Learning of Knowledge and Skills as a Prerequisite for Connecting Motivation with Higher Team Performance

Furukawa, Hisataka
Faculty of human-environment studies, Kyushu university(Professor)

Learning of Knowledge and Skills as a Prerequisite for Connecting Motivation with Higher Team Performance[1]

Hisataka Furukawa　*(Faculty of human-environment studies, Kyushu university)*

This study reveals the characteristics of learning in a high performance team. Research was done for sales teams that were working via face-to-face and e-mail communication. Members were requested not only to write daily reports and comments but also to respond to them by e-mail. By analyzing the contents of all communication logs stored in a server computer, we could delineate properties of team learning, which don't appear by the questionnaire method alone. Results clearly showed that the high performance team learned well "knowledge and skills," "location of knowledge," "value and standard," and "ways of cooperation" needed for sales activities.

Keywords:　knowledge learning, information processing, cooperation, high performance, e-mail

It is intuitively supposed that if team members are highly motivated and also work well together as a team, then work performance will surely increase. Why does team creativity and performance increase when the quality of teamwork is high? No explanations have been presented to us with a sufficient theoretical examination.

The present paper intends to reveal that team creativity and performance increase only in cases (1) when high quality team work gives rise to differences in information processing, which in turn (2) allow for the learning of knowledge and skills relevant to the topic at hand among the team members to occur.

It has been widely described that team members' vigorous intrinsic and extrinsic motivations aroused by the stimulation due to competition and social facilitation are necessary conditions for team creativity and performance. Accordingly, there have been a number of theories advanced concerning the mechanisms of the formation of personal motivation (Vroom, 1964; Locke, 1974; Deci, 1981; Bandura, 1990, Mitchell, 1997, etc.).

However, even if individual members' motivation is high we cannot conclude that this motivation is connected with new ideas, creativity, or high performance achieved by the team as a whole. By referring to the theoretical models related to processes of team activity and productivity presented to date (Steiner, 1972; McGrath, 1984; Hackman, 1987;

Gladstein, 1984; Cohen, 1994, etc.), it can be concluded that there are six necessary conditions that must be met by teams.

That is, each member must have a (1) distinct role consciousness and (2) adequate task consciousness. In addition, members should have (3) fundamental intellectual ability and aptitude, and learn (4) knowledge and skills related to the task. If such knowledge and skills are not learned, a high level of motivation will not be connected to high performance. Furthermore, the (5) values and standards related to what is being emphasized and how important it is considered must be accurately grasped and understood. It is supposed that social learning and modeling (Bandura, 1986), which are based on interactions with others, are connected with these values and standards. Finally, (6) cooperation with and mutual support of surrounding individuals are essential factors, because in most instances task execution cannot be done alone.

Of these six necessary conditions, in order to ensure that individual motivation is connected to team creativity and performance, team members must not only have a conscience as a team and adequate role and task consciousness, but also learn sufficiently "knowledge and skills," "values and standards," and "cooperation and mutual support." The importance of these conditions has been also indicated in recent literature on intellectual capital (Marquardt, 1996), knowledge assets (Stewart, 1995), and transactive memory (Wegner, 1987, 1995).

Previous research that has examined the determinants of team performance and creativity provided the findings that (1) a higher degree of familiarity or intimacy among team members raises team performance (Kanki & Foushee, 1989; Goodman & Shah, 1992, etc.), (2) a higher degree of

perceptions of mutual expertise among team members pro-
duces better discussion results (Henry, 1993, 1995; Littlepage
et al., 1992, 1995, etc.). Oppositely, there is also research
which has shown that (3) familiarity may undermine team
performance (Katz, 1982; Kim, 1997, etc.). However, there
seems to be no previous research that provides direct evidence
that learning by team members increases team performance.

To summarize at this stage of the report what at first
glance appears as inconsistent research findings, it appears to
be the case that team members' mutual progression of cogni-
tive familiarity and expertise have a positive relationship with
team performance only when familiarity does promote the
team members' learning of knowledge and skills instrumental
for personal and team task execution.

In research focusing on sales team members belonging to
92 "branches" of a large Japanese pharmaceutical company,
the author (Furukawa, 1998) has previously shown how the
degree of within-team information processing activities (in-
formation gathering and presentation, elaboration and sharing,
and storing and utilizing) is closely related to team perform-
ance (compared to the previous year). It has since been inter-
preted that this finding might be a result of the mutual promo-
tion, among team members, of knowledge and skill learning
through team information processing activities.

