Capturing Learning and Applying Knowledge: An Investigation of the Use of Innovation Teams in Japanese and American Automotive Firms.

by

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Published in 'Journal of Business Research',
volume 47, issue 1, pp 35-45.

ELSEVIER

Capturing Learning and Applying Knowledge: An Investigation of the Use of Innovation Teams in Japanese and American Automotive Firms

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Many organizations view teams as a means to enhance the development of new products and systems. Here we report on the use of teams by two automotive firms. Each organization used different approaches to meet the same goal—innovation to reduce costs. Choice of strategy is significant in determining the level of output teams achieve. An important role is played by those outside firms in stimulating ideas and learning. However, the team plays a crucial role in selecting these externals, with attempts by the organization to provide predetermined experts appearing to be limited. This external assistance coupled with a team's internal drive to improve are significant in raising the quality of an innovative product. Efforts by firms to enforce standardized procedures have paradoxical impacts, resulting in the initial constraint of the team ideas, while enhancing any benefits of innovation across the whole organization. J BUSN RES 2000. 47.35–45. *© 1999 Elsevier Science Inc. All rights reserved.*

The use of work teams has increased in all types of organizations. Automotive manufacturers are at the forefront in using teams. For these organizations, the deployment of teams goes hand-in-hand with the operationalization of lean manufacturing techniques, as in the Toyota production system (Forrester, 1995). In questioning why we find this upsurge in the use of teams, increasingly the answer seems to be the potential improvements that teams can make in the effectiveness and efficiency of both products and processes (Campion, Papper, and Medsker, 1996). This study explores the application of innovation teams in two automotive firms operating in the UK, but owned by US- and Japanese-based organizations. All of the teams are specifically used to innovate. This paper considers the different strategic responses and outcomes to their utilization, the relationship between innovation and learning, and proposes some recommendations for teams' future application.

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Strategy and Teams

Teams are frequently cited in the management literature as providing a competitive advantage for organizations (Tjosvold, 1991). Using Porter's (1985) model, it is evident that the competitive advantage in this situation stems from focusing on reducing cost, as opposed to any differentiation of product. This view is corroborated by Campion, Medsker, and Higg (1993) who suggested links between teams and productivity and efficiency, through cost advantage. In this paper, both of the organizations sought to innovate through using the multiple inputs that teams offer. At the core of both of these policies was a need to increase competitive advantage by cost advantage, gained through the financial savings the teams' innovations could produce.

Learning and Innovation

A review of the literature reveals an apparent overlap in the models of learning and innovation. Interest in learning, from an organizational perspective, increased dramatically during the 1980s, as organizations sought to turn themselves into "learning organizations." Within the UK, the automotive sector has been at the forefront of organizations introducing open learning policies and facilities for all their staff. As with increased utilization of teams, this policy is an effort to increase the individual's contribution to the firm. The learning policy is aimed at individual enhancement; the team issue is aimed at the potential synergy bonus of individuals working collectively on problems. Attempts have been made to categorize organizational learning into two distinct types (Argyris, 1982). The first, defined as single-loop learning, involves the rectification of a mismatch between desired and actual states. A far more profound level of learning is, however, achieved through a double-loop process. In this, although a mismatch is again identified, the process involves revisiting and questioning the underlying values surrounding the situation or issue. This

Journal of Business Research 47, 35–45 (2000)

655 Avenue of the Americas, New York, NY 10010
ISSN 0148-2963/00/$–see front matter
PII S0148-2963(98)00049-6

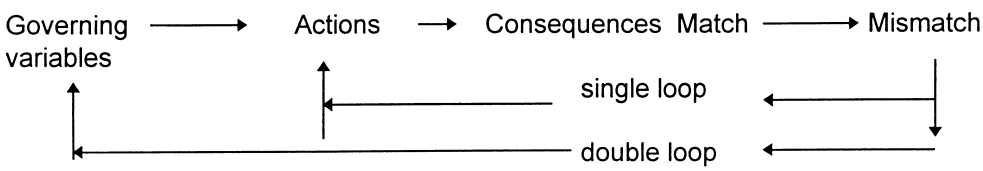

Figure 1. From Argyris, 1982, p. 8.

provides the basis for the double loop, as can be seen clearly in Figure 1.

Argyris (1982) argued that in organizations, learning effectiveness and innovation capability were positively linked. This view was supported by research specific to the automotive sector by Pascale (1990). In this study, he established a dichotomy similar to that of Argyris regarding learning, relating each type to an innovation outcome. His first learning category, small "l", focused on incremental improvements in baseline performance. This was found in his U.S. automotive organization. In contrast, the second type of learning, big "L," was more evident in his Japanese organization. As with Argyris' model, this second type of innovation encompassed a far more radical shift in what constituted the actual baseline of performance.

