-adding segments. Lacking the capital and skills needed to compete in more sophisticated market segments, small firms are limited to strategies based on cost reduction and price competition, or even illegal activities such as patent infringement and environmental degradation. Even in sectors where networked firms have demonstrated considerable technological prowess, such as in Silicon Valley and the Italian industrial districts, some argue that large firms are consolidating and centralizing power through selective acquisition and divisive subcontracting practices (Florida and Kenny, 1990; Harrison, 1994). The critique suggests that networks are a transitory phenomenon or a temporary response to major structural changes in technology and world product markets. As managerial hierarchies learn and assimilate flexibility they will out-compete less integrated networks.

The question posed here is to what extent can spatially concentrated production networks compete with vertically integrated managerially co-ordinated firms? The notion of competitiveness used here is derived from Porter (1990). The term is used in the sense of system productivity and refers to the ability of a firm or network to gain domestic or international market share while supporting increasing returns to capital and labour. In this view competitiveness is a function of a system's value-adding strategies and organizational capabilities. A competitiveness approach to performance permits us to make comparisons between dissimilar organizational forms. In the following sections a framework is developed around the dimensions of adaptability and asset specificity which permits a comparison of the relative organizational capabilities.

NETWORK COMPETITIVENESS

The advantages claimed for production networks lay in their flexibility and rapid response to changing market conditions. Small scale permits extensive customization and product differentiation. Product-based competition emphasizes the ability

to incorporate incremental, continuous improvements in a process Best (1990) calls 'collective entrepreneurship'. Networks create product diversity through technological and design incrementalism which equips them to respond to specialized premium-price market segments (Becattini, 1990; Saxenian, 1990). The theoretical construct underlying this system of organization is flexible specialization: a system of production in firms that are simultaneously specialized in a particular task but flexible in serving a wide range of market demands. Flexibly specialized firms thrive when situated in a localized, regional economy of differentiated firms whose core expertise is based around a common technology or product market.

Three factors differentiate a flexibly specialized regional network from a vertically integrated mass production firm. Flexible specialization involves (i) the production of differentiated goods which command an affordable price premium by (ii) skilled, polyvalent workers using (iii) flexible multi-purpose assets. Advocates of flexible specialization emphasize the importance of labour and subcontractor collaboration as a defining characteristic (Piore and Sabel, 1984). By contrast, managerial hierarchy is locked into a mass production logic which promotes the manufacture of (i) standardized goods at low cost by (ii) unskilled workers operating special purpose or product-dedicated assets (Sabel, 1989, p. 18). Labour and subcontractor relations are generally adversarial.

While this depiction of the 'Chandlerian' firm may appear oversimplified, it does isolate a key variable for the purposes of this a paper, namely asset specificity. Networked firms rely on technology, production systems and physical assets that in Williamson's (1985) terms are characterized by low asset specificity: hierarchies are comparatively efficient due to long-term investments in product-specific machinery.

The growth and proliferation of networks organized around the principles of flexible specialization is due to two related conditions: hierarchical failure and the comparative adaptability of networks. In the 1970s, hierarchical organization experienced a crisis in mature western economies attributable to a series of environmental disturbances. For example, hierarchies were unable to respond quickly and in sufficient diversity to the demassification of markets which resulted in lost market share (Piore and Sabel, 1982). Competition from newly industrial countries undermined large firms' historical efficiency advantages. Other accounts stress the failure of the labour process in hierarchies; here the shift to smaller units is a management strategy to regain control of a unionized and inflexible work place (Bluestone and Harrison, 1982; Shutt and Whittington, 1987). At the same time developments in information technologies has facilitated the disaggregation of employment into smaller units. The interaction of these and other forces have created the conditions for the emergence in all industrial economies for the re-emergence of small enterprises (Sengenberger et al., 1991). However, the decomposition of hierarchies into smaller establishments does not in itself confer the benefits of flexibility.

TRUST AND NETWORKS

The key organizational requirement for the establishment of a high-performance network is trust or social cohesion (Beccatini, 1990). Trust can be viewed as a

dyadic, interpersonal phenomenon (Lorenz, 1988). In Ring and Van de Ven's (1992) words, it is 'confidence in the other's goodwill'. Trust can also be viewed as a broader socio-economic notion that Powell (1990) calls a consensual ideology and Lazerson (1995) calls moral capital. The key point is that trust in a network has productive value as it economizes on information, search and commercial transactions costs. It creates the conditions where exchanges between technologically and legally separate entities can take the form of problem solving rather than bargaining (March and Simon, 1958). Trust promotes adaptive and flexible adjustments to changed circumstances in a context of joint utility maximization. Interestingly, these adaptive qualities are also claimed for hierarchy (Williamson, 1991), but hierarchy constitutes a deadweight economic cost relative to spontaneously generated network organization.

Proximity fosters norms of trust because there is a greater probability of future interaction among neighbouring businesses (Axelrod, 1984) and because reputation signals are more reliably transmitted over short distances. With the evocative phrase 'neither friends nor strangers', Lorenz (1988) argues that, at the interpersonal level, trust in localized production networks is characterized by an optimal degree of social distance. If agents are complete strangers both will lack the necessary information to establish a non-contractual exchange. (They must incur transactions costs, for instance, obtain credit checks to establish reliability or complete a formal contract to cover foreseeable contingencies.) If agents are too close, linked by friendship or kinship, then non-transactional obligations may enter in to the arrangement and corrupt economic rationality. Proximity helps agents identify trustworthy partners.

Competition among network members can be extremely intense, but if tacitly regulated by co-operative norms actors may be capable of perceiving and organizing for the collective interest. Here a wider notion of trust is relevant in the analysis of local production networks. Trust can also be viewed as a generalizable reciprocity or civic culture (Puttman, 1993). Civic culture implies individuals' recognition of place and a willingness to undertake activities and roles that promote the general good of the place. As Reich (1992) puts it, such co-operation is the 'principle of self interest rightly understood' (p. 68). When the social fabric is densely connected through multiple roles and social ties we can identify a productive social capital which permits a region to develop institutions and practices which contribute to economic performance. Examples include support for state initiatives, local industry self-regulation and the creation of real service agencies.

