The present crisis, a pattern?

Every production phase or civilization or other human invention goes through a so called transformation process. Transitions are social transformation processes that cover at least one generation. In this article I will use one such transition to demonstrate the position of our present civilization and its possible effect on stock exchange rates.

When we consider the characteristics of the phases of a social transformation we may find ourselves at the end of what might be called the third industrial revolution. Transitions are social transformation processes that cover at least one generation (= 25 years). A transition has the following characteristics:

- it involves a structural change of civilization or a complex subsystem of our civilization
- it shows technological, economical, ecological, socio cultural and institutional changes at different levels that influence and enhance each other
- it is the result of slow changes (changes in supplies) and fast dynamics (flows)

Examples of historical transitions are the demographical transition and the transition from coal to natural gas which caused transition in the use of energy. A transition process is not fixed from the start because during the transition processes will adapt to the new situation. A transition is not dogmatic.

Four transition phases

In general transitions can be seen to go through the S curve and we can distinguish four phases (see fig. 1):

1. a pre development phase of a dynamic balance in which the present status does not visibly change
2. a take off phase in which the process of change starts because of changes in the system
3. an acceleration phase in which visible structural changes take place through an accumulation of socio cultural, economical, ecological and institutional changes influencing each other; in this phase we see collective learning processes, diffusion and processes of embedding
4. a stabilization phase in which the speed of sociological change slows down and a new dynamic balance is achieved through learning

A product life cycle also goes through an S curve. In that case there is a fifth phase:

5. the degeneration phase in which cost rises because of over capacity and the producer will finally withdraw from the market.

The S curve of a transition

Indications of system transitions
- pre development
- take off
- acceleration
- stabilization

Figure 1: Four phases in a transition best visualized by means of an S curve.

Spreading process of transitions
The process of the spreading of transitions over civilizations is influenced by a number of elements:
- physical barriers: oceans, deserts, mountain ranges, swamps, lakes
- socio cultural barriers: difference in culture and languages
- religious barriers
- psychological barriers

The Neolithic transition was the most transition for mankind. This first agricultural revolution (10000 – 3000 BC) forms the change from societies of hunter gatherers (20 – 50 people) close to water with a nomadic existence to a society of people living in settlements growing crops and animals. A hierarchical society came into existence. Joint organizations protected and governed the interests of the individual. Performing (obligatory) services for the community could be viewed as a first type of taxation. Stocks were set up with stock management, trade emerged, inequality and theft. Ways of administering justice were invented to solve conflicts within and between communities and war became a way of protecting interests.
The Neolithic revolution started in those places that were most favorable because of the climate and sources of food. In very cold, very hot or dry areas the hunter gatherer societies lasted longer. Several areas are pointed out as possible starting points: southern Anatolia, the basins the Yangtze Kiang and Yellow river in China, the valley of the Indus, the present Peru in the Andes or what is now Mexico in Central America. From these areas the revolution spread across the world.
The start of the Neolithic era and the spreading process are different in each area. In some areas the changes are relatively quick and some authors therefore like to speak of a Neolithic revolution. Modern historians prefer to speak of the Neolithic evolution. They have come to realize that in many areas the process took much longer and was much more gradual than they originally thought.

Three drastic transitions
When we look back over the past two centuries, we see three transitions taking place with far-reaching effects.

1. The first industrial revolution

The first industrial revolution lasted from around 1780 tot 1850. It was characterized by a transition from small scale handwork to mechanized production in factories. The great catalyst in the process was the steam engine which also caused a revolution in transport as it was used in railways and shipping. The first industrial revolution was centered around the cotton industry. Because steam engines were made of iron and ran on coal, both coal mining and iron industry also flourished.
Britain was the first country that faced the industrial revolution. The steam engine was initially mainly used to power the water pumps of mines. A major change occurred in the textile industry. Because of population growth and colonial expansion the demand for cotton products quickly increased. Because spinners and weavers could not keep up with the demand, there was an urgent need for a loom with an external power unit, the power loom.

