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ABSTRACT

Organizational Innovations (OIs) are defined as disembodied technology as against embodied technology or technical (technological) innovations. The firms, as we see them today in the USA, Japan and many other countries, are organized according to OIs that took place in the USA and Japan in the last 150 years or so. A historical review during that period will identify OIs in these two countries. OIs such as integration of production and distribution, focal factories, and just-in-time cum quality control (JIT/QC) are more thoroughly described.

INTRODUCTION

What is the relationship between Organizational Innovations (OIs) and technological innovations or technology, at least from a definitional point of view? The definition of technology provided by the United Nations Centre on Transnational Corporations (UNCTC) in 1983 is revealing:

> *"…Technology may be embodied in the form of capital goods, such as machinery, equipment and physical structures; or it may be disembodied in such forms as industrial property rights, unpatented know-how, management and organization* (my emphasis), *and design and operating instructions for production systems…"* (Quoted by Dicken, 1998, p.248).

A key objective in this study is to separate embodied from disembodied in the definition of technology. Hence, what are referred to as OIs forms part of the disembodied technology (according to the above definition of the UNCTC). The term technical innovations (TIs) is adopted to refer to embodied technology.

OIs are any new specific relations between labor (L) and capital (K), between L and L, or between K and K; these relations form modes of production that are innovative compared with previous modes; for example, the integration of mass production and mass distribution led to the mode of production described as the 'big business' in the USA (see below).

The primary aim of this paper is to pinpoint the most significant and essential OIs in the USA and Japan. The period examined is approximately from the 1850s to the present. However, two sub-periods will be more closely scrutinized, the 1880s to 1920s and the 1950s to 1990s, of approximately 40 years each. During these two sub-periods the so-called Second Industrial and Third Industrial Revolutions took place. The first two sections will examine the historical evolution of OIs up to WWII (the first section for the USA and the second for Japan). The next two sections will examine the historical evolution of OIs from WWII onwards (the third section for the USA and the fourth for Japan). Finally in the fifth section a brief comparison between the two countries in terms of OIs will be undertaken. In this historical survey I will concentrate my analysis on the detection of the main OIs and their evolution, thus avoiding as much as possible any links with economic theories. These links will be made in other papers. Also, note that this study does not provide a comprehensive history of all OIs in the two countries; rather, its aim is to selectively pinpoint the aspects and nature of the major OIs that will be useful in the exploration of economic growth in future research. Finally, I have put more emphasis on Japanese OIs as the American ones have been extensively explored by other researchers (e.g. Chandler, 1977, 1990).

1 OIs IN THE USA UP TO WORLD WAR TWO (WWII)

This section is primarily based on Chandler's pioneering work on the evolution of big business. However, it is important to note that exploration of big business is not the only type of business that has shaped the American economy. Scranton (1997) emphasizes that 'specialty production' paralleled,

complemented, and sometimes conflicted with the mass production corporations; this other side of the second industrial revolution certainly played an important role in shaping the American economy, but major OIs that took place during the period examined were more related to mass production and other features (which will be explored in the following pages). Thus, Boyce and Ville (2002, p. 150) remarked: "…Specialist manufacturers relied extensively on skilled labor, while mass producers de-skilled workers. The methods employed by the former relied on 'smart workers', while the latter depended on 'smart (production) systems'…"

1.1 The Appearance of Big Business, Full Integration, Hierarchies and Oligopolies

The US westward movement of population was the moving force for the rapid development of the railway system in the 1840s and 1850s, which eventually created a national market. However, its growth and restructuring was not complete until after the recession years of the 1870s. The development of the railway system coincided with the USA' s economic industrial take-off period in the mid 19th century. The most important achievement in railway development was the appearance, for the first time in economic history, of the modern big business based on salaried managers to run multimillion-dollar railway firms across the country (Chandler, 1977). These firms influenced many other enterprises in different industries in terms of their organization and management techniques in the decades up to the end of the 19th century. Many famous entrepreneurs, who played a marked innovation role in their own business were originally trained in railway firms.

Together with the development of a national rail network, there was a parallel development in telegraph, steamships and cable systems which all allowed for the first time in history a speedy and voluminous dispatch of various products to all parts of the vast country. This in turn paved the way for huge economies of scale and scope in existing and new industries during the second half of the 19th century. Another precondition for the second industrial revolution was the superabundance of land, combined with a favorable inclination for entrepreneurship (Americans were always fascinated by the success of their business people) and a shortage of labor (McGraw, 1990; Habakkuk, 1962).

In the 1870s, the major industries serviced an agrarian economy. The urban population was 28% of the total population by 1880. However, within two decades it grew to 40%, thus intensifying overall economic development. Major and minor technological breakthroughs, although continuous in trend, were particularly noticeable in the 1870s and 1880s. At the same time big business, through mass production, began to gather steam in the 1870s and 1880s. Out of the Fortune 500 largest American firms in the mid 1990s, 53 were founded in the 1880s (e.g. Kodak, Johnson & Johnson, Coca-Cola, Westinghouse Electric), 39 in the 1890s (e.g. General Electric, Pepsico, Goodyear), and 52 during the 1900s (e.g. Ford Motor, Gillette, General Motors) (Source: Harris Corporation, 1996).

The first industries to grow very large were two types of consumer goods industries: the first category includes fresh meat, cigarettes, high-grade flower, bananas, harvesters, and sewing machines, which all first built large marketing and then expanded horizontally. The second type includes staple items such as the production of sugar, salt, leather, whisky, glucose, starch, biscuits, kerosene, fertilizer and rubber the production of which first expanded horizontally and then created their marketing and buying organizations. The same story was repeated in other industries processing agricultural products, for which a number of machines were invented in the late 1870s and 1880s to permit large-batch and continuous process production (cigarettes, matches, flour, breakfast cereals, canned foods and soap). The innovators in new consumer durables, such as harvesters and sewing machines, followed much the same pattern (eg McCormick's and Singer's firms).

In the 1880s and early 1890s, many small manufacturers in the sugar, leather, salt, distilling, linseed and cotton oil, biscuit, petroleum, fertilizer and rubber boot and glove industries, jointly formed large horizontal combinations. The latter resulted mainly as a response to overproduction by numerous small firms in an expanding national market during the 1860s and 1870s, that threatened prices falling below production costs (Chandler, 1959, p. 10). In most of these industries, consolidation and vertical integration followed horizontal combinations. Examples in this category are the whisky enterprises and the rubber boot, shoe and glove industries. In both the petroleum and fertilizer industries, control over raw materials came after the combination and consolidation of groups of small manufacturing

firms. For instance, the Standard Oil Trust, formed in 1882, consolidated its production activities and created a domestic marketing system first and only in the late 1880s did it start to adventure into the production of crude oil. The producer goods industries developed later. Until the depression of the 1890s, most of the combinations and consolidations had been in the consumer goods industries.

In the 1890s, railroad construction started to decline and at the same time there was a explosion in the population growth in the big cities. Carnegie's decision in 1887 to shift steel production from rails to structures represented the coming change in the market. Also, the growing consolidations in the consumer goods industries further increased the demand for producer goods. By the first decade of the 20th century the leading firms in many consumer goods had become departmentalized and centralized as a consequence of vertical integration, thus creating oligopolies and sometimes monopolies for their markets. For instance, by 1898 the Rubber Company controlled 75% of the nation's rubber boot, shoe and glove output.

Like the companies making consumer goods, those making producer goods also set up nation-wide and world-wide marketing and distribution organizations, consolidated production into a few large plants and established purchasing departments. Also, except in steel, integration usually followed combination in the producer goods industries. The growth of such large enterprises often led to diversification of the types of products these manufacturing companies made and sold. The 'full line' strategy, pioneered by General Electric and Westinghouse, was soon adopted by many other consolidated concerns. Continuing diversification came largely in industries where science could be most easily applied. Thus,

> *"…The chemical, automotive, power machinery, rubber and petroleum industries led the way to the development of new processes and products, new ways of internal organization and new techniques of external competition as the new century unfolded. The metals industries and those processing agricultural goods have, on the other hand, changed little since the beginning of the century... For them the greatest period of change came in the last decade of the 19th century…The middle of the first decade of the new century might be said to mark the end of an era." (Chandler, 1959, p. 26,).*

These large industrial firms became by the turn of this century vertically integrated, forward into distribution and backward into supplies of inputs, as well as centralized and functionally departmentalized organizations. They became increasingly bureaucratic internally and oligopolistic externally, despite some tendencies for monopolies. Integration and combination by one manufacturer forced others to follow. The oligopolistic structure of most of the leading industries meant that, by and after 1900, costs rather than interfirm competition determined prices, and that strategies such as price leadership and price umbrellas became common practices. Therefore the top management of these industries paid more attention to issues such as advertising, product differentiation, brand names, improvements in further integrating manufacturing, marketing and buying processes, and developing more diversified lines of products.

In short, the American economy was consolidated and strengthened during the approximate period 1880 to 1920. This consolidation took place through the process of appearance of big national and international corporations, which usually were backward and forward vertical integrated (full integration of mass production and mass marketing for both the consumer goods and producer goods industries). In addition, these corporations were multi-functional hierarchical business organizations (to some extent similar to that of the railways firms), they were markedly changed in the organization of the shop floor, especially through various applications of scientific management (see next sub-section). Their salaried managers took over in the running of busines from the founding entrepreneurs in an increasing way; in particular, middle management and especially top management for the first time replaced market forces in an oligopolistic environment (the learned skills and knowledge within each oligopolistic market were company-specific and industry-specific).

Many economic historians and other researchers have found that numerous fundamental changes took place during the period 1870-1920 in the USA; hence many characterizations were given to this period. For instance, Sklar (1988, p. 1) says: "...The period 1890-1916 in United States history, encompassing what is commonly called the Progressive Era, was both an age of reform and the age of the corporate reconstruction of American capitalism..."

