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THE ANATOMY OF JAPANESE QC CIRCLES

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The phenomenal growth of the Japanese economy has generated a lot of interest on Japanese management. The so-called three pillars of Japanese management, namely, lifetime employment, seniority-based wages and promotion, and enterprise unions have been the subject of great debate. Despite the popularity of Japanese management, however, only Quality Control (Q.C.) circles as a management technique, has been diffused worldwide. Q.C. circles are seen to be a key element that led to the dramatic improvement of the quality of Japanese products.

Prior to World War II, Japanese products were known to be cheap and of inferior quality. To rebuild the economy after their defeat, Japan embarked on a nationwide effort to improve product quality. These efforts by the government and the private sector commenced with unbelievable speed. By December 1945, the Japanese Industrial Standards Association was founded. In 1946, the Japanese Union of Scientists and Engineers (JUSE), the nucleus that was to spearhead the promotion of quality control, was established. JUSE is closely connected to the most powerful management institution in Japan, the Japanese Federation of Economic Organizations (Keidanren).

JUSE invited Dr. W.E. Deming to conduct seminars on Statistical Quality Control (S.Q.C.) from 1950 to 1952. Deming's coming to Japan marked the starting point of the

diffusion of S.Q.C. in Japanese companies in the 1950's. To commemorate the contribution of Deming and to promote further the application of contribution of Deming and to promote further the application of quality control in Japan, JUSE established the Deming Prize in 1951. The Deming Application Prize is awarded to companies that attain remarkable results with the application of S.Q.C. To date, around 100 companies have been the recipients of this award (personal communication with JUSE, 1986).

J.M. Juran came to Japan in 1954. He emphasized that quality control be utilized by top management as a management tool. Juran's lectures exerced a strong influence on managers. As a result, the stream of thinking that quality control be considered a managerial function rapidly spread (Kano, 1985, Ishikawa, 1981).

Q.C. Circles and Company Wide Quality Control

In 1951, Feigenbaum published the book "Total Quality Control". Feigenbaum, then the Quality Control Department Head of General Electric, emphasized the managerial aspects of quality control in his definition of Total Quality Control (T.Q.C.) as

> "... an effective system for integrating the quality-development, quality-maintenance, and quality-improvement efforts of the various groups in an organization so as to enable marketing, engineering, production and service at the most economical levels which allow for full customer satisfaction".

In his book, Feigenbaum proposed that "quality control is everybody's job". At the same time, however, he was doubtful concerning the application of this principle. This is because

"since quality control is everybody's job, it may become nobody's job". He recommended that quality control be a specialized function to be handled by quality engineers, process engineers and the like.

Nevertheless, Feigenbaum also recognized that quality control planning would only succeed with "quality-mindedness" from top management down to the worker. His way of thinking was that total quality planning operates as a communication channel on product quality information, and serves as a structure of employee participation. However, organizational structures were not established to promote employee participation in quality control in the United States. This was first possible in Japan, with the establishment of Q.C. circles.

The Japanese Quality Control Observation Team sent to the United States brought home Feigenbaum's concept of T.Q.C. in 1958. As a result, quality control across all departments involving all employees gradually spread in Japan from the 1960's. Although the concept of T.Q.C. was originally formulated in the United States, its practice was far more advanced in Japanese companies. To advocate Japan's state of the art of implementing quality control based on the participation of all departments and all employees, Ishikawa (1981) coined the term Company Wide Quality Control (C.W.Q.C.) to differentiate it from T.Q.C.

The foundation of C.W.Q.C. lies in the management philosophy of Quality Assurance. Ishikawa (1981) describes it as

> "to assure quality such that the consumer can buy and use a product for a long period of time with satisfaction and a sense of security".

According to Ishikawa, there are three priority viewpoints in Quality Assurance : inspection, process, and new product development. Quality Assurance cannot be realized solely based on inspection. This is because no matter how strictly inspection is undertaken, this cannot eliminate defective products. Thus, quality has to emerge from production stages, preferably from the stage of product design. Thus, Ishikawa advocated that Quality Assurance be undertaken from product development through the manufacturing process.

A second element of CWQC lies in Policy Management. Based on medium and long range plans, a company president formulates the company's annual policy. Each division head in turn formulates the division policy which the division must attain to implement the president's policy. At the same time, this policy is concretized with an action plan. Cascaded to lower management levels, the plant head formulates the plant policy which the plant must attain to realize the division's politicies, and in like manner, develops a corresponding action plan. Thus, in policy management, under the embrella of the president's policy, the policies and action plans of all departments are all joined to form a chain. The action plan is a total management plan which includes goal-setting, strategy-setting for goal attainment, mobilization planning and budget progress management planning, takin into account the relationship with other departments (Mizuno, 1984). In this manner, Policy Management can also be viewed as a "Management Control System".

A third feature of CWQC lies in the participation of all workers in quality control, through QC circles. In essence, Feigenbaum's basic principle that "quality control is everybody's job" was realized for the first time in Japan vertically, from top

management down to rank and file employees, and horizontally, where quality control through all departments became an organizational reality.