An extensive social capital also diminishes the likelihood of free-riding and other forms of social malfeasance, which impose additional costs on a community. In short, a *trust enhanced network* improves information availability, it reduces transaction costs, contributes to positive association, and may ameliorate negative externalities. These factors create for firms situated in a regional economy an additional 'thrust' over firms trading in spatially dispersed and unenhanced market environments.

The dissolution of large enterprises and the emergence of small enterprises does not necessarily lead to improvements in a firm's, or a region's, performance. Writers such as Teece (1986) and Pisano (1990) argue that reliance on markets to access specialized assets or to conduct complex transactions leads to a deterioration in firm's capability. They argue that firms which follow de-integration strategies,

particularly those engaging low cost offshore (spatially dispersed) contractors to produce key subcomponents, lose manufacturing capability. Writers stressing the importance of learning by doing (Cohen and Levinthal, 1991; Cohen and Zysman, 1987) also point out that outsourcing firms risk losing the ability to innovate and design their core products. The search for low costs and flexibility can lead to a firm becoming 'hollowed out'. Others argue that small firms are excessively entrepreneurial and pursue internecine or short-term strategies (Florida and Kenny, 1990).

In this perspective the emergence of design dependent, de-skilled subcontract networks and hollowed-out marketing shell firms are a recipe for deteriorating competitiveness. We may refer to this organizational form as an *unenhanced production network* which may be either spatially dispersed or spatially concentrated. The competitiveness of the spatially dispersed network is beyond the scope of this paper, but see Donaghu and Barff (1990) for a discussion of the absence of trust in such networks. Examples of unenhanced production network include the massive disaggregated production systems located around Sao Paulo and Mexico City in Latin America (Scott, 1988) and in certain regions of south-east Asia. Below I argue that the watchmaking industry of Hong Kong belongs to this category. At their present stage of development these examples do not yet appear to display the organizational features of flexible specialization, nor an extensive social capital. To distinguish between enhanced and unenhanced production networks we need to discuss the nature of the assets and skills and capabilities available to each form.

TRANSACTIONS COST, ASSET SPECIFICITY, AND COMPARATIVE ADAPTABILITY

Transactions costs economics is concerned with firm boundaries and the distribution of transactions between market, hierarchies and other organizational arrangements. Recently, there is also a concern with the performance of systems of aggregate transactions (Williamson, 1991). The transactions cost approach offers successful explanations of a wide variety of organization structure issues such as managerial compensation, vertical integration, the M-form firm and the multinational enterprise. It is less successful explaining the emerging de-integrated industrial structures. While plausible institutional economics accounts of specific hybrid organizational structures, such as franchise systems (Brickley and Dark, 1987) and equity joint ventures (Hennart, 1988) have been advanced, others argue that there is much in networks and hybrid structures that escapes transactions costs reasoning. Granovetter (1985), Powell (1990) and Sabel (1989) explicitly reject transactions costs accounts of networked organization because of the failure to account for the role of context.

It is possible to recognize the key role of trust as a contributor to the competitiveness of production networks without rejecting the role of transactions costs. What has not been widely recognized by sociological accounts of networks is that transactions costs introduces a concern for the efficient deployment of productive assets in organizational systems. It is this concern with the failure of networks to adapt to technological developments characterized by network externalities, or increasing returns to scale, that has prompted several writers (Glasmeir, 1991; Harrison, 1994a) to question the universality of flexible specialization as a

desirable model of development. Writing about Italian industrial districts, Brusco (1990) is acutely aware of the problem:

> The district (production network) is characterized by a strong, heavy inertia. It goes on learning the technology in a deep personal and creative way, but it is very difficult to move this huge mass of people. Therefore, industrial districts must now face the problem of how social districts are to be endowed with the technologies which are necessary to revive a process of creative growth. (Brusco, 1990, p. 17)

Large firms are capable of moving 'huge masses of people' through bureaucratic fiat; firms can acquire new technologies and exit older ones in a more direct and organized way.

CO-ORDINATED AND ENTREPRENEURIAL ADAPTABILITY

The central problem for transaction costs economics is the management of uncertainty or organizing for unforeseen contingencies – this is essentially the problem of adaptation. According to Williamson (1991), two types of adaptive capacity are found in high performance systems. We shall call them entrepreneurial and co-ordinated adaptability respectively. The former reflects the capacity of economic agents to adapt to disturbances caused by relative scarcities indicated by changing factor and product prices. Neoclassical markets in which utility maximizing economic agents respond independently and autonomously to parametric market signals are entrepreneurially adaptable in this sense. Co-ordinated adaptability is the ability to effect realignments between large-scale dedicated or co-specialized assets (Teece, 1986) located at different stages in an industry value chain. Historically such realignments were co-ordinated within large firms.

Chandler's works *The Visible Hand* (1977) and *Scale and Scope* (1991) offer an excellent illustration of the advantages of co-ordinated adaptation. Chandler shows how vertically integrated administrative hierarchies were developed to provide the organizational capacity to exploit the economies of scale and scope offered by technological breakthroughs in railroad transportation, mechanical, electrical and chemical engineering. On the question of competitiveness Chandler (1991) argues that to operate successfully in global markets over the long term, firms must make tripartite investments in world-scale production facilities, international marketing networks, and in a managerial hierarchy to co-ordinate the two. He argues that a nation's long-term strengths in an industry is ultimately determined by the creation of such firms (Chandler, 1992). Firms (or regions) that do not invest in production, marketing assets and co-ordination mechanisms are driven out by firms that do. Both Williamson and Chandler recognize industries differ widely with respect to the potential for the exploitation of economies of scale and scope.

For Williamson (1991) markets and hierarchies possess different adaptive capabilities: the organizational problem is to match the organization form with the prevailing kinds of uncertainty. In steady state product markets entrepreneurial adaptability is an adequate mechanism for coping with disturbances to equilibrium, entrepreneurs react swiftly to changes in prices and product demand.

