Japan's innovation system and "cool" industries: What does game software case teach us?[i]

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1. Introduction

There are signals indicating the long hoped-for recovery of the Japanese economy – may it be the drastically improved business confidence, the growth of GDP or the decreasing unemployment rate. At the same time, however, pronounced scepticism towards the further development of the Japanese economy is expressed, which refers mainly to still existing problems especially within its innovation system. Indeed, in international rankings Japan is still placed on a low rank. One problem the Japanese economy faces is obviously the path dependency of its established institutions. Path dependency is the key concept in institutional economics in order to explain why a desirable institutional change does not take place even if an increase in welfare for all people concerned could be expected. Relating to Japan, path dependency can be found in its national innovation system as well, whose needs are still oriented towards the needs of a developmental state, that is by catch-up institutions such as closed industrial groups, a closed labour market, a low role of independent entrepreneurship or a generally preferred employment policy aiming to produce disciplined, loyal workers. Thus, the Japanese economy has major problems to solve. This paper starts from the concept of path dependency, but then goes one step further in analysing how path dependency can be overcome. The solution is found in institutional path plasticity which is often underestimated in the concept of path dependency.

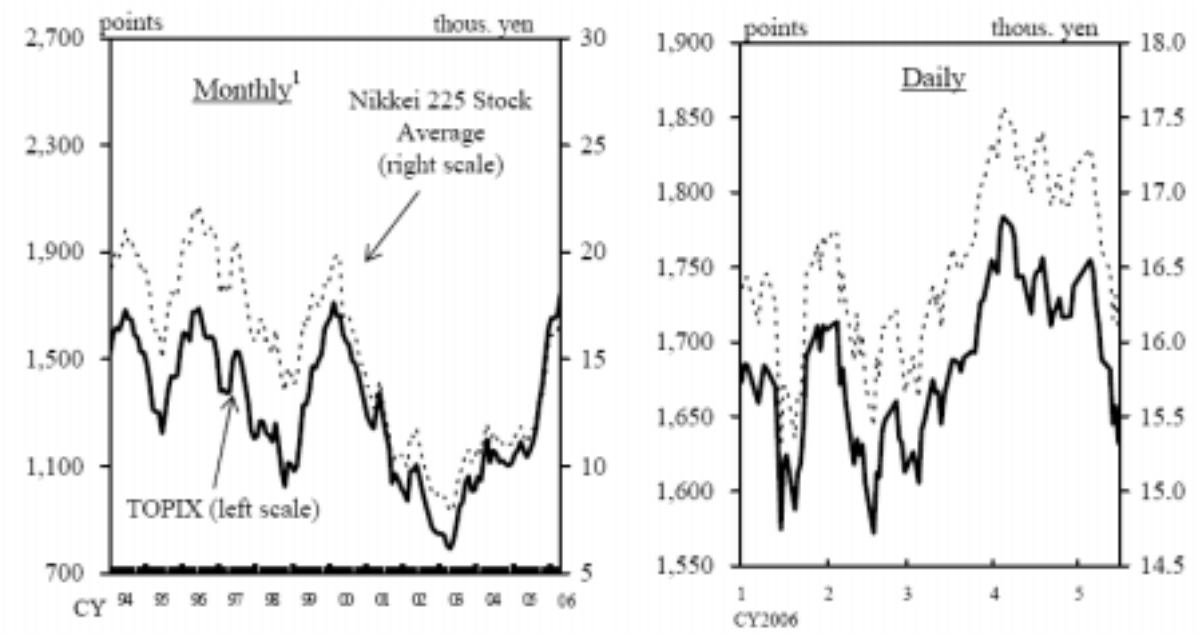
The leading question of this paper is therefore, which role path dependency plays for Japan's competitiveness. The main argument is that even in existing paths new, hitherto "unthought-of" solutions are possible, and that new paths can be developed out of established paths in an unforeseen way. The paper is structured as follows: In the second section, signs for recovery and unsolved tasks are sketched. In the third section the role and potential impact of path dependency is discussed. As a case, in part four the concept of path dependency is applied to the Japanese innovation system. The focus of this paper is on part five, in which the role of plasticity in given systems is stressed, referring to the case of the successful Japanese game software. The paper ends with a conclusion and some political suggestions.

2. Japan's economy: Signs for recovery and unsolved tasks

Japan is one of the most important players in the international economy: Its GDP, the traditional indicator of welfare, is the second largest in the world; it is one of the leading nations in the world patents statistics, and even if one includes non-economic indicators, it is positioned among the leading nations[ii]. The central role of Japan in the world economy is the reason why the interest in the recovery towards the Japanese economy is great: A weak Japan can endanger the stability of the world economy.

The bursting of the speculative bubble in Japan in 1989 was followed by the long "lost decade" in the 90's. Today, there are signs that the Japanese economy is on the path of recovery: May it be the GDP, the stock markets or the business climate – in all aspects the indicators show a change for the better (comp. fig. 1,2,3).