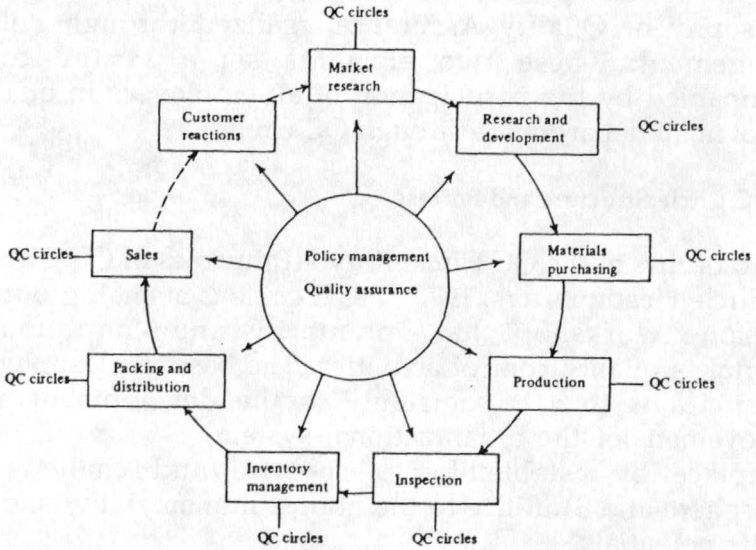
The linkage between QC circles as part of CWQC is shown in Figure 1. The key features of CWQC lie in the managerial philosophy of Quality Assurance, realized through Policy Management. These two elements serve as the core, accompanied by the participation of all employees in quality control in all departments through QC circles.

The QC Circle Structure and Process

According to the QC Circle Koryo (Principles of QC Circles, QC Circle Headquarters, 1970), a QC circle is a small group in the same workshop that voluntarily and continuously undertakes quality control activities. The basic philosophy of QC circles is to : 1) contribute to the development and improvement of the organizational system, 2) humanize the workplace by establishing a cheerful and challenging atmosphere and 3) utilize to the utmost human ability and its infinite potentials.

A QC circle is usually formed based on one work unit or section. The number of members in a circle is thus determined by the number of persons in the unit. Based on a JUSE nationwide survey (1983), the average circle is composed of seven individuals. Each circle has a leader who guides the entire activity, and a theme leader who is chosen on the basis of the circle theme being handled. When circles are newly formed, the foreman or the first-line supervisor usually becomes the leader. As the circle accumulates experience and acquires the necessary knowhow, the circle leader is either selected by circle members or designated by the supervisor.

Figure 1 : The Key Features of Company-Wide Quality Control



Although it is often emphasized that Circle activity is "jishuteki" or one based on employee initiative, the formation of circles is initiated by the organization. According to the same JUSE nationwide survey, 90 % of 478 managers responded that circles are established as part of company policy and directives, in contrast to 6 % who answered that circles are formed based on employee initiative.

Circles are closely related with the organizational structure, which integrates the activity to the organization. Table 1 shows the relationship between QC circles and the organizational structure in two Japanese companies - a bank, and an automobile manufacturing company.

Table 1. **The Relationship of QC Circles with the Organizational Structure**

Organizational hierarchy	Circle Sytem
Bank	
Assistant branch manager	Person-in-charge
Supervisor	Adviser
Employees	Circle leader/ members
Automobile company	
Department Head	Person-in-charge
Section chief	Assistant person-in charge
Sub-section chief (Kocho)	Adviser
Foreman	Sub-adviser
Team leader (Hancho)	Circle leader/
Skilled workers (Ginoin)	circle members

Sources : Onglatco and Matsui (1984) and Kadota (1983)

In the bank, the assistant manager oversees circle activity in the entire branch as the person-in-charge, while the section head, who is the first-line supervisor, acts as circles adviser. Indirectly, they participate in circle activity. The Quality Control Department in the Head Office provides assistance.

On the other hand, in the automobile manufacturing company, with the assistance of the QC steering committee, the department head serves as the person-in-charge, the section chief as assistant person-in-charge, the kocho as adviser, the foreman as sub-adviser, the hancho or team leader as circle leader, while skilled workers who are circle members rotate among themselves in assuming the role of theme leader. In this manner, although QC circles are based on the activity of employees in the organizational base, they do not undertake the activity unassisted. Rather, the activity is supported, and at times, is subject to pressure by the organizational hierarchy.

Table 2 shows the relationship between circle activity themes and company objectives with 454 circle leaders as repondents (JUSE, 1983). It indicates that 83 % of circle themes work unit matters. This shows that QC circles serve as a useful mechanism in integrating employees towards the attainment of organizational goals.

Table 2. Circle Themes and Company Policy Attainment

Thrust of circle theme	Percentage
To attain superiors' policy/directives, key work unit matters	85.6
No relation to the above	10.6
Others	3.8

Source : JUSE (1983)

Table 3 shows the content of circle themes based on 439 circle leaders (JUSE, 1983). Two observations can be pointed out. First, improved quality, enhanced efficiency, cost reduction,

and innovation of facilities account for 78 % of themes handled. This indicates that QC circles do not simply focus on reducing defects in production; rather, the thrust is towards more economical means of production.

According to the same nationwide survey, approximately 78% of circle members set circle themes by themselves, while only 2 % of themes are set based on superiors' directives. It is important to note that although the formation of circles and the participation of members in circle activity are strongly tinted with compulsion, the conduct of the activity itself is entrusted to members' initiative (jishusei) to a considerable degree.

Circle activity is undertaken based on a set of standardized procedures and statistical techniques. The former is often referred to as the "QC story", while the latter is called the "QC Seven Tools". From the author's point of view, the prescription of standard steps and statistical techniques makes it possible for rank and file employees to participate in a highly technical activity. In addition, they contribute to the rapid diffusion of QC circles nationwide through information exchange on circle experience and knowledge on an intra-company and inter-company basis.