However, where technological, economic, or major regulatory changes create the potential for investment in assets with significant scale and scope economies, autonomous adaptation will lead to sub-optimal investment. Sub-optimization is a market failure: external costs and benefits arising out of investments in specialized productive assets cannot be captured in the individual utility calculations of autonomous economic agents. Research and development expenditures or investments in labour force training create externalities that an autonomous agent cannot fully appropriate. Responses to these opportunities require co-ordinated action and in this the hierarchy has advantages over autonomous, entrepreneurial adaptation. Large firms internalize the externalities.

As noted, the co-ordination advantages of internal organization can become liabilities in markets where there are few economies of scale or scope. Here the flexibility provided by entrepreneurs responding autonomously to market signals have the advantage. Secondly, hierarchies are disadvantaged compared with markets in their ability to offer strong incentives. Managers are not owners and hierarchies face incentives to grow beyond their optimal size, or to operate with substantial 'slack' capacity. To root out slack and underutilized assets, hierarchies must employ monitoring and auditing mechanisms which in themselves add to the cost of hierarchy. In markets efficiency incentives are stronger. If entrepreneurial agents are predominantly owner-managed units there is no incentive to 'overinvest' in uneconomic capacity. Ownership of residual returns ensure that capital is deployed sparingly and used efficiently. Ownership of residual returns also ensures the direct and indirect production costs are tightly managed (Brickley and Dark, 1987). Third, because assets tend to be dedicated, hierarchies must also endure periods of overcapacity when demand slips. Generic assets can be deployed to other product market applications without any loss in value.

To summarize: hierarchies face incentives to invest, and overinvest, in co-specific assets, but having done so they face weak incentives at the margin to manage those assets efficiently. In contrast, entrepreneurs in networks face weak investment incentives, and will underinvest in co-specific assets; however, they face strong cost containment incentives and will manage assets efficiently.

Figure 1 shows that entrepreneurial and co-ordinated adaptability pull in opposite directions in terms of their adaptability and incentive attributes. The horizontal axis depicts organizational size as the key variable: at the lower limit of the individual as entrepreneur, entrepreneurial adaptability and efficiency characteristics hold strongly, with increases in size these characteristics give way to the advantages and disadvantages of the vertically integrated firm. From the discussion above it is evident that both enhanced and unenhanced production networks are characterized by entrepreneurial adaptation, while vertically integrated firms possess superior co-ordination capacity.

ASSET SPECIFICITY AND EFFICIENCY

Asset specificity is 'the degree to which an asset can be redeployed to alternative uses and by alternative users without sacrificing productive value' (Williamson, 1991, p. 281). When asset specificity arises, a long-term bilateral interdependency occurs between the stages that create trading hazards between autonomous

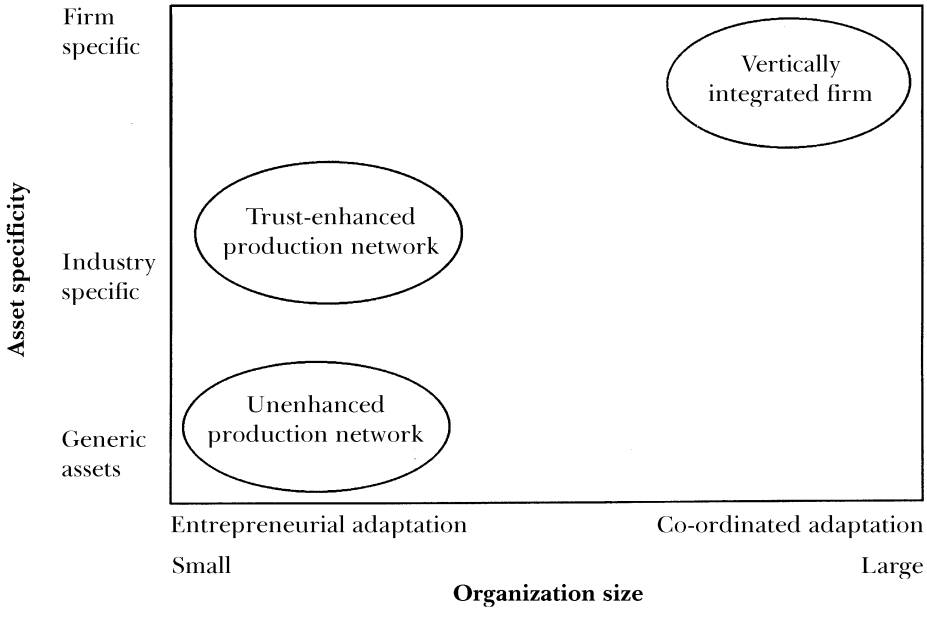

Figure 1. Asset specificity and comparative adaptability of networked production

trading partners. It is the trading hazards created by the structure of a market exchange that create transactions costs. Hierarchy by definition removes transactions costs as it restructures a trading relation to an authority relation. Integration reduces transactions costs, but it is not a costless solution; as noted above, there are diseconomies of organization related to weak incentives and the need for monitoring. Firms seek to minimize organization costs by integrating in a discriminating way, that is, when transactions costs are significant and more than offset the cost of internal organization. Secondly, transactions costs can be avoided either by not investing in specialized assets or by transacting with firms utilizing generic assets. However, these solutions have productivity consequences.

Competitiveness issues arise only when specialized assets are structurally superior to generic assets in terms of efficiency or productivity. Williamson (1991) argues that agents in high performance economies will invest in such productive capacity and outperform rival systems which deploy less productive, generic, assets.