A similar distinction between incremental versus radical improvements can also be found in the literature. Bessant (1992) highlighted the importance of incremental improvements in producing competitive success. Coldwell (1996) developed these arguments further suggesting a link between competitive advantage and type of innovation strategy for organizations adopt. He proposed that the more radical the innovation, the higher the strategic risk for firms. He went on to describe how more radical ideas cross an "innovation boundary," which breaks the continuity in the organization, thereby increasing the risk incurred. The dilemma for the organization, he argued, was that the greater the competitive advantage produced from the innovation, the larger was the degree of risk associated with it. Through this model, he distinguished between "improvements" that do not pass the innovation boundary from their more radical and risky counterparts, *innovation*.

Therefore, an important link between innovation and learning relates to the issue of continuity. Learning is a form of change, and the more radical that change, the more profound its impact. Changes to the baseline, or fundamental, values, as outlined above, are accompanied by breaks in the continuity for any organization, as it seeks to accommodate or assimilate the new information into its existing knowledge. Research by Bouwen and Fry (1988) and Bouwen, De Visch, and Steyaret (1992) has explored the impact of new knowledge in terms of innovation in organizations. The model they propose for successful acceptance of innovation by organizations identified the balance of three crucial behavioral tasks (Figure 2).

The first aspects, in line with Colewell's (1996) work, emphasized the role of continuity. Bouwen, De Visch, and Steyaret (1992) then identified how the organization thought about new ideas and either achieved transition to the new idea, or did not. The accommodation of new learning they term "new logic," which replaces its previous knowledge or "dominant logic," (Bouwen, De Visch, and Steyaret). Through this research, they link learning to an on-going social construction of knowledge and understanding occurring within organizations. The success of an organization in implementing innovations, Bouwen, De Visch, and Steyaret argued, depends upon the gap between the new idea and the existing understanding or logic. In particular, their research highlighted the importance of individual, group, and organizational learning. Throughout the innovation process, they argue that the individual's knowledge, termed "action logics," are reframed by on-going discussion to produce new, shared logic. As a result of this, Bouwen, De Visch, and Steyaret argued, a tension is produced in the organization by the emergent individual's new "action logic," or learning. As the distance between the organization's logic and the new logics widens, the organization is faced with the dilemma of continuing their older understanding or breaking with it and commencing transition to the new logic.

Returning to Pascale's (1990) model, it is evident that in the case of small "l" or improvement-based innovation, there is limited tension or gap between the firm's existing knowledge. Organization's risk is, therefore, at very low levels, because any break with continuity is minimal. The parallel between Colewell's (1996) and Bouwen and Fry (1988) and Bouwen,

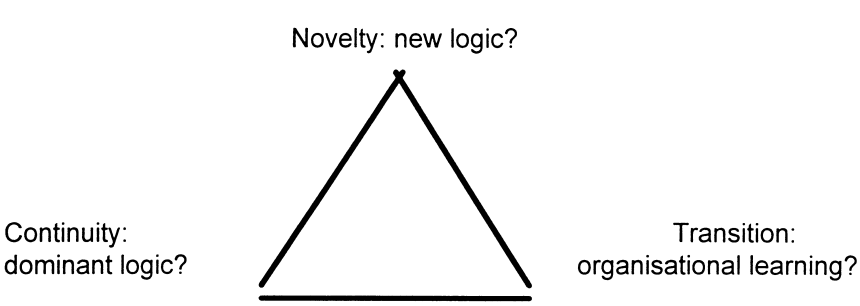

Figure 2. Tracks of innovation management from Bouwen, De Visch, and Steyaret, 1992, p. 123.

De Visch, and Steyaret (1992) work lies in the transitionary phase, in which the organization is forced to break with its existing perspectives. Colewell, in his 3-D model of innovation, shows this break in terms of a "wrinkle," in which the organization is literally stopping and going backward in order to subsequently go much further forward. Through Bouwen's work, the increased risk associated with innovation can be clearly seen in terms of the distance from the organization's existing learning. The importance of Bouwen's work is that it highlights the social nature of the learning process within organizations.

Teams and Innovation

Research into team innovation is a significant contribution to our knowledge of those factors important for successful development and implementation of innovation. Studies also illuminate factors significant in the actual generation of new ideas. The importance of sociopsychological elements has increased over the years as research has moved away from an emphasis on organizational processes.

In terms of organizational learning, attempts to define innovation highlight the role of novelty only as it applies to that operational unit. Therefore, it is possible that what are innovations in one area, may be standard practice in another. The issue for organizations is that the idea is new for them. The distance from the firm's previous learning will determine how profound the transition is for them. Innovation, as distinct from creativity, is concerned with the intentional and applied adoption of a new idea. Therefore, it focuses on the practical application of ideas.