The present paper, in a continuation from this research,
aims to identify any learning effects created by teams' daily
information processing activities and reveal how such learn-
ing is closely related to team performance. Therefore the
present paper focuses on the characteristics of content of the
everyday communication within teams because it is thought
that the degree and state of each team's learning of interests
and concerns (values and standards), and learning of knowl-
edge and skills, will be reflected in those communications.

Method

1. Research Target Organization and Teams

The Tokyo branch of a Japanese general electronics com-
pany was the target organization of the study. This branch,
after some corporate reorganization, as of July 1999 has 65
employees, including the branch manager and resident work-
ers, who have been trying eagerly to change it's information
structure to be more "flat," allowing everyone to exchange
business information freely, regardless of workers' relative
job positions. The branch advocates that this change will
allow information dissemination and sharing to occur more
rapidly and smoothly.

Outline of Business Support System : These internal

changes began in the latter part of 1994 with the creation of
a database of business-related information within the branch's
central computer server. This was followed by the formation
of a "business support system" to which every branch em-
ployee could access and refer to freely. All workers carried
with them a notebook computer, and through access via a
local network LAN or existent phone lines they were able to
not only enter progress reports on daily sales activities, but
also communicate with others, make inquiries, have consulta-
tions, and express opinions and thoughts that emerge from
daily experiences.

All stored information could be read by the branch man-
ager as well as by all other employees. In addition, responses
to this information, in the form of comments or ideas by other
workers, group leaders, the branch manager, or even individu-
als from other teams, were encouraged. All such communica-
tion was automatically stored in the database. Further, by
using this support system employees could have access to
many kinds of information inside and outside of the company.

After the introduction of the business support system, for
the period of one and a half years from the beginning of 1995
to mid-1996, a campaign to promote this system was con-
ducted. This was done through creating a climate in the
branch office that reduces resistance and anxiety toward the
introduction of the electronic communication system (ECS)
and encourages information sharing. More specifically, em-
ployees were educated in how to use the system, and im-
provements of its shortcomings were performed. Further-
more, using the system not only for reports of daily activities
and replies to inquiries and contacts, but also the active send-
ing of comments or advice to fellow employees was particu-
larly encouraged, and the practice data on these activities in
turn were used as one of the primary factors for performance
evaluation.

In the latter part of 1997, notebook computers and cellular
phones were distributed to all business employees of the
branch, thus enabling the transmission of business reports,
brief meetings, comments, and advice at any time and place.

2. New Research Method

The present study focuses on two types of communication
and analyzes the characteristics of their contents. One type, as
mentioned above, consists of the communication designated
as "comments and advice," which are sent mutually via e-mail
by team members.

The other type is communication based on face-to-face
discussion about business policy and exchanges of ideas. A
member of each group calls an assembly of all members, and

Design Reviews (DR) are held to discuss and examine the ways to approach clients. The branch manager recommends and encourages the holding of DRs. Contents and conclusions of all DRs are subsequently entered into the "business support system." Consequently, it is possible to know the details of every DR session of all groups, from past to present.

It is supposed that (1) each team's daily activities as well as (2) the degree and nature of team's learning in values (interest and concern) and standards (norms), knowledge and skill, and mutual cooperation, are each reflected in these two types of communication.

Merits of Log Analysis as a Methodology : Paying attention to log records stored in this business support system provides a previously unavailable, new research methodology. That is, in investigating the learning effects of team information processing activities, relying solely on generally used questionnaire data (also used in the present study) allows one to measure team information processing activities at a single point in time. In addition, it is limited to quantitative data. On the other hand, if one relies solely on interviews, the quantitative characteristics and temporal changes of information processing activities can't always be made clear.

From this, it can be concluded that the current study, through detailed analysis focusing on electronic communication log records saved in the business support system, allows for both a quantitative and qualitative analysis of daily information processing activities. Thus it becomes possible to perform an analysis better reflective of the true nature of sales activities.

Results

1. Establishment of the Business Support System

As a measure of how well the business support system became established in the branch office, the average of the total number of comments (includes replies and notes of advice) along with the standard deviation (individual differences among members) for every half-year period beginning with the first half of 1995 were calculated, as shown in Figure 1 below.