1.2 The Rise of Scientific Management and Fordism

The coordination and control of the flow of materials at a high volume and speed through many departments in which many workers were employed in each of the production processes created challenging administrative and managerial problems in the second half of the 19th century. For instance, Litterer (1963) said that the growth of internal disorder fell into two major categories: first, a breakdown of co-ordination among subordinates, and second, a breakdown in relationships between top and lower levels of management. These problems became acute in the late 1870s and 1880s but their solutions only started to take place in the 1890s and 1900s. The movement of 'Systematic Management' attempted to suggest such solutions from the 1870s (cf. Litterer, 1961, and 1963); Nelson (1974, p.479) said in this regard: "…The Taylor system was a comprehensive answer to the problems of factory coordination, a refinement and extension of the earlier ideas known as systematic management…"

During the expansion years of the 1870s and 1880s, industrialists relied on skilled foremen to recruit, train and manage the workers. That was the 'inside contracting' system of labor organization, according to which these departmental foremen were contracted with the owners to produce a specified number of parts or mechanisms in a specified time (usually a year) for a specified price. In this way, the owners were able to pass on to the contractors all management related problems. With this system, the owners lost control over costs and the coordination of the flow of goods through the many departments. The contractors had obvious reasons to conceal valuable information from the factory owners, and did not have the need to coordinate shop floor operations in an efficient way.

H. C. Metcalfe, in 1885, prescribed a solution to the 'inside contracting' system in his book 'The Cost of Manufactures and the Administration of Workshops, Public and Private' (the first book ever published in the United States on factory management). His solution was an adaptation of the voucher system of accounts developed in railroad repair shops to meet the needs of interchangeable-parts manufacturing (Chandler, 1977). However, Metcalfe's solution had major disadvantages: first, it required an excessive amount of paperwork from the foremen and second, the latter were still not willing to provide all necessary information. H. A. Towne of Yale and Towne, F. A. Halsey of the Rand Drill Co. and other metalworking manufacturers, subsequently developed the 'gain-sharing' system, according to which any reduction in unit costs achieved by improved machinery and plant design, better scheduling, or more productive labor would be equally shared by the company, the workers and the foremen (the latter would get 60% to 80% of the non-company share) (Ibid).

A further suggestion came from F. W. Taylor, who, in 1895, pronounced his 'scientific management', according to which the standards of premiums and bonuses paid should be determined 'scientifically' and not historically. He also urged that a number of 'functional foremen' and a 'planning room' should replace the contracting foremen. However, American manufacturers rarely adopted Taylor's full system, which was developed during the period 1895 to 1915. To further explore this system, it is worth comparing the new order in business management that slowly started by the1880s, and hence it is necessary to briefly remind the reader of the old order. This was based, in the more sophisticated industries such as the mechanical ones, on the inside contracting system.

> *"… contractors were prosperous entrepreneurs who engaged skilled people to do vital shop floor production work. But the system also encouraged 'scams' that resulted, as Frederick Winslow Taylor described it, in 'a jungle of restrictive practices, ca'canny, hanging-out, or soldiering', none of which induced efficient production in standardized American process manufacturing…"* (Locke, 1996, p. 19).

On the other hand, the scientific management was based on different premises. George (1972) summarized Taylor's ideas as follows (p.93):

> *"…First: Develop a science for each element of a man's work, which replaces the old rule-of-thumb method.*
> *Second: Scientifically select and then train, teach, and develop the workman, whereas in the past he chose his own work and trained himself as best he could.*

> *Third: Heartily cooperate with the men so as to insure all of the work being done in accordance with the principles of the science which has been developed.*
> *Fourth: There is an almost equal division of the work and the responsibilities between the management and the workmen. The management take over all work for which they are better fitted than the workmen, while in the past almost all of the work and the greater part of the responsibility were thrown upon the men…"*

In the above quote, it is worth noting the contrast between the old paradigm of organization and the new one proposed by Taylor. However, there is more to it (George, 1972, pp. 96-99):

- "…Scientific management involves a complete mental revolution…" (Taylor, 1947, p.27).
- Research for all aspects of work.
- Establishment and use of standards in every phase of management.
- Systematic planning and control.
- Conservation, not waste in effort, materials, time, and so on.

On the last point, the Taylor Society in its early days enunciated the following aim:

> *"…To earn through a waste-saving management and processing technique, a larger income from a given expenditure of human and material energies, which shall be shared through increased wages and profits by workers and management…"* (Quoted in George, 1972).

This aim is obviously related to increasing productivity. Hoxie, an early critic of Taylor's ideas and suggestions, also emphasized the purpose of scientific management to eliminate 'avoidable wastes' in the process of production (quoted in Nyland, 1996).

There is another way of looking into the relation between workers on the *shop floor* and management of the production processes. Skilled workers who played a central role in shop floor operations were transformed into lower managers, thus a valuable cooperation was gained from these transformed salaried employees. As Lazonick said: "...making skilled workers members of the firm helped management to divide and conquer the labor force." (Lazonick, 1990, p. 229). Lazonick regards the shift in control over shop-floor organization from craftsmen and inside-contracting on the shop floor to line and staff managers as a key feature of managerial capitalism in the USA during the period from the1880s to the 1920s. The main reason for this shift, deliberate and deterministic in nature as Lazonick describes it (1990, chapter 7), was the fact that the shop was really run by the craftsmen or inside contractors and hence the upper management was obstructed from introducing new technologies and methods of production.

By now, it is perhaps becoming apparent that the gradual disappearance of the inside-contacting system coincided with the parallel advent of various methods of scientific management. As Lazonick (1990, p. 223) said: "…Inside contracting, and with it craft control, was particularly prevalent in the metalworking industries of the northeastern United States. It was also these machine shops that gave birth to the scientific management movement…" One of the consequences of this transformation towards a management controlled mass production system was a sharp increase in managerial, engineering, scientific, and generally professional personnel during the period 1890 to the 1920s. For example, "…the total number of salaried employees in manufacturing in the United States rose from 348,000 –1 for every 12.9 wage earners in manufacturing- in 1899 to 1,496,000 –1 for every 5.6 wage earners- in 1929…" (Lazonick, 1990, p. 229). During the same period, the higher education system developed in a similarly spectacular way (Ibid). All this important organizational transformation, which accelerated at the end of the 19th century and became a common policy at the beginning of the new century, was observed by other researchers as well. For instance, Montgomery (1987, p. 215) has argued that "…proliferation of white shirts and conversion of craftsmen into supervisors were universal and continuing phenomena..." in the first decades of the 20th century.

Furthermore, this organizational transformation was also linked to new technologies. For instance, the period 1880 to 1920 saw an immense increase in the development of machine tools for highly specialized purposes. This development started earlier with the production of firearms, continued with the production of sewing machines from the 1850s to the 1870s, then culminated in the 1890s through

to the 1910s with the emergence of the bicycle and automobile industries (Rosenberg, 1976, pp. 18-31).

An application of scientific management was Fordism. Effectively, Fordism was a not so fortuitous continuation of the Taylorist principles. As Littler (1982, p.56) said:

> *"…By the time that Henry Ford came into business Taylorism had begun to affect the US engineering industries. Consequently, Ford took over some of the essential aspects of Taylorism (the divorce of planning and doing, the fragmentation of jobs, each task allotted a specific time, etc), but he also went further by introducing two further principles. These were the flow-line principle and a new method of labor control. The new method of labor control used by Ford revolved around the 'Five Dollar Day'…"*

Thus, scientific management was not the only revolution in organizational matters that took place in the 1910s. It was also the semi-automatic assembly line process engineered and introduced by Ford. Though American factories introduced continuous-process machinery on the floor to increase production throughput already from the 1870s (Chandler 1977, Locke 1996), Ford's assembly line in operation by 1913 epitomized this mass production process. Fordism, when introduced in the 1910s and 1920s, needed Taylor's principles about standardization, work codification, and time studies. Above all, it most likely needed more than anything else Gilbrerth's motion studies as Kijne (1996) correctly remarked. Note that the term Fordism is a generic term that encompasses more than what Ford innovated in the first place; for instance, it also includes the further split of the professional division of labor to comprise financial managers or marketing specialists introduced by Sloan of General Motors (Womack *et al*, 1990).

2 OIs IN JAPAN UP TO WWII

Though this section draws extensively from Fruin (1992), several other sources were consulted that confirm some of Fruin's pioneering work; these sources include: Yui and Nakagawa, (1989), Lockwood (1968), Morikawa (1992), and Hirschmeier and Yui (1981).

2.1 Conglomerates (*Zaibatsus*) and a Large Number of Small and Medium Firms

Fruin (1992) distinguishes three types of enterprises, which made an impact during the initial period of industrialization (from around 1870, beginning of the Meiji era till WWII), namely the *zaibatsu*, the independent urban firms, and the independent rural firms. Most studies have concentrated on the first type, which, admittedly, is the most prominent in shaping Japanese industries.

Two of the largest *zaibatsu* (literally meaning financial or business group), Mitsui and Sumitomo were created by merchants back in the 16th century, after which they prospered especially in the trade and banking sectors. The two other largest groups, Mitsubishi and Yasuda, as well as the four other smaller ones, namely Furukawa, Okura, Asano, and Fujita were founded around the middle of the 19th century. However, as Fruin (1992, p. 92) has suggested, it is not proper to call these businesses *zaibatsu* until they were transformed by the purchase and imperfect integration of government-initiated ventures during the 1880s. This transformation for all *zaibatsu* became quite clear towards the end of the 19th century. The privatization process, which took place during the second stage of the Meiji Restoration after 1885, was not smooth in that there was disarray in government-business cooperation, a failure of coordination of the process, general confusion and political intrigue, personal favoritism and nepotism. All this led to the particular mode of operation that the *zaibatsu* acquired during that period. Indeed, these groups were, from that starting point, a collection of mostly unrelated commercial, industrial, and service enterprises which were family-owned and for a while family-managed. To use a modern term, they became conglomerates and they had to find a way to create inter-dependence between enterprises of the same *zaibatsu* conglomerate.