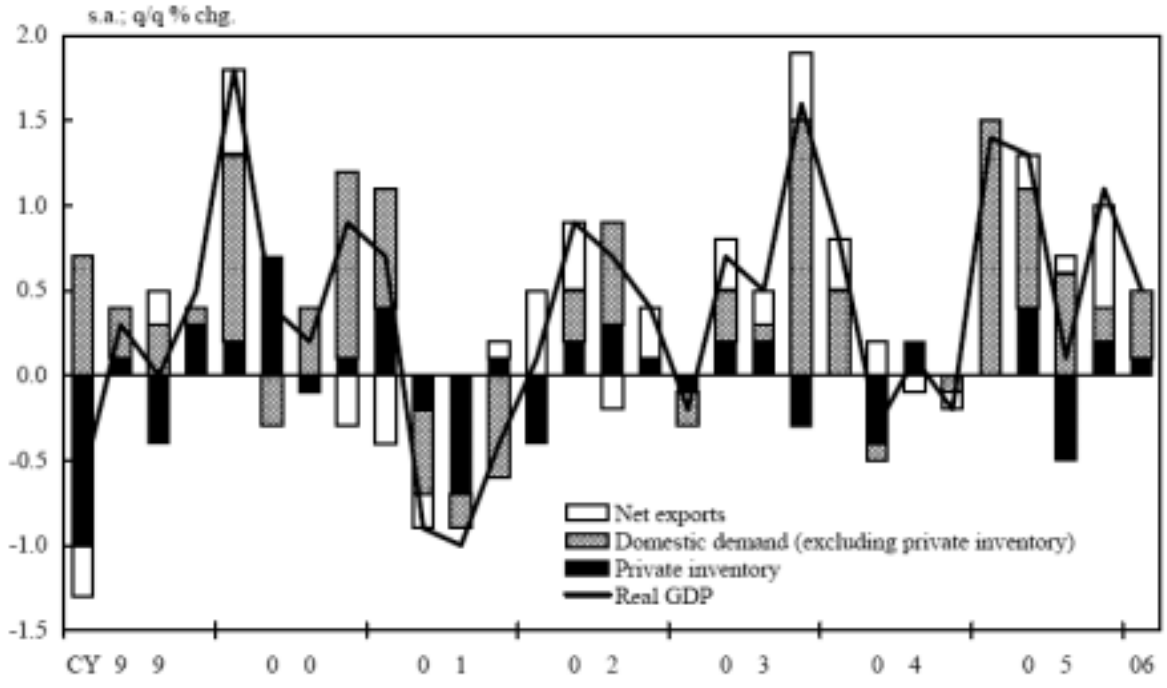
Figure 1: Stock prices



Notes: 1. Data are monthly averages.

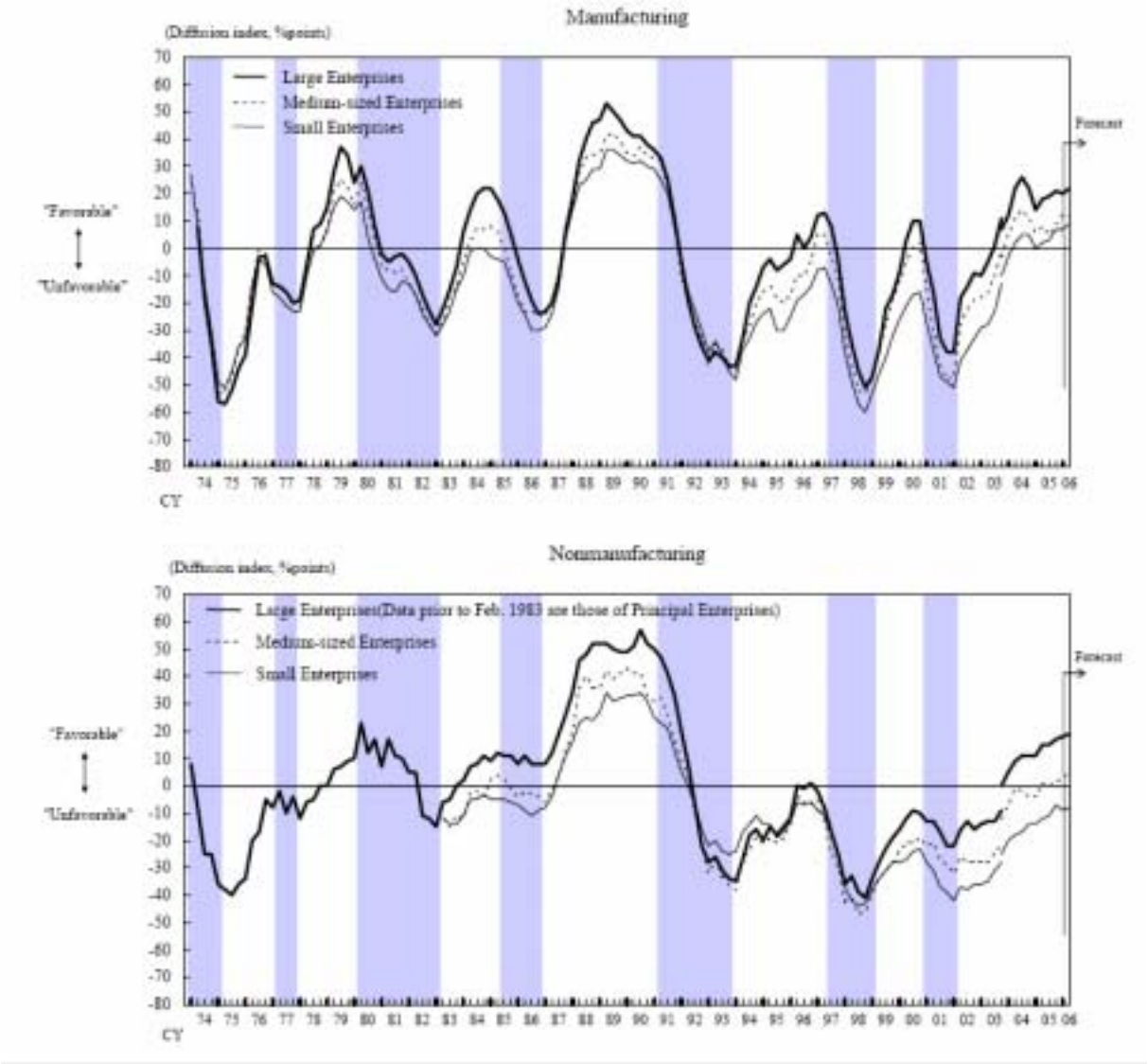
Source: Bank of Japan (2006a: Chart 37)