The activity process is fundamentally based on the PDCA (plan-do-check-action) cycle. The QC story outlines how the activity is to be undertaken in concrete steps. It consists of the following steps : 1) theme setting, 2) reason behind theme selection, 3) diagnosing the existing situation, 4) causal analysis, 5) setting of countermeasures and its trial implementation, 6) verification of effects, 7) standardization/stabilization/ recurrence prevention, 8) reflection/review of existing problems and 9) planning.

Table 3. Circle Theme Content

Theme content	Percentage
Improved quality	24.8
Enhanced level of efficiency	24.7
Cost reduction	18.9
Innovation of facilities	9.6
Prevention of errors	5.0
Higher standards of control	5.0
Safety	3.2
Others	9.4

Source : JUSE (1983)

The QC story does not only provide the direction for the smooth implementation of the activity. Circle presentations on the results of the activity in nationwide and international conferences are all based on the QC story. Thus, it also serves as a common language for the exchange of circle experience and information among industries not only within Japan but with other countries as well.

The QC seven tools, on the other hand, are the most fundamental techniques selected among different types of statistical techniques that can be utilized in quality control. The use of these techniques are emphasized in circle training. The QC seven tools are derived from the following : 1) Pareto chart, 2) cause and effect diagram, 3) graph and control chart, 4) checksheet, 5) histogram, 6) scattergram and 7) stratification. These techniques are discussed in detail elsewhere.

The Effects of Circle Activity

Figure 2 shows Nita's (1978) model. Circle activity effects are divided into direct improvement outcomes and indirect organizational outcomes. The former refers to better product quality, cost reduction and other tangible outcomes which the activity yields in the form of long-term or short-term economic outcomes to the organization. Economic outcomes are financial benefits that result from better quality, cost reduction and the like minus the amount of expenses needed to implement circle suggestions, and to maintain the activity.

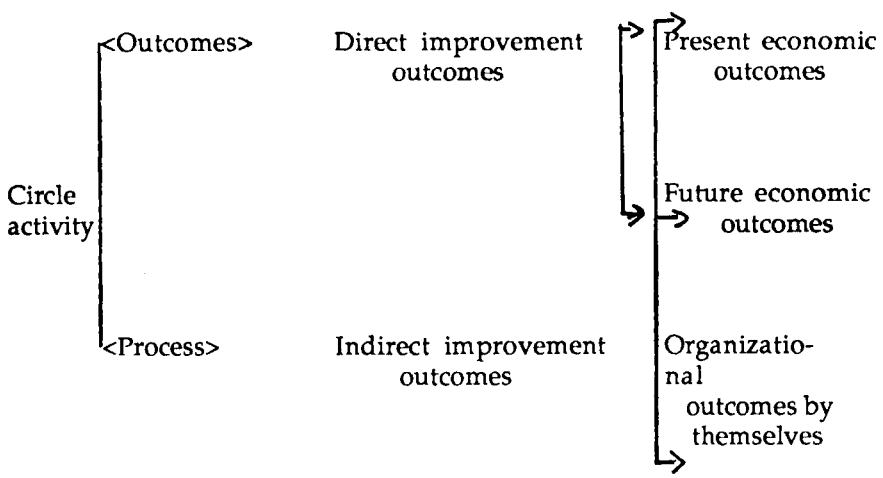


Figure 2. **A Model of QC Circle Activity Effects**

Indirect organizational outcomes refer to outcomes that arise from undertaking the activity process itself. Examples include enhanced problem consciousness among employees and improved communication in the workplace. Indirect outcomes are also known as intangible outcomes. Although it is difficult to measure these outcomes financially, theoretically, they should be reflected in both present and future economic outcomes.

The central focus of circle activity lies on work-related themes chosen based on organizational goals. The circle process is a structured, problem-solving activity. From the causal diagnosis of a work area to the implementation and evaluation of countermeasures, actual data collected and analyzed is used as basis. It is reasonable then to expect that if circle themes are relevant towards organizational objectives, and if, fact finding, which characterizes the activity process is applied accordingly, circle activation should contribute significantly towards improvement in organizational performance.

Although such contributions are emphasized in the current descriptive literature, the causal relationship between the level of circle activation and improvement in organizational performance has not been tested empirically. To infer that circle activation improves organizational performance, there is a need to prove that circle activation is an antecedent condition of performance improvement, and that circle activation leads to a change in performance.

For this purpose, the authors conducted a cross-lagged correlational analysis. In this method, the level of circle activation and organizational performance are measured in two different time points in time (T1 and 72). The correlation of the circle activation index at T1, with the performance index at T2, and the correlation between organizational performance at T1 and the circle activation index at T2, are computed. If the former is significantly greater than the latter, it can be judged that circle activation is a contributory factor of organizational performance improvement.

The time-lagged correlation between the circle activation index and the efficiency index of sixty branches of a Japanese commercial bank was computed in Bank Study-1 (see Notes 1 and 2). Results are shown in Figure 3.

