CHANGES IN R&D RESEARCHERS' CAREER LADDERS IN MIDDLE AGE

TAJI, Noriko

(出版者 / Publisher)
法政大学経営学会
(雑誌名 / Journal or Publication Title)
経営志林 / 経営志林
(巻 / Volume)
49
(号 / Number)
4
(開始ページ / Start Page)
15
(終了ページ / End Page)
28
(発行年 / Year)
2013-01-31
(URL)
https://doi.org/10.15002/00013144

法政大学経営学会 経営志林 抜刷
第49巻　第４号　2013年１月

CHANGES IN R&D RESEARCHERS' CAREER LADDERS IN MIDDLE AGE

Noriko Taji

[Article]

CHANGES IN R&D RESEARCHERS' CAREER LADDERS IN MIDDLE AGE

Noriko Taji

HOSEI University

ABSTRACT

Japanese researchers' career ladder is not the dual ladder system divided by academic degrees found in Europe and America. All researchers start out focusing entirely on research. It is only when reaching middle age that they may be promoted to Manager, the first step on the managerial ladder.Before becoming managers, they were exposed to bosses and colleagues who served as role models, and their own participation in management added to their management experience. They are, thus, trained and ready to function as managers. Their managerial activities are categorized into two types, contributions to team and contributions to commercialization. Contributions to team include searching for information both inside and outside the organization and contributing to the organization and functioning of the team in ways that increase research productivity. Contributions to commercialization are developing new business: serving as bridges between R&D and other departments; securing funding and negotiating with clients.

1. Dual Ladders for R&D Researchers

R&D researchers who work for profit-making corporations play two roles, scientific professionals and organization men. This distinction between professionals and organization men can be traced back to Gouldner (1957). Professionals display commitment to their scientific specialties. They are cosmopolitans whose primary reference group is others in the same field, as opposed to those who work for the same company. Organization men display loyalty to their organizations. Their orientation is local, not cosmopolitan. They express interest in rising within their organizations. Researchers in technical fields display both these aspects. On the one hand, they are scientists who pursue the universal values of science. On the other, they are organization men, discovering value in commercial success in the firms that employ them. Two models are not antinomy. It is verified that two models exist in one person in Japan and the United States (Fujimoto, 2000; Misaki, 2004; Peltz and Andrew, 1966; Wallace, 1993). In the dual ladder system, the technical ladder is for those who prefer to dedicate themselves to science. The managerial ladder is for those who seek promotion as managers.

In this study, I compare these two ladders, drawing special attention to perceptions and behaviors aimed at contributing to the organization. The focus of my research is the semiconductor industry, in which technologies become obsolete at an ever accelerating pace, given the fierce competition between firms that distinguish semiconductors, even from other high-tech fields that require

researchers to acquire high levels of specialized knowledge and experience. I chose that industry because I hypothesized that the more demanding the environment, the more individuals working in it must be conscious of their contributions to the organizations of which they are a part. As others have pointed out, seeing speedy R&D as the key to maintaining a competitive edge has an impact on researchers' work and careers (Che, 1999; Pfeffer, 1994).

That said, the dual career ladder system in Japan differs from those in Europe and the USA. In the next section I compare the Japanese and American systems, highlighting the distinctive features of Japanese human resource management.

2. Dual Ladders in Japan and the USA

The dual ladder was a model developed to explain HR politics affecting researchers in the USA. In both Europe and the USA, the rationale for the dual ladder is to allow researchers with outstanding talent in technological fields to focus on research, while receiving compensation on the same economic level as those climbing the managerial ladder (Moore and Davies, 1977). The result is the dual ladder illustrated in Figure 1 (a). Positions on the managerial ladder are Manager, Director, Vice-President, and Chief Technology Officer (CTO). The corresponding positions on the technical ladder are Senior Researcher, Senior Scientist, and Fellow.

In the American system, academic degrees play an important role in determining which ladder to climb. Researchers without Ph.D are regarded as technicians and unqualified to climb the technical ladder (Allen and Katz, 1986; 1992). Thus, those without Ph.D must climb the managerial ladder if they want to get ahead. Frequently they are hired just after graduation from college, and the separate managerial ladder allows them to be promoted without the Ph.D.