A semi-automatic shuttleless loom was invented, and a machine was created that could spin several threads simultaneously. This "Spinning Jenny", invented in 1764 by James Hargreaves, was followed in 1779 by a greatly improved loom: 'Mule Jenny'. At first they were water-powered, but after 1780 the steam engine had been strongly improved so that it could also be used in the factories could be used as a power source. Now much more textiles could be produced. This was necessary because in 1750, Europe had 130 million inhabitants, but in 1850 this number had doubled, partly because of the agricultural revolution. (This went along with the industrial revolution; fertilizers were imported, drainage systems were designed and ox was replaced by the horse. By far the most important element of the agricultural revolution was the change from subsistence to production for the market.)
All those people needed clothing. Thanks to the machine faster and cheaper production was possible and labor remained cheap. The textile industry has been one of the driving forces of the industrial revolution.
Belgium becomes the first industrialized country in continental Europe. Belgium is "in a state of industrial revolution" under the rule of Napoleon Bonaparte. The industrial centers were Ghent (cotton and flax industries), Verviers (mechanized wool production), Liège (iron, coal, zinc, machinery and glass), Mons and Charleroi. On the mainland, France and Prussia followed somewhat later. In America the northeastern states of the United States followed quickly. After 1870 Japan was industrialized as the first non-Western country. The rest of Europe followed only around 1880.

The beginning of the end of this revolution was in 1845 when Friedrich Engels, son of a German textile baron, described the living conditions of the English working class in “The condition of the working class in England“.

2. The second industrial revolution

The second industrial revolution started around 1870 and ended around 1930. It was characterized by ongoing mechanization because of the introduction of the assembly line, the replacement of iron by steel and the development of the chemical industry. Furthermore coal and water were replaced by oil and electricity and the internal

combustion engine was developed. Whereas the first industrial revolution was started through (chance) inventions by amateurs, companies invested a lot of money in professional research during the second revolution, looking for new products and production methods. In search of finances small companies merged into large scale enterprises which were headed by professional managers and shares were put on the market. These developments caused the transition from the traditional family business to Limited Liability companies and multinationals.

The United States (U.S.) and Germany led the way in the Second Industrial Revolution. In the U.S. there were early experiments with the assembly line system, especially in the automotive industry. In addition, the country was a leader in the production of steel and oil. In Germany the electricity industry and the chemical industry flourished. The firms AEG and Siemens were electricity giants. German chemical companies such as AGFA and BASF had a leading share in the production of synthetic dyes, photographic and plastic products (around 1900 they controlled some 90% of the worldwide market). In the wake of these two industrial powers (which soon surpassed Britain) France, Japan and Russia followed. After the Second Industrial Revolution more and more countries, on more continents, experienced a more or less modest industrial development. In some cases, the industrialization was taken in hand by the state, often with coarse coercion - such as the five-year plans in the Soviet Union.

After the roaring twenties the revolution ended with the stock exchange crash of 1929. The consequences were disastrous culminating in the Second World War.

3. The third industrial revolution

The third industrial revolution started around 1940 and is nearing its end. The United States and Japan played a leading role in the development of computers. During the Second World War great efforts were made to apply computer technology to military purposes. After the war the American space program increased the number of applications. Japan specialized in the use of computers for industrial purposes such as the robot.

From 1970 the third industrial revolution continued to Europe. The third industrial revolution was mainly a result of a massive development of microelectronics: electronic calculators, digital watches and counters, the compact disc, the barcode etc. The acceleration phase of the third industrial revolution started around 1980 with the advent of the microprocessor. The development of the microprocessor is also the basis of the evolution and breakthrough of computing. This had an impact in many areas: for calculation, word processing, drawing and graphic design, regulating and controlling machines, simulating processes, capturing and processing information, monetary transactions and telecommunications. The communication phase grows enormously at the beginning of the new millennium: the digital revolution. According to many analysts now a new era has emerged: that of the information or service economy. Here the acquisition and channeling of information has become more important than pure production.

By now computer and communication technology take up an irreplaceable role in all parts of the world. More countries depend on the service sector and less on agriculture and industry.

Effects of three industrial revolutions

The first (and second revolution) transformed an agricultural society into an industrial society where mechanization (finally) relieved man of physical labor. The craft industry could not compete with the factories that put products of the same or even better quality on the market at a lower price. The result was that many small businesses went bankrupt and the former workers went to work in the factories. The effects of industrialization were seen in the process of rapid urbanization of formerly relatively small villages and towns where the new plants came. These turned into dirty and unhealthy industrial cities. Still people from the country were forced to go and work there. Because of this a new social class emerged: the workers, or the industrial proletariat. They lived in overcrowded slums in poor housing with little sanitation. The average life expectancy was low, and infant mortality high. The elite accepted the filth of the factories as the inevitable price for their success. The chimneys were symbols of economic power, but also of social inequality. You see this social inequality appear after each revolution. The gap between the bottom and the top of society becomes very large. Eventually there are inevitable responses that decrease this gap. It could be argued that the Industrial revolutions have created the conditions for a society with little or no poverty.