Much research has concentrated on how teams are structured to foster and implement new ideas. Studies of ideal composition have tended to focus on a number of facets: the identification of specific roles (Belbin, 1981); the correct size (Gersicka, 1983); the optimal age of members (Mumford, Olsen, and Jones, 1989); and finally, the impact of longevity of teams (Payne, 1990). Although there seems to be limited agreement on the precise requirements for a team, this lack of consensus serves to highlight the impact of more fundamental psychological processes. For example, in the case of team size, the more members in a team, the increased likelihood of social loafing or free-riding (Albanese and Van Fleet, 1985), and also added coordination difficulties (Hackman, 1987). In terms of longevity, Janis's (1972) work on "group think" highlighted the negative implications for the exploration of new ideas by mature teams. A further underlying factor is the homogenous nature of team members. Interesting work has investigating the impact of minorities in teams (Nystrom, 1979; Moscovivi et al., 1985; Zadaniuk and Levin, 1996). These studies have indicated the important part minorities play in opening up groups by providing new perspectives and viewpoints. Linking all of this work are those exploring group cohesion and innovation. The research points to the paradoxical value of both heterogeneous and homogenous team members. Further investigation from a longitudinal perspective has indicated the need for heterogeneity of membership in the initial idea generation phase, but homogeneity in the implementation of ideas (Nystrom). However, homogeneity has been found to limit innovation in groups (Crosby, 1968), but plays an important role in team cohesion, which may facilitate innovation through feelings of trust or psychological safety among team members (West, 1990).

It is apparent from these studies that the process of innovation can be divided into at least two stages. The first stage of idea generation and development highlights the role of minorities in the production of ideas. As Bouwen and Fry (1988) indicated earlier, new "action sets" can be linked to heterogeneity of team membership, where thinking and scope of ideas need to be liberated. A productive avenue of inquiry relates to the sources of these new ideas. Research examining innovation through organizational networks in sectors has identified the importance of the external interface between firms (Conway, 1995). This work, building on Allen's (1977) studies, has shown the role of certain individuals who play a crucial part in providing the team with up-to-date (external) information. Termed "boundary spanning" (Conway), this behavior seems to be an important characteristic for innovators. The link between external influence and innovation corroborates Quinn and Cameron's (1988) findings. They identified two important organizational dimensions for innovation concerning flexibility from formal procedures and openness to outside influences. The more heterogeneous a team's members, the potentially wider the range of external contacts, and therefore, the more disparate the action logics available to the team, but also the greater the tension between the organization's dominant logic and that of the team.

More macro-organizational factors have also been assessed in relation to their influence over team innovation. Elements emerging as significant have included training (Anderson and West, 1994), the emphasis on goals (Lawler and Hackman, 1969) support from management (West and Wallace, 1988) and effective participative communication (Kanter, 1989). Evidence for team effectiveness notes the importance of autonomy and control for the innovative team. Many researchers have highlighted the positive role of communication both within and across teams, and the role of leaders or ambassadors for ideas (Kanter; Tjosvol, 1981).

There has been much less theoretical or empirical agreement over the process innovation follows in teams. The limited work in this field is dominated by the group dynamics movements and has produced several models outlining the sequence of group development (Tuckman, 1965). In all of these models, group development is regarded as an almost inevitable progression, a view that has been challenged (Fisher, 1970; Gersick, 1988) both in terms of the linear ordering of these sequences and the possibility of multiple and concurrent activities. Attempts to understand what actually triggers

changes in teams have been limited. Gersick suggested that deadlines and external influences are important. However, replications of this work have failed to corroborate this.

Although innovation can be regarded as a form of organizational learning, there have been few attempts to explore it from the perspective of teams operating within an organizational context. The lack of consensus in the research on teams points to a complex interrelationship between individual, team and organizational elements. This research sought to examine what factors teams regarded as important in facilitating and/or preventing innovation. It is likely that the pattern of interaction between the different levels of analysis is key to understanding how innovation, teams, and learning inter-relate.

Research Methodology

This study took the car industry as its focus. This sector is well known in the UK as a leading innovator and one of the first to introduce open learning into manufacturing. Two organizations were selected that stated they used teams to innovate. Both organizations were operating within the UK with head offices elsewhere in the U.S. and Japan, respectively. To control for organizational differences, two sites were selected that built comparable small- to medium-sized cars. Team members were randomly identified from each site. All were UK nationals, and the sample comprised between 16 and 18% of population of each site. The data were collected using a semistructured interview technique in which team members were asked to recall their recent experiences of innovating within a team. Following this "story" telling, open questions relating to specific aspects of their experience were asked. This more grounded based approach initially facilitated a more open exploration of their experiences; whereas, the more standard questions ensured common perspectives could be captured.