Consequently, for this type of enterprise, from this early period, there was a situation of joint production and distribution generating economies of scope, thus firms were becoming interdependent. As Fruin (1992, p. 90) remarked "…In Japan, *zaibatsu* grew for the most part by unrelated diversification, which is to say that economies of scale in production and distribution were not the forces behind the development of national or *zaibatsu* business groupings…" Unrelated diversification was a salient feature of these groupings before the 1930s. The initial clusters were transportation, mainly in shipping, energy production, and finance. Manufacturing was crafted on to these initial activities. These early Japanese *zaibatsu* gradually became more efficient and lowered their costs by economizing in scope much more than in scale.

Furthermore economies of scale did not take place until the boom associated with WW1, and in a more extensive way in the late 1950s: "...In Japan before WW2, indeed before the late 1950s, the domestic and proximate East Asian markets for volume goods were not large, and it was extremely risky to compete on the basis of economies of scale in most instances…" (Fruin, 1992, p. 113). Some sustainable scale economies were present before WW1 only in some industries, such as textiles, paper, some metals production, food (sugar, beer, milled grains), beverages, some chemicals, and cement. However, only textiles were exported in bulk, thus realizing more economies of scale.

A significant corollary of the importance of economies of scope present in this early Japanese industrial development, is the "…nearly universal separation of production and distribution…" (Fruin, 1992, p. 109). Fruin gives four reasons for this separation. First, traditional products, such as foodstuffs, beverages, paper, and lumber products already had well established marketing channels since the pre-Meiji era. Second, the transportation, and in particular the railway, revolution reinforced these traditional channels. The consolidation of railway networks under government control in the early 20th century accentuated this reinforcement. Third, "… the focused product line strategy of Japanese industrials played into the hands of distributors. By linking markets and marketing activities, distributors could achieve economies of scope in heterogeneous products. Single-product firms rarely had the wherewithal or know-how to distribute nation-wide…" (Fruin, 1992, p. 111). Fourth, new industrial products were introduced by either piggybacking them on already established routes, or they were handled through entirely new distribution companies.

The parallel existence of these two phenomena, namely, first, the divorce between distribution and production and second, the economies of scope had another consequence, namely the non-existence of organizational centralization; hence Japanese firms of this period had a non-complex U-form organizational chart. The Japanese holding companies concentrated managerial resources in factories and at the lower level of the firm, and consequently they did not act as a capital market to allocate funds to subsidiary enterprises. Even the most managerially advanced companies (as explained below), the textile ones, kept a relatively simple form. Nonetheless, and despite a low proportion of middle managers, textile firms were the first ones to introduce managerial hierarchy, coordination of production and distribution, a careful monitoring of the steps of production, a better trained and motivated workforce, and a more highly capitalized and better managed enterprise (Fruin, 1992, p. 117). Despite these elements of a more modern firm, textile companies integrated and coordinated activities in a decentralized way. For instance, in 1914, one of the largest industrial enterprises in Japan, Toyobo textiles, had a total personnel of 36,694, out of which only 479 (or 1.3%) were located in the head office to carry out administrative, accounting and personnel functions. "…Toyobo's example of not centralizing operations was widely imitated, following a wave of mergers in the textile industry during the recession years of 1907-14…" (Fruin, 1992, p. 118).

Although *zaibatsu* firms played a central role in Japanese economic development, the independent enterprises were more numerous, widespread, and diversified in terms of their activities. "…They were also more important given their estimated two-thirds (2/3) to three-quarters (¾) contribution to the nation's domestic manufactured product…" (Fruin, 1992, p. 119). Table 1 summarizes the characteristics of the independent urban and rural companies, as well as the *zaibatsu*.

Table 1 Japanese firms from the 1870s to WWI

Characteristics	Zaibatsu	Urban independent	Rural independent
First appearance	Meiji era, during 1875-1900	Meiji era, during 1875-1900	Middle of the Tokugawa period
Type of products	Financing, transport, purchasing, distribution	All types	Food and beverages, textiles, paper, clay/stone/glass, gas and electrical-lighting fixtures
Examples	Mitsui, Sumitomo, Mitsubishi, Yasuda, Furukawa, Okura, Asano, Fujita.	Seiko (clocks, watches, pharmaceuticals, seasonings), Takeda (pharmaceuticals) Kirin (beer), Textile firms	Textile firms, Kikkoman (soy sauce), Onada (cement), Meiji (Sugar)
Marketing	Specialized sales and the trading companies within *zaibatsu* group	Marketing and distribution by wholesalers and trading firms	Marketing and distribution by wholesalers and trading firms
Interfirm relations, diversification	Evolving vertical and horizontal integration within holding-company control, hence a wide diversification both related and unrelated	Limited, specialization in a single product/market	Limited
Ownership and management	Closed-family ownership of strategic assets through holding company and bank control, professional managers for key positions after 1900	Separation of ownership from management after WWI	Close-family ownership with holding company control
Competition	Oligopolistic with other *zaibatsu*, focusing on economies of scope	Based on price	Local monopolies, or within regional trade associations
Finance	Internal capital accumulation, intergroup banking and shareholding, coordinated through family holding company control	City banks and stock issue on regional exchanges	Local banks and wholesale credit
Coordination	Functional after 1900 (Accounting, research, planning, marketing)	Functional by 1920	Functional by the 1930s
Government relations	Close cooperation with encouragement and subsidies	Regulation by central government	Close with prefectural level authorities
Size	Very large to large	Medium and small	Usually small

Source: Based on Fruin (1992, chapter 3)

2.2 Small Focal Firms and Interfirm Networks

Both the Japanese economy and Japanese firms grew stronger and stronger, especially after the auspicious conditions of WW1 (increased demand of Japanese products by combating countries). The products of the Second Industrial Revolution started penetrating the Japanese markets in an aggressive way. The demand for new products, coupled with new producers and new technologies,

accelerated substantially at the time of the Great War, primarily because the country was not part of the European conflict and, as a result, Japanese firms filled prodigious orders for virtually all combatants (for many types of goods). Thus, without the natural resources of many Western nations, through the impetus provided by WWI, Japan was going to further reinforce its existing strategy of creating this unique organizational system of its own.

One of the main messages from Fruin's detailed study (1992, especially chapter 5) is that Japanese firms did not grow very large compared with Western companies, they specialized their production in mainly one or two products at the most, and they concentrated their activities within the factories, thus avoiding centralization and accentuating inter-firm networks.

A number of examples illustrate this important conclusion. Niigata Engineering's four factories in 1937 were specialized in different markets and each factory had its own sales office, whereas the head office was correspondingly small. Asano Cement was managed from two branch offices, one for eastern and another for western Japan, and each branch office had production, sales, and accounting functions. Onoda Cement delegated most sales and distribution functions to Mitsui & Co. Nichiro Fishery had 270 factories in the 1930s which were controlled locally with production, sales, and accounting functions carried out at each production site (ibid, p. 154-5). The Fujikoshi Machine Tool Company grew substantially from 40 employees and 22 machine tools in 1931 (founding date) to 1980 employees and 771 machine tools in 1937, and yet in order to cope with this rapid expansion the company created a functional U-form structure comprising manufacturing and sales.

Further evidence of the product focused inter-firm networks is the degree of out-sourcing as a percentage of manufacturing value added. A government publication of 1936 based on 1932 data (Fruin, 1992, p. 134) showed that this proportion varied between 5% and 65%. In the automobile, textile weaving, and electrical equipment industries, at least 20% of the manufacturing value of all products came from suppliers. These figures strongly indicate that vertical integration was low and that a large network of product-based firms was already in place in Japan during the inter-war period. This network was more obvious in the case of *zaibatsu*. For example, Mitsui & Co., the main trading firm for the Mitsui group, held a direct controlling interest in several manufacturing ventures. By 1940, Mitsui & Co. held equity shares in 253 companies covering 14 industries for a total of 275 million yen (Ibid, p. 140). Horizontal integration, through mergers and acquisitions, especially in textiles, paper, agricultural chemicals, and machinery led to a concentration of resources at production sites and decentralization.

Decentralization of management decisions amounted to the development to what Fruin calls the focal factories (Fruin's work on focal firms in Japan is referred to by other researchers, for instance Boyce and Ville (2002, p. 159):

> *"… Within focal factories, a panoply of corporate functions could be found: quality-assurance offices, marketing and sales staff, research facilities, and even personnel departments. Factory managers, like company presidents, were enveloped by a hive of clerical and technical specialists…Focal factories were charged not only with labor management but also with technology transfer, product and process innovation, engineering, manufacturing, cost accounting, new personnel policies, regional distribution, and sales coordination…"* (Fruin, 1992, p. 136).

Thus, a focal firm is a factory, relatively small in size (in comparison with American firms), focused in activities (e.g. not diversified), organizationally interdependent within the network it belongs to, and with all distinct functions, such as technology research, localized at the factory level. Table 2 contains the main characteristics of focal firms according to Fruin's work.

Table 2 Characteristics of Focal Factories

IMPORTANCE	FEATURE
High	Management-intensive
High	Learning is emphasized
Low	Similar to strategic business units in functions and significance
Low	Similar to subsidiaries and affiliates of big American firms
High	Link between production and distribution
Very High	Linked with corporations and interfirm networks
Very high	All distinct functions are localized: applied technology research, product and process research, market research, product design and planning, design engineering, trial manufacture, sales coordination etc
Low	Unbalanced product specialization (a number of products are produced in varying amounts)
Medium	Interactive, feedback process
Very High	Focus efforts in well-defined activities
High	Complementary activities between focal factories
High	Organizational interdependence, hence permeable boundaries joining factory, firm, and network
High	Usually low-volume manufacturing (due to imitation of foreign technology, a recently formed mass consumption society)
High	Often a cluster of focal factories orbiting the core firm, but having their own dynamic centers of technological competence
Medium	If the focal factory is part of a core firm (e.g. Toshiba) then strategic planning remains in the hands of divisional and corporate-level managers
High	The number of product families is limited
Very High	Intrafirm and interfirm economies of scope

Source: Information gathered from Fruin (1992)

It is worth noting that a similar system of industrial organization to the Japanese focal factories, also called *territorial administrative systems*, can be found in Italy, France and Germany, where industrial local districts are highly viable (see for instance, Best (1990) for the Italian case, Piore and Sabel (1984) for the French and Italian cases).