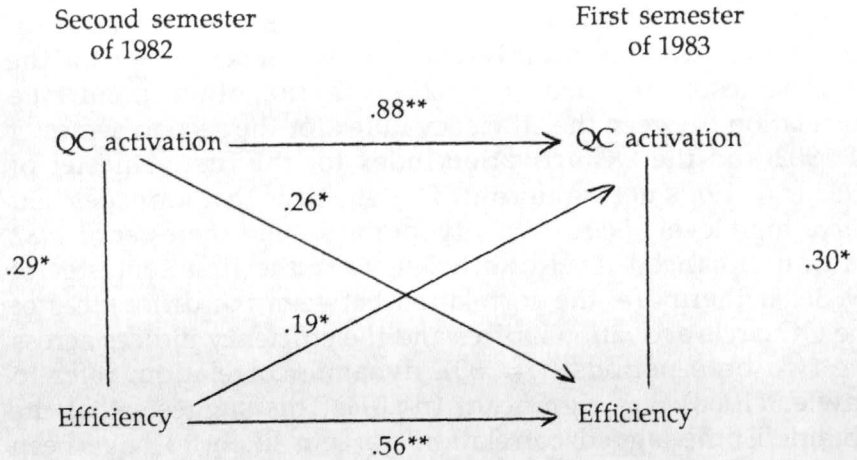


Figure 3. **Coss-lagged Correlations between QC Activation and Branch Efficiency**

Note : N = 59. A branch was not included due to incomplete data
*p <.05, **p<.01

The correlation of the QC circle activation index at the two time points (r = .88, p<.01), and the correlation between the two efficiency indices (r .56, p<.01) indicate the reliability of the two measures over a 6-month period (see Note 2 for the QC activation index and the efficiency index). The correlation between the QC activation index and the efficiency index at each time point (r = .29, and r = .30) indicates the concurrent relationship between the predictor variable (QC activation) and the criterion variable (organizational efficiency) at the respective time period.

The remaining two coefficients indicate the time-lagged correlations between the QC circle activation index and the efficiency index. Although the difference between the two time-

lagged correlation coefficients is not significant, it is worthy to note that the QC activation index for the second semester of 1982 correlates significantly with the efficiency index for the first semester of 1983 ($r = .26$). On the other hand, the correlation between the efficiency index for the second semester of 1982 and the QC activation index for the first semester of 1983 ($r = .19$) is not significant. This suggests that branches that had a high level of circle activity for the second semester of 1982 had an enhanced level of efficiency for the first semester of 1983. Furthermore, the correlation between the differences of the QC circle activation indices and the efficiency indices across the two time periods ($r = .35$), dynamic correlation, refer to Lawler (1968) was significant ($p<.01$). This suggests that the obtained time-lagged correlation was not likely to have been biased by a third factor.

Indirect Organizational Effects

As shown in Nita's (1978) effects model, indirect organizational effects of circle activity arise from undertaking the activity itself. For example, when communication among workers is improved based on circle activity, and morale in the workshop is enhanced, these are indirect organizational effects which are of value in themselves. Many Quality Proponents emphasize more the indirect organizational outcomes, rather than the direct outcomes.

To evaluate the indirect effects of circle activity, it is necessary to investigate whether in undertaking circle activity, employees become more improvement-conscious, and have better interpersonal relations in their work units. To achieve this, the authors tested the following five hypotheses with 131 circles in the First Electronics Company Study (refer to Note 1).

Hypothesis 1. The higher the level of circle activation, the higher the level of improvement awareness of its members. Circle activity is essentially work improvement. Circle members identify work areas that need to be improved, set improvement goals, collect and analyze data, set countermeasures, verify effects and submit improvement proposals. In undertaking this process, it is expected that concern for improvement will not be limited to the activity itself, but will be carried over to daily work.

Hypothesis 2. The higher the level of circle activation, the deeper members' understanding of their own work and that of their unit's. To initiate work improvement in circle activity, circle members analyze work methods to determine where the areas of correction are. At times, they also have to take into consideration the relationship between their own work and work in other workshops as well. In this manner, circle activity provides the opportunity for members to review their own work deeply and intensively. This should be useful towards deepening their understanding towards work.

Hypothesis 3. The higher the level of circle activation, the higher members' sense of participation in decesion making. To implement countermeasures decided upon in circle activity, it is necessary to obtain managerial approval. In many cases, approval is obtained. This is because circle proposals are not mere notions, but are based on data. Thus, QC circle activity provides employees with the opportunity to feel that "we ourselves can exercise influence in decisions on key work unit matters".

Hypothesis 4. The higher the level of circle activation, the higher the fulfillment of higher order needs in daily work. The activity process is a data-based problem solving process. Circle members use a variety of statistical techniques and skills. The

solving of difficult problems in the work unit. Therefore, a sense of achievement and satisfaction in circle activity becomes a part of the quality of work life. As a result, it is expected that this enhances the fulfillment of higher-order needs.

Hypothesis 5. The higher the level of circle activation, the higher the level of social integration in the work unit. Usually, a circle is established based on a section, and the activity focuses on the solution of common problems in work handled by the section. Thus, it is expected that circle activity serves as an integrating mechanism of unit members. It also provides an opportunity for members to share their work-related views in an informal atmosphere. This is a good chance particularly for employees who work individually to interact with their peers.

To test the above hypotheses, scales were developed to measure circle activation and the five indirect organizational effects. The circle activation index is composed of 15 Likert type scales adapted from Nagamachi's (1980) Activation Scales. The five indirect organizational indices were developed by the authors. For each index, 4-5 Likert type scales were developed.