Each of the interviews was then transcribed verbatim and using discourse analysis, and common themes were identified regarding innovation in teams. On the basis of this analysis, a posteriori coding system (Altheide, 1987) was devised collecting the themes the respondents had noted as important. (This approach was selected in preference to a predetermined coding system as a means of allowing the study to reflect aspects the teams determined were important). All of the transcripts were then coded. From this coding, an edited document was produced, which included all the coded "meaningful segments" (King, 1994, p. 26) of the text. At this stage, there were 86 clusters. To ensure both the validity of the coding of the selected segments, and to identify higher-order clusters, an independent researcher Q-sorted all of the statements (Hycner, 1985). As a result, the clusters were collapsed to 29 higher-order aspects with acceptable reliability levels between the coders ($r = >0.7$).

The clusters that emerged from the interview covered five broad areas. These included aspects relating to organizational strategy and standardized procedures, the team's innovation process, team composition, learning and innovation, and interface with the external world. These are discussed in turn with illustrations from the interviews to contrast the differences and similarities found between the firms (segments of text appear in boxed bold Italics).

Findings

STRATEGIC PERSPECTIVE AND STANDARD ORGANIZATIONAL PROCEDURES. Each of the organizations adopted a very different strategic response to their applications of teams. Linked to this was the use and enforcement of standardized organizational procedures aimed at facilitating the teams in their innovation role. Table 1 is a summary of the findings.

One of the most obvious differences between the two organizations became apparent when setting up the interviews. Each of the firms organized its innovation teams very differently. In the U.S. firm, a top-down approach was adopted through establishment of a stand-alone team of engineers and other specialists. The members of the team were drawn from all areas of the business, including design, production, and purchase, with the designated remit of innovating only for that product. The reverse was found in the Japanese organization, in which a bottom-up approach was taken. In contrast to the U.S. operation, the Japanese utilized many teams, operating on a far more fluid basis, and drawn mainly from distinct production areas. Team innovations were a regular feature of every area of the plant, with the membership of individual teams changing constantly. The individual teams were short-lived, lasting for only 2 days. Frequent members included shop floor operators, who would probably be part of a team once a year, supervisors who would have at least three teams a year, and engineers who would participate far more often each year.

Related to the strategic decision, differences emerged about the organization level each firm saw innovation as cascading toward. Through their policy, the Japanese sought to make innovation a part of every employee's role, regardless of levels. In contrast, the U.S. decision concentrated innovation among fewer staff members. Innovation was to be pursued by "ideas champions," who each had a discrete area. By adopting such distinct strategic decisions, each organization also indirectly informed staff about their role in generating new logics and insights. The Japanese located innovation across the whole organization; whereas, the U.S. firm saw only the *implementation* of ideas as the domain of all staff. We can only speculate whether the following quote from a U.S. team member is a cause or an effect of this policy.

> It's only certain people that pick up an idea and run with it. And if they're not very forward-looking they won't bother.

The final objective of using teams for innovation was the same for both firms. Although quality and safety aspects were mentioned, the over-riding goal for both teams was cost reduction. Thus, innovation was used as a means to achieve savings

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Table 1. Strategic Response and Organizational Procedures

Areas	Japanese Findings	American Findings
Strategy	Bottom up, cascade approach	Top down, no cascade
Objective	Financial savings	Financial savings
Use of appraisal system	Focus on achieving annual targets no. of innovations required from supervisor; area for innovations set annually	Emphasis more on quality of innovation; innovators entered into company-wide reward scheme based on value of savings
Use of innovation process	Innovations followed predetermined procedure, impact = limits type of innovation that could be done	Formal procedure available; innovation conducted with no adherence to formal process
Dissemination of ideas	Set procedure for collecting ideas; supervisors expected to implement all relevant ideas in own section	Informal dissemination based on informal networks of contacts around firm
Use of experts	Organization identified internal "advisors" identified on company basis	Champions chooses their own experts; both from within larger team and spanning number of organizations

through changing systems, developing new materials and component applications, or through staff reductions. In each firm, the teams had to calculate specifically both the cost implications and savings of "pay-back" from their ideas. Ultimately, financial considerations were behind even safety or quality issues, with teams having to justifying any expenditure. Therefore, comments related to this were very similar.

> All your evaluations are tuned to what's the best value for money, what's the best techniques.
>
> It is cost related and it is also manpower related.
>
> Generally, you get a budget (for each innovation). . . . But the main idea is that it's low cost and implemented quickly.
>
> If it saves money, just do it!