Asset specificity enters the framework in figure 1 as an independent dimension because any particular production task can usually be performed using generic or specialized assets. For instance, an oil pipeline (high asset specificity) linking a producer and a refiner may be in certain circumstances structurally more efficient compared to a fleet of vehicles (low asset specificity) capable of performing the same task. A high performance system would deploy the pipeline; however, failures to develop an adequate governance structure (either a suitable term contract, firm or hybrid structure) may lead to the adoption of the vehicles. For individual agents in the oil business the selection of the vehicle option may be transactionally efficient but it is systemically inefficient. I propose that the competitiveness of networks derives in part from an ability to deploy an optimal mix of assets. This is not to say that highly specific, or dedicated assets are always

superior, rather a competitive system needs a mix of dedicated assets around tasks that are characterized by scale and scope economies and generic assets when there are none. Where generic, multi-purpose assets are equally or more efficient than comparable specialized assets, no governance problems arise because generic assets are transaction cost neutral.

The relative efficiencies of specialized or dedicated and generic assets also change over time and this introduces the need for adaptation. Chandler (1977) mostly describes cases where the availability and adoption of specialized assets in fragmented industries leads to the growth of hierarchical co-ordination. However, the opposite case also holds – for example, many tasks formerly accomplished by large mainframe computers running firm-specific customized software now appear less efficient than networked PCs running off-the-shelf software. The result is that firms are increasingly outsourcing data processing or using generic software available from major vendors.

The transactions cost schema outlined in figure 1 provides a performance perspective on different organizational arrangements. The basic distinction is between generic (low asset specificity) and firm specific assets (high asset specificity). Transaction cost sensitive, vertically integrated firms will internalize tasks utilizing assets characterized by high asset specificity. The competitiveness of managerially controlled hierarchies derives from both co-ordinating capacities and the ability to effectively deploy productive firm specific assets. In industries where scale and scope economies are significant this advantage is decisive. In industries where scale and scope economies are less significant and where generic assets are more productive than comparable dedicated assets, production networks should outcompete hierarchies. In these circumstances, access to dedicated assets confers no major advantage to large firms. Networks with relative organizational efficiencies (absence of hierarchy cost) plus fast and flexible entrepreneurial responsiveness have the upper hand.

It is often argued that the competitiveness of production networks derives from an ability to freely utilize non-unionized low cost labour. There is something to this argument: the ability to identify and organize cost-effective labour such as immigrants, part-time employees, and home-workers has been the initiating force in the origin of several networks (Sengenberger et al., 1990). However, as Porter (1990) argues, factor costs provide only a transitory role in creating and sustaining competitiveness. Evidence suggests that networks persist in the face of increasing labour costs – for example, labour costs in Emilia Romagna are among the highest in Europe (Best, 1990). The competitive advantages of networks derive from sources other than low labour costs. The next section argues that some networks may attain an intermediate position in figure 1; one that provides additional advantages relative to large firms.

REAL SERVICES: IMPROVING THE PERFORMANCE CAPACITY OF PRODUCTION NETWORKS

Between generic assets and firm specific assets are a category of investments called industry specific assets. These are types of assets and equipment that are used widely in an industry. Most often they will be privately owned and supplied to

industry users in a contractual way. However, an important class of assets may be characterized by three conditions: (1) economies of scale and scope, (2) information impactedness, and (3) externalities. Together these conditions cause market failure, sub-optimal quantities of the assets are supplied. In theses circumstances there is scope for an intermediary organization called a real service agency. Real services are defined as 'those service activities that generate structural rather than temporary changes in the organization of production within a company' (Bellini et al., 1990).

Real services are an attempt to enhance the capability of production networks through the collective provision of 'corporate' services. As Brusco (1990) observes, it is easier to describe real services through example than to provide exact definitions. Examples of services include research and development facilities (contract research and technology transfer), prototyping and scale-up plants, quality diagnosis, testing and certification laboratories, consultancy and feasibility studies, and marketing, sales and trade promotion services. Bellini et al. (1990) point out that real services provision is the central feature of Emilia Romagna's industrial development strategy for its diverse industrial districts. The provision of actual services to firms is a marked departure from the traditional regional development strategies based on the distribution of financial support (tax breaks, grants, soft loans, etc.).

I suggest three factors differentiate real service agencies from traditional mechanisms of state support. First; agencies have a principal mandate to assist local industries and firms. Government-supported labs and agencies often have multiple mandates or goals other than providing support to local firms. Policy makers will express the hope that a particular institute will spin-off new firms or co-generate external benefits, but this is not the principal mandate. At best, assistance and contribution to the local economy is a by-product of the agencies' activities. Secondly, agencies should provide more than real estate or business premises. The science park concept, a close relation to the real service agency, has not proved successful as an isolated policy tool (Massey et al., 1992). To meet the definition of a real service the agency should provide specific programmes of activity such as quality assurance, product testing, or market research. Third, real service agencies must have permanent staffs with functional expertise and equipped with industry specific assets that are not available commercially. In the UK, for example, local development agencies provide a range of services such as the provision of premises, financial advice, and business promotion (Bennet and Krebs, 1994). The difficulty with this multi-sector approach is that the skills and assets are highly generic in nature and provide only a basic level of support. The demands of a dense concentration of related firms in a region permits an agency to develop skills suited to local needs.

As noted, the economic logic for real services is that firms in fragmented industries are not large enough to provide the services internally. Many services also are collective goods, left to the market they will be sub-optimally supplied. Market failure dictates government provision. Technically, private providers of real services are unable to fully appropriate returns to their efforts because the outputs are externalities; therefore, the state must initially help establish the agencies and fund operational expenses for an extended period. However, industry must provide financial support in some degree as it is difficult to legiti-

mize indefinite funding to communities of firms which appear financially healthy.

For real services agencies to succeed there must be some local industry financial support and a willingness to use the agency's services. Usage involves an element of risk, since firms inevitably give up proprietary knowledge to the agency, and hence competitors, as the mandate of agencies is knowledge transfer and information sharing. Agency managers and employees must also be committed to meeting the needs of local industries; it is possible for fully funded government agencies charged with a developmental mandate to become aloof and indifferent to the needs of local communities (Castells and Hall, 1994). Yet they must be sufficiently autonomous to decide priorities and make tradeoffs. Real service agencies occupy an economic twilight world of external economies and information impactedness; as such, they enjoy an ambiguous status among community decision makers and private interests. To create the operational latitude to respond to varying stakeholder expectations the agency must create within and around itself community consensus with a full appreciation for the potential and limits of the agency's role. A rich civic culture provides the moral atmosphere for such an understanding.