Why has this focal factories system evolved so strongly in Japan? Several reasons can be detected from Fruin's analysis. First, the end of the 19th century witnessed a process of trial-and-error adaptation of Western knowledge and technology, which found a fecund area for development in small-decentralized local and autonomous firms. The time and economic uncertainty constraints made this process even more necessary in such firms. Second, the economic downturn following WW1 and defence cuts caused widespread lay-offs in military arsenals and civilian shipbuilders. This large pool of skilled and semi-skilled underemployed or unemployed workers became the pool of many small subcontractors who became suppliers to large firms between the mid 1920s and the beginning of the 1930s. A survey of Tokyo factories published in 1932 reported that 2/3 of the 322 small metalworking shops in that city were founded between 1922 and 1930. Third, and as a corollary of the second reason, larger firms used the smaller subcontractors because of their lower wages.

Fourth, factories were not producing for the national market but for regional or international markets. Fifth, cost accounting methods were not well developed. Sixth, the well-established regional traders and middlemen prevented companies from centralizing and coordinating relevant functions. This was especially true in the textile, cement, food, and beverages industries, which, considered together, accounted for 53% of the 200 largest industrial firms in 1930. Seventh, there was no anti-trust legislation to prohibit interlocking business alliances and hence small local firms could exist independently and yet be at the same time part of a bigger group such as the *zaibatsu*.

Eighth, alliances in manufacturing and distribution of small focal firms minimized risks while taking advantage of the production and distribution resources that other firms commanded. "…a strategy of maximizing inter-firm economies of scope through group-driven cooperative transactions made better sense than the pursuit of internal production and allocative efficiencies through vertical integration and product diversification…" (Fruin, 1992, p. 157). Ninth, as the performance of focal factories was strongly correlated with the existence and intensity of inter-firm networks, there were substantial savings in transaction costs and diseconomies of managerial control.

What are some of the other consequences of this dual system of focal factories cum inter-firm networks? First, the narrow specialization in products of Japanese firms made these firms- even the larger ones- small by Western standards (for instance in terms of employment or output) . Second, the difference in relative size of Japanese firms created a dual regime of wages and security, where these were higher for larger firms, especially those that were part of a *zaibatsu*, but lower for smaller firms, and especially those that were subcontractors. Third, the upper management, and, to some extent, the middle management was relatively unimportant. Finally, Japanese firms aimed not to just increase the number of different products manufactured in-house but also to increase their value added contribution to the manufacturing process.

3 OIs IN AMERICA AFTER WWII

3.1 Diversification, Multidivisionalism, and Conglomerates

The American economy was already dominating the world economy before World War II. When the latter ended, the American economy was even stronger and totally in control of the non-communist globe. It was not until the late 1960s, and especially the 1970s, that the European and Japanese nations started threatening this American supremacy. It is again worth referring to Chandler in one of his most recent studies in order to assess the situation:

> *"...The successors of the 1950s managers -the third generation- were those who had to meet the challenges of intense inter-industry and international competition that began in the 1960s, the most serious competitive challenge yet faced by US managers…But in the 1960s, firms from abroad and from related industries began to crowd their markets. Excess capacity increased. Prices fell, costs rose, ROI dropped…"* (Chandler, 1994, p. 16).

How did these managers respond to the fierce competition developing during the 1960s and 1970s? Chandler (1990, 1994), and other researchers have suggested that the American firms decided to expand through the process of diversification either to a minor extent into related industries, or, to a major extent, for the first time, into unrelated ones. One of the reasons, although not the most important, for this new way of expanding business, was the continuous passing of anti-trust laws by the American government. Thus, the Celler Kefauver Act in 1950 further tightened restrictions on firm growth through horizontal and vertical integration. However, there are other reasons. A brief discussion as to why firms diversify is found in Didrichsen (1972, p.205). For instance Penrose (1959) said that diversification is a solution either to specific problems such as cyclical fluctuations, or a solution to more growth and expansion.

It seems that the latter solution was the dominant one in the 1960s in the USA. The emergence of many conglomerates was an innovation of the 1960s (Chandler & Tedlow, 1985, p. 739) for the USA. These authors (1985, p.737) say that: "…In the 1960s, a new kind of business enterprise played a key role in mergers and acquisitions. This was the conglomerate type. Eleven of the top 25 acquiring companies in the 1960s were classified as conglomerates. These 11 firms acquired over 500 companies between 1961 and 1968. And these acquired companies represented over 92 % of the acquired firms' assets by the latter years…" Classic conglomerates such as ITT, Litton and Textron developed a new administrative structure: in brief, central offices were small and included mainly finance, acquisitions and control. Hence, the purchasing, production, R & D, and marketing were left to the separate divisions, namely the former firms. Consequently, in conglomerates the role and importance of the divisions was enhanced.

During the third most important merger movement in American economic history (in the 1960s) the number of mergers and acquisitions rose from about 2000 in 1965 to more than 6000 in 1969, falling back to 2861 in 1974 (Chandler, 1990, p. 622). Overall, American managers, via this merger movement in the 1960s chose an easy way of making extra profits, or at least conserving existing ones, but they did so not by lowering unit costs of various products via economies of scale as they had done, so successfully, during the Second Industrial Revolution.

Shleifer & Vishny (1994) argue that, in the 1960s (and in the 1970s), aggressive anti-trust enforcement was the most important reason for unrelated diversification, and they strongly suggest that the latter was a mistake of managers' strategy to grow in such a way. At the same time they reaffirm that "…One of the reasons that firms diversified was to get into growing lines of business when their current operations matured. When continued growth could not be sustained from existing operations, firms bought growth in unrelated lines of business…" (p. 405). Shleifer and Vishny (1994) also conclude that in the 1980s there was a tendency back to consolidation and specialisation, and away from unrelated diversification. The same authors debated as to whether both periods examined (the 1960s and 1980s) were based on the principle of efficient diversification or not and their conclusion was that the 1980s move by the managers was a move to correct the inefficiencies created in the 1960s.

Another aspect, which ought to be emphasised in this brief discussion, is that diversification and multidivisionalisation (M-form of firms) go hand in hand. The continuous process of vertical and horizontal integration as well as product extension into additional industries during more than a 100 years of American economic development has ended up in more and more multidivisionalisation. A measure of the extent of diversification can be obtained by examining the number of different SIC categories in which the largest firms operated. Thus, in 1948 relatively few of those firms operated in as many as 5 3-digit industries (see for example UNIDO, 2000), but by 1973 a sizeable number were operating in 10 or more such industries (Chandler, 1990, p. 619).

From the so called U-form structure of the American firm of the 1900s (which started in the 1890s and continued into the 1910s) which was centralized, and functionally departmentalized, a new structure, the M-Form, started emerging from the 1920s which was multidivisional in nature. As Chandler emphasized in his numerous studies (for example in his "Strategy and Structure", 1962), not all industries were keen to adopt the M-Form. Basically, the latter was adopted by the most technologically and capital-intensive industries, such as Du Pont and General Electric. Rumelt (cited in Scott, 1973, p.139) notes that the proportion of multidivisional firms within the Fortune "500" grew from about 15% in 1950 to over 75% in 1969. At the same time, in 1969, numerous companies were operating 40 to 70 divisions, whereas before the Second World War II the corporate office of many large firms rarely managed more than 10 divisions (Chandler 1994).

Some general remarks will close this sub-section. First, as Chandler suggested (1990, 1994), following the continuous diversification into related and unrelated industries, there has been a separation between top managers at the corporate office and the middle managers of the divisions. This separation created a problem regarding the statistical and cost accounting tools used by managers to evaluate projects and division performance. Second, after the Second World War, in parallel with decentralized profit-planning, the system of capital budgeting was developed in order

to organize data and make relevant decisions. As Baldwin and Clark (1994, p. 80) indicate, the resulting cash inflow-outflow view of investment "…remains the theoretical core of most capital-budgeting systems in the early 1990s…". However, as these authors testify, such systems, though useful in some aspects of efficiency evaluation, led companies to invest vigorously but in the wrong projects.

3.2 Fordism, Neo-Fordism, and Flexible Specialisation

Since the introduction in various ways of the Tayloristic subdivision of labor at the beginning of the 20th century and the mass production of cars achieved by Ford which was also based on applications of scientific management, a growing part of American manufacturing became gradually "Fordist". Fordism can be extended beyond its relevance to the production process to become "…a social system combining a Tayloristic organization of work with a Keynesian role of the state and with mass consumption of standardized industrial products…" (Jaeger and Ernste, 1989, p. 163). Ford had actually initiated this parallel mass consumption by substantially increasing wages and promoting his cars.

The new information technology introduced in the 1950s (with the development of the electronics industry), expanded in the 1960s, and really took off in the 1970s. It allowed the appearance of flexible and programmable machines, which can be used not just for one task but for a whole series of tasks. These machines can extend Tayloristic organization of labor from mass production to the production of small lots and even single products. Consequently, "…Corporations would be run as networks of establishments often considerably smaller than the classical Fordist factory. Also many forms of subcontracting, franchising and the like are used to a considerable extent to create formally independent units well integrated in such networks…"(Ernste & Jaeger, 1989, p. 173). In this respect, Chandler (1990, p. 607) says "…In the 1960s and 1970s a wide variety of industries shifted from electromechanical to electronically controlled processes of production that began to transform the work place and alter the materials used in production. They realigned the economies of scale and scope, often reducing minimum efficient scale and at the same time expanding the opportunities for exploiting the economies of scope…"

Neo-Fordism is the continuation of Fordism in the USA, thus still including the trend of Taylorisation and deskilling, but also including the new information technology. As such, Neo-Fordism is opposed to Post-Fordism, which is more related to the system of flexible specialization. The latter can be defined in broad terms as a vertical disintegration of some core industries or as "…the establishment of a much more independent network of small plants based on a work organization which as a complement to flexibility and specialization explicitly emphasizes professionalisation…" (Ernste & Jaeger, 1989, p. 176).