Two members randomly selected from each of the circles rated the activation level of their own circles. The average of the ratings of the two members rated each of the five indirect organizational effects based on their own work experience. The circle average served as the basis for the indirect organizational effect indices (refer to Note 2).

Circle members' ratings were used to evaluate circle activation, not managers' or circle leaders' ratings. First, circle members know their circles best, and second, members, unlike managers and leaders, do not need to project a better image of their circles; thus, it is possible to get "fair" ratings. Furthermore, the circle activation index and the indirect

organizational effects were rated by different circle members. If both indices were rated by the same circle members, the correlation between the two indices would be necessarily high. The correlation between the circle-based average score for each effect and the circle activation index was then computed. Results are shown in Table 5.

Table 5. **Circle Activation and Indirects Effects**

Indirect effects of circle activity	Correlation with circle activation index
Improvement awareness	.21*
Work understanding	.23*
Social integration	.22*
Enhanced sense of participation	.22*
Fulfillment of higher-order needs	.22*

Based on the First Electronics Company Study. N=131 circles.
*p<.05.

As shown in the table, the circle activation index has a significant positive correlation with the indices of all of the five effects. This indicates that the more active circles are, the greater the extent to which improvement awareness is heightened, understanding towards work deepened, the work unit integrated, a sense of participation in deciding key work unit matters enhanced, and higher-order needs in daily work fulfilled. However, since the correlation is based on the circle activation index and employee work attitude indices at the same time point, in a strict sense this cross-sectional data does not shed light on the causal relationship between the two variables. It should be noted that it merely suggests the indirect effects of circle activity.

Indirect Effects as Moderated by Employees' Growth Need

Although it was shown above that QC circle activity yields various indirect effects, there is no assurance that circle activity yields positive effects on work motivation and satisfaction to all circle members unconditionally.

In interviews conducted with circle members of an automobile manufacturing company, the authors investigated the influence of circle activity towards employee work motivation and satisfaction. It was found that employees who had a positive working attitude tend to integrate circle activity together with work, while those who did not have such a positive attitude tended to consider circle activity as an extra burden. Thus, it was hypothesized that employees with a strong concern for growth and development in work would tend to integrate the activity with work, thereby yielding indirect organizational outcomes.

To test this hypothesis in Bank Study-1, the moderating effect of circle members' growth need on the relationship between circle activation and indirect outcomes was investigated. For this purpose, stepwise, hierarchical regressions were computed with intrinsic motivation, work satisfaction, and growth satisfaction as dependent variables. The following two equations were utilized in this analysis (See Note 4 for methodology) :

$$y = a + b_1 x_1 + b_2 x_2 \qquad \text{(Linear Regression)}$$

$$y = a + b_1 x_1 + b_2 x_2 + b_3 x_1 x_2 \qquad \text{(Moderated Regression)}$$

where

y = dependent variable (intrinsic motivation, work satisfaction and growth satisfaction)

x_1 = circle activation index of the circle members belong to

x_2 = growth need strength

$x_1 x_2$ = interaction between circle activation index and growth need strength

Table 6 shows the increments in multiple R for moderated regressions. For males, the increment in multiple R is significant for the dependent variables intrinsic motivation, work satisfaction and growth satisfaction. For females, the increment in multiple R is significant for work satisfaction.

These results indicate that growth need strength moderates the relationship between the circle activation index of the circle to which members belong to and work satisfaction for both males and females, and intrinsic motivation and growth satisfaction for males. In other words, this suggests that for members who are high in growth need strength, a high level of circle activation yields indirect organizational outcomes as it enhances intrinsic motivation, work satisfaction and growth satisfaction.

Table 6. Summary of Stepwise, Hierarchical Regression Analysis

	Males (n=202)			Females (n=168)		
Dependent variable	R (1)	R (2)	F Inc.	R (1)	R (2)	F Inc.
Intrinsic motivation	.19	.24	13.03*	---	---	---
Work satisfaction	.20	.27	18.99*	.11	.15	7.72*
Growth satisfaction	.20	.26	16.05*	---	---	---

Based on Bank Study-1.

R^2 (1) =R based on equation (1), (2)=R based on equation (2).

Inc.= increment.

*p<.01

Attitude of Circle Members and Union Leaders Towards Circle Activity

Circle Members' Attitude

Despite the diffusion of circle activity, surveys on the attitude of circle members towards the activity are surprisingly few. The authors thus conducted comparative surveys on the attitude of male and female circle members in the Second Electronics Company Study, and in Bank Study-1. In these studies, 16 items were used. Factor analysis of these items led to the categorization of the items into three areas, namely, the relationship between QC circles and work, a positive attitude towards QC circles, and a negative attitude towards QC circles. Table 7 shows the comparison between members belonging to the manufacturing company and the bank for both males and females, based on two selected items representing each area.

Table 7. **Attitude of Manufacturing and Bank Circle Members**

		Manufacturing			Banking		
		D	?	A	D	?	A
It facilitates the review of work	M:	4.8	36.3	57.9	6.9	37.1	55.9
	F:	.9	29.1	69.2	8.9	55.4	35.7
I consider circle activity to be a part of my work		22.9	43.7	32.7	11.9	44.5	43.6
		17.1	50.4	31.6	63.1	32.7	4.7
It is a good chance to utilize our thinking and judgement		6.8	38.0	53.7	8.9	52.4	38.1
		6.8	35.0	57.3	8.9	52.4	38.1
QCC is a voluntary (jishuteki na) activity		15.1	33.6	46.9	54.5	27.2	17.8
		10.3	35.9	50.4	74.4	20.8	4.8
If I had a chance, I would not participate in QCC		41.7	38.6	17.9	39.6	42.1	18.3
		38.5	47.0	13.7	16.1	34.5	49.4
I cannot understand why there is QCC in spite of a heavy workload		38.0	37.1	24.9	26.2	20.3	53.5
		35.0	47.0	17.9	8.9	20.8	70.2

Notes : D=disagree, ?=uncertain, adn A=agree.
For the manufacturing industry, N=537 males and 112 females.
For the banking industry, N=202 males, and 168 females.