The flexibly specialized industrial districts of Italy fall between the unenhanced subcontract network and the vertically integrated firms. Several writers suggest that the decentralized ownership and production structure of Italian districts offers what is here called entrepreneurial adaptability. In addition, trust provides the conditions for the collective provision of industry specific assets. Best (1990) argues that co-operative localized institutions such as the real service agencies are the functional equivalent of hierarchy. This is a strong claim, since it suggests trust forms the basis for both (i) the deployment of dedicated assets, and (ii) the organizational capacity to bring about co-ordination between agents at different stages in the value chain.

The first claim has merit: co-operative local institutions such as real services provide industry specific or rather locale specific 'functions', since any firm locating in the region has potential access. Hierarchies, in contrast, internalize and provide proprietary firm specific services. I propose that the second claim is more problematic. Trust-based relations do not cope well with adjustments between technologically separable stages in the production chain, especially in cases where the interests of agents diverge sharply. Production process innovations and rationalizations put stress on trust relations. Communities of firms will rarely support projects which favour a subgroup of the industry, or which might damage the interests of member firms. For example, projects which rationalize production, perhaps reducing demand for a particular phase of production and class of phase firms will be resisted. By contrast, large firms can often move more decisively.

Nor is it inevitable that networks will develop the trust necessary for the establishment of real service agencies. For example, Florida and Kenny (1990) argue that the excessively entrepreneurial, *laissez-faire* culture of Silicon Valley has not been conducive to the development of co-operative solutions to competitive threats. Saxenian (1994) also notes the absence of self-regulating institutions which might assure longer-term viability in the same industry. See Browning et al. (1995) for a noteworthy exception. Harrison (1994b) observes that the adaptive capability of Silicon Valley is partly attributable to its entrepreneurial small firms; however, he emphasizes the role played by the US Department of Defense and more impor-

tantly the co-ordinating role played by large firms. In terms of figure 1, the competitiveness of Silicon Valley derives from the interaction, mainly competitive, between a population of large and small firms which collectively provides that network with a discriminating mix of both entrepreneurial and co-ordinating adaptability and an appropriate combination of generic and specialized assets. Italian districts appear to lack large firms; bridging organizations, such as Benneton and Sasib (Harrison, 1994a), are the exception. In Italy real service agencies fill a gap in the provision of corporate services. The Hong Kong watch industry described below represents another variant on the production network model.

The Organization of Production in The Hong Kong Watch Industry

Watch production is a useful industry for observing the comparative performance of managerial hierarchies and production networks, since production is divided between both organizational models. The description below of Hong Kong watch production is largely based on secondary, archival data. Descriptions of firm production and marketing strategies are to be found in the two Hong Kong watch industry trade journals, *Timepieces* and *Watch Review*. Information on demand and trading conditions are provided in the annual reports of the Federation of Hong Kong Watch and Trade Industries (1994), an industry association. Statistics on the number of establishments, employment and wages, capitalization, output and exports are found in the Annual Surveys of Industrial Production and the Reports of Employment, Vacancies and Payroll Statistics (Census and Statistics Department, 1993). Information about the Hong Kong Productivity Council's role in the industry is contained in its house journal (*HKPC Productivity News*, 1995). Interviews with three HKPC watch industry consultants were held between January and June 1995 and focused on the mandate of the HKPC with respect to watch production and local firms' utilization of the centre's services.

Japanese firms produce approximately 37 per cent by volume of annual industry production (see table I), with three large firms (Seiko, Citizen and Casio) accounting for the majority of output. Japanese firms are technology based, with extensive production expertise in micro-manufacturing and component miniaturization. They are also vertically integrated into movement making and in distribution. The Swiss industry accounts for 16 per cent by volume, but is the world leader by value of production. The Swiss industry is an amalgam of vertically integrated firms such as Rolex, Tissot and Omega, and international brand holding companies (e.g. Dunhill and Cartier) which subcontract production to larger producers. The capabilities of Swiss firms revolves around the ability to manage exclusive brand names and mastery of a craft production process. Some Swiss firms such as SMC (Swatch) have emulated Japanese expertise in the mass production of low cost movements (Glasmeir, 1991).

Established in the 1950s, watch making in Hong Kong is comparatively new. The first watchmakers used imported mechanical movements from Japan and Switzerland (Glasmeir, 1994). An indigenous watch parts and accessories industry was also established at this time as part of the rapid expansion of Hong Kong's export oriented manufacturing (*HKPC Productivity News*, 1995). Momentum gathered with the short-lived development of digital movements and LED and LCD display watches in the 1970s. Many firms entered the industry as suppliers to

Table I. 1994 output by volume and value, leading watch producers

	Production by volume Millions	*Production by value US$ billion*	*Average export price per unit US$*
Japan	392	2.7	30
Hong Kong	345	1.8	9
Switzerland	135	4.7	160
	1070	n.a.	

Source: Citizen Watch Company. *Annual Review of World Watch Industry*

US-based firms as prices of these components fell quickly during this period (Glasmeir, 1994). Hong Kong firms quickly adopted quartz analogue components in the early 1980s, and by 1983 Hong Kong had become the world's leading watch exporter by volume. In 1993 Hong Kong remained the world's largest exporter (by volume), exporting watch cases, parts and wristbands worth US$1.8 billion. Table I indicates Hong Kong's market position as a high-volume, low-end producer.