Overall, Neo-Fordism has not introduced new OIs, as Ernste & Jaeger (1989) or McLoughlin and Clark (1994) testify. Post-Fordism on the contrary has, but not in the USA, at least up to the 1980s. Post-Fordism is more linked to the OIs introduced in Japan after the 1950s (McLoughlin and Clark (1994); this will be explored in the next section, though the concept of Post-Fordism *per se* will not be analyzed. However, in the USA, during the last 20 years firms all sectors have been in the process of imitating (because American firms were becoming less internationally competitive contrary to Japanese firms) a strong element of Post-Fordism, namely the JIT/QC process, which initially had been developed in Japan (this topic regarding the American imitation of the JIT/QC philosophy was the object of the paper by Sanidas, 2001).

4 JAPANESE OIs AFTER (WWII)

4.1 OIs: the Just-in-time (JIT) System

Several OIs took place in Japan after WWII, all of them revolving around the JIT/QC system. The present sub-section is a necessary introduction to this system, mainly seen through the analysis of

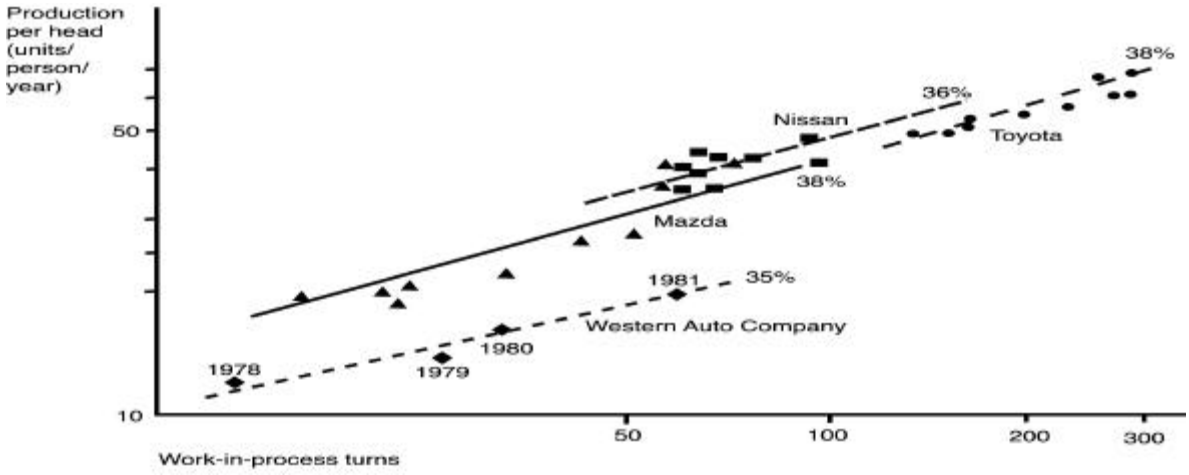
Best (1990) (numerous other references will be used in subsequent sections). This author states (p. 143):

> *"…It was not until the 1970s that Japanese firms developed the plant flexibility to produce a range of products on the same production lines without driving up indirect costs. The new plant flexibility emerged out of the focused system and the refinement of associated production activities which together established the organizational preconditions for the 'just-in-time' (JIT) production system. JIT is not simply an inventory management system…"*

Best (1990) suggested that the 'New Competition' (as it is elaborated below) emerging from Japanese firms is not sufficiently explained by strategy and culture alone, but also by new production innovations such as the JIT system. The latter is closely linked to the concept of process efficiency, which includes the productive time (per worker or per machine) as the basis for operational efficiency, as well as the unproductive time, which eventually generates process efficiency. The unproductive time is the time materials spend in inventory, handling, moving, inspecting, recording, batching, reworking, chasing, counting and repacking. Emphasis on process efficiency, and hence unproductive time, is justified when one observes that the amount of time workers are actually transforming material is a small percentage of total production time (estimated as being as low as 1% to as high as 20%) (Best, 1990, p. 148).

Another way to measure process efficiency is the 'work-in-process' (WIP) turn, which is the ratio of annual sales to WIP (the value of inventories excluding inventories of produced goods waiting to be shipped). Abegglen and Stalk (1985, p. 113-4) provide the following relevant information. In the late 1970s most Western vehicle companies had WIP turns of around 10, but Toyota's (the leader in that respect) WIP turn was greater than 300 per year and Mazda's WIP turn went up from 12 times in 1976 to over 50 times in 1981. The same authors calculated that every doubling of the WIP turn increases labor productivity by 38%. Figure 1, according to these writers, shows the relationship between WIP turns and labor productivity (a similar relationship was taken up in Sanidas, 2001 for econometric purposes).

Figure 1 **Productivity and Work-in-Process (WIP) Improvements of Selected Automobile Producers**



Source: Abegglen and Stalk (1985, p. 114)

Process efficiency is not only related to the inventories side of the production process but also to the production itself. Thus, it is inherently linked with short production runs (flexible production reducing the cycle from start to finish; for example the time to start a new car model and finish its production is considerably diminished under the regime of short runs), which reduce the time that materials are stored and level out production runs in supplier firms (see Atkinson, 1990 for a brief description of the close links between short runs, JIT, work cells, customer responsiveness, etc). In order to find alternatives to long production runs, the solution was to drive down changeover times so that small batches could be run with minimal interference with flows. This necessitated the invention and innovation of 'single-minute exchange of dyes' that are necessary in the production of cars, or other products (Best, 1990, p.152).

The organization of production in Japan was revolutionized in at least three other related ways (Best, 1990). First, machines were laid out in U-shapes with a single worker overseeing a group of machines around her/him, in lieu of the usual straight-line layout. This organizational innovation also increased productivity. Second, workers became problem solvers as opposed to merely minders, since their tasks were transformed into detecting the problem of the self-stopped machines and developing a solution. Third, a degree of automation became necessary, though as Abbeglen and Stalk (1985, p.116) remarked:

> *"…Many Japanese companies view the adoption of JIT as the prelude to full factory automation to further reduce costs. As one recent executive of a robot manufacturer said, 'If you want to know what is wrong with your process, try putting a robot in it'. Factories must be running efficiently before they can be automated…"*

Another aspect closely related to the implementation of the JIT system is the sub-contracting process. Parent or generally larger companies have established with suppliers, or generally smaller firms, two types of sub-contracting, an informal one or *kyoryokukai* according to which written contracts are non-existent, and a formal one. A set of 'shared network norms' is established over time in the former one with the objective of achieving a trusting relationship. Within the sub-contracting system special emphasis must be given to component design, which, depending on the relative independence of the smaller firms, enables technological innovations to be maximized. Following Best's analysis (1990, p. 164), there are three types of component design relationship between automakers and parts makers:

1. The automaker provides blueprint specifications to a range of potential parts makers, each of whom submits a price bid.
2. The automaker supplies blueprint specifications but expects the parts maker to suggest alterations in the development process.
3. The automaker does not provide blueprint specifications but only component performance requirements. Here the parts maker is expected to have an independent design capacity and be able to solve problems jointly with the automaker.

The second and third types of supplier relation are much more networked than the first one and they also are more of a Japanese type of OI, which has been successful in promoting new technologies combined with high quality. This innovation has gradually penetrated other industries as well.

Finally, three more aspects related to the JIT system will be briefly mentioned here. First, Western researchers about the miracle of the modern Japanese economy, from 1950 to 1990, repeatedly observed that there is cooperation at all levels of Japan's society. For instance between workers and managers, between government agencies and firms etc. "…Japan's physical and geographical characteristics give social reinforcement to its social history of groupism, interdependence, and sense of ON and GIRI- debt and obligation…" (McMillan, 1984, p. 23). As Caves and Uekusa (1976, p. 59) have written:

> *"…Japan is a group-oriented society, and its economy exhibits a startling variety of groupings of firms that extend beyond well-defined commodity markets. These groups in turn are cemented by a variety of commercial linkages: between buyer and seller of goods, lender and borrower, shareholder and issuer of equity…"*

This spirit of cooperation can be especially detected in firm networks. Imai (1994) identified four different types of enterprise groups (see Table 2), which can be combined into many other hybrid types in the real world in Japan. Even in the apparently least connected groupings, the fission type, the sense of cooperation is paramount. As cited in Imai (1994, p.136), the President of the fission type group Maekawa said: "…Each company strives to have its own character, but the more clearly defined that character becomes, the clearer it becomes that it is part of the whole, and that it must collaborate with other group members which have other characters…"

Table 2 Japanese network groups: characteristics

Zaibatsu type	*Independent type*	*Fission type*	*Network type*
• No central headquarters or central authority	• Not as diversified as zaibatsu	• No unifying force from a core organization	
• Presidents councils for communication	• Built around powerful enterprises such as Hitachi and Toyota (the equity of the latter is substantial in dozens of dependent firms)	• Separation of business divisions or sections into autonomous enterprises	• The linkages are often through communication networks
• Long term and large scale cross shareholding	• There were 28 independent groupings in 1988: Kobe Steel, NTT, Honda Motor, Nissan Motor, etc		• No core enterprise
• Major banks at the core for financial transactions and appointing directors	• Firms separated from the parent and grown into major semi-independent firms them-selves, finally covering several industries, e.g. Hitachi	• Spin-offs create founders of new firms, for which the new presidents will be employees of the 'parent' company, e.g. the Taiyo industries group	• No formal capital or personnel links between the individual enterprises
• Large trading companies at the core for trading transactions	• Firms having their origins as business departments of the parent enterprise and grown into having their own subsidiaries, expanding in the same product area, e.g. Matsushita	• The only Headquarters (that is of the leading firm) functions, besides recruiting college graduates, are finance and long term R & D.	• Participants are not connected vertically as 'parent', 'child', and 'grandchild' companies but horizontally, e.g. the 'Community Network" which has 27 firms in travel, sports, banking etc
Zaibatsu type	***Independent type***	***Fission type***	***Network type***
• There are six such groups: Mitsui, Mitsubishi, Sumitomo, Fuyo, Sanwa, Dai-ichi Kangin	• The parent company unifies multiple layers of subcontractors in vertical production relationships, e.g. Toyota	• Workers can and do move between individual companies	
•	• There is no central group bank		
•	• Subsidiaries are independent joint-stock companies, but their stock is 100% owned by the independent group, and their personnel affairs are controlled by that group's personnel department, e.g. NEC	• Personnel appointments to top posts of the individual companies are decided following consultation among those firms, and the leading company e.g. Maekawa makes the announcement	• A key firm provides an effective 'place' for the interaction and business development of the others
•	• Production plans and capital investment are decided by headquarters, eg in	• Production plans and capital investment are decided autonomously by	

