TECHNOLOGICAL DEVELOPMENT IN AUTOMOTIVE INDUSTRY AND TRANSFORMATION IN CORPORATE GOVERNANCE SYSTEM

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Abstract

This study aims to understand how governance change is triggered by cybernetics issues, such as the development of automotive navigation systems in German, Japanese and US automotive industry. Six points are discussed for the central question which are 1) GDP Trends for Manufacturing Activities, 2) Organizational Structure for Supply Chain Management (SCM), 3) Viewpoint related to Internet of Things (IoT) usability, 4) National IoT planning, 5) Definition of IoT, 6) Developing Navigation Systems. At first, the trend in manufacturing activity reveals two different trends: a downward trend in Japan and the USA, and a stable trend in Germany. We see several possible reasons for this difference; first, the “smiling curve concept” is applied to visualize the difference. And the organizational structure of SCM is concerned such as “Keiretsu” in Japan, “Konzern” in Germany and the “Anglo-American” model. Then, this paper addresses how the unique organizational features of SCM might react to the technological developments in automotive industry such as autonomous driving, which has shaken the core of the industry. For this gradual change, the IoT technology is necessary. IoT means the progress of certain embedded system, which adds a network function into it. The embedded system for automobile orientation on a map (hardware and software) has to be upgraded with the network function. These technological developments could influence their corporate governance system. Then, the discussion matrix is formed for the six points, which are discussed in this paper and reveal the boundaries between Japan, Germany and the US. According to Beer, the societary maps (the cybernetic maps) are required for this structural progress to find the right way to go. Finally, we think a dynamic industrial movement is ensured by keeping fair competition, which ensures diversity as well as technological development. It could be the last resort to protect our “Designing Freedom”.

Keywords: Corporate Governance, Internet of Things (Iot); Supply Chain Management (SCM); Automotive Navigation System; Cybernetics

1. INTRODUCTION

Kurzweil, R.; (2010) was born in February 1948. He is now 70 years old. His prominent theory is “Technological Singularity”. He said, “the computer in your cell phone today is a million times cheaper, a million times smaller, and a thousand times more powerful. That is a billion-fold increase in capability per dollar that we have actually experienced since I was a student. And we are going to do it again in the next 25 years.”

Automotive industries are also facing this technological progress. Moreover, they are trying to change their organizational structure to enable quick response to dynamic market demand. For this purpose, the major automotive producers connect their production equipment through internet technology to reduce their inventories, costs and time.

These ideas "producer-centric viewpoint", which contains manufacturing activities such as SCM, follow as low inventories and lean production. Consumers are always dependant on suppliers, who inspect carefully their demand with marketing surveys. Galbraith, J. K.; (1967) points out society becomes more influenced through advertising. With this artificial demand creates huge mass-production of commercial goods and services. He is concerned the public sector concentrates on purchasing luxury goods, rather than implements other important traditional values, such as kindness, trust, loyalty, and more and more materialism and money mindedness. "The New Industrial State" describes the group of technicians within a corporation. Those technicians form an administrative body not by their technological interest as a driving force, but managerial capitalism as background. His "technostructure" can be polished up with this technology such as IoT, which we are discussing here.

This study agrees with his discussion, and the technological progress sharpens an edge of the managerial capitalism. However, we explore a real organizational dynamism and find a direction to "Designing Freedom".

IoT technology might have some possibilities to transfer their accurate data to making a high definition map, which is greatly needed for future autonomous driving in society systems. The 'bird's-eye view' function (global positioning system: GPS) on mobile phones provides useful functions to customers. However, this is not sufficient for autonomous driving or for filling the gap between human and machinery recognition. GPS can achieve a maximum precision of 7-12 centimetres. The machine needs more accurate positioning on a detailed high definition (HD) map, although the precision is measured precisely from outer space. IoT technology which is used for connected cars, common mass-produced sensors and other related technologies can help to fill this gap in making the HD map. The HD map will provide more precise road information, such as the nature of an undulating surface, exact corner points and obstructions. Gaining more accurate information for "cyberspace" has become a highly competitive field for companies in recent times.