Figure 2: Growth of real GDP - Changes from the Previous Quarter (Seasonally Adjusted Series)



Source: Bank of Japan (2006a: Chart 3).

Figure 3: Tankan results



Source: Bank of Japan (2006b: 8)

These indicators are by far not sufficient, nor are they unproblematic – the annualization of growth rates is questionable, stock markets are not necessarily a mirror of the real economic development, and business confidence is not necessarily coupled with economic recovery - , but, nevertheless, in sum, the upward tendency of important economic indicators is remarkable.

At the same time, however, problems still are identified in the Japanese system of innovation which seems to be insufficient to adapt to the needs of new technologies. In leading international rankings such as the Global Competitiveness Report and the Global Information Technology Report of the World Economic Forum or the World Competitiveness Yearbook of the Institute for Management Development (Switzerland) Japan is placed in far behind the US, Sweden or Germany the last few years, in some reports even on the lowest rank.

Two of the reports were especially sobering for Japan: The Global Information Technology Report and the World Competitiveness Yearbook. The Global Information Technology Report assesses the environment of ICT (information and communication technologies) offered by a country and the readiness of individuals, businesses and governments to use ICT. The ranking of 2005 placed Japan at No. 16, far behind the leading OECD members (WEF 2005). The estimation of the Japanese innovation system in the area of ICT is obviously not high. The results of the report were taken up intensely in the Japanese media. The other report which demonstrated Japan's backwardness was conducted by the Institute for Management Development, measuring competitiveness in a very broad understanding by including sub-indices such as regulatory and market environment, macroeconomic stability, corruption, country credit ranking and ICT. The report of 2005 placed Japan at rank No. 21, again far behind most OECD members (IMD 2005). Referring to the production factors labour and knowledge, Japan got the worst assessments in entrepreneurship, creation of firms and flexibility and adaptability. In all these categories, Japan is holding rank 47 to 49.

Even if such rankings are problematic since their analysis is often superficial, and reflect more the general mood than really being able to assess a country's competitiveness, they show at least that the expectations of the Japanese economy are not too high. Before this background it is not astonishing that special issues of renowned journals regularly analyse specific problems of the Japanese economy, shedding light on weaknesses of its innovation system too (Oxford Review 2000).

3. The tragic: The role of path dependencies

The specific orientation of the Japanese innovation system towards incremental innovation can be assessed, in a pointed way, as being tragic: We learnt from institutional theory that single institutions are always interlinked and mutual complementary, both resulting into path dependency. For a true and successful change in one institution, it is therefore necessary to provide compatibility with the overall system of existing formal and informal rules. As this is tremendously difficult to accomplish, every single reform could even hamper the effectiveness of the whole system. This is the reason why system change is typically rigid and slow: The stability of existing institutions may lead to a low success of institutional transfers and ‚best practice'-rules (Berkowitz et al. 2003). Certain authors surely recognize the openness of development – North (1997) already conceded that there are "windows of opportunity" which make change possible –, but especially in the applied research a certain determinism gained a foothold, and a scepticism towards institutional change and the ability to implement successful reforms preponderates: Eggertsson (1998) e.g. overwrites one of his papers with the title "Limits to Institutional Reforms", and other critical writings analyse the reasons for the reduced options for designed policy planning (Yarbrough and Yarbrough 1998; Zysman 1994). The problems of the transformation process in Eastern Europe were used as an illustrative example how restricted the options for political reforms can be, and which role the complementarity of formal and informal institutions play (comp. Schröder 1999, Panther 1998)[iii]. Several younger publications explain the restrictions to change in Japan and East Asia as resulting from complementarities between formal and informal institutions (compare e.g. Aoki and Hayami 2001; Pascha 2002; Storz 2002).

The more the institutional settings differ, the more difficult the transfer will be: „But to recognize the superiority of one organisational mode of capitalism is not to say that it is an easy task to import, copy or assimilate its rationale and its institutions, by the very fact of their being specific to a society" (Boyer 1997: 93). In homogeneous groups, institutional change

may take place even more slowly (Eisenberg 1999). If one classifies Japan as a relatively homogeneous culture[iv], the persistence of established institutions can be considered as especially strong here. Indeed, younger works on Japan support the thesis of institutional path dependency, e.g. in relation to monetary or fiscal policy. As for the Japanese innovation system, complementarities can be found between the research and marketing department, the human resource system, the education of young, mouldable generalists, the diffusion orientation of property rights and the credit-based and risk-averse financial system.