Those who have only bachelor's or master's degrees but want to pursue careers on the technical ladder must take leave or quit their jobs to return

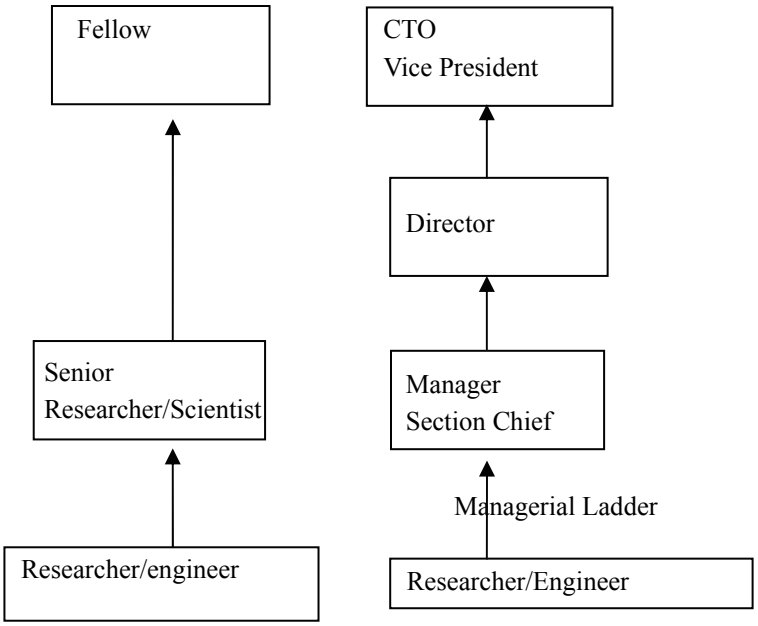

Figure 1(a) Career Ladder in the US

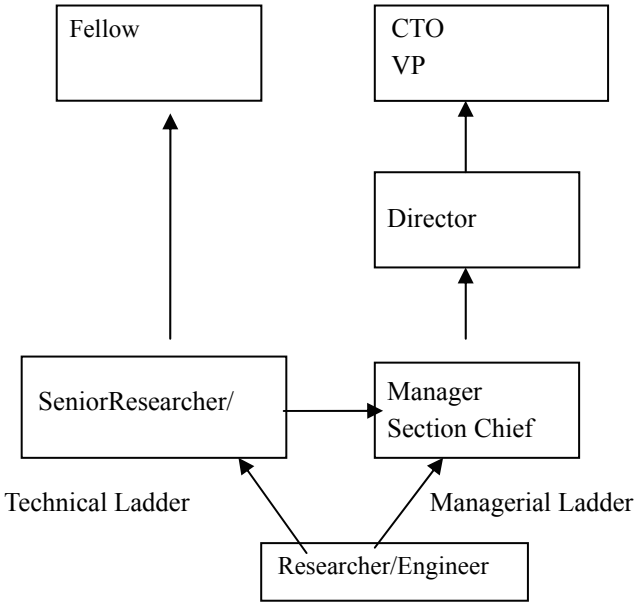

Figure 1(b)　Career Ladder in Japan

to graduate school. In contrast, those with Ph.D encounter no similar obstacle when switching from the technical ladder to the managerial ladder. Career switches of this type typically involve a shift in focus of interest, from science to business (Allen and Katz, 1992).

In the USA, the choice of career ladder, occurs early in a researcher's career and is determined by academic degree. As shown in Figure 1 (b), however, in Japan there is no dual ladder available for young researchers. There are firms whose human resource management (HRM) systems allow Senior Researchers to become Managers. Fellows, who occupied the highest rank on the technical ladder, are rare. These positions often remain vacant for long periods.

Previous studies have pointed out the absence of full-blown dual ladders in Japanese HRM systems (see, for example, Itoh, 1992, 1993; Imano, 1992; Fujimoto, 1998). Many R&D researchers shift to managerial positions around the age of forty. According to Itoh (1993), when researchers are confronted with the choice of continuing to do research or becoming managers, the greater availability of managerial positions ensures that most choose to climb the managerial ladder. The strong demand for project managers in the high-tech sector, which developed dramatically during the period of Japan's rapid economic growth through the 1980s, reinforced this tendency. Another important factor was the speed of technological innovation, which quickly rendered researchers' skills obsolete. Shifting researchers to management positions made possible their promotion to higher rank andcontributed to organizational order and employee morale. One other result, however, was the slowness with which Japanese firms developed full-blown technical ladders.