From Figure 1 it can be seen how the business support system became established in the branch. Namely, the beginning period following the introduction of the business support system (from the first half of 1995 through the first half of 1996) can be labeled as the familiarization period (Phase 1). During this phase the company held a campaign to encourage use of the system, and the average number of comments increased every period, though the standard deviation indicating individual differences remained considerably large.

During Phase 2 (from the latter half of 1996 through the first half of 1997), which began after the campaign was over and comments were no longer being used as a basis for evaluation, it is not surprising that the average of the total number of comments decreased. However, they did not decrease to nothing. In fact, even through Phase 3 (from the latter half of 1997 through the first half of 1998), when the use of notebook computers and cellular phones was introduced, this level remained constant. Through the continued use of the business support system the average number of comments and notes of advice per individual remained steady at approximately 30. Individual differences (standard deviation), on the other hand, decreased largely in Phase 2, and remained at the same level through Phase 3.

2. Effects of Mitigating Resistance and Building an Atmosphere of Mutual Trust

It seems necessary at this point to identify an interesting observation. It has been suggested that for the successful
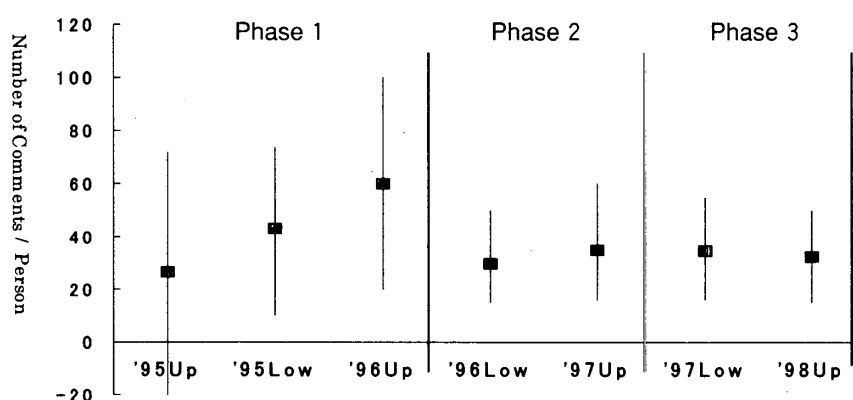

Figure 1 Changes in Number of Comments / Advice to Other Team Members

introduction and establishment of an electronic communication system, it is helpful to focus on and make use of advantages with which such systems are equipped, such as interaction, non-synchronicity, and promptness (Sproull & Kiesler, 1991). On the other hand, however, the effects of (1) mitigating feelings of uneasiness and resistance accompanied with electronic communication might be large, as well might be the effects of (2) creating an atmosphere of mutual trust and cooperation among team members. In fact, even at this Tokyo branch office, it is suggested that the new system was promoted by the assigning of an employee whose primary job was to reduce and resolve resistance associated with its introduction. These resistance problems were related mainly to complaints that the system is inconvenient or troublesome.

There are five teams of salespersons within the branch. The degree of four types of information processing activities, namely (1) the "gathering and presenting" of information (open presentation of experience and acquired information), (2) the "elaborating and sharing" of information (multi-sided discussions based on opinions and cases presented by team members), (3) the "storing and utilizing" of information (dictation of discussions concerning cases and the utilization of that information as know-how), and (4) the "dissemination and multiplication" of information (transformation and translation of information and experience to other teams and occasions), were compared between before and after the introduction of the system. Changes were significantly larger for the group that emphasized planning for everyone's cooperation and partnership as well as communication and understanding. In particular, the two types "gathering and presenting" and "elaborating and sharing" showed remarkable increases.

Thus it can be assumed that the establishment of an electronic communications system can be promoted by the existence of mutual trust and cooperative relationships among salespersons.

3. Changes Brought by the Application of the System: Advancement of Expert Recognition

In what areas do team members feel changes due to usage of the system? A questionnaire was administered to examine this. The significant (p < .01) changes were found in the following four items: (1) getting to know who is most familiar about what kind of information, and then, when necessary, being able to obtain that information, (2) becoming mutually acquainted with work-related problems and obstructions, (3) giving advice to fellow salespersons about effective sales strategies, and (4) mutually knowing and acknowledging each other's ability and level of competence.

Thus, firstly, expert recognition among team members was promoted. That is, through personal e-mail and by monitoring e-mail exchanged by others, it was possible to mutually confirm who is most familiar or most knowledgeable about what. Secondly, team members were stimulated in learning knowledge and skills, which is thought to be a connecting factor between high motivation and higher creativity and performance, through being able to monitor the sales activities of other members.