The third revolution transformed an industrial society into a service society. Where mechanization man relieved of physical labor, the computer relieved him of mental labor. This revolution made lower positions in industry more and more obsolete and caused the emergence of entirely new roles in the service sector.

Dow Jones Industrial Average

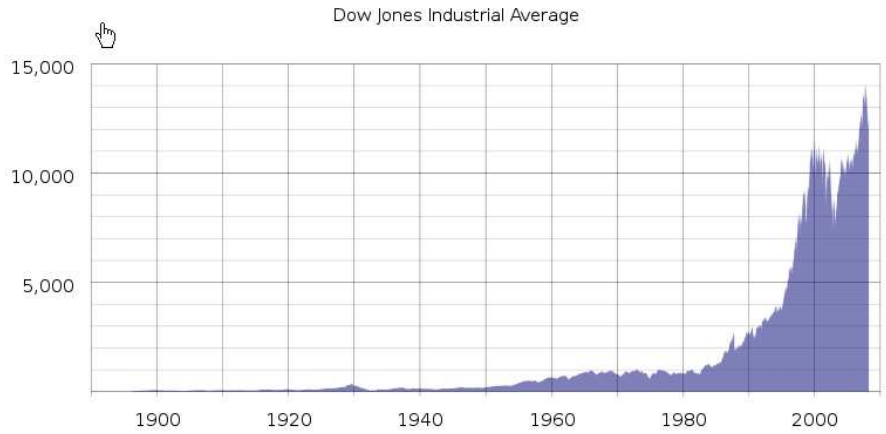


Figure 2: Exchange rates of Dow Jones during the latest two industrial revolutions. During the last few years the rate increases have accelerated enormously.

Industrial revolutions and stock market indices.
The Dow Jones Industrial Average was first published halfway through the second Industrial Revolution, in 1896. The Dow Jones Industrial Average (DJIA) Index is the oldest stock index in the United States. This was a straight average of the rates of twelve shares. A select group of journalists from The Wall Street Journal decide

which companies are part of the most influential index in the world market. Unlike most other indices the Dow is a price-weighted index. This means that stocks with high absolute share price have a significant impact on the movement of the index.
The S & P Index is a market capitalization weighted index. The 500 largest U.S. companies as measured by their market capitalization are included in this index, which is compiled by the credit rating agency Standard & Poor's.
The BEL 20 is Belgium's most important stock market index. It consists of up to 20 stocks chosen by the market authorities of Euronext, based on a number of criteria. First and foremost, they need to possess a sufficiently high market capitalization. Then the stocks are ranked according to their free float market capitalization. Then, besides the market capitalization other criteria such as the liquidity and marketability are taken into account, to fill the remaining four places. From a weighted average of the prices of these shares, the position of the BEL 20 is calculated.

What does a stock exchange index like DJIA, S&P 500 or BEL 20 really mean?

In many graphs the y-axis is a fixed unit, such as kg, meter, liter or euro. In the graphs showing the stock exchange values, this also seems to be the case because the unit shows a number of points. However, this is far from true! An index point is not a fixed unit in time and does not have any historical significance.
An index is calculated on the basis of a set of shares. Every index has its own formula and the formula gives the number of points of the index. Unfortunately many people attach a lot of value to these graphs which are, however, very deceptive.