A change of the whole Japanese innovation system will need reforms in all institutions – universities, enterprises, politics, capital and labour market. As a consequence, a change of one institution, may it be formal or informal, necessitates the change of all institutions in which it is embedded: Since the human resource department does e.g. not accept mobility, there is no incentive for individuals to change firms or to start an enterprise of their own. On the other hand, as re-employment is sanctioned by the decline in earnings, there are no mobile individuals, and no incentive for the human resource department to change established practices. Another example for mutual reciprocity are property rights. Changing the law would only make sense if legal decisions were reigned by the idea that innovators indeed have rights which need to be protected, but this is obviously not the case. In other words, the problem of reforming the Japanese innovation system lies in its path dependencies, called knowledge regimes, trajectories, dominant designs or techno-economical paradigms in other contributions. These path dependencies work as a specific selection environment, which only include or exclude the possibilities that suit the already existing institutional setting.

With the negative experience in developing and transformation countries, a certain tradition of perceiving chances for reform and leeways for action as utterly restricted has been established. In this understanding, path dependency of given institutional settings is often understood as a system to which actors have to adapt. Therefore, suitable formal (and informal) institutions become an important prerequisite for the development of nations. Groups without unfavourable institutions are restricted in their options towards better institutions. The influence of history and the resulting persisting difficulties of the transformation process in Eastern Europe give indeed enough reason to convince critics that the potential for political reforms is not as high as was assumed, and that it is wise to make the limits of planned design evident. This scepticism towards the options for change can be found in the assessment of the Japanese innovation system as well. The next section will shortly outline the basic approach.

4. The case: The Japanese innovation system

Knowledge is the most important source of welfare, since it is the only factor of the economic production factors which can be increased. Therefore, the nation's positioning of its innovation system is of central importance for its further economic development.

On the surface, the results of the Japanese innovation system are good: despite the long phase of economic weakness in the 90's R&D activity is high (contrary e.g. to Germany), the R&D input in relation to the GNP is with 3.25% higher than in the US or the EU (with 2.67% and 1.88%respectively), and its technology trade balance is positive too (below the US, but higher than Germany) (compare for details Kevenhörster, Pascha und Shire 2003). Nevertheless, deep-routed problems exist: the Japanese innovation system is still characterized by incremental process innovation, by diffusion and dissemination and by a long-termed learning along vertical co-operation. In other words: the inward orientation is as in the labour market

relatively strong; even intra-firm cooperation is no real external co-operation since suppliers are often in fact part of an enterprise group. Compared to this, external co-operation e.g. with universities as suppliers of original knowledge is underdeveloped, as well as the transfer of knowledge out of universities into enterprises. All characteristics that seem to be the reason for the success of Japanese companies in the 90's seem to hinder today the development of radical innovation. Therefore, Japan's world wide share of R&D intensive goods is low: Its share in world trade of knowledge-intensive goods (goods with a share of research & development of more than 3.5% of the turnover) is about 14%, in contrast to the US with about 21%. This is especially impressive since in 1992, the share of the US and Japan was with 18-19% still about the same (BMBF 2000 a; BMBF 2000 b)[v].

The software industry is one of the knowledge-intensive industries in which Japan's competitiveness is weak. On the world market, there is under the twenty leading software firm only one Japanese. This might be dangerous since the ICT industry, in which is the software industry is part of, is assessed by the OECD (2001) as a "driver of growth", and by other authors as a new general purpose technology. It seems to be risky not to be present in this industry. ICT needs standardized interfaces, open co-ordination and a flexible combination of modules. The dominant design of Japanese industrial organisation is almost the opposite of these needs since Japanese enterprise groups (*keiretsu*) are characterized by group-specific, integral-closed structures – an observation which led Anchordoguy (2000) to the question whether the poor success of Japan's software industry is a failure of institutions. If one follows the thesis that important new industries such as biotechnology require similar open structures, then the competitiveness of Japan can indeed be questioned (compare too: Lynn and Kishida 2005; Baldwin 2001; Kokuryô 1997).

Another indicator which is often used to assess the dynamics of an economy is the entrepreneurial climate in a society. The Global Entrepreneurship Monitor estimates the so-called total entrepreneurial activity by grasping the sum of nascent entrepreneurs (people in the process of starting a new business) and new businesses (GEM 2005: 17). According to this indicator, the entrepreneurial activity in Japan is extremely low: Only 1,5% of all adults are grasped as being entrepreneurial active. It is noteworthy that not only this share is very low in an international comparison – the average is about 9,3% - but that the share has decreased in the last years: For 2000 and 2001, a total entrepreneurial activity of 5% to 6% has been measured (comp. table 1; GEM 2005: 16-17).

