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Network Resources as a Source of Competitive Advantage

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Abstract. Japanese automobile makers were seemed to have a competitive advantage in 1980s, by their close relationship with their parts suppliers. But, what was the difference among Japanese automobile makers? In this paper, we explore accumulated resources among the parts suppliers as network resources, and compare the resources between automakers. Finally, we conclude there are difference about the level of accumulation and the style of accumulation.

Keywords: competitive advantage, resource, Japanese automobile industry

1. Introduction

Japanese automakers have close relationships with parts manufacturers, and, by the nature of their production process, require the parts manufacturers to possess the same level of capability as the automakers. This study, by observing the process of diffusion of major innovations in the automotive industry in postwar Japan, will consider the process of accumulating proprietary resources and capabilities among groups of companies in close cooperative relationships.

Within strategic theory, there is a current that focuses on corporate positioning within the market (Porter, 1985), and a current that focuses on resources within the company (Barney, 1991; Wernerfelt 1994). The positioning school sees the company's relationships relative to the outside world as a source of competitive advantage. The resource-based view sees resources within the company as a source of competitive advantage. The unique technology, skills, and culture possessed by a company enable actions that are impossible for other companies. Through these, the company gains competitive advantage. These also have the benefit of being difficult to imitate.

According to Asanuma (Asanuma, 1989), the key feature of the Japanese automobile industry lies in its stable long-term business relationships. He asserts that parts manufacturers accumulate many capabilities through the stable, long-term relationships between the parts manufacturers and automobile assemblers. Through those capabilities, the business relationship between the parts manufacturers and assemblers evolves. At first, production takes place based on loan drawings – that is, blueprints with all design of parts performed by the automobile assemblers, which are then loaned to the parts manufacturers. Once the parts manufacturers gain development capabilities, production takes place based on approved drawings – that is, blueprints with basic design performed by the assemblers, but detailed design performed by the parts manufacturers. Thus, the difference between these two types of drawings reflects not only a difference in the business relationship, but also a difference in the capabilities possessed by the parts manufacturers.

Given this situation, it is apparent that both positioning and resources are too narrow in scope. Entities that exist outside the company are not necessarily potential competitors. Additionally, it is not the case that only those resources that exist inside the company confer uniqueness upon the company. Therefore, this paper refers to those resources that the company possesses externally as network resources. Defined strictly, network resources are "resources that extend through a company's ego-centric network" (Figure 1). Therefore, to the extent that the same types of resources are accumulated in a given egocentric network, the degree of accumulation of network resources can be said to be high.

These network resources can be broadly classified into three types. First are those resources that are historically accumulated by the company and that are not found in other companies. We name these innate resources. Innate resources are often resources that are difficult to imitate, but which, if they can be transferred, become one of the elements making up network resources. Second, there are those resources that are built up through long-term business relationships, as described by Asanuma. We term these relationship resources. Finally, there are those resources that extend through the network without particularly assuming experience on the part of a given company. We name these general resources.

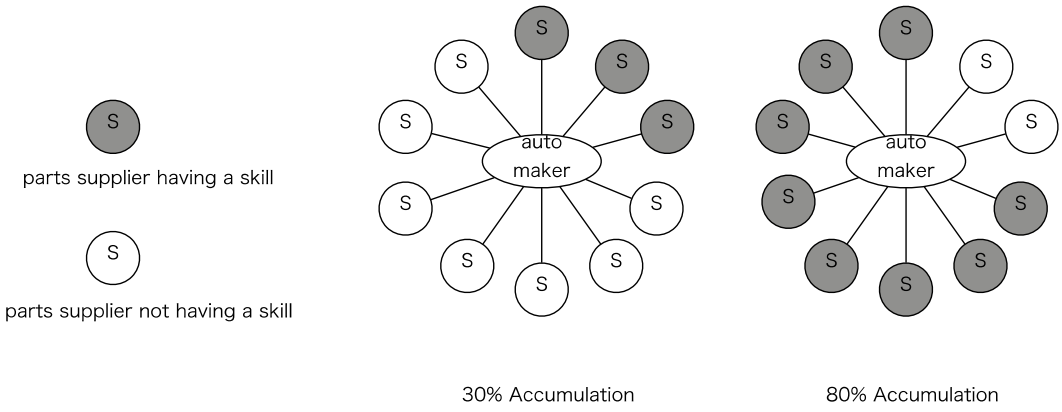


Fig. 1: Concept of Network resources.