4. Shifts in Sales Performance of the Branch Office

Shifts in total performance of the branch : When compared with those of the first half of 1996, changes in total sales figures per salesperson increased steadily from the latter half of 1996 through the first half of 1999, as follows: 116.4%, 122.3%, 137.0%, 159.7%, 181.6%, 206.7%. Considering the fact that Japan has been experiencing a sluggish economy for the past number of years, the sales performance of this branch can be considered very positive.

Though we must be cautious to conclude that this sales increase is a result of the introduction of the business support system, the possibility might be suggested that incorporating an electronic communication system in sales activities could have a certain positive effect on sales performance.

Inter-team Differences in Performance : In the branch office, there are five sales teams, which handle their own products and clients and are supervised by a team leader.

Table 1
Shifts in Total Sales by Team (Comparison with upper of 1996)

Team (Conditions)	'96 lower	'97 upper	'97 lower	'98 upper
A (Healthy Sales)	216 %	287	255	374
B (Sluggish Sales)	107	108	102	89
C (Sluggish Sales)	106	124	146	130

There were differences in sales performance among these five teams. Here we will focus on three of these teams. One is Team A, which has been recording high performance. The others are Teams B and C, which have been recording low performance. Shifts in performance (sum of orders received) per half-year period for each of these three teams is summarized in Table 1 above.

5. Information Processing Activities and Learning Observed Through Comments and Notes of Advice

Four major categories were revealed through a content analysis of comments/advice sent to others on a daily basis. These were (1) "activity plan" category (notes on courses of action for sales activity or personal sales plans, etc.), (2) "information exchange" category (offering information on hand to others, inquiring about or requesting necessary information, etc.), (3) "emotional support" category (notes to support, encourage, motivate, or point out something, etc.), and (4) "formalized communication" category (notes containing highly formal greetings, announcements, etc.).

Viewed as a whole, the information exchange category of notes was the most common, at 35% of the total, while the remaining three categories were approximately equal, at roughly 20% of the total for each category.

An analysis was then performed to determine the percentage of each category of comments/advisory notes for the two types of teams, that is, a high-performance team (Team A) and a low-performance team (Team B). Results indicated no differences in percentages for the categories "activity plan" (A=24%, B=21%) and "emotional support" (A=18%, B=20%) categories. However, the "information exchange" category percentage was higher with the high-performance team (A=47%, B=23%), while the "formalized communication" category percentage was higher with the low perform-

ance team (A=11%, B=36%).

These results suggest the possibility that the learning of knowledge and skills as well as the learning of values and standards is promoted by the frequent use of the "information exchange" category, which includes the (1) mutual sharing of on-hand information (things seen, heard, or felt while visiting clients), and (2) mutual appeals for necessary information utilized among teams.

6. The Relationship Between Team Learning and Performance

Types and frequency of Design Review sessions : As previously described, there are three types of Design Review (DR) sessions. The first type is known as "pioneering DR," consisting of brainstorming for ideas to attract new clients and polish up proposals. The second type is termed "proposal DR," which makes projects currently under progress have more impact on clients. The third type is called "reflective DR," where successful and unsuccessful orders are reviewed.

Figure 2 shows the degree to which three teams with differing levels of performance (A, B, and C) engaged in each of the three types of DR.

Regarding Team A (high performance), over time it increased the number of pioneering DRs, and proposal DRs show a steady increase as well. Naturally, sales teams cannot devote all their time to holding DRs, for they must actually meet with clients and perform sales duties. Accordingly, due to the time expended in these first two types of DRs, it is only logical that the number of reflective DRs should decrease, but the frequency of this type of DR also remains steady.

Regarding Team B (low performance), reflective DRs were held exclusively while pioneering DRs and proposal DRs were rarely held. As for Team C (low performance), during the first half of 1997 almost all DRs were proposal
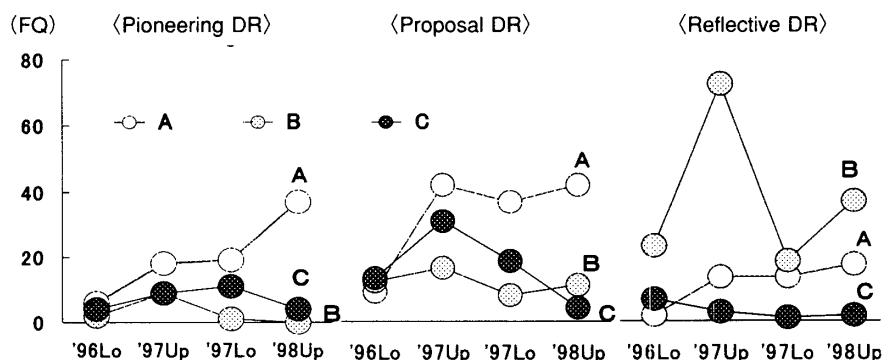