The major features of the Hong Kong watch manufacturing sector are:

(1) A highly disaggregated production system and small firm size structure. In 1993 there were 1,455 establishments with an average of 12 employees (Census and Statistics Department, 1993). Firms perform one or two phases of production within a larger industry value chain such as assembly, lens, dial, case, band making, and button-battery manufacture. Many parts firms produce to a high standard and are capable of meeting the quality demands of Swiss industry which now subcontracts to Hong Kong. Production flows through several establishments in elaborate subcontract networks – for example, work is further subcontracted into sub-phases such as die-casting, electroplating, and polishing (Glasmeir 1994).
(2) In the recent past, few firms have produced significant quantities for their own account. There remains a reliance on offshore firms which place orders with lead contractors. Local lead firms attend the Basle international trade show to seek large orders. A Hong Kong Productivity Council industry consultant estimated that 70 per cent of annual Hong Kong production is confirmed there. Recently some firms have begun to develop their own brand names, establishing niches in minor foreign markets such as Iceland (*HKPC Productivity News*, 1995). The Hong Kong Productivity Council along with the industry trade association have organized a local watch fair in an attempt to bring buyers to the territory.
(3) In common with most manufacturing enterprises firms prefer minimal capital investment and are highly labour intensive (Lee and Davies, 1995). The average establishment gross addition to fixed assets in the watch industry in 1991 was approximately US$38,000,[1] about the cost of a medium-sized truck in the territory. One implication resulting from undercapitalization is the absence of the multi-phase firm, which severely limits the sophistication of what can be produced. For example, fewer than ten firms in Hong Kong have the capacity to produce 18 carat gold components. The process involves the co-

location of three subprocesses based on metallurgy, gold forging and watch engineering. Few firms are willing to invest the capital required to house the processes (*Timepieces*, 1995). Gold watch production is also limited because it is not 'easy money'. Several commentators told the writer that Hong Kong entrepreneurs prefer projects characterized by the widely used term 'fast money'. Limited capital is invested in general assets that can be flexibly deployed to meet needs of different product markets. For example, a watch band maker can turn to the manufacture of costume jewellery if the watch band business dries up. The ability to switch between product markets is a major characteristic of Hong Kong manufacturing in general. Redding (1994) also points out that firms actively avoid locking into particular production technologies that demand high capital investment.

(4) There are no regular government statistics on the ownership of establishments, but studies suggest owner-managed establishments predominate (Redding, 1994). The typical mid-sized manufacturer employs 20–50 operatives and 5–7 non-operatives (Census and Statistics Department, 1993). A staff of 50 will provide the capacity to produce about 40,000 pieces per month. A firm may be able to produce up to 100 different designs per year and will accept orders as low as 100 or 200 pieces (*HKPC Productivity News*, 1995).

(5) Firms do little original product or process research and development, but are rapid imitators of nonproprietary (and some proprietary) products. Firms are often quick to adopt techniques which improve productivity or lower costs, such as rapid product prototyping. Generally, the defining characteristic of the industry is an intense entrepreneurial ethic, reflected by intense price competition, flexibility, ingenuity and a fast response to buyer needs: major competitive variables are 'days to fill an order' and 'minimum quantity order' (*Timepieces*, 1995).

The organization of watch production is comparable to that found in Hong Kong garment making and consumer electronics (Liu and Chui, 1994). There is widespread recognition in Hong Kong that its manufacturing industries must upgrade and export higher value-added products. While the government's position is largely *laissez-faire*, industrial strategy is based on the principle of 'positive non-intervention' (Yeh and Ng, 1994), which means government will involve itself in the market when relatively small interventions can produce significant advantages. One beneficiary of this approach is the Hong Kong Productivity Council (HKPC).

Technical Change – The Role of the Hong Kong Productivity Council

Founded in 1967, the HKPC's principal mandate is to assist Hong Kong manufacturing firms identify, learn and absorb productivity improving production processes. While government subvented, the council is part self-financing, up to 60 per cent of its annual revenues are from private contracts. It is prohibited from providing services which are adequately supplied by the private sector. Once an HKPC pioneered application has become 'industrial strength' in Hong Kong, the council will withdraw and leave its delivery to the market. For instance, the council acquired the territory's first rapid prototyping facility. The ability to make fast prototypes (samples or models) is critical in fashion sensitive industries such as watches and toys. HKPC leases space to users on the facility and also offers

training courses. However, once there is a user base and a trained workforce for the technology it is probable that private design studios will offer the service and the council will slowly exit this technology.

The council is a real service provider by the three criteria identified above – that is, it has a principal mandate to assist firms, it provides a range of real services, and it has a permanent staff (about 600) dedicated to this task. The council's mandate is to serve industry in general, but it has developed a number of sectoral skills or industry specific assets, due in part to the clustered nature of Hong Kong's manufacturing firms (Lee and Davies, 1995). One of these sectors is watch making.

In 1995 the council was engaged in five industry specific research and development projects, including metal injection moulding and a process to substitute nickel in electroplating. In the past it had developed design and software skills for the industry. The council introduced CAD/CAM into the industry.

While the Hong Kong watch industry has not been a source of innovation, it has adapted to major product changes, moving from mechanical to digital to quartz-analogue production within 30 years (Glasmeir, 1994). The council's role, then, is as a technological intermediary, as the underlying technology basis of watch production develops the council helps producers adjust. In terms of figure 1, the council provides a degree of co-ordinated adjustment and it provides access to industry specific assets.

There are limits to the extent to which a real service organization can assist the adjustment process in the industry. HKPC has been enthusiastically promoting ISO 9000 certification but only one firm has become certified. A plan to consolidate the council's watch industry expertise into a watch and clock technology centre has foundered because the industry cannot agree on a formula to provide its share of the funding. One informant proposed that the emphasis on fast money means that many firms are unwilling to invest in projects that do not give a quick payback. Nor has the council or the industry developed the self-regulating mechanisms needed to prevent some of the more egregious cases of trademark infringement that have plagued watch making in the territory. This lack of commitment by the industry contrasts with the reports of Italian industry support of real service agencies.