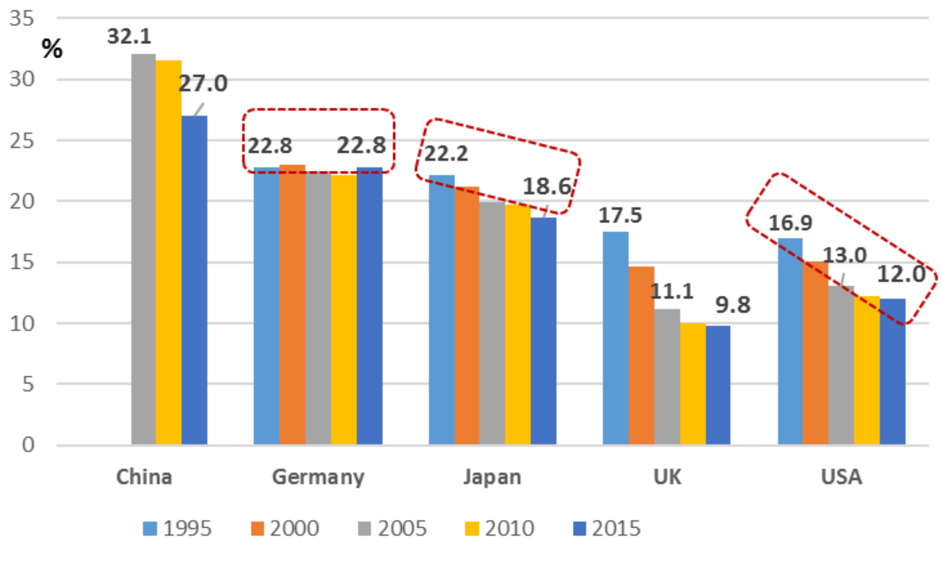
2. REASON FOR STRUCTURAL GOVERNANCE CHANGE

2.1 Comparison of Value Added by Manufacturing Activity, and Percentage Distribution (Shares) in GDPs of China, Germany, Japan, UK, and the USA

According to National Accounts Main Aggregates Database (2017), the bar chart illustrates data comparing major countries (China, Germany, Japan, UK and USA) regarding the value added by manufacturing activity and percentage distribution (shares) in GDP from 1995 to 2015 for every five years. As can be seen from Figure 1, the highest number for manufacturing activity was in China at 32.1% in 2005 and down to 27.0% in 2015 (minus 5.1%). *The Chinese figure was only provided after China joined the World Trade Organization (WTO). The downward trend was in general with those in Japan, the UK and the USA. However, remarkably, Germany showed a stable trend at 22.8% in 1995 and the same point in 2015.

What is the reason for these differences between these major countries?

Figure 1. Comparison of major countries in terms of value added by manufacturing activity, percentage distribution (shares) in GDP



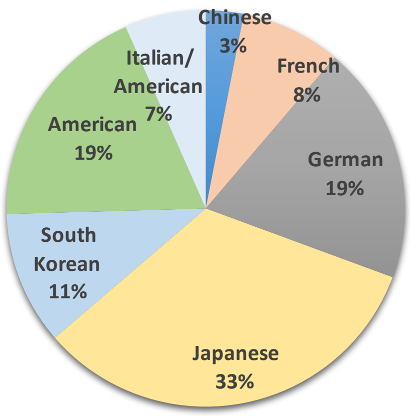
The major automobile industries have moved their "home" countries to locations that offer cheaper labour costs, such as China. Japanese "Toyota", German "Volkswagen" and American "Ford" are the transnational companies that have re-located their production facilities, followed by a strategy for the overall optimization of their current resources.

3. REASON FOR THE DIFFERENCES BETWEEN DOWNWARD AND STABLE TRENDS

3.1 Smart Factory or Smart Car? The concept of IoT usability

An article entitled "Smart Factory or Smart Car? The concept of IoT usability" was previously written by Shimizu for the ICN 2016 meeting in Lisbon (Shimizu, 2016). It discussed, primarily, how to implement IoT technology in the Japanese, German, and US automotive industries, as well as differences in the concepts of IoT usability in these three countries (see. Figure 3). The "smiling curve concept" is discussed by Shin (Shin, 2002). Next, the "producer-centric idea" is assessed, such as the smart factory in Germany and Japan, and the "user-centric idea" for a smart car in the USA. As a result, we explain the advantages of intercorporate relationships and how integral parts of the product will be replaced using IoT technology.