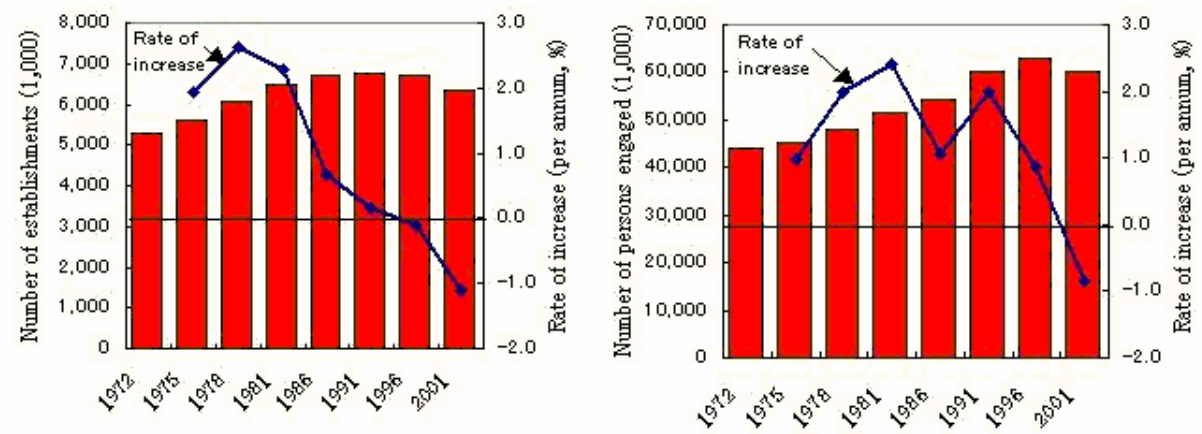
Table 1: Total Entrepreneurship Activity from 2000 to 2004 (in %)

	2000	2001	2002	2003	2004
Japan	6,4	5,2	1,8	2,8	1,5
USA	16,6	11,6	10,5	11,9	11,3
Germany	7,5	8,0	5,2	5,2	4,5
Average for all countries in 2004: 9,3					

Source: GEM (2005: 17)

Indeed, the number of companies has been shrinking in Japan for several years (figure 4). Even if an equalisation of the start-up rate and innovation is problematic since it excludes the fact that start-ups are not necessarily innovative , but often franchised companies without innovative potential, the low level of start-ups can be interpreted as a signal of a deficit in pushing through radical innovations; moreover, it reduces chances in the creation of employment.

Figure 4: Number of establishments and number of persons engaged (1972 to 2001)



Source: Statistical Bureau of Japan (2006)

The characteristics of the Japanese innovation system are of central importance for the (continuing) competitiveness of the assembling industry, but have obviously led to weaknesses in the field of new technologies. This insight was a shock for Japan's public actors, and has led to increasing public input into R&D (which is remarkable since it contrasts with most other OECD member countries), to deregulations supporting a higher mobility between universities and private actors, deregulation in venture capital markets, and a more active participation in international standardization organisations (comp. Storz 2005). One important background for these reforms was the revised Science and Technology Basic Law of 1995.

Nevertheless, the success of reforms – may it be the implementation of knowledge in universities by start-ups, may it be changes in the venture capital market, may it be the internationalisation of research – are evaluated sceptically. The fact that they are accompanied by uncertainty (how to design a "better" innovation system?), by high costs of changes (e.g.

building-up of new education systems) and by complementarity (e.g. between radical innovation and underdeveloped capital markets) seems to make institutional change difficult. Especially in network related industries the factor of complementarity is important, since enterprise-specific systems make individual changes almost impossible (comp. Storz 2003a; Storz 2003b).

The problems of changing innovation systems have been analysed in depth by literature that focuses on national (or local) innovation systems. They present enough evidence that a change is difficult, that the danger of lock-in is given, and that structures of the path influence decisively the development of the future (compare Dosi and Nelson 1994Freeman 1994). The Japanese case is therefore not specific. Coming back to the leading question of the competitiveness of Japan, path dependencies in its innovation system make a change to a new system difficult and may be an obstacle to a sustainable recovery since the established institutions are unable to meet the new challenges.

In this paper, I support the thesis that the challenges for the Japanese innovation system are high because of path dependencies. But I leave the widely spread scepticism and suggest another approach by stressing the plasticity of paths, offering a variety of ex ante unseen options. The following section will discuss options for leaving existing paths by referring to the successful Japanese game software industry.

5. Plasticity of paths: The invention of a new media industry

The following case study presents evidence how innovation takes place in paths, and how breaking away from a given path becomes possible. It is based on the ideas of Amable (2004) and of Streeck and Thelen (2005) who suggest that periphal institutions with a logic contrasting to the dominant one, and at the same time existing institutions whose functions are re-interpreted, are two important pre-conditions for institutional change and innovation (compare Storz forthcoming, too). The case study is based upon totally 32 case studies which have been carried out in Japan[vi]. One additional interview has been carried out with the American game software company Electronic Arts.

According to the OECD, the digital media industry is expected to become one of the leading sectors of the future (OECD 2004; OECD 2005). Japan's position in this sector is so strong that the Business Week asked in a somewhat provocative article whether American agencies in the media industry will be able to change their traditional function of a mainly nation-based distributor to an import agency of (mainly Japanese) cultural products (Business Week 2004). This is definitely somewhat exaggerated since significant weaknesses in the Japanese media industry can be identified as well: The Japanese market is shrinking (at least, if one counts newly sold game software and related hardware products), and the share of Japanese firms at the game software market world wide is estimated to have shrinked from about 50% in 2000 to about presently 20%. One reason seems to lie in a different preference of American consumers, preferring action and sports game; a field, in which Japanese firms are relatively weak so that the growing demand on the US market is served mostly by American firms. This development is especially astonishing since PWC has prognosed a growth in Asia Pacific about 16% which means that Japanese firms are not participating in the growing American and Asian markets. Nevertheless, the Japanese game software industry is still an example of a succesfully established new path: Japan realises trade surpluses with game software, despite its weakness in standardized business software, and despite its weakness in almost all popular

cultural industries on the world market (METI 2004a; interviews). Additionally, new options for SME are generated by games developed for mobile phones.