On another scale of analysis the development of Seiko's message watch demonstrates the limitations to a real service strategy aimed at helping industries and firms upgrade. Advances in the micro manufacturing and the progressive miniaturization of electronic components now permit the fitting of a telecommunications paging and information receiving device to fit comfortably into a wrist-watch. The message watch is pioneered by Seiko. The watch retails for US$80. However, it is the monthly rental and paging revenue which derive from user subscription to the information service that represents the major business opportunity with this product-service.

To supply data and paging services Seiko is establishing a global wireless network using FM radio signals to distribute information. A company press release states:

> Just as quartz revolutionized the watch industry in 1969, we see limitless potential for this new technology to be incorporated in a large number of the

> more than one billion timepieces produced industry-wide each year, as well as in millions of other mass-market consumer devices. (*Wireless World*, 1994)

The data transmission system utilizes the unused frequencies of an FM radio station's bandwidth. Seiko has developed transmission and receive technology which permits the communications system to utilize existing FM radio infrastructure: Seiko will effectively rent radio space from existing radio stations. To promote and develop the system the firm has created North American and European subsidiaries with an initial capitalization of US$57 million.

The message watch illustrates the limits of production networks. Hong Kong watchmakers may soon manufacture message watches, undercutting Seiko-produced devices, but they do not have the capacity to operate a national or international communication systems, nor develop and commercialize a technical innovation which could transform the watch industry. The managerially co-ordinated firm can fund large scale innovation and develop the organizational structure to implement global strategy. A production network cannot emulate this strategy.

Reducing Labour Costs: Entrepreneurial Responses to Increasing Competition

Far more significant for the structure and competitiveness of the Hong Kong watch industry is the present migration of manufacturing to mainland China. Table II shows (row 1) the value of exports produced by firms located in Hong Kong expanded rapidly between 1960 and 1990 but falls off after 1991. After 1990 watches made in China shipped to Hong Kong for re-export play an increasing role (row 2). The shift of production to China is clearly indicated by rows 4 and 5 in table II, which show the decrease in employment and the gradual reduction in the number of local establishments. By 1994 local employment has fallen 70 per cent from its 1981 high. The decrease in employment reflects the

Table II. The expansion and contraction of watch production in Hong Kong

	1960	*1970*	*1980*	*1985*	*1990*	*1991*	*1992*	*1993*
1. Exports, by value	17	208	6,576	9,573	19,133	16,727	15,476	13,161
2. Re-exports from China, by value	n.a.	n.a.	n.a.	152	3,973	6,053	8,488	9,632
3. Value added per person employed	n.a.	n.a.	n.a.	40	127	142	n.a.	n.a.
4. Number of establishments	61	229	1,509	1,805	1,690	1,707	1,524	1,477
5. Industry employment	2,433	9,773	49,454	36,692	25,154	23,936	18,995	17,119
6. Nominal wage index, watches and clock operative*				131.7	250	266	297	301

Note:
*1982 = 100, Value figures in HK$,000.
Sources: Census and Statistics Department (1993) Surveys of Industrial Production.

movement of watch assembly and component manufacturing across the border into Guangdong province. While physical production occurs in China, industry observers still refer to the Hong Kong watch industry (to distinguish it from the emerging indigenous industry which is organized differently). However, it is accurate to describe the industry as Hong Kong based since local firms own and operate the Chinese factories, provide the know-how, and market the production. Chinese partners supply (low cost) labour, land and bureaucratic permissions. Much of the transplanted industry is located in the special economic zone of Shenzen, which is only 30 kilometers from central Hong Kong.

The movement of the industry to China has not substantially altered the organization of production. Although establishment size appears to have increased in mainland factories, the prevailing model remains the single stage phase firm located in a subcontract network and largely reliant on orders from foreign OEMs (original equipment manufacturers). Non-production employees engaged in procurement, engineering, product design and sales and marketing remain in Hong Kong based offices.

The move to China is motivated by access to significantly lower cost labour and land and underscores the importance of costs in networked production. Throughout the growth of the industry local firms had access to abundant low cost labour as the government maintained a liberal policy on immigration from the mainland. The population of the territory expanded from 1.5 million in 1950 to over 6 million by 1990. 1981 marked the beginning of economic reform in China. In 1983 the UK and China governments agreed a procedure for the handover of Hong Kong to China resulting in a tightening of immigration policy. These political changes led to increases in local labour costs. These forces might have led to the substitution of capital for labour, a basic upgrading strategy in Porter's (1990) model. Under this scenario the role of agencies such as HKPC could have been critical in contributing to the development of the industry. This strategy has not been adopted: the watch industry's dominant logic or core competencies are based around cost containment, and transferring production to China marks a continuation of the strategy.

DISCUSSION: EXPLAINING THE PERFORMANCE OF NETWORKED PRODUCTION

Watch making in Hong Kong is characterized by low asset specificity and entrepreneurial adaptation. In terms of figure 1 the industry corresponds most closely to the unenhanced production network. On this basis the network dominates the bottom end of the global market. At the margin Hong Kong watchmakers compete with Japanese and Swiss producers, but for the main part they occupy a different product-market position. The point is that managerial hierarchies and networks possess different capabilities. Japanese Swiss and Hong Kong watchmakers face different types of competition and financial risks: it is unlikely that Seiko will ever be able to match Hong Kong watchmakers in terms of costs, prices and product variety. If Japanese firms were to locate their entire production in China their cost structure would remain unfavourable. At the same time, Sieko's message watch and associated communications system may fail to develop the critical mass needed to establish a viable telecommunications system. Japanese

Table III. Competitive advantages compared

Organization form	*Product market strategy*	*Organizational capability*
Unenhanced production network	Low cost, imitation, product diversity	Variable cost containment, low overhead, capacity utilization, low information costs, entrepreneurial adjustment (flexibility, fast response)
Trust enhanced production network	Premium price, proprietary products	Industry wide upgrading co-operative marketing and R&D
Vertically integrated firm	Low cost or differentiated products Proprietary products and processes	Scale and scope economies co-ordinated adjustment

firms' technological asset base will continue to supply innovative proprietary products and processes.