Figure 2. Manufacturers by motor vehicle production on country origin base and percentage distribution in 2015



According to "Organisation Internationale des Constructeurs d'Automobiles (OICA)" the manufacturers by motor vehicle production included here are all country origin base in 2015. Figure 2 shows 52% of automobile production is handled by Japanese and German producers. For example, Japanese manufacturers include Toyota, who produces over 10 million units as highest ranked in 2015, and other such as Nissan, Honda, Suzuki and Mazda are included in this Japanese number. American producers are accounted at 19% of world production, which shows downward trend from Figure. 1. And German producers take a shear at 19%, which indicates a stable trend.

There are differences between Figure.1 and Figure.2. Figure 1 shows the total number of manufacturing activities, not only motor vehicle production at Figure.2.

3.2 The difference in GDP Trends for Manufactu-ring Activities between 2010 and 2015

Table I shows the percentage of total automobile distribution by German, Japanese and American manufacturers in 2010. Automotive production increased by around 11 million units from 62,727,463 in 2010 to 73,669,906 in 2015, the resulting in a 15% increase in market size. The automotive production is very dependent on their value added by manufacturing activity, percentage distribution (shares) in GDP at Figure 1.
Table I shows the difference in GDP Trends for manufacturing activities between 2010 and 2015. It shows these changes: Germany (+2.0%), Japan (+1.0%) and the USA (-1.0%). One percentage point equals roughly 1 million cars, according to the total number of cars manufactured in 2017 estimation. The differences are relatively small. However, the downward and upward trends may be seen differently for these three countries in Figure 1. The difference can be interpreted as a dynamic industrial movement.

Table 1. The difference in GDP Trends for manufacturing activities between 2010 and 2015

Year/Country	*Germany*	*Japan*	*USA*	*Other*
2015	19.0%	33.0%	19.0%	29.0%
2010	17.0%	32.0%	21.0%	30.0%
Difference	2.0%	1.0%	-2.0%	-1.0%

Source: OICA, Authors

3.3 Smiling Curve

To explain the reason for the difference in manufacturing activity between the downwards trend in Japan and USA and the stable trend in Germany at Figure 1, we can apply the concept of "smiling curve".

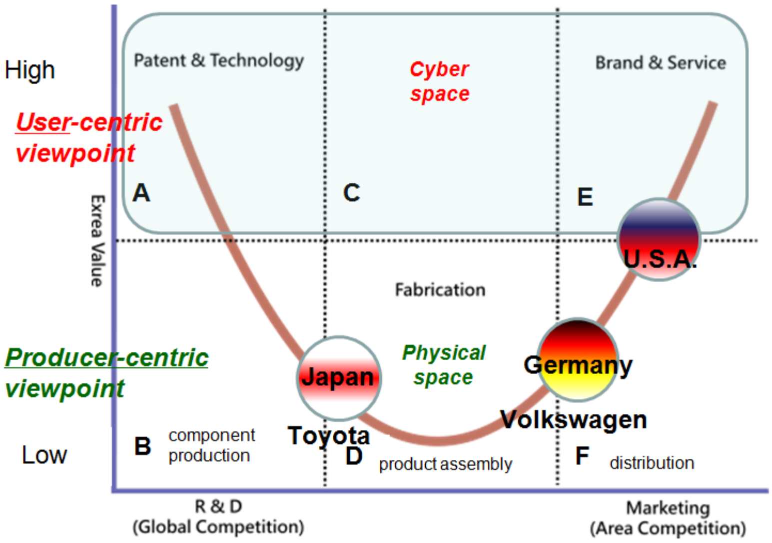
A smiling curve is an illustration of value-adding potentials of different components of "the value chain" in a mainly manufacturing industry.

The concept of 'value chain' contains the primary activities and the support activities. The primary activities in the value chain are such as inbound logistics, operations, outbound logistics, marketing & sales and service. Also, support activities contain firm infrastructure, human resource management, technology development and procurement. M. Porter (Porter, 1998) provided these descriptions of the "value chain" in his first edition 'Competitive Advantage' in 1985.