Figure 2   Changes in Frequencies of Design Review (DR) for Each Team (A, B, and C)

DRs, but in the following periods this number gradually decreased.

Thus it is evident that among the three teams there were differences in the frequency of holding DRs as well as in the type of DRs held. This fact strongly suggests the possibility that opportunities for learning knowledge and skills as well as team values and standards necessary for sales activities, through reflecting on one's own direct experiences and team member modeling, etc., differs among teams.

The learning of values and standards : As described previously, the content of all DR discussions were entered (recorded) into the business support system. Accordingly, through a content analysis focusing on the context and meaning of these records, one can infer what each team is aiming for, interested in, and also, as a result, what kinds of things did the team members learn mutually.

The context and content of the DR reports could be classified into the following five categories: (1) confirmations (confirmation of all meetings and inquiries, confirmation of the status sales activity schedules, etc.), (2) problem finding (reporting on occurring problems, telling about the cause of these problems, and attention-rousing, etc.), (3) proposals (suggesting issues to be dealt with and possible concrete countermeasures, etc.), (4) requests (asking for the appropriate person or post to undertake proper actions, etc.), (5) result reports (reports about successful and failed orders, cause-

analysis reports of successful and failed orders, etc.).

We analyzed which of the above five categories of context/content correspond to which type of DRs held by each team from the first half of 1996. The results are shown in Table 2.

From this it can be understood that the topics discussed and examined during DRs are different depending on the team. It is clear that Team A (high performance) discussed concrete proposals, made certain confirmations, aroused mutual attention and caution toward, and requested more frequently the most appropriate persons and positions. That is, it can be understood that Team A conducted most often those discussions which are vital for the "processes" of sales activities. In contrast, Team B has an overwhelmingly large number of "result" reports, while those related to "processes" are few. Finally, for Team C, the overall number of reports is remarkably small.

The learning of knowledge and skills : To summarize the results of the analyses discussed thus far, the atmosphere and content of the DRs conducted by each team, or in other words, the characteristics of the information processing activities carried out by each team, are distinct from each other.

As for Team A (high performance), proposal DRs are conducted regularly and frequently. The contents of these consist of "uncovering any remaining problems with proposals," accompanied with "what to do from now" and "quick

Table 2

Content Analysis of Design Reviews (DR): Context Categories and Frequency for Each Team

Categories of content and context of reports	Team A	Team B	Team C

Confirmations
  Confirmation of present & planned schedules
  Meetings and survey related information
	100	39	49

Problem Finding
  Communication about probable troubleshooting
  Suggestions about problem origins
  Evoking attention and caution
	39	12	11

Proposals
  Suggesting issues to be dealt with
  Applicable countermeasures
	70	20	37

Requests
  Requests for the appropriate person or post
  to undertake tasks or tackle issues
	21	0	3

Results Reports
  Reports on succeeded and failed orders
  Cause-analysis on succeeded & failed orders
	1	157	7

Total	231	228	107

action" as key discussion points. During pioneering DRs, team members are acutely aware of cooperation with other posts and persons which are essential for effective proposal sales. As for reflective DRs, failed orders are focused upon, and relapse prevention efforts are emphasized.

As for Team B (low performance), pioneering DRs and proposal DRs are very rarely held, but reflective DRs are held very often. The content of these DRs were mainly discussions about successful orders. This is in contrast with Team A. Furthermore, the recorded reports are rather brief and lacking in content, which casts doubt on their usefulness as a reference at a later date.

And, as for Team C (low performance), the patterns and frequencies of this team are very similar to those of Team A. However, members' motivation to refine proposals was not sufficient. For example, in spite of the fact that it would be much simpler to write a request or inquiry in an e-mail to convey it directly to another member, communications were restricted by impersonal replies such as "the approval of Mrs. So-and-so is delayed, and therefore your request is taking additional time." Moreover, with some members unable to think beyond individual jobs and duties, the overall team feelings of "everyone working together to think about and connect ideas to concrete proposals" were weak.