Imano (1992) compares US and Japanese researchers who choose to climb the technical ladder and finds that in the USA, where this option is more often available, researchers have a brighter, more positive outlook toward their jobs. Sakakibara

(1995) compares the USA and Japan and finds little sense that the two ladders are equal in Japan, where the managerial ladder is more highly valued and there is a strong belief among researchers that managers are better treated. In contrast, in the USA there is a strong tendency to believe that the technical and managerial ladders are treated equally, in terms of compensation. Sakakibara also infers, and my own research confirms, that in Japanese eyes the most important measure of treatment is salary. However, as economic growth in Japan has leveled off since the year 2000, the belief that managers are better compensated has weakened, and many now find trying to climb the managerial ladder less attractive.

We come, then, to the focus of this essay, the proposition that young Japanese researchers do not see the two ladders as parallel tracks for career advancement. Instead, they anticipate that when they reach middle age, they will become managers. In their twenties, they are buried in their research, unconcerned about career. When they reach their mid-thirties, they expect to shift from research to management. But, in contrast to the 1990s, when this shift was expected to occur around age forty, since 2000 the age at which this shift occurs appears to be decreasing.[i] I predict that there is no significant difference between those with bachelor's or master's degrees or Ph.D in making that switch. As more young people now have advanced degrees, those with only bachelor's degrees are increasingly employed only in sales or technical service positions, with relatively few assigned to R&D units. Those with bachelor's degrees assigned to R&D units do, however, receive the same treatment as those with master's degrees in many cases.

Another distinctive feature of the system in Japan is that Managers remain actively involved in research. Only later, as they advance up the managerial ladder from Manager to Director of Department do they leave research behind to focus on project management.

3. Research Question

In Japan, the bulk of young researchers' work in R&D is intended to produce commercial results. With the choice of technical ladder or managerial ladder delayed until middle age, few withdraw completely from active involvement in research, even when they embark on the managerial ladder. When they take their first step and become managers, they are expected to continue their research while taking on additional management responsibilities. They thus face high hurdles to further advancement. Some recently promoted managers lack management ability and are unable to carry out their roles. They are labeled with the damning words, "Being an outstanding researcher doesn't make you a capable manager."[ii]

Isn't it, however, a blind and reckless policy to suddenly impose management responsibilities on people who have devoted themselves to research ever since joining their companies ?

It remains possible, I believe, for researchers and senior researchers to prepare for management responsibilities while remaining dedicated to their research, through management training and virtual experience received while still immersed in their research.

I envision this training and virtual experience along the following lines.

In the semiconductor industry, improving product performance requires increasingly complex architectures. Those whose business is creation of superior products can not depend exclusively on their own technical expertise and research ability. To improve the performance of research teams, combining experts from several fields is essential. Thus, even researchers who will not climb the managerial ladder need to be conscious of how the team as a whole performs and pursue their research accordingly. They cannot avoid involvement in how their teams are managed, and those most actively involved will be those promoted from senior researcher to manager. Much of their training and

virtual experience comes from the managers and directors who serve as their role models.

The semiconductor industry faces fierce competition in a global market. The result is a high-pressure corporate environment within which individuals compete for advancement. We thus expect to see significant differences, depending on degree of participation in management, between those who will and will not climb the managerial ladder. We also expect to see significant differences between those who climb the technical and the managerial ladders. What, however, are the managerial activities in which researchers on the technical ladder are involved ? This question is the topic of the next section.

4. What Do Researchers Contribute to Management ?

The subjects of the research reported in this study are researchers employed in leading-edge research in the semiconductor industry. They are not isolated individuals. They conduct their research in teams, and coordination is often needed not only within but also between teams. Because competition is intense, they must often consult with customers before products reach commercial viability. This is an environment in which, as young researchers grow older and gain experience, they cannot avoid becoming conscious of management issues. Increasingly, researchers reaching middle age are expected to display management ability. Those reaching the rank of senior researcher or senior scientist must deal with management issues as well as increase their research output. Those who remain oblivious to these issues will not advance on either the technical or managerial ladder. The high performers are those who use their knowledge of management to increase research output.

Thisstudy reports first on results of interviews with a sample of subjects who work for the semiconductor consortium or semiconductor firms.[iii] The aim of these interviews was to investigate researcher contributions to management. Topics covered in the interviews included “What are you proud of ?” “What are your contributions ?” “Which superiors or colleagues do you respect the most or have the greatest influence on you ?” and “In setting project goals, are you conscious of what results should be achieved ?” Informant comments about their own experience or that of respected superiors or colleagues were coded and cross-tabulated.[iv] These questions identified not only contributions to research (finding a new substance, improving a yield, improving performance, etc.) but also contributions to management.

As expected, the interview results pointed to two types of activities that contribute to management: contributions to team building and teamwork leading to higher research productivity and contributions to commercialization involving negotiations with other business units and customers and managing budgets while commercializing research results. Here we will call the first contributions to team and the second contributions to commercialization.