In Figure 3, the smiling curve is shown, from left to right on the horizontal axis. The 'user-centric viewpoint' is indicated by A, C and E on the top of the diagram, it is called '*Cyberspace*'. In Cyberspace, we can add a high-value virtually. This sphere includes intellectual properties, such as patents, technologies, R&D, brands and service reputations, which is not materialized at this stage.

The bottom part of the conceptual diagram, labelled B, D and F, shows what is referred to as '*Physical space*'. This area is limited to the added value by the physical existence of a real product. The real parts-component of a products is a good example in this context. This materialized product contains the certain value-chain activities.

Figure 3. Positions of Japan, Germany and USA on the smiling curve



As we are trying to plot the positions of Japan, Germany and USA on the smiling curve. And according to figure 1 and 2, which is concluded two different possible perspectives which are 'producer-centric viewpoint' and 'user-centric viewpoint'. Japanese and German car producers focus more on the physical manner of the factory base, to use their modules (parts combinations) in the real world from 'producer-centric viewpoint', compared to US 'user-centric viewpoint', which is the internet related innovation as a major industrial driving force.

3.4 Reasons for Downward and Stable Trends

As we discussed above difference is evident between the downward trends of manufacturing activities in Japan and USA, and the remarkable stable German trend. In my previous research, I concluded this was because the Japanese and German car producers have more of a 'producer-centric viewpoint', versus the American 'user-centric viewpoint'. Then, one possible reason for this difference may be the organizational structure, which plays an important role in SCM such as Japanese "Keiretsu", German "Konzern" and the Anglo-American model (Turnbull, 1997).

3.5 Organizational structures for SCM: the Japanese "Keiretsu", the German "Konzern" and the Anglo-American model

Usually, ownership is necessary to control corporate governance, and matters such SCM. However, ownership is not necessary for some countries. For example, the Japanese "Keiretsu", the German "Konzern" and the Anglo-American models are explained as follows.

3.5.1 The German "Konzern" is a legally recognised corporate group with complex structures in Germany. The relationship between the controlling and controlled enterprises is based not only on the human management relationships, but also on legal parent and subsidiary companies, in terms of share ownership and voting rights. Strong involvement of a German bank ("Macht der Banken") that does not have a "firewall" is also essential for this special organisational structure *(Baums, 1994).*

a) German Corporate Governance System: The German system relies heavily on their labour Unions. German corporation law ("Aktiengesetz") requires all public companies ("Aktiengesellschaften") to have two-tier boards: a management calls a "Vorstand", and a supervisory board called an "Aufsichtsrat". Generally, the supervisory board makes the final decision and takes more responsibility than management in terms of job restructuring. In Germany, the supervisory boards of large companies are composed of 20 members, 10 of whom are elected by shareholders, and the other half are elected by employee representatives, which is likely to be why German manufacturing spending shows a stable trend. The supervisory board has a bias for protecting their employees from their weight of delegation. This corporate governance system applies to the "Kozern" and creates these special organizational feature *(Shimizu K. , 2012).*

b) IG Metall: According to *the Guardian* newspaper, for example Volkswagen employs 600,000 people worldwide, including 120,000 in Germany. Their rival Toyota employs roughly 350,000 and General Motors has 200,000. With this large number of employees, German car producers have to find a way to compromise with the strong national unions, that are organized by industrial bases, such as "IG Metall" for German car producers. IG Metall is the dominant metalworkers' union in Germany and it is the country's, and Europe's, largest industrial union. They are responsible for education systems aimed at maintaining their high-quality products, such as luxury automobiles like those of Daimler and BMW.

3.5.2 The Japanese "Keiretsu" is a corporate group that involves complex interlocking business relationships and shareholdings. Cross-shareholding is essential within these groups. Corporate engagement with shareholders and other stakeholders, such as supplier can differ substantially across different control and ownership structures. The Japanese "Keiretsu" was formed by influence from US occupational authorities after world-war second, that which is likely to be why Japanese manufacturing spending also shows the downward trend in the US. There are two types of "Keiretsu" *(Crane, Andrew; Matten, Dirk;, 2010).*

First, vertical *"Keiretsu"* forms the core manufacturing firm and the suppliers at the center of the network.