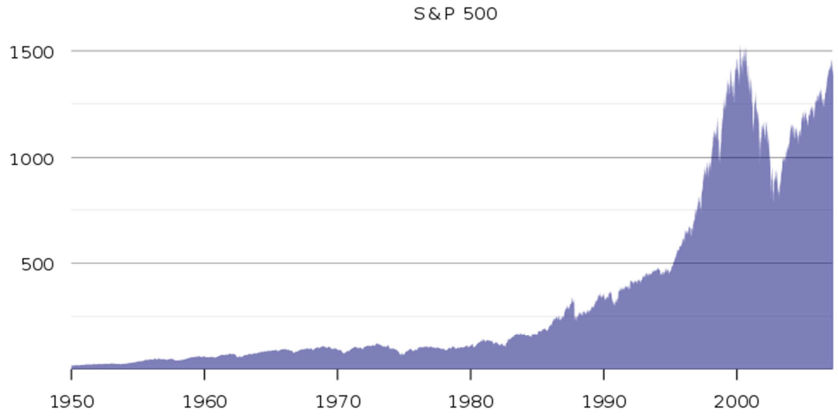
- An index is calculated on the basis of a set of shares. Every index has its own formula and the formula results in the number of points of the index. However, this set of shares changes regularly. For a new period the value is based on a different set of shares. It is very strange that these different sets of shares are represented as the same unit.
  After a period of 25 years the value of the original set of apples is compared to the value of a set of pears. At the moment only 6 of the original 30 companies that made up the set of shares of the Dow Jones at the start of the acceleration of the last revolution (in 1979) are still present.

- Even more disturbing is the fact that with every change in the set of shares used to calculate the number of points, the formula also changes. This is done because the index which is the result of two different sets of shares at the moment the set is changed, must be the same for both sets at that point in time. The index graphs must be continuous lines. For example, the Dow Jones is calculated by adding the shares and dividing the result by a number. Because of changes in the set of shares and the splitting of shares the divider changes continuously. At the moment the divider is 0.132319125 but in 1985 this number was higher than 1. An index point in two periods of time is therefore calculated in different ways:
  Dow1985 = (x1 + x2 + ...+x30) / 1
  Dow2009 = (x1 + x2 + ... + x30) / 0,132319125

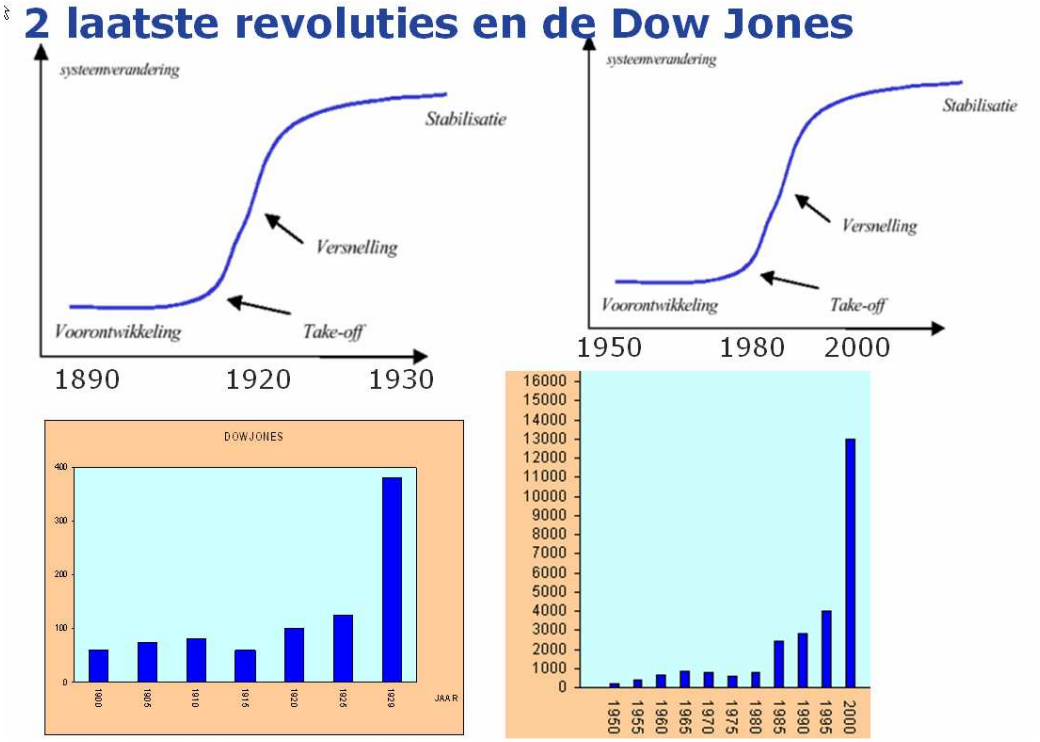
  In the nineties of the last century many shares were split. To make sure the result of the calculation remained the same both the number of shares and the divider

changed (which I think is wrong). An increase in share value of 1 dollar of the set of shares in 2009 results is 7.5 times more points than in 1985. The fact that in the 1990-ies many shares were split is probably the cause of the exponential growth of the Dow Jones index. At the moment the Dow is at 9665 points. If we used the 1985 formula it would be at 1279 points.