We turn first to contributions to team. In Japan, researchers attached to R&D units are all in the trenches together. Regardless of academic rank, they are expected to contribute to the success of the teams to which they are assigned. More concretely, their role is to utilize personal networks both inside and outside the company to gather information and know-how valuable for the team’s project, to discover for themselves things that need to be done to contribute effectively to the team’s success, and to involve individuals outside the team to finding solutions to the problems the team must address. Those contributions could be defined as follows:

Contributions to team includesearching for information both inside and outside the organization and contributing to the organization and functioning of the team in ways that increase research productivity.[v]

The following are several typical comments.

I think the difference between other people and an excellent boss is probably their communication skills. To take that person as an example, he has wide-ranging networks, and doesn't go off in the wrong direction. He has well-developed networks. He also has plenty of knowledge. Other colleagues, who have only been carrying out research, have less well-developed networks. (Mr. O, 29 years old, commenting on an excellent team leader, raising the points of independently encouraging problem-solving by subordinates, and making use of internal and external networks.)

This particular team leader uses a wide personal network to gather useful information for his team and is renowned for the ability to point his team in successful directions.

There was once a project that was discontinued at my company, and the project, together with the factory, was going to be sold off to another firm. A researcher thought he had to stop this from happening, so he created the project's system architecture in just a month. This project is now responsible for one of our company's leading products, and I was very impressed, very moved by his technical ability, as well as his ability to take action, in creating something like this in just one month. His diverse knowledge, and his ability to mobilize people—I mean, of course he's thinking for himself, but he goes around asking everybody's opinions on what's possible. He collects this kind of information and brings it all together. So I was impressed with his ability to gather information that he lacked. (Dr. H, aged 40, commenting on a highly capable Project Manager who brought together his information gathering and management abilities to handle the whole process, from development to Business.)

Here the focus is on the ability to manage projects and keep them moving quickly and smoothly.

I am very capable of meeting specific needs. If I'm asked to work with a certain cost, I somehow manage despite the fact that I have never calculated costs before. And I am also able to respond well when it's predicted that materials outlining the investment plans should be compiled at some point in future discussions. I've been commended that I'm good at pointing out what's missing from a project, or suggesting that we focus on certain areas. It was only then that I realized I had this ability. (Dr. M, a Manager, aged 38, who identified aspects for which he/she was highly evaluated as the overseeing of projects, including the management of progress and the setting of issues for research.)

In this case, the individual contributes organizationally through his supervisory activity, not only keeping a project on track but also being able to set goals for the project.

Of the three cases described above, the first and the second individuals had, while still at the rank of researcher or senior researcher, role models whose examples they emulated when they themselves started to climb the managerial ladder. Watching the role models at work was a virtual management training experience. In the third case, we find an individual who was already making business contributions before being assigned management responsibilities.

Turning, then, to contributions to commercialization, some require working in tandem, exchanging information and forming relationships with the firm's own sales, marketing and manufacturing divisions.[vi] In high tech industries,

moreover, researchers are more likely than members of the sales department to identify the needs of the lead users who will place the first orders for a new product. Taking both these reasons into account, we definecontributions to commercialization, as follows.

Contributions to commercialization are developing new business; serving as bridges between R&D and other departments; securing funding and negotiating with clients.

We asked our informants what was required to make a commercial success of a project. One answered,

People who go directly into the research laboratory after graduating from university don't know anything about getting their hands dirty earning money or making products, and although that means they can use their imagination freely, they can sometimes stray off the point and become obsessed with an idea and then it becomes difficult to see what they will produce as a result. We have to come up with ideas that relate to promising business areas in the future. . . . Instead of merely publishing papers, *we have to think of how that research will translate into a product or, if it is different from other products, how it will be used to create new business*. (Mr. S, 40 years old, manager)

Successful product development requires close attention to profitability. The following informant learned this lesson from his boss.

I was extremely impressed by the devotion of our previous boss, the project leader, who commercially developed a scanner. When considering what would lead to successful commercialization, in contrast to (pure) research, reliability data is necessary, and he thought very carefully about what is necessary to bring the product to maker. He was the type of boss who would push to achieve that goal.

(My previous boss) is very aware that the final goal of research is commercialization of the product. We receive an assignment from a division and are expected to produce results in response to that assignment. It is obviously important to avoid wasting time and resources, and so we have to produce results accordingly. What's more, it shouldn't be the kind of research for presentation at academic meetings, but research that leads to profit or business opportunities. In some cases, we need the courage to discontinue the research. He told me often to watch out for such situations, and I realized he was very right. (Mr. Y, a senior researcher, aged 38, who follow the manager whose policy is pursing commercialization.)