For males, both belonging to the manufacturing company and the bank, majority of the respondents recognized circle activity to be a good opportunity to review work, to utilize one's ingenuity and ability, which makes them accept circle activity as a part of work. Significantly more members in the manufacturing company consider the activity to be their own "voluntary" activity. On the other hand, more bank employees expressed doubts on the necessity of engaging in the activity despite a heavy workload. On the whole, members from manufacturing were more positive towards the activity compared to bank members.

Differences in attitude were more striking for females. Although bank employees recognize the advantages of circle activity in relation to work, remarkably few accepted circle activity to be a part of work, or considered the activity to be a "voluntary" one compared to the manufacturing employees. Furthermore, an overwhelming majority expressed doubts in undertaking circle activity despite a heavy workload, and more than 70 % responded that if possible, they would not participate in the activity.

The positive attitude of the manufacturing employees was also demonstrated in open-ended responses obtained from the same study. Out of a total of 198 responses, 34.8 % felt that the activity is beneficial not only for the company, but also for circle members themselves.

The results showed that for both the manufacturing company and the bank investigated, circle members acknowledged the advantages of circle activity in relation to work. On the whole, manufacturing employees were more positive towards the activity, with a marked difference among females. These findings lend support to the trend in Japan that QC circles are actively undertaken in manufacturing work

units, but are relatively difficult to activate in staff units like administration and sales (Wakeda, 1982).

Table 8 shows problem areas encountered in circle activity as perceived by circle members in Bank Study-1. The members were divided into sales and non-sales departments (deposit, foreign exchange, loans, etc.).

Both sales and non-sales circle members acknowledge difficulty of data-gathering while working as an impeding factor. Sales circle members find the lack of time due to a heavy workload more of an impediment compared to circle members belonging to other departments. In contrast, non-sales circle members find the lack of QC knowledge, difficulty of theme generation, and lack of knowledge on activity results as factors that impede circle activity to a great extent, compared to sales.

Table 8. **Impeding Factors from the Point of View of Circle Members**

Impeding Factor	Sales (n=206)	Non-Sales (n=709)
Difficulty of data-gathering while working	88.6 %	86.9 %
Lack of time due to heavy workload	88.1	80.5
Lack of QC knowledge	68.6	83.9
Activity is only for a few	58.8	62.6
Difficulty of theme generation	39.9	70.5
Indifference on the part of superiors	30.6	19.1
Absence of reliable evaluation	28.4	27.8
Lack of knowledge on results	21.9	45.2
Strong pressure from superiors	2.8	28.1

Based on Bank Study-1. Response alternatives were "applicable" and "unapplicable". Values in the table shows the percentage of subjects who answered "applicable".

Circle members usually collect data in the midst of discharging daily work. Ever since the oil crises, Japanese companies maintain a minimum work force, so that the workload is usually heavy. This becomes a source of strain for employees. Another problem cited is the difficulty of theme generation. To sustain circle activation, problem areas which need improvement have to be continuously identified. However, with continued activity implementation, progress in work improvement accumulates, which results in the decrease of areas of potential change that can be handled by circle members. This is exemplified by the following statement of a Japanese female circle member in a bank :

"Around the first three years of circle implementation we exerted our efforts in improving work areas which did not meet set standards. During that time it was relatively easy to conduct circle activity. However, as time went on, it became increasingly difficult to initiate work improvements based on circle activity. This is because through the efforts we exerted, we exhausted possible work improvement areas. Remaining areas of improvement that could be undertaken require changes in the work system, which we cannot initiate as circle members".

Union Leaders' Attitude

Table 9 shows the attitude of union leaders towards small group activity (QC circles included), based on survey results as conducted by the Denkiroren (1983), Zenkokukinzoku (1984), and the Japan Institute of Labour (1982).

Table 9. **Union Attitude towards Small Group activity**

Survey	Number of unions	Supportive	Tacitly approve	Opposed
Denkiroren	213	57.3 %	38.5 %	4.2 %
Zenkoku Kinzoku	59	33.9	59.3	5.1
Japan Institute of Labor	344	56.1	41.9	1.2
Sohyo	44	34.1	56.8	4.5
Domei	93	71.0	26.9	1.1
Churitsuroren	37	35.1	64.9	0.0
Unaffiliated	161	59.6	39.8	0.6

Results showed that majority of the union leaders have a favourable attitude towards small group activity. At least 60 % of non-affiliated union officers, together with those affiliated with Denkiroren and Domei expressed positive support for small group activity. Even though the result of the unions did not show positive support for the activity, these unions expressed tacit approval; only less than 10 % were against the activity. What are the possible reasons behind this positive support of labour unions towards small group activity ?