- The most remarkable characteristic is of course the constantly changing set of shares. Generally speaking, the companies that are removed from the set are in a stabilization or degeneration phase. Companies in a take off phase or acceleration phase are added to the set. This greatly increases the chance that the index will rise rather than go down. This is obvious, especially when this is done during the acceleration phase of a transition.
  From 1980 onward 7 ICT companies (3M, AT&T, Cisco, HP, IBM, Intel, Microsoft) , the engines of the latest revolution were added to the Dow Jones and 5 financial institutions, which always play an important role in every transition. This is actually a kind of pyramid scheme. All goes well as long as companies are added that are in their take off phase or acceleration phase. At the end of a transition, however, there will be fewer companies in those phases.



<<Fig 3: 3rd industrial revolution and the S&P 500 >>



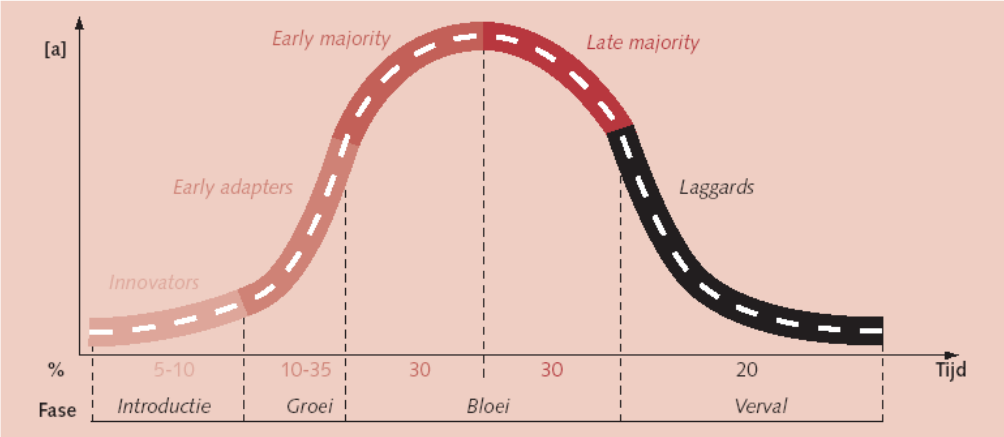
Indications of system transitions
- pre development
- take off
- acceleration
- stabilization

<<The two most recent revolutions and the Dow Jones index. The stock value increase has accelerated enormously.>>

Will the share indexes go down any further?

Calculating share indexes as described above and showing indexes in historical graphs is a useful way to show which the industrial revolution is in.

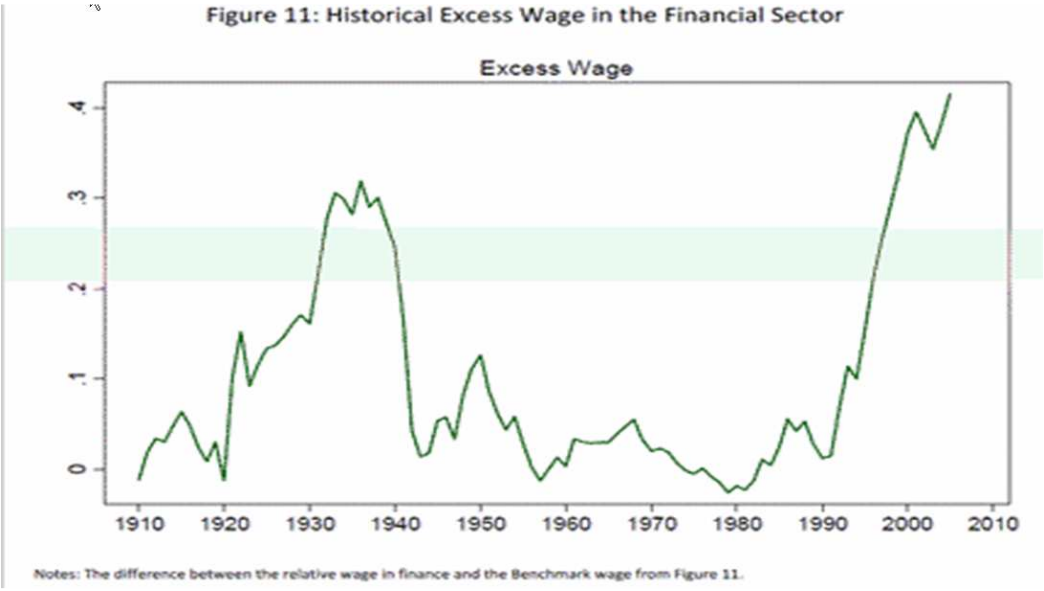
Figuur 3. Typisch verloop van een marktontwikkeling