Researchers who take the next step up the managerial ladder, from manager to director, cease to be directly involved in research. Their job is now to interface with other divisions and to prepare business plans with concrete numbers. Here is what one director has to say about his job.

Before becoming Director, I was almost always positioned very close to the research. But for the Director class—until the Head or Manager class, research is your main work, but when you progress from Manager to Director, your main work starts to involve management, such as negotiating, thinking about specific business opportunities other than the technologies being developed, deciding whether or not to continue with a project, or considering who to cooperate with. You also deal with internal affairs, like accounts and where to obtain funds. For us, what's most important is how to acquire consignments. These kinds of tasks suddenly increased [when I became Director]. (Dr. Y, a Director aged 50, who responded that the volume of management tasks he handles increased after he was promoted to the Director position.)

As indicated here, climbing the managerial ladder means greater responsibility for commercialization of research results. Since, however, many of those who climb the ladder emulate previous role models, they seem to feel little resistance to expansion of their management responsibilities.

Having distinguished between these two types of contributions, it is time to offer hypotheses.

5. Hypotheses

Those who do not climb the ladder display low awareness of management issues and do not participate actively in management.

Hypothesis 1. Compared to those who climb the ladder, those who do not climb the ladder make fewer contributions to both team and commercialization.

Those on the technical ladder may contribute to team productivity and may have the ability to contribute to product commercialization as well, but they have no responsibility for the latter. They are, thus, less active participants in management than those on the managerial ladder.

Hypothesis 2. Those who climb the technical ladder contribute less to commercialization but show no difference from those on the managerial ladder in their contributions to team.

Directors bear heavier responsibility for commercialization of products than do Managers. We thus expect to see larger contributions to commercialization.

Hypothesis 3. Directors are more active in commercialization than Managers.

6. Survey Method

6.1 Sample

To test our hypotheses we conducted a survey to collect quantitative data. The sample consists of individuals age 29 to 50 seen as prominent candidates for promotion. Five semiconductor device manufacturers and four major semiconductor equipment makers were asked to cooperate with the project. Five of these companies (Two of the semiconductor device manufacturers and three of the semiconductor equipment makers) agreed to do so. The quantitative survey was conducted at these five firms. Questionnaires were distributed at the work sites from November 2006 to January 2007 and returned by post.

Sample: n = 133
Employed by semiconductor device manufacturers 69
Employed by semiconductor equipment makers 64
Age: 29–50 (average age: 39.8)
R&D focus: Semiconductor device and semiconductor equipment makers
Assignments: Personnel working in R&D at research labs or development sections
Rank: The five firms use different nomenclatures, but the following criteria are applied in all. All five are major corporations with annual sales of ¥800 billion or more. One is a spinoff from its parent company but still uses the same system as the parent company.

Not promoted	41	Researcher, Technician, other
Technical ladder	52	Senior Researcher, Senior Scientist,
Managerial ladder	35	Manager, Section Chief, Leader
Upper management	5	Director

Last degree: Bachelor's 50, master's 67, doctoral program 16

For relation between rank and last degree, see table 1.

Last academic degree appears to have no influence on promotion.

Chi-square tests were conducted on cross tabulations of highest degree and rank in company. To control for the effects of age, the sample was divided into four categories at five-year intervals. Since doctorates and master's degrees are considered equivalent when it comes to specialized expertise, the last academic degrees were divided into two categories, bachelors and master's -and-above. Those with master's degrees who had written doctoral dissertations are included in the master's-and-above category. All respondents aged 35 and under, however, are in this category, so in this group we separate those with master's degrees from those with doctorates. Ranks are divided into senior researcher -and-below and manager-and-above. In the 35 and under age cohort, however, there are none in this category, so this group is divided into researchers and senior researchers.

The 2x2 Chi-square test conducted using Fisher's exact method revealed no significant relationships (see Table 1). There thus appears to be no correlation between last academic degree and rank in company.