2. Analytical Framework and Hypotheses

In order to discuss network resources, the participants in the network, i.e., the nodes, must be determined. Also, it is possible to compare degrees of accumulation at a point in time, and to observe the process of resource accumulation. For the latter, the cumulative accumulation of resources in the network is plotted against the time axis. This paper applies its analysis to the accumulation process, rather than to comparisons at one point in time. Specifically, we conduct our analysis according to the following analytical framework:

(1) We analyze the temporal process of network resource accumulation using the Bass model (Mahajan, 1985), which is used as a model of new product diffusion. In this analysis, "adoption" in the diffusion of new products can be read as the "accumulation" of a resource by a parts manufacturer. The Bass model is represented by the following equation:

$$f(t) = \left[p + \frac{q}{N} N(t) \right] \left[1 - F(t) \right]$$

(2) The p-value and q-value, which are coefficients of the Bass model, are used to indicate the style of network resource accumulation. In general, p is a coefficient weighting the influence of the mutual interaction between the central node and its surrounding nodes, while q is a coefficient weighting the influence of the mutual interaction among the surrounding nodes. Therefore, we consider p to represent centralized accumulation, and q to represent decentralized accumulation.

This study intends to show that network resources differ among networks. In particular, the question of how resources that are difficult to imitate are accumulated as network resources is of importance to strategic theory. Here we present the following hypotheses:

Hypothesis 1: Differences exist in the degree of accumulation of network resources. If network resources are related to competitive advantage, then differences in the degree of accumulation of network resources must exist.

Hypothesis 2: Differences exist among networks in style of accumulation. If differences exist among companies in degree of accumulation, it is necessary to clarify the cause. Differences in the style of accumulation present one candidate.

3. Analysis of Data

In this section, we validate the above hypotheses using original data. Data were collected through a questionnaire sent to major Japanese automobile parts manufacturers. Specifically, we targeted companies which have business relationships with Japan's five major automakers (Toyota, Nissan, Honda, Mitsubishi, and Mazda), which have at least ¥50 million yen in capital, and whose ratio of automobile parts to total sales is at least 50%. In allocating these to egocentric networks, we determined that a parts manufacturer with a sales ratio of at least 40% toward a particular automaker is a node in that automaker's egocentric network. We treated parts manufacturers not allocated to a particular automaker's egocentric network as independent parts manufacturers.

This study will address nine types of network resources: the approved drawings method (which reflects the parts manufacturer's development capabilities), Just-In-Time delivery method (two types: toward automakers, and in-house), VA/VE (which reflects improvement capabilities), non-inspection delivery (which reflects quality control capabilities), TQC, TPM, 3D CAD, and online ordering.

Among these, the JIT system was invented and developed by Toyota, and is positioned as an innate resource. Approved drawings, VA/VE, and non-inspection delivery are relationship resources. TQC and TPM are known to have spread to almost all manufacturing industries in Japan, and are being disseminated by independent organizations. As such, TQC and TPM are considered general resources. 3D CAD and online ordering are new technologies introduced in recent years. Both require connectivity with the automakers that are the buyers; further, these were not standardized upon initial implementation, and each network was proprietary. As such, these are positioned as relationship resources

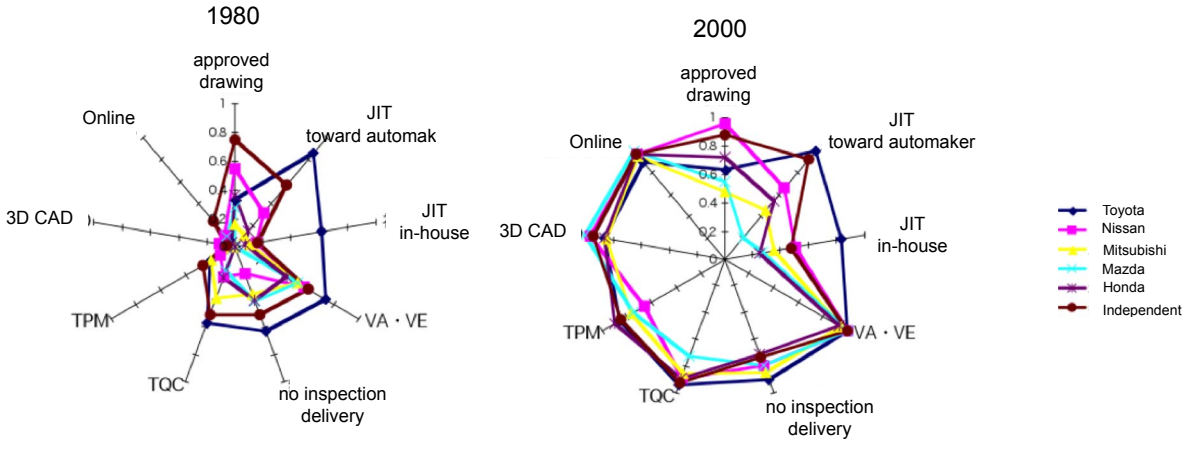
3.1. Hypothesis 1: Differences exist in the degree of accumulation of network resources