	NEC	individual companies	
• Giant conglomerates producing and trading goods in most industries	• Group led by a powerful founder or owner-manager, eg Seibu (railways)	• Independent subsidiaries to meet particular business opportunities	• Examples: a network for the supply of daily use goods, or a network for pharmaceutical sales
• Group enterprises carry out more transactions with other group firms than within their own group	• The group belongs to several presidents' groups of the zaibatsu type	• Individual companies pay 3% of their sales turnover to the leading firm (e.g. Maekawa) and other such financial arrangements	

Source: Based on Imai (1994)

Second, regarding cost systems, "…The Japanese do not let the accounting procedures determine how they measure and control their organizational activities. There are relatively fewer accounting and finance personnel in Japanese firms compared to similar US companies…" (Giffi *et al*, 1990, p. 155). Also, direct labor cost is not used to allocate overhead expenses. The Japanese treat direct labor cost as a fixed asset (Ibid). Third, though the tendency for diversification and multidivisionalism has followed an upward trend since World War II, "…M-form organization has developed less extensively in Japan than in America, Britain and West Germany, yet still accounted for over 40% of the country's leading companies in the early 1970s…" (Cable and Yasuki, 1985, 417).

4.2 Just-in-time (JIT) Manufacturing: A Basic Description

Though there are some suggestions that the JIT system was introduced in the 1920s in the USA through the 'hand-to-mouth' purchasing approach (Langlois and Robertson, 1989), this system became known to the world as such through Japanese initiatives I will first refer to the evidence brought by some experts on this field, such as Harrison A. (1992, 1994), Schonberger (1982, 1986), and Imai M. (1991, 1997). Historically, the JIT system became known to the Western world through the Toyota's rigorous implementation of JIT principles as these were developed by the two Japanese pioneers Taichi Ohno and Shigeo Shingo from the mid 1950s to the late 1970s. However, as Schonberger (1982, p. 17) remarked, according to his own sources, the shipbuilding industry was the starter of the JIT idea with inventories "…20 years ago…" and subsequently this idea spread to other Japanese companies; and all this took place before T. Ohno and others started writing about JIT in the mid-1970s. Nonetheless, it is much more sensible to believe the story told by Fujimoto (1998):

> *"…The idea and slogan of 'Just-in-Time' was created and advocated by Toyota's founder-entrepreneur Kiichiro Toyoda during the 1930s…When Kiichiro started the automobile business, he first posted the words "Just in Time' on the walls, and told his subordinates to receive just twenty engine-blocks in the morning and no more if only twenty were needed that day. Kiichiro was frequently walking about the factory and threw away anything above what was needed…"* (p. 23)

Furthermore, the proper JIT process started in the 1950s with the introduction of the formal mechanism *Kanban* by Ohno who also took many ideas from the textile industry where he had previously worked. Thus, Toyota was the pioneer of the JIT system, and it was mainly through Toyota's experience (and the other car producers) in the 1970s, that the JIT system spread rapidly to other industries. For instance, "…In the electrical industry, Matsushita (a much larger but less well-known company than Sony) developed its own version. Shingo thought that the Matsushita production system was better than Toyota's. Instead of using *kanban* to signal the need for more parts between separated operations, Matsushita concentrated on placing operations next to each other so that there was no need for signaling…" (Harrison A, 1994, p.180). Furthermore, it must be emphasized that as QC in general started in Japan immediately after the end of WWII, many Japanese companies were ready to adopt the complementary system of JIT later in their evolution.

Already, Toyota in 1951 implemented the 'Idea Suggestion System' to continuously reduce production costs (Fujimoto, 1998); this subsequently became the basis for *kaizen* and TQC.

A first succinct but holistic definition of JIT is given in Harrison A. (1994, p.175). This author distinguishes three fronts of quest for excellence regarding the JIT philosophy or as it is also called 'Lean Production', or 'World Class Manufacturing':

- Techniques, which are systematically put in place to attack all sources and causes of waste.
- Everybody is included and participates in the JIT process and management.
- Continuous improvement searches for the ideal case of zero scrap, defects, and inventories.

Strictly speaking, the JIT system is only a major part of the 'lean' system; however, the former can only be successful if it becomes holistic in its nature and thus it becomes equivalent to the latter. Womack *et al* (1990, p. 13) sheds some light on the definition of the lean production system (LPS):

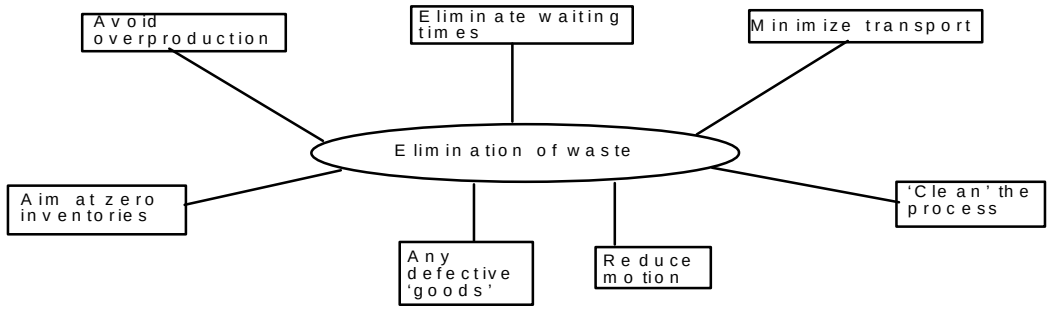
> *"...Lean production (a term coined by IMVP researcher John Krafcik) is 'lean' because it uses less of everything compared with mass production- half the human effort in the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop a new product in half the time. Also, it requires keeping far less than half the needed inventory on site, results in many fewer defects, and produces a greater and ever growing variety of products..."*

Note that in the just mentioned IMVP (International Motor Vehicle Program) researcher's article (Krafcik, 1989), it becomes evident that lean production, flexible production, and minimum inventories through the JIT process are all intrinsically interrelated.

Briefly the aim of JIT is to meet demand instantaneously with perfect quality and no waste. Hence, TQM or TQC and JIT are complementary strategies in order to excel in manufacturing. Since Total Quality primarily means that "…The customer is the next process…" (Ishikawa, 1985), the JIT/QC course of action involves many areas of the production chain, and especially it involves the design part, sales/distribution, and the supply component.

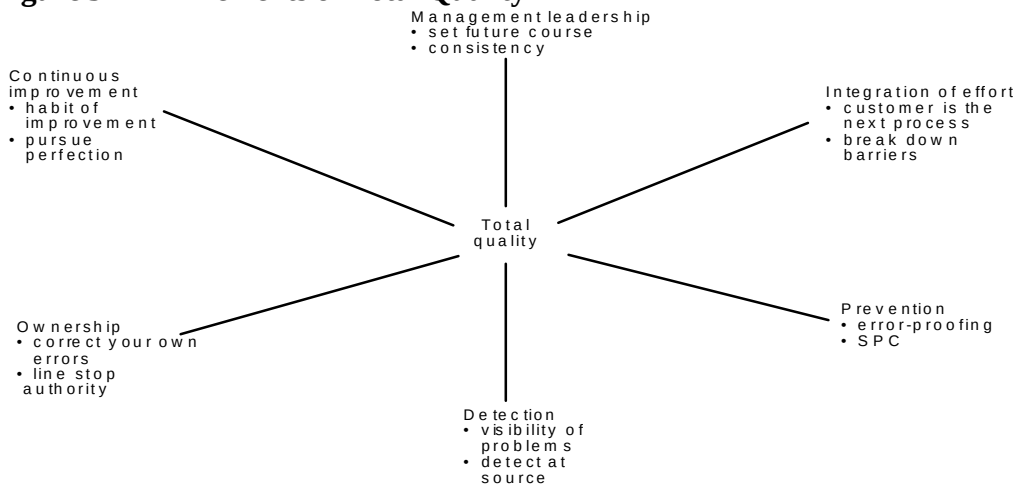
According to Harrison A. (1994), there are three elements in JIT/QC management. These elements are schematically shown in Figures 1, 2, and 3.

Figure 2 The Elimination of Wastes Process



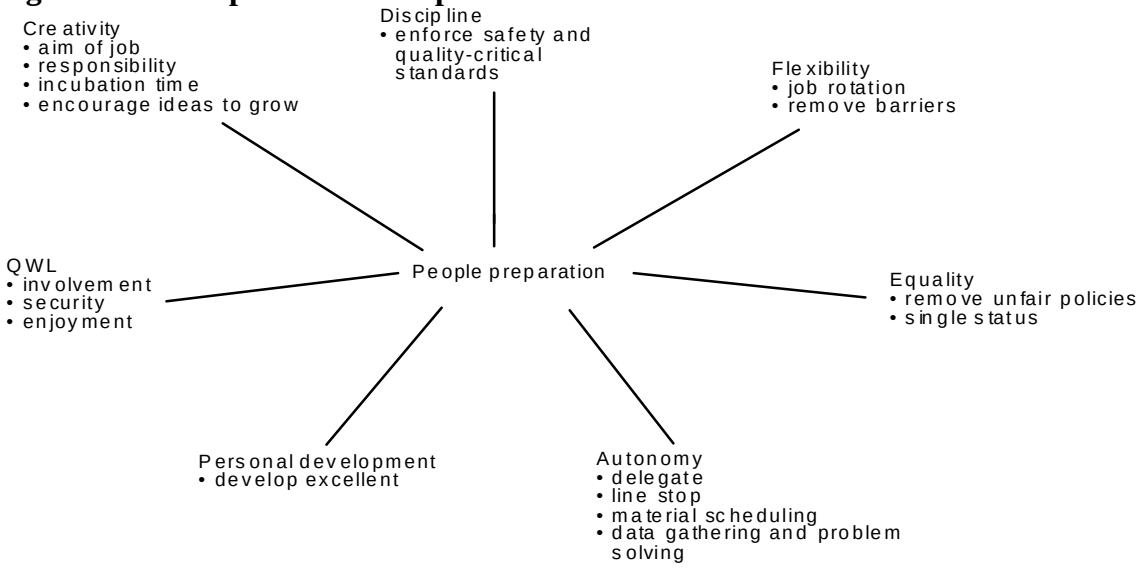
Source: Based on Harrison A. (1994, pp. 182-83)

Figure 3 Elements of Total Quality



Source: Harrison A. (1994)

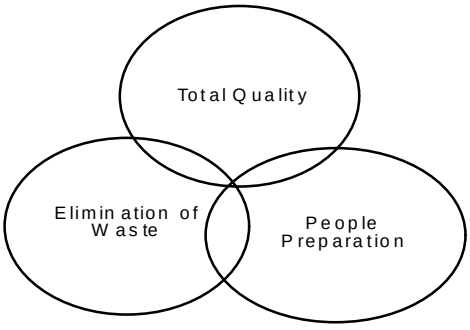
Figure 4 Importance of People



Source: Harrison A. (1994)

Figure 4 summarizes the interaction between the 3 elements of the JIT/QC whole process according to Harrison A. (1994).