These potentials of the so-called "content industry" (where the game software is one part of) are one reason why METI is interested in giving support to it. The tools resemble those chosen for other industries such as the support of related associations and related activities (e.g. industry fairs, promotion via JETRO, personal exchange; formulation of political recommendations in areas which are esteemed as being central for the further development of game software, such as concrete measures for the protection of intellectual property or the procurement of venture capital). The direct funding is still low, but hitherto activities seem to have contributed to the fact that the game software industry is increasingly identified as an important industry for Japan's competitiveness. Further, popular culture, to which game software belongs as well, is an important tool for establishing the brand "Cool Japan" and to enhance Japan's "soft power"; a concept, which gains presently strong support from ministries and policy-makers not only related to the METI.

Roughly speaking, innovation in the sector of games is driven by enterprises which are "unusual" in several aspects – their methods of recruiting, their specific innovation management and their personal background. Individual creativity plays a central role, which in the Japanese context is a noteworthy new competence, since traditionally, innovation resulted out of the integral connection of research & development, production and distribution. The acquisition of new competencies in design is a highly uncertain learning process, offering no models for orientation. Another learning process is the development of a new sector which hitherto did not exist: This included trial and error (e.g. closure of young start-ups) and creative combinations of existing, but totally diverse knowledge, such as especially the combination of Japanese comics (*manga*) with customized software and electronic hardware (Marubeni 2004; METI 2004b). Thus, a new sector with new types of businesses was developed, surprisingly in the software industry in which Japan has seemed to be weak.

The structure of the game software industry is as follows: Hardware makers are Nintendo, Sony Computer Entertainment and, in the last time, Microsoft, which offer consoles respectively personal computers, on which game software can be played. The game software is not only produced by Nintendo or SCE alone, but draws back on numerous independent publishers and developers. The difference between publishers and developers is that publishers develop and produce game software, whereas developers only develop game software; their production fees are mostly paid by the buyers. Publishers have a staff of about 1000-4000 employees, whereas developers are small and medium enterprised firms. Suppliers produce certain parts of the games, especially computer graphics, programming and music.

Looking more in detail into the innovation process, two importants patterns can be identified which helped the industry to become established: On one side, periphal institutions of the Japanese innovation system were grasped. Such periphal institutions in the industrial organisation can be found on the level of developers, which develop original software products and sell them to publishers or hardware makers. Even if the final product is mostly sold under the name of the respective publisher or hardware maker, these firms develop creative software with own contents which is essential to the success of the hardware. In most cases, the function of the publisher/ hardware maker is restricted to check the milestones which have been identified in an agreement in advance. Even if this screening is rigid, and becomes due to increasing cost and time pressure even more rigid in the future, and even if the control of milestones include a certain definition of contents of well, this pattern of development is different from the established dominant model of the automobile or

electronics industry in which makers define much more strictly the content. In game software, though, developers do not receive a detailed plan according to which they develop the game software. There are no statistics which grasp all game software related firms, but we know that despite a decrease in start-ups up from about 2000, there exist presently about 250 to 300 game developers in Tokyo. Besides them, there exist myriad small suppliers.

Game software is not only developed by developers, but also by publishers. The leading ten firms are, in the ranking of their turnover, Nintendo (which produces game software mostly internally), Bandai, Konami, Square Enix, Sony Computer Entertaintment (which produces game software mostly externally), Namco (which has fused with Bandai in April 2006), Capcom, Koei, Sega and Banpresto. In contrast to developers, they produce the developed software as well. The striking new element is that hardware makers do not hold shares in them (except one case). This stands in sharp contrast to the industrial organisation of the core industries (automobile, electronics), in which makers like Toyota or Nissan held about 30% shares in their first suppliers[vii].

Periphal institutions in the labour market do play an important role for the development of game software as well. Sketching the institutions in the labour market, it has to be mentioned in advance that the personal systems between marketing/management (*eigyô*) and creators (or: developers; *kuriêtâ* or *kaihatsu*) are often different. The following remarks are only related to creators. To begin with, it is striking that the labour markets for creators (concretely: programming, planning, design, computer graphics, music) was relatively open until about 2000, so that transfer between firms and temporarily occupation were quite normal. Due to the shrinking game software market from 2000 on, the movement between firms has become more restricted. As it concerns the internal labour market, several new institutions have been introduced which assigned dominant institutions such as seniority a less important role: In the engagement of creators, the university's ranking played, expect in one case, a low role. The university's ranking seems to lose its function as a signal for qualification, and individual capability increasingly replaces it. This does not mean, that the type of the university become irrelevant; leading positions are filled up mostly with graduates from universities, and graduates of specialized universities (*senmon daigaku)* fulfil more operative work, but this reflects real differences in the education, which is in universities more basic oriented (e.g. including mathematics or physics) than in specialized universities. Since most game software firms (publisher, developer) engage about 50% of their staff during the year (so-called *chûtô saiyô*; in contrast to them, graduates are called as *shinsotsu* and engaged in April), it is relatively common that staff with work experience is engaged. Often and perhaps against common perception, these persons are less specialists with high salaries, but fulfil more operative tasks, so that we often have an informal ranking between those persons engaged during the year and graduates from specialised universities, carrying out more operative work, and graduates from general universities, taking over management positions. In internal achievement, most firms have made the experience that, due to payment according to individual or teams achievement, high discrepancies in salaries exist. These discrepancies do not exist for "non-creators", but for creators they can become quite large.