And the other is horizontal *"Keiretsu"*, which was separated on the six industrial giants. Mitsubishi, Mitsui, Sumitomo, Fuyo, Dai-Ichi-Kangyo and Sanwa was the majors. In a recent, those major six groups are reduced to three groups. For example, Sumitomo and Mitsui, also Fuyo, Dai-Ichi-Kangyo and Sanwa equally merged their businesses for increase their competitiveness.

3.5.3 The Anglo-American model depends on institutional investors. Such institutional investors can build a dominant position in the market for stock in larger corporations. Institutional investors are always putting pressure on corporations to achieve a high stock price. In the case of the Anglo-American model, the stakeholder theory is frequently used for the political economics perspective. The stakeholder is divided different type of interest groups, such as management, shareholder, employee, supplier, competitor, community, government and others. However, shareholders are at the top of the interest with the chronological order in this perspective. Also, IT-related start-ups are often financed by angel investors, who provides capital flow into the business, in exchange for equity ownership. Therefore, a company is very involved by the shareholder from the start.

These three types of organizational structure can influence SCM, and the manufacturing activities in the three countries.

As discussed, automobile industries can gain a competitive advantage through special intercorporate relationships (value chain). The smiling curve (Figure. 3) shows the linkage between cyber and physical space, which can be realized common cheap sensors. The availability of mass-produced sensors helps in restructuring these unique intercorporate relationships.

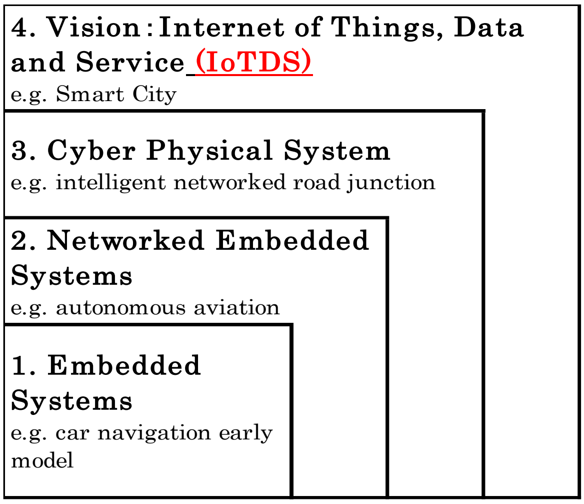
IoT technology can trigger the next big step to demonstrate visible data, which was previously invisible for example 'nonverbal communication' and was then transformed by human recognition. For example, Japanese car producers have already shown several changes in new parts combinations, through Toyota's New Global Architecture (TNGA), by means of a "Keiretsu" relationship. Also, Germany's Volkswagen is developed Modular Transversal Toolkit (MQB) a long time ago, which appeared to form their "Konzern" organizational structure. These new types of lean production methods have been accelerated by advances computer technology, which has allowed the formation of networking structures with a sensor. Those parts become more and more complex like follows Moore's law. This above-mentioned phenomenon is likely to be why a structural governance are facing at influence from a cybernetic issue.

4. FROM AN "EMBEDDED SYSTEM" TO AN "INTERNET OF THINGS" PLUS "DATA AND SERVICE"

4.1 Embedded software-intensive system

An embedded system is a computer system, and is commonly found in high-tech products and systems, such as in devices, beverage vending machine, vehicles, aircraft, consumer products and production systems. According to newspaper, the embedded system, which could be forecasted to be over 40 billion devices worldwide in 2020. It is an overstatement to say that such system controls all mechanical devices in common use today. The embedded system is the basic system for enhance their capability from the close to open system, such as the networked embedded system, the cyber physical system and the IoT plus German data and service.

Figure 4. Evolution of embedded systems into the IoT, data and services



1) *Embedded systems,* such as the closed embedded systems, such as airbags, are the starting point(Figure. 4). All machines are controlled by the embedded system.