First, in Japanese enterprises, even if productivity increase leads to surplus personnel in the workplace, this does not result interminations. In 1955, the Japan Productivity Centre was established. A nationwide productivity movement was initiated, spurred by the promulgation of the "Three Principles" between labour and management. The first principle calls for the absorption of surplus personnel that may result due to productivity increase through transfers and other measures to avoid terminations. This has exerted a big influence on the attitude of labour unions towards QC circles. As reflected in the Denkiroren survey, more than 80 % of the union leaders supported small group activity, while more than 60 % of union leaders that tacitly approved of small group activity evaluated small group activity as useful towards increased productivity.

Second, Japanese labour unions are so-called enterprise unions. In the final analysis, the interests of the labour union and management are one. Each union, in working towards the improvement of the quality of living of union members, has no recourse but to cooperate with management in enlarging the pie.

Thus, labour unions positively support small group activity that is useful towards improved productivity. Although aware of a number of problems, unions are not against the activity,

even if they do not positively support it. This disposition of Japanese labour unions is well illustrated in the case of Hango Seisakushou, where the union agreed in its labour-management agreement that it would cooperate with management towards "enlarging the pie". In this company, circle activity is undertaken as part of the "shokuba gurumi" (workplace grassroot) movement.

Concluding Remarks

More than twenty-five years since their conception, QC circles have pervaded countries in different parts of the world. The universal nature of QC circles is described aptly by Sasaki (1981). According to him, "the QC circle is not at all a unique product of Japan, based on the unique culture of Japan. It can be applied to any culture". The transplant of QC circles to countries outside of Japan is examined elsewhere (Asian Productivity Organization, 1980; Onglatco, 1988) and will not be treated here.

Among the many Japanese management techniques, why have QC circles alone exerted such a big influence ? First, QC circles yield tangible effects which are of greatest concern to management - quality improvement, cost reduction and enhanced efficiency. Japan's dramatic economic growth was realized through the export of low-cost, high-quality products.

Second, the QC activity process is based on standardized methods and statistical techniques, which are easily comprehensible and transcend culture and language. Theme-setting, the collection of data in the identification of problem causes, the proposal of solutions to eliminate major problem causes, and the verification fo yielded effects - this methodology

of QC circles is a by-product of a theoretical, scientific way of thinking which can be easily understood.

Third, QC circles serve as an opportunity for employee participation. The activity enhances employees' drive for work (hatarakigai), which met a worldwide demand in the latter half of the 1960's. It was found that QC circles increase members' sense of participation in decisions, and enhance the social integration of the workshop. These effects basically fulfill the demand of improving the "quality of work life". Although problems exist in the mode of implementing QC circles even in Japan (Onglatco, 1988), the positive effects of the activity will have to be acknowledged.

NOTES

1. The following are the four studies conducted using the interview-questionnaire method :

BANK STUDIES 1 et 2 were conducted in a nationwide Japanese commercial bank which pioneered the introduction of circle activity in the banking industry more than seven years ago. All bank employees are circle members, with a total of 1780 circles.

The circle structure in the bank corresponds to the existing unit structure, with some exceptions where work units are merged. Circle members select circle leaders who serve as coordinators, under the guidance of unit supervisors, who serve as advisers. All circles within a branch are placed under the responsibility of the assistant branch manager, who is designated as "person-in- charge" or "sewanin".

BANK STUDY-1, conducted in 1983, covered all nine work units in 60 branches of the bank. Sixty branch managers, 60 assistant branch managers (persons-in-charge), 149 supervisors (advisers), 370 circle members (202 males and 168 females) representing 149 circles served as respondents for Bank Study-1. Mean age for male members was 27.5 years, and 23 years for female members. The average size of the circle was 4.8 employees.

BANK STUDY-2, carried out in 1984, covered 46 suburban branches, and focused on deposit and sales units, with 135 circle members from 46 deposit circles, and 292 members from 68 sales circles as key respondents. Mean age was 28.2 years for sales, and 22.9 for deposit members. The average circle size for sales was 7.5 employees, and 4.7 individuals for deposit.

The FIRST ELECTRONICS COMPANY STUDY was conducted in 1985 in a company that produces car accessories. It has been conducting circle activity for around seven years. The company let circle activity take its own course of development, without exerting much pressure on the part of management.

The sample consisted of 131 circles from 13 factories located nationwide. A total of 802 circle members, 507 males and 295 females served as respondents. Average age for males was 27.6 years; for females, 30.7 years. The average circle size is 6.7 individuals.

The SECOND ELECTRONICS COMPANY STUDY was also undertaken in 1985 in a factory of a big-scale, diversified electronics firm. Circle activity has also been conducted for seven years, with the full support of the factory manager.

The sample consisted of two groups : one on circle attitude, with a total of 649 respodents, 537 males and 112 females; another on the relationship of goal setting and circle activation, based on 41 circles. For the first group, the average age of male members was 36.5 years; for females, 30.7 years. As was done in previous studies, the questionnaire was administered by guaranteeing respondents' anonymity. Respondents merely wrote down their circle name.

2. For the cross-lagged correlational analysis on the effect of QC circles on bank efficiency, the following two indices were used :

The QC index is measured on a branch level. It is calculated by the Quality Control Department tice a year, based on company records on the following major criteria : completion of themes by branch circles within the 3-4 month designated period, number of management presentations made and the number of branch circles chosen for inter-branch and company-wide conventions and the like. Thus, this index represents an average score of the extent to which circles within a branch exerted their effort in engaging in circle activity, and over-all excellence in activity content in termes of theme relevance toards organizational objectives (See Onglatco and Matsui, 1984 for details). The study utilized branch activation indices for the second term of 1982 and the first term of 1983. Means were 13.46 (SD=4.50) and 13.41 (SD=D.49) respectively.