Table III summarizes the predominant strategies and organizational capabilities of each of the forms depicted in figure 1. The flexibility and rapid responsiveness of unenhanced networked production has significant competitive advantages relative to the vertically integrated firm especially in consumer product markets marked by rapid but minor changes in design. The emphasis on low-end markets and cost containment does not denote an absence of capability. Indeed it is the comparative advantages of this system that has led to the restructuring of many large firms and the trend to outsourcing so prevalent in mature European and North American industries.

Interestingly, Redding (1994) attributes the efficiency of the Hong Kong production system to a trust-bonding ethic, based on Confucian values, which serves to reduce transaction costs. I propose the contrary: transaction costs in Hong Kong manufacturing and in generic asset regimes must be very low. There is little need to create elaborate governance structures around a generic asset base. When firms have no investment in transaction specific assets, they are flexible and may switch rapidly to other industries and partners. Presumably, one reason firms fail to invest in lock-in technologies is that owners cannot trust their trading partners not to exploit the bargaining advantage it would hand to them.

The operations of local trust-bonded production networks do provide other efficiencies for local firms – for example, they reduce search costs and they allow firms to make more accurate estimates of a supplier's competence or a buyer's credit worthiness. Proximity not trust reduces information costs for agents in networks; these are the product of positive externalities of an agglomerated production system (Scott, 1988). In other words, localized networks supply information that enhances the operation of the marketplace. There are two implications: first, contrary to the prevailing view, trust may play little role in the functioning of some networks; and second, despite the absence of trust networks possess a number of advantage that contribute to competitiveness. The performance of Hong Kong watchmakers illustrates the fact that unenhanced networks can be a formidable competitive force.

A key advantage of low asset specificity is that firms and subcontractors are kept at full capacity. Firms with generalized assets can switch production rapidly to serve quite different product markets. Firms can extract the maximum operating leverage out of the available capital because it is so generalized. Variation in demand volumes can be met by subcontracting or by adding additional labour. The system has numerical flexibility; when absolute volumes become too great, firms quickly drop less profitable lines. Generalized assets permit firms to enter and exit niches in response to small price movements. There is little incentive for a firm to grow in these circumstances, so the optimal size of a firm remains small and firms carry little unproductive slack. In Hong Kong there is no great attachment to watchmaking (Glasmeir, 1991), which is in marked contrast to the European industrial districts where craft traditions in some industries date back centuries.

The ownership structure of networked production encourages tight control over direct and indirect production costs. Owner-managers appropriate residual returns and have a strong incentive to control the variable costs of production. In watchmaking a critical component is the ability to identify and organize low cost pools of labour. At the structural level network firms incur few indirect costs. Two sources of managerial overhead in hierarchies are minimal among networked firms. First, as noted above, information about markets and suppliers is supplied costlessly by the network. Second, ownership incentives reduces the need for third party monitoring and supervision. Compared with large hierarchies, which have higher managerial overheads and weaker incentives with respect to direct cost control, the networked owner-managed firm is a model of parsimony. The efficiency of the system derives from tight cost containment rather than low transaction costs. These efficiencies are clearly evident in the Hong Kong case; they accrue also in trust enhanced networks (Brusco, 1990).

Small-scale batch production permits continuous small changes in product design and generates an astonishing variety of customized products, none particularly revolutionary since producers take their cues from successful products. For instance, in the Hong Kong watch industry design trends are taken from the Basle International watch fair. The system generates random design mutations and feeds them into the market; if successful, other firms emulate and rapidly adjust to market demand. These advantages are particularly relevant in fashion-driven sectors such as garments, toys and low-price watches – as patents and copyrights offer little protection, there is a premium on the ability to get a successful design quickly to the market. Hierarchies are quite cumbersome in these respects.

The above discussion illustrates the major sources of competitiveness for unenhanced production networks, but there are threats and weaknesses inherent in the system. As Porter (1990) argues, competitive advantage dependent solely on the exploitation of low factor costs is vulnerable to competition from other lower cost regions and nations. In the Hong Kong case, low cost labour in Hong Kong and later in China has undoubtedly contributed to the performance of the industry. However, the discussion of the entrepreneurial process indicates that other capabilities are evident. Arguably, continued access to low cost labour removes the incentive for networked firms to develop other, deeper, organizational capabilities. One policy implication is that programmes and schemes aimed at

helping small businesses to upgrade should not be undertaken without reference to immigration and labour market conditions.

The second problem is that the absence of mechanisms for making non-incremental or discontinuous adjustments may leave networks technologically backward. The latter threat reflects networks' weakness with respect to co-ordinated adaptability. One solution to the problem is vertical integration or the emergence of co-ordinating firms (Harrison, 1994). Unlike Silicon Valley with its mix of small and large firms, and Italian industrial districts with co-operative real service organizations, the Hong Kong watch industry has not developed comparable institutions. The HKPC suggests a nascent co-operative response. There can be little doubt that the council has contributed to the technological adjustment in the industry, but it remains a secondary force. While the council struggles to establish a dedicated watch technology centre, the main thrust of the industry is its relocation to China. Notably absent are self-regulating agencies that would support intellectual property protection, quality control and labour market training. The emphasis on fast money means that entrepreneurs are uncommitted to the industry. Successful entrepreneurs invest in sectors like property, not in projects that might secure the long-term upgrading of the industry.

The conclusion offered here is that establishing co-operative bridging institutions in networks requires from firms and owners a commitment to a particular industry – the more generic the asset base of a network the less likely this will develop. In addition, an accumulation of social capital, or trust, is needed to support institutions in the quest for a relevant expertise and for the development of deeper organizational capabilities. Excessive individualism acts as a barrier to potential collective productivity improvements. If the self-interest calculus is too sensitive, there is little room for investments in real service organizations which deliver a mix of collective and private goods. Commitment to an industry and the confident expectation that others will make similar contributions are a prerequisite for this form of development; this is the contribution of trust to network productivity.

NOTES

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[1] Author's estimate based on data from Surveys of Industrial Production, Hong Kong Census and Statistics Department.

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