2) *Networked embedded systems*. Previously, the embedded systems operated in a closed system: a machine to machine (MtoM) concept. Embedded systems have become increasingly complex in recent times, run by complex, powerful central processing units (CPUs), such as Intel microprocessors followed by Moore's law. An example of a networked embedded system would be an intelligent traffic information that has immediate response from other a devices, such as smartphones. This data is collected as individual one by one basis, and the central database of Google can collect and sorts huge data from user's positioning as traffic jam alerts.

3) *Cyber-Physical Systems (CPS).* Now it is becoming common use, to connect items via the internet, a key step behind the IoT. Indeed, previously closed embedded systems are increasingly opening up and are being connected to other systems through the internet, and becoming CPS.

4) *Vision: the Internet of Things, Data and Services* is different than the original IoT definition. The future vision is influenced by German automotive industry. Also this IoT technology might have the key role for a future smart-city. Therefore, the German National Academy of Science and Engineering ('acatech') research note explains the differentiated concept to reflect from the local ICT needs *(acatech POSITION PAPER, 2011).*

4.2 IoT usability

The capabilities of embedded systems will continue to advance as the development of powerful central processing units (CPUs) facilitates the transition from closed to open systems. The basic infrastructure for the internet is already available in much of the world, which will support this transition going forward (Kagermann, Wahlster, & Helbig, 2013).

The IoT is the interconnection of embedded systems and objects within those systems via the internet.

Each targeted country has its own national program. The so-called "Anglo-American model" has an influential way, as it relies on an advanced IoT planning program called the Advanced Manufacturing National Program (AMNP) (Report to the President, Accelerating U.S. Advanced Manufacturing, 2014). The Japanese "Society 5.0", which includes Japanese IoT development strategy for 2017 (The goverment of Japan, 2017), while the Germans named their embedded systems via the internet, "INDUSTRIE 4.0". This high-level planning has driven competition among several countries in terms of the standardization of technological and organizational features (Siemieniuch, Sinclair, & Henshaw, 2015).

5. DEVELOPMENT OF AN AUTOMOTIVE NAVIGATION SYSTEMS IN GERMANY, JAPAN, AND THE USA

5.1 Automobiles as sensors and sustainability

An automobile is becoming like moving computer because it collects more information ever through IoT (common sensor) technology (Porter & Heppelmann, 2014). From an IoT perspective, the car itself is being transformed into a sensor, and this will rearrange the entire transportation system in the process.

The main function of an automobile can be characterized by two primary features: the engine for mobility and the human driver for control. First, engines have become far more complex in recent years and have higher power outputs.

They have also become physically smaller as a result of technological advances. However, technology aimed at manipulating the driving function is still under development.

1) *Google versus automotive industry:* Google is currently developing autonomous driving cars, despite a lack of knowledge and experience in automotive production. As one of the largest and most powerful internet companies in the world, Google has much more information-based expertise, which will aid in its quest to replicate human driving behaviour. Another expectation is that electric motors will replace the internal combustion engine, although 90% of all vehicles in operation still run on internal combustion engines today. Google has a competitive advantage when it comes to innovating autonomous driving programs, which will also add to the company's extensive expertise in other aspects of the internet business.

5.2 The 'Bird's-Eye View' Versus the 'Insect's-Eye View'

The Japanese and the Germans are adopting autonomous driving technology more slowly. The 'producer-centric viewpoint' concentrates primarily on the internal combustion engine, and how to optimise fuel efficiency. The 'user-centric viewpoint' focuses more on reaching a destination without becoming stuck in traffic or involved in an accident. There are two different approaches for the successful realisation of autonomous driving. Google Maps has adopted a 'bird's-eye view', while automobile manufacturers take more of an 'insect's-eye view'. Both approaches have advantages and drawbacks. Google Maps already has millions of users, who share their exact positions in real time. This interactive system transmits user data and provides practical information for other users, such as traffic data and construction warnings. However, this information is not sufficient to create high-definition maps that can be used for navigation in autonomous driving. Automotive manufacturers are concerned about safety, and they are sceptical as to how well autonomous driving will work properly without accurate driving will work without accurate maps and combined with the proper steering technology. Thus, it may be necessary to collect data from vehicles through sensors to obtain accurate information from road situation. GPS cannot achieve a more precise measurement. The machine needs more accurate positioning. IoT technology can help to fill the nature of an undulating surface, exact corner points and obstructions to make an HD map.