Introduction
Growth
Flourishing
Decline

<< Fig 4: Typical course of market development >>

The third industrial revolution is clearly in the saturation and degeneration phase. This phase can be recognized by the saturation of the market and the increasing competition. Only the strongest companies can withstand the competition or take over their competitors (like for example the take-overs by Oracle and Microsoft in the past few years). The information technology world has not seen any significant technical changes recently, despite what the American marketing machine wants us to believe. During the pre development phase and the take off phase of a transition many new companies spring into existence. This is a diverging process. Especially financial institutions play an important role here as these phases require a lot of money. The graphs showing the wages paid in the financial sector therefore shows the same S curve as both revolutions.



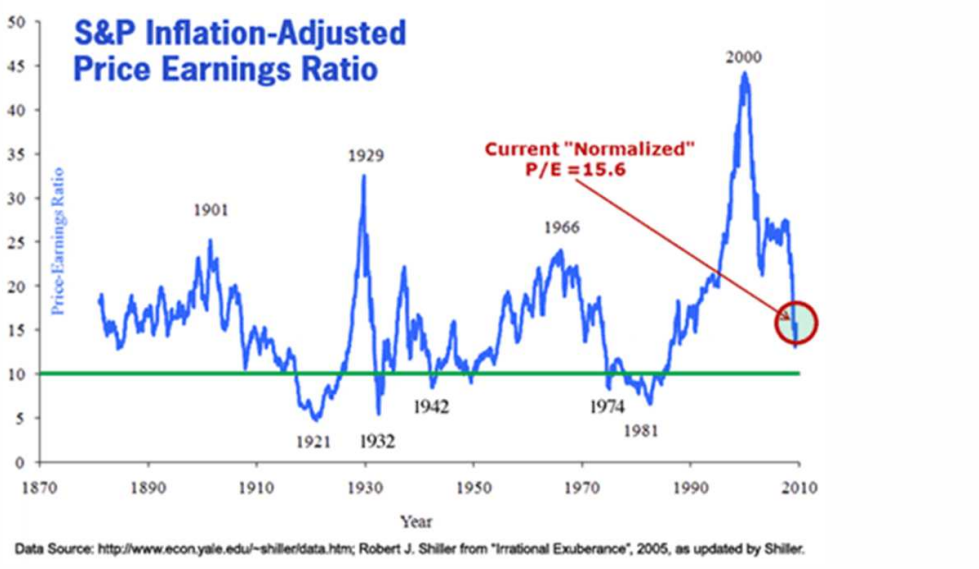
<< Fig Historical excess wage in the financial sector >>

Investors get euphoric when hearing about mergers and take overs. Actually, these mergers and take overs are indications of the converging processes at the end of a transition. When looked at objectively, each merger or take over is a loss of economic activity. This becomes painfully clear when we have a look at the unemployment rates of some countries.

New industrial revolutions come about because of new ideas, inventions and discoveries, so new knowledge and insight. Here too we have reached a point of saturation. There will be fewer companies in the take off or acceleration phase to replace the companies in the index shares sets that have reached the stabilization or degeneration phase.

In the graph below we see the share price/income ratio over the past two industrial revolutions. At the end of the 2nd industrial revolution in 1932 this index reached 5. At the moment we are at 15. The index prices can still go down by a factor 3.