Table 1.　Rank and Highest Degree Correlationer

Age	2x2 Cross-Tabs	Sample	Fisher Exact Test
29-35	Researcher /Senior Researcher Master's/Ph.D.	３５	0.575
36-40	Senior Researcher /Manager Bachelor's/Master's	３０	0.138
41-45	Senior Researcher /Manager Bachelor's/Master's	４２	0.118
46-50	Senior Researcher /Manager Bachelor's/Master's	２６	0.428

6.2 Variables Related to Business Contributions

Questionnaire items were based on codes suggested by the interviews. A pre-test of the questionnaire was conducted in 2005 on a sample of consortium members.[vii] The questionnaire was then revised based on interviews with employees of private firms and the suggestions of those responsible for the project at the firms the study targeted. Factor analysis using maximum likelihood promax rotation was employed to extract factors related to the two types of behavior. The results of the factor analysis are shown in Table 2.

The average of four items is used as our measure, with Cronbach's alpha calculated to evaluate internal consistency. For contributions to commercialization, $\alpha = .79$ and for organizational contributions $\alpha = .77$; both values are statistically significant. (See Table 2.) The two measures are correlated at the 1% level, allowing us to infer that organizational contributions and contributions to Business are strongly correlated.

Table 2 Factor Analysis of Management Contributions

	Items	Factor1	Factor2
Contribution to commercialization	Negotiation with other units	1.018	-.250
	Smooth negotiator with customers, quickly grasps chances to understand customer needs	.592	.222
	Cultivates ties with sales and manufacturing	.548	.174
	Works to secure project funding	.542	.044
Contribution to team	Builds external network through friends and academic associations	.003	.811
	Constantly gathers information related to technology	-.155	.687
	Takes initiative in seeking help from internal or external experts when team encounters difficulty	.250	.519
	Knows who has what kind of expertise and where to find them in the company	.285	.434

Table 3 Average Correlation, SD, α

	Commercialization	Team	Average	SD	α
Commercialization	—	0.57**	3.54	0.69	0.79
Team	—	—	3.37	0.74	0.77

**P<. 01

7. Results

Hypotheses 1, 2 and 3 are all fully supported. (See Table 4 and Table 5.)

Hypothesis 1. Compared to those who climb the ladder, those who do not climb the ladder make fewer contributions to both team and commercialization.

Hypothesis 2. Those who climb the technical ladder contribute less to commercialization but show no difference from those on the managerial ladder in their contributions to team.

Hypothesis 3. Directors are more active in commercialization than managers.

The evidence shows that those who climb the ladder are more actively involved in management, confirming Hypothesis 1. Since contributions to team are relatively simple to implement, the reason for lack of advancement by those who remain researchers appears to be a lower level of contribution to team than those promoted to senior researcher.

Turning now to Hypothesis 2, our evidence confirms that the contribution to team of senior researchers on the technical ladder and managers on the managerial level are similar. Senior Researchers are exposed to virtual experience that prepares them for management and promotes greater involvement in operating activities. Senior researchers, however, do not contribute as much as managers to the commercialization of research results.

The greater contributions to commercialization

of the managers may reflect the demands of their position on the managerial ladder or, alternatively, commercialization contributions whose recognition resulted in promotion. The data collected by this survey are not, however, sufficient to justify the conclusion of a stronger correlation with one or the other possibility. To discriminate between them will require research using longitudinal data.

Evidence supporting Hypothesis 3 suggests that directors' greater involvement in commercialization reflects their greater responsibility in this area or, alternatively, that involvement in commercialization while still manager leads to promotion to director. For the same reasons described in the case of Hypothesis 2, a clear causal connection with one or the other cannot be verified.

8. Conclusions

Japanese researchers' career ladder is not the dual ladder system divided by academic degrees found in Europe and America. All researchers start out focusing entirely on research. It is only when reaching middle age that they may be promoted to Manager, the first step on the managerial ladder. Even then they remain involved in research while taking on additional managerial responsibilities. It might seem that they are loaded with heavy responsibilities, but in fact this is not so. Before becoming managers, they were exposed to bosses and colleagues who served as role models, and their own participation in management added to their management experience. They are, thus, trained and ready to function as managers.

The results of our quantitative research on how management activities change as researchers climb the ladder are summarized in Figure 3. Here we see evidence that senior researchers participate in a greater number of activities that result in contributions to team than do ordinary researchers. For them, this career stage becomes a time of training for future responsibilities. Senior researchers and managers do not differ in their contribution to team. Their difference lies in their contributions to commercializing the results of research. For their research to succeed, senior researchers must take steps to enhance the performance of their teams. Since, however, they

Table 4.　Comparison between Ladders on Contributions to team

	Managerial Ladder：　Director．（N=5）Manager（N=35） Technical Ladder（N=52）　Not Promoted（N=41）	P
	Technical Ladder ＞ Not Promoted	.004**
	Managerial Ladder（Manager）＞ Not Promoted	.017*
	Managerial Ladder（Manager）＞Technical Ladder	.738
	Managerial Ladder（Director）＞Managerial Ladder (Manager)	.143