6. DISCUSSIONS

6.1 Explanation of the Discussion Matrix

The Discussion Matrix (Table II) allows us to draw some tentative conclusions through the lenses of static and dynamic analysis, including six points about technological development in automotive industry and transformation in corporate governance system. Those conclusions can be summarised as follows:

1) *GDP Trends for Manufacturing Activities:* There is an obvious difference in the GDP from manufacturing in Japan and USA, compared with the stable GDP growth from manufacturing observed in Germany (see Figure. 1).

a) Across Boundaries: Figure 2 shows that the Japanese automobile manufacturers account for 33% of global automobile production, although there has been a general decline in Japanese manufacturing as a whole.

b) The difference in GDP Trends for Manufacturing Activities between 2010 and 2015: The figure differences are shown Germans (+2.0%), Japanese (+1.0%) and US (-1.0%) on Table I. The differences are small. But, we can assume at least three imprecations from the figure.

1. German, Japanese and US Industrial policy relate to their industrial relations
2. Acuserarate a monopolistic movement,
3. Dynamic industrial movement between ICT and Automotive industries.

*2)*Organizational Structure for SCM: One possible reason for the difference in manufacturing volume in Japan and USA versus the stable trend in manufacturing in Germany may be the different organizational structures in each of these countries, which play important roles in SCM: the Japanese "Keiretsu", the German "Konzern" and the Anglo-American models.

Table 2. Discussion Matrix

Discussion Matrix	*1) GDP Trends for Manufacturing Activities*	*2) Organizational Structure for SCM*	*3) Viewpoint relating to IoT usability*
Germany	**Stable**	Konzern	Producer-centric (Smart FACTORY)
Japan	Downward	Keiretsu	Producer-centric (Smart FACTORY)
	Boundaries		
USA	Downward	Anglo-American model	***User-centric (Smart CAR)***
Discussion Matrix	*4) National IoT planning*	*5) Definition of Internet of Things*	*6) Development of Navigation System*
Germany	INDUSTRIE 4.0	Industrie 4.0 and relate to IoT plus **Data &Service**	Insect's Eye (HD map)
Japan	The growth strategy 2016	IoT and Industrie 4.0 in the middle	Insect's Eye (HD map and Prove system)
	Boundaries		
USA	Manufacturing National Program (AMNP)	IoT	Bird's Eyes (GPS)

Source: Author

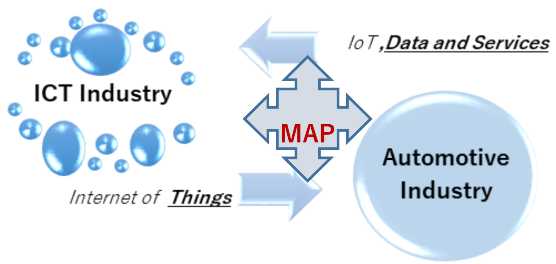
3)Viewpoint related to IoT usability: In previous research, possible explanations were presented for the differences in IoT usability in Germany, Japan and the United States. Japanese and German car producers have more of a 'producer-centric viewpoint', versus the American 'user-centric viewpoint'. This becomes more apparent when looking at the Figure 2, which shows that 55% of automobile production is by Japanese and German producers, while American producers accounted for just 20% of global production.

4)National IoT planning: There are currently several national initiatives for combining the internet with embedded systems in Germany (INDUSTRIE 4.0), Japan ("Society 5.0") and the United States (AMNP), respectively.