First, we will look at whether there are differences among networks in the degree of accumulation of resources. Figure 2 shows the degree of accumulation of each resource by network, for 1980 and 2000. In 1980, new technologies (online ordering, 3D CAD) were not yet introduced. Overall, it can be seen that Toyota's network is progressing in accumulation. Conversely, in 2000, differences are small among networks for resources other than approved drawings and JIT. The difference between Toyota and other networks is especially remarkable in JIT, which is considered an innate resource of Toyota.

From the above, it was found that there were differences among networks in the degree of accumulation of resources, mainly in the 1980s. While those differences subsequently contracted, differences in the accumulation of JIT remain even in 2000.

The longer the time required to accumulate resources within the network, the longer-term the impact of differences in starting time. Moreover, if the time required to accumulate resources differs among networks, the network that is able to accumulate these faster will be able to take a relatively advantageous position.

Figure 3 uses the Bass model to indicate the estimated time required by each network for 80% accumulation of each resource. The resource requiring the most time to accumulate is approved drawings (about 61 years), followed by in-house JIT (about 57 years). The resource taking the least time is 3D CAD (about 19 years). Taken on average, we see that it takes about 35 years to achieve 80% accumulationt.



	A.D	JIT	JIT(In)	VA・VE	No-Insp	TQC	TPM	3D CAD	Online	AVG.	AVG.2
Toyota	16.0	3.5	5.0	4.1	6.0	5.2	8.2	2.9	4.7	6.2	6.7
Nissan	11.2	9.5	11.8	5.1	6.6	5.9	7.2	4.2	3.8	7.3	6.3
Mitsubi	12.4	12.4	16.9	4.4	6.1	3.9	6.1	3.0	2.6	7.5	5.5
Mazda	12.4	-	-	3.0	7.9	5.4	2.0	3.7	3.3	5.4	5.4
Honda	13.5	10.6	-	7.3	5.2	6.2	3.0	3.1	3.5	6.6	6.0
Indepen	8.5	5.4	12.3	8.5	7.5	8.5	9.0	5.1	5.7	7.8	7.5
AVG.	12.3	8.3	11.5	5.4	6.6	5.9	5.9	3.7	4.0	7.0	6.2

Figures were estimated using Bass model.
1 means 5 years.Then, Toyota needed 80 years for A.D.
AVG.2 exclude JIT and JIT(In) as Toyota's innate resouces

Fig. 3: Time required for network resource accumulation

3.2. Hypothesis 2: Differences exist among networks in style of accumulation

Figure 4 is a list of the p and q values estimated under the Bass model. A particularly large difference can be seen between Toyota and Nissan. Toyota has a relatively large p, and Nissan a large q. Figure 5 indicates the influence of p and q on the time required for accumulation of TQC. Curves in the figure show identical accumulation times. Comparing Toyota and Nissan, the time required for accumulation remains similar at about 30 years. However, there is a difference in the style of accumulation. Toyota has a large p-value and small q-value, while Nissan displays the opposite. Therefore, Toyota performs centralized accumulation, while Nissan performs decentralized accumulation. Then, Toyota accumulated more rapidly than Nissan. Because of that, Toyota enjoyed the difference from 1970s to 1980s.