Only one organization used formal organizational procedures to support and promote innovation. The Japanese organization's members repeatedly commented on a number of procedures. These included the 2-day stages through which teams had to go, an appraisal procedure, and dissemination systems from their ideas. Each teams' supervisor was given a specific number of innovation targets to meet by their line managers. Potential innovation areas were discussed and agreed upon beforehand. Supervisors reported being dissuaded from tackling areas that would either have an impact on a number of departments or would be in any way controversial. The finalized objectives were given to supervision across a shift as a means of ensuring support and acceptance of innovations in that area. Although appraisals were used in the U.S. organization, the team leader mentioned these only in passing. Each organization focused on very different aspects of appraisal, with the Japanese company measuring both quantity and quality of initiatives, contrasting with the emphasis on quality by their U.S. counterparts. Also, the U.S. firm's innovators could be candidates for an international annual financial award if the savings they achieved were substantial.

The Japanese operation had further processes designed to collect and disseminate the innovations across all the teams. (Many supervisors used this as a development opportunity for their staff's presentation skills.) In this way, the Japanese organization created a positive culture for the transfer of innovations. As a result of this dissemination, teams across the department were expected to adopt any relevant ideas without question. In the U.S. firm, communication about new ideas were spread on a more ad-hoc basis. The team had formal meetings to inform one another of their projects. There was no formal communication with other teams about the developing innovations. Perhaps this is not surprising for an organization wherein, as one interviewee commented, even production across shifts did not follow a standardized procedure.

A final system the Japanese used was standarization of expert information. Each site had a number of Japanese nationals, whose role was to act as advisor to the teams. These advisors were selected for their expertise and would be based at the plant for 2 years. The interviews, however, revealed significant problems with the actual operation of this system. Comments indicated that the advisors rarely contributed to the generation and/or development of the team's ideas. Two reasons were proposed for this; teams either perceived that advisors lacked expert advice, or worse, they felt information was deliberately withheld from them. Staff knew informally that information was available, but was not disclosed to them. They also knew that their ideas were going back to be used in Japan. Therefore, we wonder about exactly how much advisors were, in fact, to aid dissemination.

Over all, the interviews suggest that use of the standardized procedures operating within the Japanese context may have had the opposite effect than that intended. Comments regarding the team's set innovation procedure suggested that it served to narrow the focus of the final idea and that supervision often had a predetermined outcome and were merely using the system to give the illusion of team participation. Those interviewed noted that sometimes there were areas in need of innovation that were not selected; whereas, those for which there were easy solutions were quickly selected. They felt the emphasis was on achieving the right *quantity* of innovations. Of all the procedures, only the dissemination system was seen

Table 2. Team Process Aspects

Areas	Japanese Findings	American Findings
Impact of time scales	Tight time scale resulted in self-censorship of idea produced	More accommodating time scale, no comments made regarding self-censorship
Stages of innovation	Idea generation and Implementation by team	Idea generated by one team, passed to others for implement
Role of suppliers	Only as a source of materials for final solution	Involved idea generation, development, and material source
Communication	High intra- and interteam level; low interorganizational	High intrateam and interorganizational, low interteam

to contribute to fostering a climate of innovation. It created an expectation of change and an atmosphere of acceptance of team-determined innovation across the firm. Within the U.S. firm, the lack of any formal dissemination system and the reliance on informal networks to spread knowledge, gave long-serving staff distinct advantages over their junior colleagues. It also potentially resulted in the duplication of effort across the organization as a whole.

TEAM INNOVATION PROCESS. There were four differences across the organizations in terms of the processes innovation teams followed (Table 2).

As previously commented upon, the Japanese team had a formal procedure that was rigidly enforced. This, coupled with the tight time scale the teams had to operate within elicited a number of comments. The combination of the two seems to have resulted in employee reticence. They chose not to mention good ideas, because, either they felt their team would not have the time to explore them adequately, or the outcome of the innovation was predetermined; therefore, there was little reason to raise alternatives. Within the U.S. team the time scale was both longer and more flexible. Team members were free to negotiate additional time if they put together a suitable argument. Self-censorship was never mentioned by this group.

The strategic deployment of the teams produced differences in the task of innovation between the two organizations. The Japanese team was responsible for generating, developing, implementing, and disseminating ideas. In contrast, the U.S. team's formal role was focused only on generation and development aspects. As one team member explained:

> They were able to tell us that that was the problem. From then on it was up to us to solve the problem really.

The team handed over implementation of their ideas to others. Many team members monitored the implementation of their innovations, but this was on a purely voluntary basis. No comments were made of any failed implementation of the team's ideas; however, whether this was as a result of their success, or because of lack of awareness of the true situation we cannot say.