5)Definition of the IoT: The key to the IoT is the embedded system, which represents the unique features of each respective producer's organisational structure. The capabilities of the embedded systems will develop from the close to open systems through the use of the internet. The main idea of the IoT is the interconnection of embedded systems within the existing internet infrastructure.

a) Across Boundaries: The Japanese "*Keiretsu*" plan has been largely influenced by the US perspective on the IoT, and relatively little by the German vision of IoT, which also includes *Data and Services*. As seen in Figure 2, Japanese car manufacturers are account for 33% of global automotive production while the Germans and Americans each account for 20% (Figure. 2). The German vision of IoT differs from the usual definition in the USA, which reflects the industrial structure of the Anglo-American model. As research from 'acatech' notes, the concept has expanded to include both *data and services (acatech POSITION PAPER, 2011).*

Figure 5. Meaning of "IoT, *Data and Services*"



- Meaning of "IoT, Data and Services" by acatech research is based on "INDUSTRIE 4.0", which is oriented to their industrial organization. German automotive industries are important for their economic activities, especially on manufacturing activities as seen on Figure.1 (22.8%). Therefore, car producers try to differentiate their manufacturing product, not only an automobile as a Things, but also a platform for data and service, which ICT industry also differentiated, See diagram on Figure 5 below. Also The sales of Japanese car producers are very much dependent on US market and consumers. They need to take into account of American IoT technology.

6) Developing Navigation Systems: There are two methods of achieving a sustainability regarding automotive fuel consumption. As discussed above, an automobile is built the electric battery separately. An automotive-control is now dependent on a complex embedded system, which operates electricity for example, a fuel injection controller. The embedded system was formally separated with other systems, and now will be connected each other by using IoT technology. Our decision making and our recognition are supported by smart related these gadgets. During driving we are not instinctively recognise a accurate motor movement, these controls are supported by cockpit module, which is already automated our recognition by many electric systems.

a) Google Maps originally used 'bird's-eye view' viewpoint and developed.

- Advantage: interactive positioning data
- Drawback: GPS can achieve a precision, which is not sufficient for autonomous driving. It needs a more accurate HD map.

b) The 'insect's-eye view' by the car producers.

- Advantage: A automobile sensor can fill the gap, which cannot transmit by GPS. IoT technology can achieve the better precision than the GPS.
- Drawback: The car producers relies more on their automotive safety.

c) The path dependency

we should focus on other remarkable results, which are 4. From an "Embedded system to an "Internet of Things" plus "Data and Service".

I want to draw the theory of the path dependency by P. A., David. He proposed three reasons for the path dependency:

1. The technical inter-relationship,
2. The switching cost,
3. *The historical accidents*.

P. A., David focused on the third factor, the *historical accidents*. The historical accidents or the unexpected circumstances are a precondition for human ability, which only connect a technology to a goal, which we want to achieve (David, 1985).

Usually, our decisions do not reflect an optimum solution, which called "the fallacy of composition" in the economic world. It means the best answer for an individual decision is not a good answer for the whole. For example, the software market is dominated by Windows operational system, despite the technological superiority of Apple iOS over Windows OS. However, these selected technologies became the standard in PC software market, which we have decided by coincident or unexpected.

H. Simon said "Unlike 'economic man', to whom hyper-rationality is often attributed, "organization man" is endowed with less powerful analytical and data-processing apparatus. Such limited competence does not, however, imply irrationality" (Simon, 1955).

7. CONCLUSIONS

As we argued above, we see the dynamic industrial movement in between these three countries. Moreover, creates the discussion matrix which includes six different reasons as mentioned above.

As J. K., Galbraith said a society becomes more influenced by the industry. And a manager creates artificial demand, which follows the huge mass-production of commercial goods and services. Recent his "Technostructure" is a phenomenon for IoT technology, which we are discussing here.

Beer explained "I do not believe that we can predict the future. I believe instead that we can describe the present with perspicuity, if we use the proper instruments, and that this same present constrains future variety. This is not the same thing (Beer, 1973)".

We think a dynamic industrial movement is ensured by keeping fair competition, which means ensures diversity as well as technological development, as we discussed before.

The technological development makes further and further progression like following Moore's law such as TNGA by "Keiretsu" and MQB by "Konzern". Or, the 'producer-centric viewpoint' concentrates primarily on the internal combustion engine, and how to optimise fuel efficiency. The 'user-centric viewpoint' focuses more on reaching a destination without becoming stuck in traffic or involved in these an accident. These different perspectives show a structural governance change, which are facing influence by a cybernetic issue.

Beer also said, "we shall still need maps. The societary maps we need are in my view the cybernetic maps that I have tried to set forth. And so you see why I have called this series Designing Freedom".

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