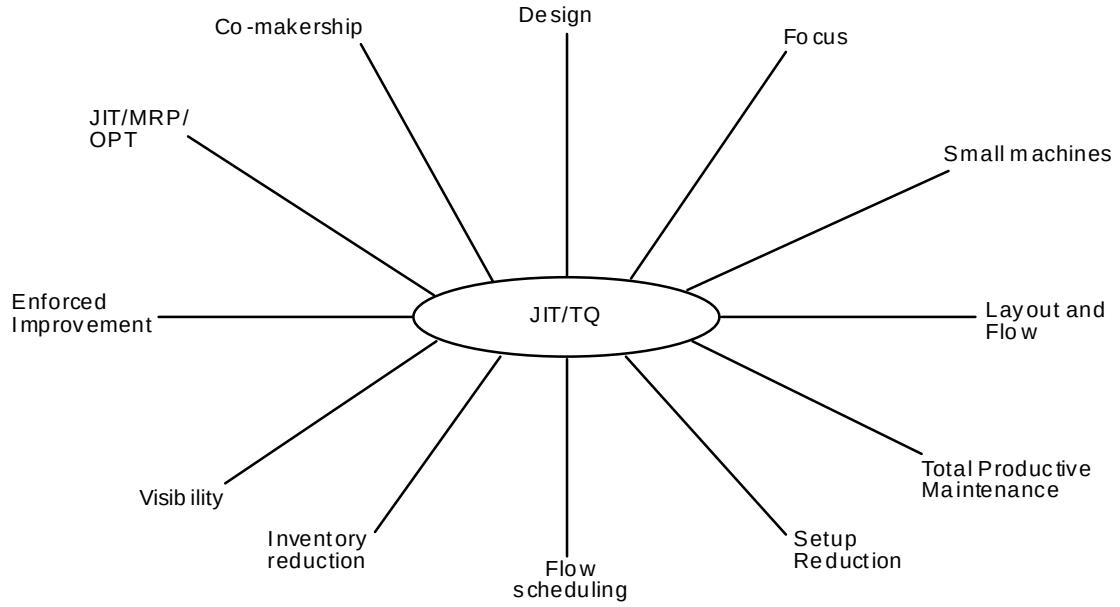
Figure 5 Wastes, Quality, and People



Source: Harrison A. (1994)

Finally, two more Figures (5 and 6) will complete the brief description and importance of this process according to the same author.

Figure 6 Selected JIT Techniques



Source: Harrison A. (1994)

Figure 5 summarizes some selected JIT techniques; a few comments are worth mentioning here. First, the "focus" technique is related to the product focus that is a major feature of JIT companies. This point is very important for my arguments, since it is related to the ample evidence I gave from Fruin's work that the Japanese firm is basically a 'focal' firm. In relation to 'Total Productive maintenance', Harrison A. (Ibid, p.189) says "…The attitude by production operators that 'maintenance is not my problem' is a killer!…Instead, production operators can help to prevent breakdowns…"

In relation to the 'lay-out and flow' technique, it is well known that the "U" pattern of arranging machines substantially improves the JIT/QC process (see for example Abegglen and Stalk, 1985, or Donchess, 1990). In addition, there is another element of layout relevant to this process, that is, the product-focused machine layout that often has the U-shape pattern. Thus, Ohno in his implementation of the JIT system in Toyota converted the engine-machining, transmission and suspension factories into product-focused machine layouts (Fujimoto, 1998). Note that from the principles point of view, the application of proper layouts can be traced back to other earlier cases (for instance, cf. Chandler, 1977 for steel plants, or Pollard and Robertson, 1979, for shipbuilding plants).

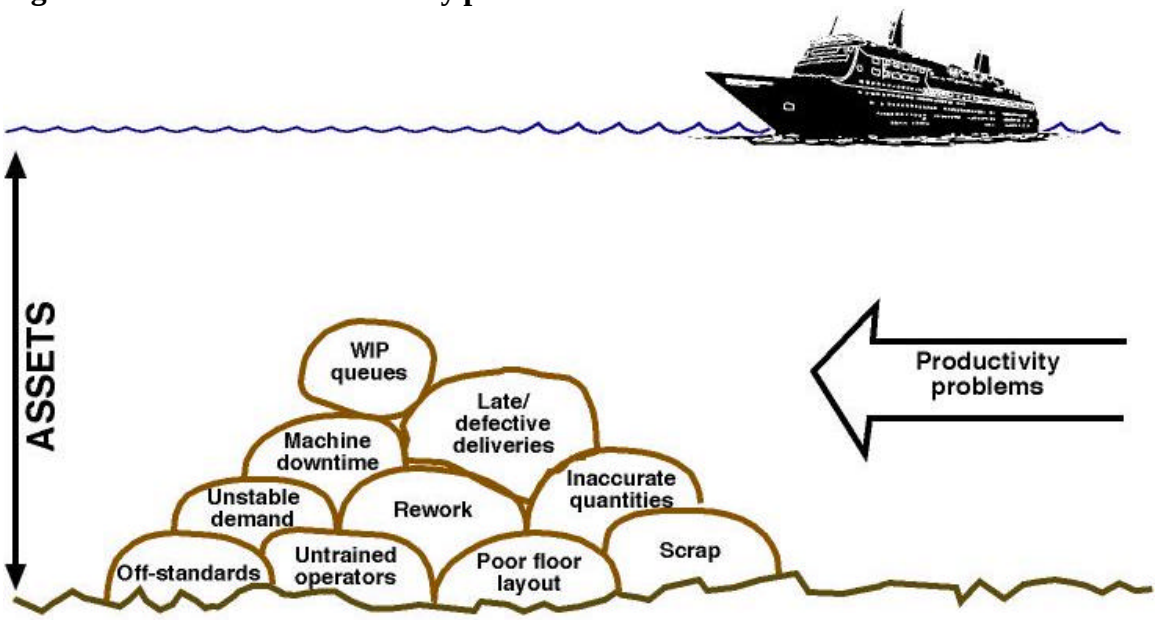
In relation to the 'flow scheduling' technique, the aim is to synchronize all operations throughout the factory so that accurate inventory timing takes place. This is achieved with the use of *kanban* cards, as the following rules show (cf. Harrison A., 1994):

1. Each container must have a *kanban* card, indicating part number and description, user and maker locations, and quantity.
2. The parts are always pulled by the succeeding process (the customer or user)
3. No parts are started without a *kanban* card.
4. All containers contain exactly their stated number of parts.
5. No defective parts may be sent to the succeeding process.
6. The make (supplier section) can only produce enough parts to make up what has been withdrawn.
7. The number of *kanbans* should be reduced.

The technique ‘co-makership’ is related to the interdependence of customer-supplier links. The technique ‘JIT/MRP(it stands for Manufacturing Resource Planning)/OPT (it stands for Optimized Production Technology) is related to the effectiveness of computerized systems (e.g. MRP).

Figure 6 explains the ‘inventory reduction’ and ‘enforced improvement’ techniques; Harrison A. (Ibid, p. 190) comments: “…Problems such as late and defective materials and machine downtime (the rocks) have been covered with a sea of inventory so that the boat can float. Enforced improvement aims deliberately to confront the problems, and by finding solutions to the basic causes of the problems allow the water level to be reduced…” This reduction of the ‘sea of inventory’ is the very visible result that any efficient JIT/QC company achieves. Thus, it makes sense to use this gauge (reduction or not of inventories) in order to measure the efficiency of firms, sectors, industries and the whole economy (the importance of inventories reduction is shown in various other passages of this study, as it is a crucial element of my analysis).

Figure 7 Productivity problems and inventories



Source: (Harrison A., 1994)

Krajewski and Ritzman (1999), amongst so many other scholars, also analyzed the JIT systems and proposed the following characteristics.

- A pull method of materials flow
- A consistently high quality
- Small lot sizes
- Uniform workstation loads
- Standardized components and work methods
- Close supplier ties
- Flexible workforce
- Line flow strategy (e.g. product layout)
- Automated production
- Preventive maintenance
- Continuous improvement

4.3 Quality Products, Quality Control, and *Kaizen*

The story about the quality issue in Japan is a fascinating one and lies at the heart of the Japanese economic miracle. Before World War II, Japanese products were low in quality (Best, 1990, p.137). After that War things changed rapidly, mainly because of some suggestions made by American scholars such as Deming (1986) who, in turn, was influenced by his mentor Shewhart, who wrote, in 1931, a book entitled 'The Economic Control of Quality of Manufactured Product'. In 1950, the JUSE (Japanese Union of Scientists and Engineers) asked Deming to give a series of lectures on statistical quality control, because they (JUSE) "…saw potential in such methods for addressing the Japanese problem of low quality products…" (Best, 1990, p. 159). This series took place successfully. At the same time Deming met many Japanese managers. "…The rest is history, as the methods (Deming's) came to be adopted by virtually all of Japanese industry…" (Best, 1990, p. 159).