In both organizations communication was seen by respondents as an important factor. The process of innovation in both firms (because it was of team-based nature) inevitably involved the exchange of information and the sharing of ideas or points of view. The most obvious differences in this area was found at the interteam level. The Japanese teams engaged in far more checking behavior between teams prior to commencement of an innovation. They were very concerned about any unforeseen implications stemming from implementation of their ideas. Time was spent before commencing upon any innovation in agreeing on the area to be focused upon and canvassing other teams to ensure their actions would not interfere with the others. In this way, the organization can be seen as seeking to control and reduce potential risks that might be incurred through innovation. In some cases, where innovation was most needed, this resulted in those areas being ignored. One poor aspect of communication in this context was the relationship with the Japanese advisors. The communication breakdown was obvious merely by visiting the site at lunch break. In the canteen, was a table of Japanese advisors, who did not mix with anyone else. The U.S. team, in contrast, would position tables so that their entire team and the guest advisors could eat together. Related to this interteam communication, the U.S. team was again more informal and ad hoc. However, there were problems as a result of this, particularly between product design and production, where this team argued that designers had forgotten how their products were actually produced!

A further element of communication frustration mentioned was organization politics. However, the approach of each firm was quite different. A number of comments were made in the Japanese organization relating to team members warning each other of problems, especially where the need in an area for innovation was being played down by managers. Pascale (1990) argues that this is a case of the organization subverting the innovation. In contrast, the U.S. operation used their leader far more to manage this political interface. He saw himself as responsible for raising the profile of the team in the wider community smoothing out potential problems for the team. As the leader noted:

> So part of the job has to be to try and keep them aware as much as possible of all the background influences that can affect that particular part of the job.

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Table 3. Team Composition Aspects

Areas	Japanese Findings	American Findings
Composition of team	Prescribed team membership; from specific area across both shifts, one central engineer involved	Flexible, idea champion selects own team as required
Leader	Facilitates team through set process	Facilitates team in wider organization, passing own relevant information
Support of management	Determines area for innovation to guarantee success	Providing wider support and exposure for the team's work

The team, although aware of this role, did not feel the politics of the organization affected their innovation outcomes. This suggests that the leader was effective in his ability to liberate the team from potential interference.

One striking difference between the firms was the role of suppliers in innovation. The U.S. firm used suppliers to generate and pilot new ideas. The Japanese organization only used suppliers to provide the goods and materials the team requested. The supplier was reported as playing no part in the innovation process.

Team Composition

Each organization was concerned about the composition of their teams. The role of team leadership was also quite distinct. Within the firms, communication style and focus were different. Team composition is shown in Table 3.

In the case of the Japanese organization, strict conventions ensured teams comprised a supervisor, three or four line operators from across both shifts, and central engineering. The U.S. operation had much more flexibility concerning who was involved. The team comprised staff from all the departments that might have a role to play in innovation. The team's leader identified a suitable champion for each project. It was then their responsibility to work with the most appropriate staff. As a result of this, the involvement of other team members in projects was very fluid. The whole team occupied a large open plan office in groupings of four related staff. The involvement of others was, therefore, inevitable, very informal, and more in terms of an on-going discussion. One team member did report a major concern about the larger team.

> At the moment we tend to have a problem at the beginning getting people when the problem comes in, . . . getting the right group of people together.

Management support was a feature of both organizational approaches. In the U.S. operation, the team noted the information and support given by their leader. His leadership style was noninterventionist, preferring to ask in passing if there were any problems. He would regularly ask staff, but preferred to facilitate rather than direct them. In support of this, he also noted how effective they were in implementing their objectives when he was away. The team leader said:

> My role is the interface of the team with senior management.

In the case of the Japanese operation, management supported the team through determining the scope of each innovation before it commenced. However, despite the thoroughness of this procedure, there were examples of situations where innovations had been developed, only to be followed by major product changes that subsequently rendered the project redundant. Interviewees felt that their managers must have known about these prior to the innovations starting. In reflecting on the purpose of these meetings, it could be argued their aim was to ensure the success of the outcome, with this time being spent to try and guarantee this. The "impression" of success in innovation was important throughout this organization. It could be assured by two means—the nonselection of problem areas, and the predetermination of solutions for others. As two respondent explained:

> The company justifies projects—it's worried by devising this unsatisfactory solution and not being able to get it opened again.

> They changed process to let them have at least one successful outcome in the time parameters.

Learning and Innovation

Across both organizations there were similar attitudes and drive toward improvement. However, clear differences can be found in how this manifested itself within each firm (see Table 4).