Discussion

The present study aimed to clarify a necessity for team members to "learn" knowledge and skills, values and standards, and cooperation and mutual support, while still retaining their identity of being part of a team through mutual exchange and communication, in order to establish a clear connection between a team's high level of motivation and high levels of creativity and performance.

Sales teams in the Tokyo branch of a large Japanese electronics maker were chosen for research. At this branch a local area network (LAN) called the "business support system" was constructed. The team members, whose data were analyzed for the present study, (1) wrote on the progress of their daily sales activities, (2) shared comments/advice with other team members through e-mail, and (3) engaged in DRs, providing opportunities to meet face-to-face with other team members to discuss various issues, the contents of which were subsequently recorded via e-mail. The content of all e-mail was made available for review to all branch employees, and all data was saved accurately and automatically on the business support system's server computer. The present study focused on the entire transmission record (log) and analyzed

its contents. In this way, characteristics of team activities could be discovered, providing a new research endeavor not attempted in any previous research.

Firstly, the effectiveness of application of this new research methodology must be discussed. Stated briefly, this new method to analyze logs (records of communications) has been shown by the present study to be effective for the purposes of uncovering the aspects and characteristics of team activities. That is, structural comparisons of content groupings and sub-groupings of the comments and advisory comments recorded as part of the log were performed. In addition, frequencies were calculated and content groupings were conducted of DRs, and results showed clearly identified team differences. Furthermore, the meaning of these team differences can be sufficiently understood as an accurate reflection of the differences in degree of content learned or in the nature of the information processing carried out by each team.

Secondly, the differences in information processing activities and learning carried out by each team should be discussed. Team A conducted its information processing activities very actively, and the contents were also topic-orientated in nature. That is, there was much sharing of necessary information (comments and notes of advice) related to the team members' mutual sales activities. Furthermore, pioneering DRs and proposal DRs were large in number, and the contents of these DRs were related to values and standards (how much of what to emphasize). Moreover, words and phrases related to the "processes" of sales activities were used in overwhelmingly large numbers by this team. Examples include "pointing out problems," "suggestions," "confirmation," and "request," etc. This suggests that the conditions were met for each member to have sufficient opportunities to learn values, standards, and skills from his or her own experiences or from other group members who acted as models.

On the other hand, both Teams B and C (both low performance) were in contrast to these results. That is, Team B's quantity of comments and notes of advice was small, and they both rarely held pioneering or proposal DRs. This fact suggests that for Team B members it was difficult to promote the learning of knowledge and skills, as well as values and standards. However, the frequency of reflective DRs held by Team B was very high. This high frequency of reflective DRs was also seen in Team A, but the content between the two teams was in contrast. The content of Team A's reflective DRs consisted mainly of discussing failed proposals and how to prevent a second failure, while the content of Team B's reflective DRs chiefly reflected on the reasons why certain successful proposals succeeded. As we know from previous

research (Sitkin, 1993), personal learning is promoted by reflecting on one's failures rather than on one's successful experiences. Therefore it is supposed here that the present difference observed in the contrasting reflective DR data suggests a difference between teams in the contents of what is learned.

Moreover, regarding Team C's comments and notes of advice as well as the DR data, the overall number of entries was small. In addition, generally speaking, team members' spontaneity and autonomy regarding information exchange and information processing was weak, and these qualities never extended farther than the team leader. For this reason it is thought that the degree of promotion of learning within the team was low.

Now, as was predicted at the beginning of this paper, are these team differences, depending on the type of information processing and type of learning, connected to team performance? When reaching this conclusion one must exercise due caution, just as one must when discussing the causality relationship between information processing or learning progress with performance.

Nonetheless, Furukawa (1998) has previously demonstrated how the qualities of information processing activities based on face-to-face interpersonal relations are strongly related to sales performance. In the current research Team A, which had a high level of learning and information processing characteristics among team members when compared with Teams B and C (which had low levels of both traits), exhibited higher performance. Accordingly, it can be suggested that the progress of learning by team members shares a close relationship with team performance.

In this way, when teams can (1) promote information processing activities through mutual trust, such as the sharing and elaborating of information, (2) acquire the skills and knowledge necessary for task execution, and (3) can make mutual confirmation concerning what values and standards to place on what items, then they can achieve high performance.

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