A further new element is that internal work is based on projects. This pattern is common in the new media industry in general (DeFillippi and Arthur 1998), and is a new pattern of work organisation in the Japanese context too. Almost all firms reported that teams are dissolved after having finished a project, and that after dissolution, members choose the next project to which they would like to adhere too. In order to enhance the motivation of the staff (e.g. in those cases, when a fitting project can not be identified), some publishers have established

programs for start-ups; under one program of Sega e.g. about 9 firms have been established. This program has been temporarily dissolved[viii], but is now re-activitated.

In sum, it can be stated that several periphal institutions in the industrial and the labour market organisation – such as the role of independent developers for the production of game software, the lack of shareholding in co-operating firms, the relatively low role of seniority, the project-based character of game software development – contrast to the dominant logic of the core industries. About in 2000, due to shrinking markets, there seem to have been a certain shift in which periphal institutions play a less significant role; nevertheless, at least until this point of time, periphal institutions contributed much to the genesis and the competitiveness of the industry.

At the same time, not only periphal and from the view of the core industries new institutions, but also established institutions fulfil a critical role in the innovation process of game software. In the industrial organisation, hardware makers of consoles draw in the beginning of the industry (in the ‘80s) onto suppliers with sophisticated knowledge and onto an already established overseas marketing network. More important, publishers make presently use of the system of guest engineering by sending own staff to co-operating developers, or by engaging staff of co-operating firms in their own company. Guest engineering is an instrument that has been already established in the automobile industry in the ‘60s and has been identified as an important instrument for knowledge sharing and fascilitating co-ordination. Additionally, according to almost all interview partners, mutual transaction relations are – given that the procured products possess a high degree of quality[ix] – long-termed. A further established structure is the relatively low systematic integration of external ideas which might be one reason for the presently weaking position of the Japanese game software industry. In contrast to American firms, conferences in which the reasons for the competitiveness of a certain game software are analysed on a systematic level (e.g. by best practices studies), do, according to our interview partners, not exist in Japan. For sure, conferences, industry fairs etc. are important for information exchange and informal networking, but it seems that more high-level and more scientific analysis play a subordinated role. The initiative of Baba Akira of theUniversity of Tokyo to build up such a network with the Digital Games Research Association of Japan is in this perspective an adequate answer.

As well, we find a re-interpretation of established institutions in the labour market. It was mentioned above that new forms such as project-based work or salary according achievement seem to play a more important role than in dominant firms. This is right, but at the same time, the concept of the “Japanese style management” is quite stable. One example is that even for creators (and not only for marketing/sales etc) a clear preference for long termed employment exist (thus reducing the difference to marketing/sales). In those cases, in which firms seem to have developed more open systems, we often find hybrid forms. In one case, e.g., an interview partner mentioned that there is permanent and non-permanent staff (the latter based on yearly contracts), but further questioning brought the result that yearly contracts are not only in most cases renewed every year, but that the acquisition of so-called “external staff” (*chûtô saiyô*) draws back exactly on these contract workers, which are already well-known to the firm since they do not only possess de facto perennial contracts, but also often have their workplace in the firm.

Thus, the re-interpretation of established institutions and their adaption to the new industry of game software was an important carrier of innovation. The question which institutions – new institutions from the periphery or established institutions of the core industries, being transferred to the game industry – have been more important for the success of the industry is

not solved. The above described shifts in 2000 may be one indicator that established institutions and rules gain an increasing weight. That this tendency is one reason why the game software industry has lost somewhat of its competitiveness may be a somewhat hasty conclusion. Nevertheless it has to be discussed more in depth how the shifts starting from about 2000 onwards have to interpreted. Independent from this, it can be concluded that the competitiveness of the game software industry in the last 20 years is grounded on the interplay of both, of established and of new institutions.

6. Conclusion

The Japanese economy has experienced a full decade of stagnation. For the last two, three years, several economic indicators have seemed to point to a recovery of the Japanese economy. Critics counter that this development is not necessarily sustainable. They argue that it is necessary to leave the superficial level and to analyse development options on a deeper level where still unsolved problems exist. In order to analyse these problems, it is obviously necessary to take a comprehensive view, and to analyse different economic indicators in detail. Such a general analysis is not the intention of this paper. This paper focuses on a specific question of the economic development in Japan, namely when and under which conditions existing paths can be left, and new paths can be created.

The Japanese innovation system indeed possesses weaknesses in the production and implementation of new knowledge. Japan is hardly present in leading knowledge-intensive industries, whereas American enterprises are leading the world market. The reason for Japan's backwardness can be found in the persistence of the established institutional setting, which does not fulfil the needs of a frontier economy, and which does not meet the needs of these new industries for which an open industrial organisation with external interfaces, a developed capital and labour market and a stricter competition policy would be helpful. Especially the exclusive industrial organisation lead into an unfavourable direction in new industries such as the software industry. The "failure" of Japanese institutions to meet the new challenges has become a familiar quotation.