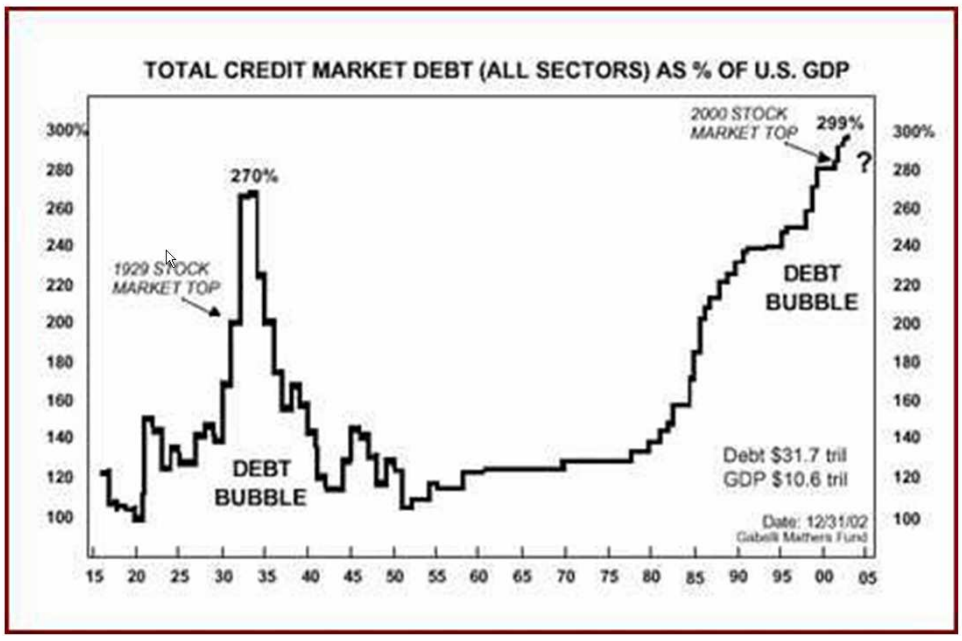
2 laatste transities: koers /inkomsten verhouding



<< Fig 2 industrial revolutions: share price / income ratio >>

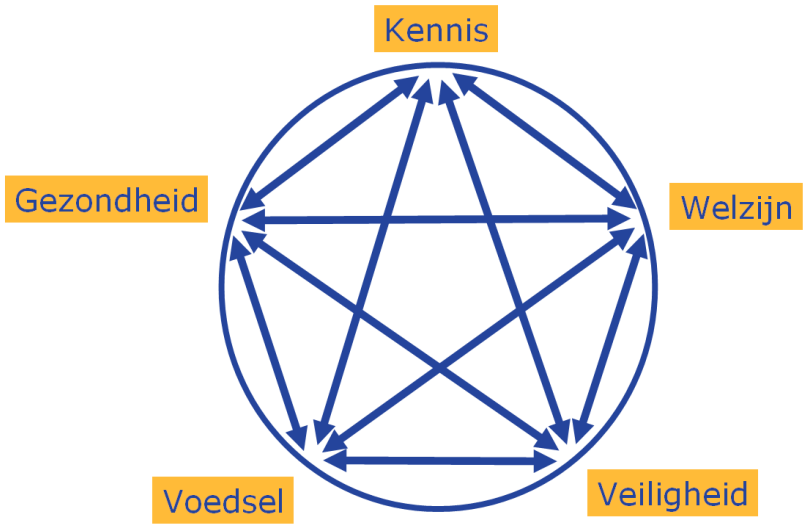
Will history repeat itself?
Humanity is being confronted with the same problems as those at the end of the second industrial revolution such as decreasing stock exchange rates, highly increasing unemployment, towering debts of companies and governments and bad financial positions of banks.

2 laatste revoluties: Schuldenlast Amerika



<< Fig Two most recent revolutions: US market debt >>

Transitions are initiated by inventions and discoveries, new knowledge of mankind. New knowledge influences the other four components in a society. At the moment there are few new inventions or discoveries. So the chance of a new industrial revolution is not very high.
History has shown that five pillars are indispensable for a stable society.



Knowledge
Prosperity
Security
Food
Health

<< Fig The five pillars for a stable society >>

At the end of every transition the pillar Prosperity is threatened. We have seen this effect after every industrial revolution.
The pillar Health of a society is about to fall again. History has shown that the fall of the pillar Prosperity always results in a revolution. Because of the high level of unemployment after the second industrial revolution many societies initiated a new transition, the creation of a war economy. This type of economy flourished especially in the period 1940 – 1945.

Now, societies will have to make a choice for a new transition to be started. Without knowledge of the past there is no future.

Wim Grommen

Sources used
Transities & transitiemanagement, casus van een emissiearme energievoorziening, Prof. dr. ir. Jan Rotmans e.a..