Individuals in both operations talked of their desire and effort to improve their innovations. The Japanese firm's employees continually identified opportunities to learn. They saw great value in analyzing mistakes and using them as learning resources. Leaders highlighted opportunities to develop or coaching others through their mistakes. The organization, in terms of training, had set up an infrastructure to ensure the different tools for innovation were utilized following initial training. They had set up a department designed to coach individuals through the innovation process and to support them. As a result, they expected staff to adhere to the innovation stages and tools they had been trained to use. One surprising finding, given the importance from the training of not having predetermined solutions, was the perception that the

innovation outcome was sometimes preset. The U.S. operation was quite different with regard to training. No mention was made of mistakes. Although they had also embarked on a major innovation process training, no attention has been given to a follow-up process. The comments on this subject speak for themselves.

> I don't say I could go out and do one just like that, but at least I've got a much better idea now than when I started.
>
> We should have done (applied the training), but we didn't do.
>
> Yes (I'll apply it) sometime as long as I haven't forgotten all about it by then. But I've got the books so . . .

The U.S. did not feel process drive, instead staff used more intuitive approaches. No attention was paid to practicing the newly acquired skills. One team members reflects the common attitude toward the value of the training received.

> We knew what the problem was, we knew what the cure was. . . . But basically we've just confirmed everything we'd already been doing (before the training), mentally if you like.

A common feature of the organizations lay in the styles of learning adopted. Both focused on an action-oriented approach with the extensive use and development of prototyping. One of the Japanese firm's team members explained:

> I did a prototype and just kept breaking that one up and making one up again until I got it right.

The Japanese strategy sought to make innovation, and also learning, part of every person's role. The emphasis on coaching styles by supervisors, who were the team's leaders, can be seen as an attempt to ensure every opportunity became a learning one. However, it is interesting to note that no comments were made by supervision about a similar approach being taken by their managers.

External Interfaces of the Teams and Use of Experts

One overarching area of difference between the organizations lies in the openness and utilization of those outside the formal team. There were marked differences in the use of external sources of information and assistance during the team's innovation process. Both teams recognized the need to innovate, however, the sources of information used by each were very different. The U.S. team had access to both internal sources, relating to costs of production, and external, in the form of customer feedback. In contrast, the Japanese team's input was almost entirely internal.

During the generation and development of innovation, the U.S. teams focused continually on external assistance. They involved others not only in the generation and development of innovation, but also in the clarification of actual objectives of the project. They actively sought involvement, particularly from suppliers. The Japanese used external assistance only at the end of the process to source the final solution. They did not use external help in generating solutions.

The Japanese firm's teams had at their disposal a small internal group to manufacture their ideas, however, again, they played no part in designing the solutions. Only the central engineer team member was from outside the production area. Over all, the Japanese teams can be characterized as closed in nature, ensuring that only team-generated solutions were explored. It would be incorrect to say that the Japanese did not gain *any* assistance and information from outside, however, the interviews revealed a striking reluctance and apprehension to do so. In contrast, the U.S. firm liberated its innovators to seek advice from whomever they wanted. (In some ways, we could argue they were like the Japanese experts, but the role was very different. They worked with each other, not with other the teams, and were responsible for the innovation, not its facilitation.) They were left free to go outside the firm. The pool of expert knowledge that was open to them was vastly expanded with specialists spanning many organizations. This had a significant impact on the type of innovation possible for the team. Across both organizations, many of the ideas were the new utilization of existing processes, technology and systems.

A significant difference lies in the application of imported ideas by the U.S. team. They gained far more knowledge and insight into potential solutions and their risks through using information from their suppliers. The suppliers had access to solutions and ideas operating in other firms and thus were

Table 4. Learning and Innovation

Areas	Japanese Findings	American Findings
Learning	Everyone involved; incremental focus to minimize risk	Limited to a few; more flexible and radical
Attitude to learning	Open to new ideas and improvement; reflecting on mistakes to max. learning	Open to new ideas and improvement; no reflection on mistakes
Company training process	New innovation process training and support to embed new learning	New innovation tools training, but no support to practice new learning
Dissemination of learning	Formal process creating climate for idea exchange	Ad-hoc informal dissemination; not-invented-here opposition; limited impact on ideas

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Table 5. Patterns from the Data for Producing Successful Innovation Teams

Level	Issues of Importance
Individual	Knowledge and expertise; acceptance of the responsibility to innovate; open to new ideas; concerned to improve and learn
Team	Building good relationships within and outside the team; good internal communication at both intra- and interteam basis; team involved in generating and developing ideas, only few involved with implementation; team free to select external inputs to bring new ideas into team; support from leader; active management of interface with rest of organization, especially polical
Organization	Clear goals for teams; acceptance of role of everyone in making change work; openness to team and individual inputs; i.e., no subvention of issues; policies to support teams; e.g., training, rewards systems; formal dissemination of ideas to create climate for innovation and change

able to disseminate greater understanding and insight. They could act both as benchmarking experts and system specialists. In creating their quasiteams, the U.S. team members were able to immerse themselves in their new teams away from the constraints of the pervading dominant logics.