Path dependency thus helps to explain why Japan is not competitive in certain industries, and why institutional change is rigid. At the same time, however, the question should be posed of how institutional change can be triggered. This paper refers to one case study, to the game software industry. Here, innovative solutions were developed out of existing paths: Three hitherto independent and diverse elements were creatively combined, namely the tradition of Japanese comics with software and electronic hardware. During the development of the industry, new institutions were introduced into the game software industry, such as e.g. project based work, an achievement oriented salary and co-operation based on rules and agreements (not on capital sharing). At the same time, established institutions were re-activated by re-interpretation, such as e.g. long-termed employment or guest engineering.

As the surplus in the trade balance of games software demonstrates, the game software industry is still competitive on the world market. Since breaking away from paths is a general option, it is not a phenomena only of today: The Japanese network in *keiretsu* organisations, which has been successful in the assembling industry until today, can be explained mainly by the fact that the restrictions caused by underdeveloped capital and labour markets in the 1950's did not offer any other chance than to develop their own, creative ways to overcome these shortages, namely to build up intense networks instead of relying on market mechanisms. It is therefore important to define the options that exist in given paths not too

narrowly, since in existing paths or at the edge of existing paths there are manifold options for action. What is important for an economy's development is whether actors exist who initiate break-away activities. It may be too early to draw a general conclusion from limited evidence, but based on the sketched theoretical outline above it seems that for the economic well-being of a society it is important how much room innovation systems offer. As for Japan, it seems – again with the restriction of limited evidence – that the potential of entrepreneurship and clever entrepreneurial solutions is underestimated.

For innovation policy, this means that it should be the aim to hold out variety in a system. Without such a variety it would not have been possible for the Japanese game software industry to become successful. Both, "old" and "new" institutions contributed to its genesis. Definitely, reforms e.g. in the capital market are needed, but the present focus on venture business has to be questioned. As it concerns labour policy, it has to be stressed that the diversity in education programs is favourable to the upgrading of the industry. It should be discussed whether curricula might be developed, similar to those which are presently developed for producers in the movie industry.

Finally, it is a not-proved presumption to know which industries are the industries of the future. Japan's competitive industries of the future may lie in different sectors than in other OECD countries, but this is not to say that Japans competitiveness is low. A different question is which institutions could stimulate which kind of learning processes in a society. On a more practical level, the factors influencing Japans competitiveness has to be analysed much more comprehensively and more in depth. Moreover, it is open which criterions should be used in order to assess the competitiveness of an industry – several contributions come to the conclusion that e.g. Japan's software or biotechnology industry is by no means a failure. The answers to these questions remain an important further research field.

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[ii] One of the leading indexes is the Human Development Index of the United Nations (UNDP), where Japan is ranked below average in aspects such as infrastructure or equal rights for women, but reaches peak values regarding life expectancy or alphabetization.

[iii] Leipold (1997: 64) writes e.g. that because of the necessity of reform policy to take effect on all levels, there are no prospects for quick success of reforms in Russia.

[iv] Important foreign culture influences which lead to disruptures in Japan are not denied with this statement (comp. Storz 2002).

[v] The development for Germany follows exactly the development lines of Japan.

[vi] In-depth interviews were conducted with 13 game software related firms in Tokyo, and with 19 "key informants" (13 researcher and analysts in game software related fields; 6 relevant industrial organisations and national/local government). Game software firms and key informants were asked to describe innovation processes, external networking, and internal labour policies in the game software industries. The interviews have been carried out between May 15th and June 4nd , 2006. As for the interviews with game software firms: hardware maker: 1 interview, publishers: 7 interviews, developers: 2, supplier: 3. The author would like to thank (in alphabetical order) Aquasystem, Bandai Namco, caca, Capcom, Hexard, Koei, Monorisu Soft, Riso, Sega (2 interviews), Sony Computer Entertainment, Square Enix and Toei. Special thanks (in alphabetical order) go to Kazuhiko Abe, Kazuhiko Itabashi, Yoshimizu Kei, Shintaro Kobayashi , Masami Nakamura, Michihiro Sasaki, Naohiro Saito, Matsutaka Seiji, Arai Shun, Hirohide Sugiura,Osamu Yoshioka and Harujiro Yokozawa. I would like to express my special thanks to Nobuyuki Yoshizawa. As for the key informants, 13 interviews have been carried out with researchers and analysts in the field of innovation economics and game software. I would like to thank all those supported my research, especially Junjirô Shintaku and Noriyuki Yanagawa, both from the University of Tokyo, Masaru Yamashita of Aoyama Gakuin University, the discussants of the Contents Sangyô Kenkyûkai at the University of Tokyo, and Hisakazu Hirabayashi of Interactive. Very helpful was the discussion with Akira Baba of the University of Tokyo. 6 interviews have been carried out with game software related associations (CESA, Digital Contents Kyôkai), with METI and educational institutions. I would like especially to thank Hajime Wakuda from METI for his helpful support.

[vii] Compare on this issue Yanagawa and Kuwayama 1999.

[viii] According to the interview partner, the spin-offs have later decided to support a fusion with Sega due to the unexpected volatility of markets.

[ix] Dependent from the procured product, the content of quality differs. As it concerns suppliers, the quality e.g. of programming or colouring is to some degree comparable to the core industries, but in the case of developers, quality includes that a delivered game software is sold successfully.