The efficiency index is also branch-based. It was developed by the Systems Development Department and computed bi-annually on the following components of efficiency : systems and operations, manpower utilization (overtime ratio), accuracy in transactions and

adherence towards set policies and so forth. This index represents the extent to which a branch exerted effort to increase efficiency in operations. It has been used as a branch evaluation index by top management. Ratings were obtained on a 5-point scale, 5 for excellent, and 1 for poor. The respective means for 1982 and 1983 were 3.8 (SD=1.23) and 4.0 (SD=1.00).

3. Indirect organizational effects on employee work attitude were measured at the circle level. Based on factor analysis of 45 items, five indices were developed : work improvement awareness, five items (e.g. interest in solving technical problems that arise in work), work understanding, five items (e.g., knowing the relationship of your own work and that of peers), social integration, five items (e.g., members crack jokes with one another), sense of participation, four items (e.g., ability to influence important matters in the workshop), and higher-order need fulfillment, five items (e.g., learning various things through work). Ratings were obtained on a 3-point scale, 1 for not at all, and 3 for very much. The average of the summed responses served as the attitudinal index score. Table N-1 shows the mean, standard deviation and alpha coefficient of each index. Inter-item correlations among the five attitudinal measures ranged from .13 to .55, with a median of .26.

Table N-1 Work Attitudinal Indices

Index	Mean	SD	Alpha
Work improvement awareness	2.1	.24	.63
Work understanding	2.1	.25	.73
Social integration of the unit	2.4	.23	.60
Sense of participation	1.7	.26	.74
Fulfillment of higher-order needs	2.0	.29	.84

Source : Onglatco (1985)

The QC activation index was also measured at the circle level. Fifteen items chosen from Nagamachi's (1980) activation scale was used for this purpose. Factor analysis of the items yielded two activation areas : enthusiasm of members towards the activity, and technical knowledge of the activity. Ratings were done on a 5-point scale, e.g., "persistently pursue a goal once it is set", 1 for not at all, to 5, very much. The index was based on the average of the responses across the 15 items for the two members, with a mean of 2.93 (SD=.51). The alpha coefficient was .86, with an inter-rater reliability of .52.

4. To investigate the effect of circle activation on employee work motivation as moderated by growth need strength, Hackman and Oldham's Job Diagnostic Survey (1974, 1976) was used. The growth need strength scale includes six items (e.g., I like to have the opportunity for personal growth and development on my job"), the intrinsic work motivation scale, four items (e.g., I feel a great sense of personal satisfaction when I do my job well"), the job satisfaction scale, two items (e.g., "generally speaking, I am very satisfied with my job"). All of these items were measured on a 7-point scale, 1 for strongly disagree and 7 for strongly agree. The growth satisfaction scale includes four items, 1 for extremely dissatisfied, and 7 for extremely satisfied, (e.g., "I am satisfied with individual growth derived from work").

   The circle activation index was developed by standardizing ratings of persons-in-charge and advisers, using six criteria : 1) enthusiasm of circle members in the activity; 2) content excellence of theme or project; 3) knowhow on QC techniques; 4) frequency of circle meetings; 5) thoroughness of review of measures; and 6) degree of initiative demonstrated. The first three criteria were used by persons-in-charge and the last five criteria, by advisers.

   Persons-in-charge were asked to rate all the circles within their branches through cross-circle comparison, with the best circle rated 5, and the least, 1. These two circles served as scores was 9.7 (SD=S.65). Advisers rated their on circles on a 5-point scale. Mean of the summated score was 15.3 (SD=3.33). Persons-in-charge and adviser ratings correlated .49 (df=147, $p<.01$). The over-all index was based on the sum of z-values of each of the summated scores for persons-in-charge and advisers plus 50.

The data shown in the table involves some statistical problems. One of the independent variables, i.e., circle activation, is a circle-based score, whereas the other independent variable, i.e., growth need strength, is an individual score. This raises the problem of "level of analysis" (Rousseau, 1985). In addition, the dependent variable, i.e., perceived motivational potential of the job, intrinsic work motivation, and so forth, and another independent variable, i.e., growth need strength, were obtained from the same subjects. This leads to the problem of "common method variance". Ways of overcoming these problems will have to be sought in future studies.

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RESUME

Les cercles de qualité se sont développés au Japon après la guerre en incorporant des concepts développés aux Etats-Unis. Peu d'études ont été entreprises pour mesurer l'efficacité de ces cercles, le degré des motivations des participants ainsi que les différences sectorielles. Il apparaît maintenant que la plupart des cercles sont créés non pas spontanément mais à l'instigation du management et que des écarts notables existent entre leur acceptabilité d'une part par la main-d'oeuvre ouvrière et les employés et d'autre part d'après le sexe des intéressés.

Les ouvriers dans la fabrication acceptent volontiers la participation même si l'activité se fait en dehors des heures normales de travail. Il n'en est pas de même dans les services tels que banques et assurances. D'autre part, pour des raisons évidentes de gestion de leur ménage, il apparaît clairement que les femmes sont beaucoup plus réticentes à sacrifier des heures supplémentaires pour y participer.