A further sign of this liberation can be seen in the flexibility of the teams to meet either on site or at the supplier's on a regular basis; it was entirely their own decision. These new quasiteams had far greater scope and depth of knowledge available to them, with each project team comprising only experts for that particular issue. Coupled with this, the interrelationships between the U.S. team members extended the expert base still further. The dynamic social nature of their innovation processes is illustrated below:

> We're always on the phone, faxing sketches and schemes through, and going and looking at the design scheme they bring in.

Conclusion

The aim of this research was to compare how two different auto manufacturers used teams to provide innovations for cost reduction purposes. From this study, some conclusions were elicited regarding, first, the extent to which each team adopted different processes toward achieving their goal, and second, the extent to which they were effective in achieving their aim. In this respect, the results are surprising. In assuming that innovation and learning are fundamental to a firm's ability to survive and thrive, then the U.S. firm's team seemed to conform more closely to the double-loop learning model. The Japanese firm, surprisingly, was most internally focused and risk averse resulting in (at best) single-loop learning. These results differ markedly from the results portrayed some years ago by Pascale (1990), where learning in the U.S. firm was predominantly concerned with small "l" or single loop. Our research shows that adherence by the Japanese to their formal processes not only forced the teams to work to strict deadlines, but had the impact of constraining ideas and preventing radical suggestions being pursued. Teams felt they simply did not have the time! The U.S. team were able to achieve much more valuable savings through their more radical innovations. Although they had more time available, they were also liberated and allowed to challenge underlying assumptions. Potentially more significant, in terms of risk management for the organization, was the use of external sources, who helped the team check their arguments and ideas. Through this, the U.S. team became more innovation focused, not process constrained. The net effect was higher financial savings for the organization, potentially less risk associated with the more radical innovations, and for individuals, a much higher level of learning—double loop.

From a wider organizational perspective however, the implementation of the team's innovation produced very different climates for learning or for achieving positive spiral for ideas across the firms (Polewsky and Wills, 1996). The strengths of the Japanese bottom-up strategy, focusing on dissemination, created a positive acceptance for ideas. By involving all levels of staff in new ideas, they were effectively able to reduce internal resistance to continual changes. However, the data indicated that resistance was not totally eliminated in the Japanese firm, despite the careful selection of projects by managers. In contrast, the U.S. firm, although seemingly able to generate more radical innovation, did meet some internal resistance in their implementation. The phrase "not invented here" was highlighted by one of the team as a barrier to the team's ideas. Surprisingly, however, this resistance did not seem to stifle the generation of ideas. None of the interview data mentioned stifling idea generation. Nor was there any reference to self-censorship from any of the U.S. firm's team members.

Although the U.S. organization achieved higher levels of innovation through this team, we can only speculate about the longer-term consequence of their approach. The incremental approach of the Japanese may achieve longer-term success by utilizing and developing the learning of everyone in the organization. The need to increase everyone's knowledge becomes more marked when the teams relied upon for innovation comprises more experienced and older staff. This was the case in the U.S. firm, who were currently using the talents of people who had retired early and were no longer formal employees of the organization. This informal structure gave

them an advantage through their expert organizational knowledge. What would happen to the organization's capacity to innovate, learn, and change if these "experts" were unavailable? The question, therefore, must be: "Can an organization achieve both radical innovation and involve everyone, thereby lowering opposition to change?" The data from this study can only point to some ways in which this balance can be achieved at the individual, team, and organizational levels (see Table 5).

Although the study explores a relatively small population, care was taken to ensure comparability between both the sites and subjects. Thus, the research does provide a useful insight into the actual process and context of innovation within teams. However, it also reveals the need for further work in this area, to allow us to understand more fully the factors that affect radical idea generation and their wider organizational dissemination. Although this study suggests that it may be difficult to achieve both, we need to be able to say why this might be the case. This research indicates the significant influence of boundary spanning in innovation. Further work should focus on the role that boundary spanning plays in these generation and implementation phases. For example, how far is external spanning important in introducing novel ideas to teams? Is its role more in providing a context, or climate, to allow team members to express their existing radical ideas? Boundary spanning may also be significant as a practical checking device in successful implementation. How far does this informal, external comparison and advice also assist firms in learning from others' mistakes and, thereby, contributing in the production of more effective (and less costly) implementations? This study raises some interesting questions that must be pursued if we are to allow organizations to capture more effective and efficient team innovations.

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