Mann-Whitney Test *P<.05, **P<.01

Table 5　Comparison Between Ladders on Contributions to Commercialization

	Managerial Ladder：　Director . (N=5) Manager (N=35) Tech Ladder (N=52)　Not Promoted (N=41)	P
	Technical Ladder ＞Not Promoted	.023*
	Managerial Ladder (Manager) ＞Not Promoted	.000**
	Managerial Ladder (Manager) ＞Technical Ladder	.001**
	Managerial Ladder (Director.) ＞Managerial Ladder (Manager)	.023*

Mann-Whitney Test *P<.05, **P<.01

are not under pressure to contribute to product commercialization, they are less involved in this activity than are managers. Upon promotion to director, they focus on business activities related to commercialization.

Finally, a few words must be said about the limitations of this study. It is only a pilot study, with a small quantitative research sample. A large-scale survey of the semiconductor industry as a whole and comparisons with other high-tech industries remain issues for future research. But even the most massive quantitative study will not suffice to demonstrate the process by which motivation becomes behavior and to explicate the framework in which experience-based learning is tapped in future activities. These questions can only be addressed through longitudinal research that tracks careers over time and covers researchers' superiors, subordinates, and colleagues, as well as the researchers themselves.

One additional point needs to be made. The subjects of this study were not employed in departments responsible for basic research or cutting-edge research, where commercialization is a long-range goal. Whether the influence of academic degrees and contributions to management activities differ from those found in the development departments examined in this study is a deeply interesting question. Those for whom commercialization is only a distant prospect are less likely to be directly involved in making contributions to commercialization, and their contributions to team are likely to lie in improvements to the efficiency of R&D activities. A shift of focus to those involved in basic research or working on the cutting edge of technological innovation is likely to reveal researchers with a more cosmopolitan, science-only orientation.

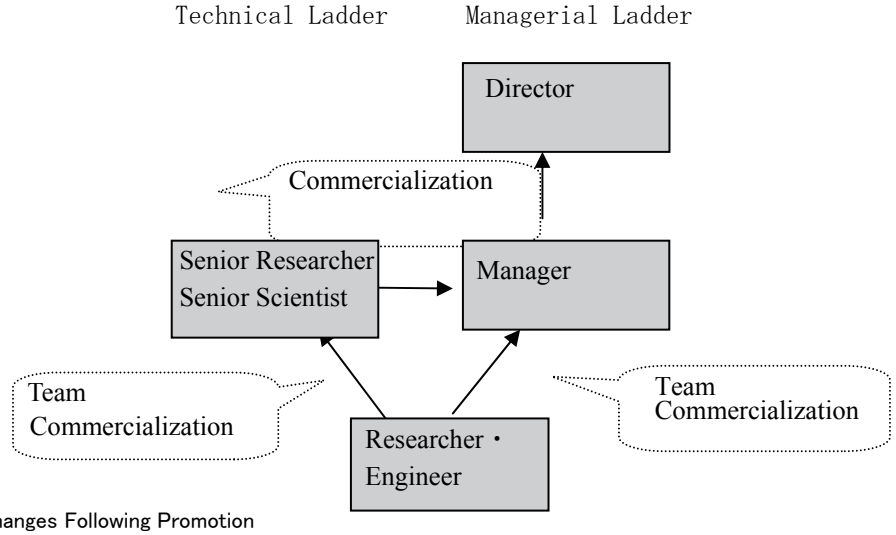

Figure 3: Changes Following Promotion

REFERENCES

Allen, T. J. & Katz, R. 1986. “The dual ladder: motivational solution or managerial delusion”, *R&D Management,* Vol.16, No.2: 185-197.

Allen, T. J. &Katz, R. 1992. “Age, education and the technical ladder”, *IEEE Transaction on Engineering Management*, Vol.39, No.3: p.237-245.

Furukawa, R. & Goto, A. 2006. “The role of corporate scientists in innovation,” *Research Policy*, Vol. 35: 24-36.

Gouldner, A. L. 1957. “Cosmopolitan-Locals: A Factor Analysis of the Construct”, *Administrative Science Quarterly*, Vol.2: 223-235.

Kerr, S., Von Glinow, M. A. & Schriesheim, J. 1977. “Issues in the Study of Professionals in Organizations: The Case of Scientists and Engineers,” *Organizational Behavior and Human Performance*, Vol.18: 329-345.