Following Deming, Duran and Feigenbaum also carried the same message to Japan where any type of quality control soon became an obsession at all levels of production, from the hourly workers to market researchers, to product designers, to materials acquisitions employees and others. Quality control, especially based on statistical methods, became priority number one in all business activities. Overall, Japanese managers and industrialists systematically followed Deming's main ideas, which are summarized in his 14 famous points (Deming, 1986, or, Evans and Lindsay, 2002, p. 92). For example: refuse to accept defects; cease dependence on mass inspection; find problems and continually and forever make improvements; provide vigorous and ongoing education and retraining; clearly demonstrate management commitment to all the 14 points every day.

Deming's ideas can also be summarized in the following way: when a worker is deprived of his/her right to do good work and to be proud of himself or herself, this may be the single most important contribution of management to poor quality (Deming, 1986). This is exactly what the Japanese worker was not deprived of, as after WWII the quality movement in Japan has generated a work environment such that the Japanese worker became dedicated to and proud of his/her work, for example *via* the creation of numerous quality control (QC) circles. It is relevant to see what Best (1990) has to say in this respect: "…The point is that Japanese companies have not been successful because of cultural characteristics peculiar to the Japanese but because of the organizational characteristics that have tapped human energies presumed, at least by scientific management, not to exist in working people…" (1990, p. 161).

Initially, QC was applied in heavy industries such as steel, because they especially required instrumentation control. At a later stage, other industries started to introduce QC for such products as consumer durables and home appliances. (Imai, 1991, p. 12). Overall quality control in Japan has been growing at an exponential rate since 1950, as Figure 8 shows. This exponential evolution can be compared with the historical expansion of quality control in Japan as Table 3 shows.

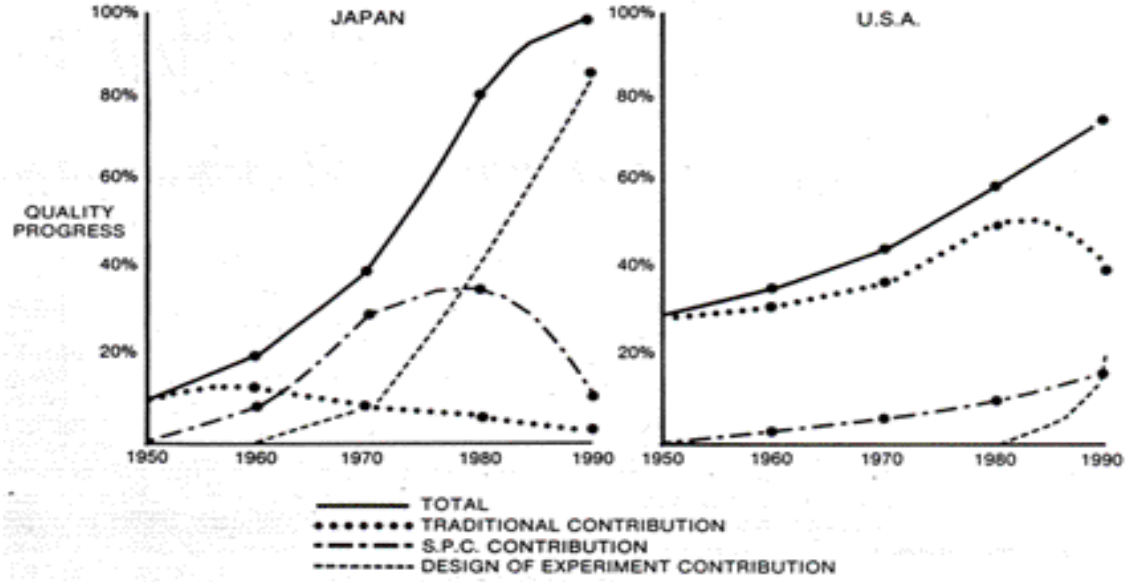
Table 3 Initial Steps of Quality Control in Japan

Date	Event
March 1950	The JUSE started publishing its magazine Statistical Quality Control.
July 1950	Deming's first visit to Japan invited by the JUSE.
1950s	Several visits by Deming.
July 1954	J. M. Juran invited to Japan to conduct a JUSE seminar on quality control management, the first from an overall management perspective.
1956	Japan Shortwave Radio included a course on quality control.
November 1960	The first national quality month was inaugurated.
1960	Q-marks and Q-flags were formally adopted.
April 1962	The magazine Quality Control for the Foreman was launched.

Source: Imai, 1991, pp. 10-12.

All these points clearly show at least one issue: a continuous dynamic search for and implementation of improvement. This is inherently related to *Kaizen*, which means continuous improvement in all aspects of life. According to Imai (1991) *Kaizen* is one of the most commonly used words in Japan.

Figure 8 Quality Control in the USA and Japan



Source: Bhote, 1988, p.28.

Kaizen is more of a philosophy, or a strategy, than an actual technique or innovation, and as such it embraces everything else analyzed so far. Imai (1991, p. 4) puts under the 'umbrella of *Kaizen*' the following concepts: TQC, robotics, QC circles, suggestion systems, customer orientation, automation, discipline in the workplace, total productive maintenance, *Kanban*, quality improvement, JIT, zero defects, small-group activities, cooperative labor-management relations, productivity improvement, and new product development. *Kaizen* is especially linked with TQC as it is already obvious from the fact that continuous improvement is inherently related to quality control. As Imai (1991, p. 13) has stressed "…Japan has developed an elaborate system of *Kaizen* strategies as management tools within the TQC movement…"

5 JAPANESE AND AMERICAN EVOLUTIONS OF FIRMS AND OIs: A BRIEF COMPARISON

From this very brief historical overview of firms and OIs developments in Japan and the USA some conclusions can now be readily made. In Japan, in parallel with only a handful of large conglomerates, smaller and more numerous firms has been the trend from the beginning of the country's industrialization process. This was due to the early development of the focal type of company because of limited resources and technology. Hence the search for cooperation and consequently economies of scope was to the detriment of economies of scale. In the USA a contrary evolution took place, in which, from the beginning of the country's industrialization, there was a tendency for the creation of big business, diversification of products, and eventually multi-divisional organization. This was due to a natural abundance of resources, human and non-human, plus a series of major and minor technological and organizational breakthroughs. This divergent historical evolution of the firm in the two countries demonstrates that there is not a unique way to evaluate competition and the role of firms, but this evaluation depends on the historical context of factors such as availability of resources, technology, and organization. In other words, what is good for the USA might not be good for Japan or what is good for Japan might not be good for Canada, and so on, this historical and spatial dependency being part of the contingency approach in management and related sciences.

Also, in Japan, many organizational innovations such as flexible production, JIT, quality control, and Japanese style sub-contracting enhanced and sustained the development of small and medium enterprises (SMEs). On the contrary only very recently in the USA, from the late 1980s, has there been a reversal in the continuous expansion of big business; thus in the last 15-20 years in the USA big firms have been shrinking and SMEs expanding in number (for example, cf. Stewart, 1993, or Brown, 2000), though the overall importance of big business remains. This is to a significant extent explained by the reorganization of the American firms in terms of the JIT/QC system as it was demonstrated in Sanidas, 2001. Otherwise, no major organizational innovation took place in this country after WWII except for an intensification of product diversification and multi-divisionalism.

In Japan, the conglomerate type of business existed from the start of the country's industrialization process and has continued its development up to the present. On the contrary, in the USA it only appeared in the mid 1960s, but its development was reversed in the 1980s. Again, this antithesis between Japanese and American firm evolutions can be –at least partly- explained by differences in OIs and TIs, resource endowments, as well as historical circumstances and culture.

CONCLUSIONS

In this paper an historical overview of the USA and Japan uncovered the major OIs as these were described by eminent scholars and in particular by economic historians. A summary of these OIs and their chronology, as established in this study, is provided in Table 4 (although the list is not exhaustive). In the USA, most of the major OIs appeared during the Second Industrial Revolution, between 1880 and 1920: mass production and mass distribution and their integration, mergers, diversification, scientific management, Fordism, and so on. In the same country, no major OI was discovered after WWII, except for the adoption of the JIT/QC system during the last 20 years via the introduction of flexible specialization and Post-Fordism (see Sanidas, 2001). On the contrary, in Japan some major OIs appeared after the 1930s and especially after the 1950s: focal firms, JIT/QC, quality control, *kaizen.*

Table 4 Organizational innovations (OIs) historically

Object of OI	Type of OI	Approximate date of introduction and country of first appearance
Production or Distribution	Craft production	From ancient times
	Putting-out production	18th century (Britain), 19th century (USA)
	Factory production	End of 18th century (Britain)
	Mass production	End of 19th century (USA)
	Mass distribution	End of 19th century (USA)
	Integration of mass production and distribution	End of 19th century (USA) and beginning of 20th century
	Lean production	1960s and 1970s in Japan
Industry Structure	SMEs and LEs	End of 19th century (USA)
	Oligopolies, Monopolies etc	End of 19th century (USA)
	Clusters and Industrial districts	1950s, 1960s, 1970s in the USA, Japan, Germany, Italy
Networks	Zaibatsus	End of 19th century (Japan)
	Keiretsus (with sub-contractors)	Since 1950s (Japan)
Firm Structure	Diversified	1920s (USA)
	Focal	1930s (Japan)
	Vertically integrated	End of 19th century (USA)
	Conglomerate	End of 19th century (Japan)
	Functionally managed	1870s and 1880s (USA)
	Divisionally managed	1920s (USA, Japan)
	Team work based	1950s and 1960s (Japan)
Production Process	U-shaped machine layout	1960s (Japan)
	Scientifically managed	1910s (USA)
	Quality controlled	1950s (Japan)
	Just-In-Time oriented	1960s (Japan)
Institutions	Government agencies	After WWII (Japan)
	Anti-Trust Laws	1890s (USA)
	Stock Exchanges	End of 19th century (USA)

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