	A.D		JIT		JIT(In)		VA・VE		No-Inspec		TQC		TPM		3D CAD		Online		AVG.		AVG.2	
	p	q	p	q	p	q	p	q	p	q	p	q	p	q	p	q	p	q	p	q	p	q
Toyota	0.03	0.18	0.13	0.84	0.06	0.72	0.08	0.85	0.03	0.70	0.06	0.70	0.01	0.76	0.12	1.17	0.01	1.24	0.06	0.80	0.05	0.80
Nissan	0.04	0.25	0.04	0.33	0.04	0.26	0.01	1.25	0.00	1.10	0.00	1.46	0.03	0.59	0.02	1.29	0.03	1.31	0.02	0.87	0.02	1.04
Mitsubi	0.02	0.36	0.12	0.02	0.08	0.03	0.08	0.76	0.02	0.86	0.10	0.81	0.05	0.62	0.02	0.98	0.02	0.93	0.06	0.60	0.04	0.76
Mazda	0.01	0.04	0.11	-	0.08	-	0.04	0.39	0.04	0.44	0.01	1.10	0.07	2.43	0.06	1.14	0.01	1.97	0.16	1.07	0.03	1.07
Honda	0.02	0.28	0.17	-	0.09	-	0.00	1.22	0.08	0.59	0.02	0.77	0.00	2.57	0.03	1.77	0.00	2.13	0.05	1.33	0.02	1.33
Indepen	0.08	0.26	0.05	0.73	0.08	0.11	0.01	0.69	0.03	0.59	0.02	0.58	0.00	0.77	0.01	1.35	0.01	1.05	0.03	0.68	0.02	0.76

Figures were estimated using Bass model.
AVG.2 exclude JIT and JIT(In) as Toyota's innate resources

Fig. 4: Differences in style of accumulation

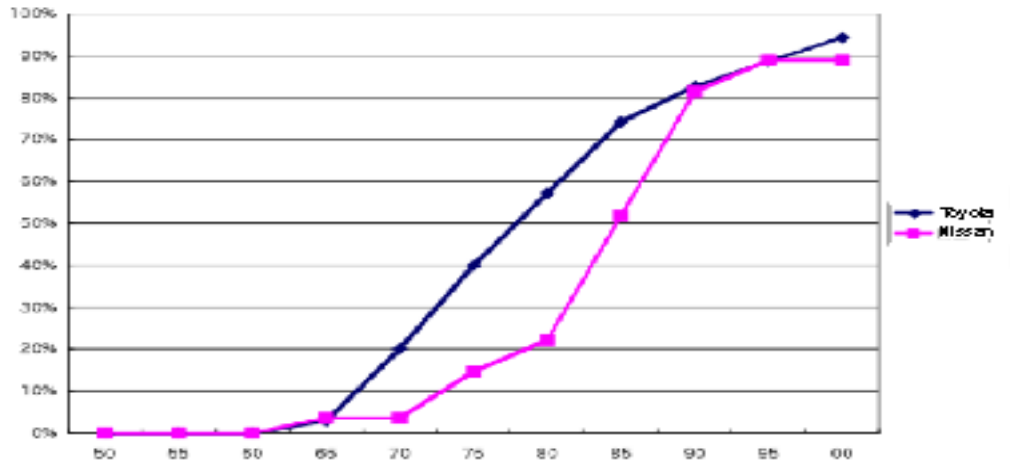


Fig. 5: Differences in styles of accumulation between Toyota and Nissan

4. Conclusions and Implications

From the analysis of data and the case study above, we conclude the following:

- Differences were seen in the accumulation of network resources in the Japanese automobile industry, mainly in the 1980s
- An average of about 30 years is required for accumulation of resources, although the speed has become faster in recent years
- Toyota accumulates in centralized fashion

From these conclusions, we see the following points as implications for business. First, companies must be resolved to spend a certain number of years in the accumulation of network resources. Therefore, assuming an unchanged speed of accumulation, a faster start is more advantageous. It is not necessary to make all resources network resources. However, when it is necessary, quick action is important. Second, it is necessary to deeply consider both accumulation style for the network and adaptation to the nature of the network resources. A centralized style is very likely to be effective for innate resources. Naturally, there is some risk of spillover, although for innate resources this concern is relatively minor. In the end, if the resources are to be imitated, it is necessary to act quickly to prolong the period of differentiation in network resources. In other words, it is necessary to select which resources should be made network resources, and to strategically perform accumulation within the network.

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