Kornhauser, W. 1962. *Scientist and Industry: Conflict and Accommodation*, University of California Press

Marcson, S. 1960. *The Scientist in American Industry: Some Organizational Determinants in Manpower* Utilization, Harper& Brothers., Harper & Brothers.

Moore, D, C. & Davis, D.S. 1977, “The dual ladder-establishing and operating it” *Research management*, Vol.20: 14-19.

Pelz, D. C & Andrews, F.M. 1962. *Scientists in Organizations*. John Wiley and Sons.

Thompson, P.H. and Dalton, G. 1976, “Are R & D organizations obsolete?” *Harvard Business Review*, November-December: 105-116.

Wallace, J.E. 1993 “Professionals and Organizational Commitment: Compatible or Incompatible,” *Journal Vocational behavior,* Vol.42: 333-349.

Pfeffer, J. 1994 “Competitive Advantage through People,” *California management Review*, Winter: 9-28.

Goldner, F.H. & Ritti, R. R. (1967) “Professionalizationas Career Immobility,” *The American Journal of Sociology*, Vol.72: 489-502.

Raelin, J.A. 1994. “Three Scales of Professional Deviance within Organization”, *Journal of Organizational Behavior*, Vol.15:483-501.

The following is printed in Japanese

Ito,M.1992:

伊藤実（1992）「技術革新と日本型研究開発システム―人と情報のフィードバック・ループ―」『日本労働研究雑誌』, 393号, 2-12頁。

Ito,M.1993:

伊藤実（1993）「研究開発技術者の企業内育成の現状」『日本労働研究雑誌』, 401号, 22-29頁

Imano,K. 1992:

今野浩一郎（1992）「技術者の労働市場と求職行動 ―日米英独の国際比較―」『日本労働研究雑誌』, 393号, 13-23.

Che,I. 1997:

蔡芒錫（1997）「研究開発組織における中間管理職の役割：上司の「自律的戦略行動」が部下の満足や組織コミットメント、研究成果に及ぼす影響」『組織行動研究』Vol.27,pp.17-28.

Che, I. 1999:

蔡芒錫（1999）『プロフェッショナルの研究成果の決定要因』慶應義塾大学産業研究所.

Sakakibara, K. 1995:

榊原清則（1995）『日本企業の研究開発マネジメント―“組織内同形化”とその超克―』千倉書房。

Fujimoto, T. 1998:

藤本隆弘（1998）「自動車産業の技術系人材形成」『日本労働研究雑誌』, 458号, 37-49頁.

Fujimoto, M. 2000:

藤本昌代（2000）「企業内プロフェッショナルにおけるコスモポリタンとローカルの併存性」『日本労務学会誌』Vol.3,pp.13-24.

Fujimoto, M. 2005:

藤本昌代（2005）『専門職の転職構造』文眞堂

Misaki, H. 2004:

三崎秀央（2004）「研究開発従事者のマネジメント」中央経済社

Morishima, M. 1998:

守島基博（1998）「研究者の業績と企業の人的資源管理」一橋ビジネスレビュー46巻1号, pp.61-73.

i Based on qualitative and quantitative research the author carried on the electronics industry, including semiconductor firms, from 2003 to 2008.

ii The conflict in roles occurs in the interstices between the two positions of scientist and organization man; considerable earlier research has addressed it. (See Che, 1999; Goldner and Ritti, 1967; Fujimoto, 2005; Kerr, Von Glinow, and Schriesheim, 1977; Kornhauser, 1962; Marcson, 1960; Raelin, 1991). This essay focuses on the contrast of roles at the point of rising on the ladder.

iii Interview data were collected from 72 researchers who worked for Semiconductor Consortiums; MIRAI, Selete and STARC between 2003 and 2005 and 40 researchers who worked for eight private companies between 2002 and 2006.

iv Efforts to gather information, defining issues, staying on budget, efforts to negotiate, business, etc.

v Thompson and Dalton (1976) have pointed out that as an employee's career advances, he or she has external points of contact in order to provide useful information to the team and comes up with ideas to stimulate other team members, serving a mentor-like role. That is similar to the activities defined as organizational contributions here.

vi Thompson and Dalton (1976) also note that when an employee's career advances further, external interchanges, contracts, and sharing information can have a significant influence internally. Such personnel play an important role in supporting and training those who will perform important roles in the future.

vii The people making up the consortium were temporarily dispatched for a three year period from semiconductor device manufactures. Thus, their attitudes towards their work and expectations for their careers do not differ from those researchers at private-sector firms.