

QCC & SS as key structures for sustained kaizen successes⁽¹⁾

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ABSTRACT

A keen observation of kaizen activity results reveals that companies may be clearly classified into two groups: those that do and can sustain kaizen successes and those that can not. So why are some improvement programs successful and others not? In other words, if some companies have been able to sustain their improvement results, why others do not?

Key words: Quality Control Circle (QCC), Suggestions System (SS), kaizen, continuous improvement (CI), improvement company (IC), improvement permanent structures, JIT, kaizen success

Introduction

In 1987, I landed in Japan with my background education in philosophy. I however had a strong interest in Japanese manufacturing companies. I made my research and specialized on the Japanese management and production system. Of the many things that struck my mind about the Japanese manufacturing compa-

(1) This paper is dedicated to Prof. T. KOJIMA. He introduced me to the Japanese production management and guided my first steps in that field. He is the one to whom I am so grateful for all he has done for me and my career. My debt of gratitude to him has no limits. The paper itself is a revised version of the presentation made at the Sixteenth Annual Conference of POMS, Chicago, IL, April 29-May 2, 2005 under the title: "Why is your kaizen activity program not so successful?"

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nies, I still clearly remember not only the incredibly high number of suggestions for improvement made at the work place but also the huge saving companies were making thanks to those improvement suggestions. K. Ohmae (1983) clearly stated that Toyota made more than \$200 million in saving. It was also the moment Toyota collected the largest number of suggestions in its history: 2.65 million suggestions in 1986.⁽²⁾

As we can see, improvements can be measured in terms of the number of suggested ideas for improvement; and/or, -more important- in terms of cost saving realized.

The question that arose in my mind at that time was, “How long can those companies keep making improvements?”

During the factory visit made to Toyota in July 2003, we were told that 651,000 suggestions for improvement were collected in 2002.⁽³⁾ That same year, Toyota made more than \$350 million worth of cost reduction, resulting in the equivalent amount of profit. According to Mr. Cho, president of Toyota at the time, that was thanks to improvements made in design rooms. He affirms that there is still enough room for improvements!⁽⁴⁾

On the other hand, during my numerous contacts with Japanese small and mid-size manufacturing companies and also during some factory visits in France, I have realized the fact that improvements had been made in some places. Unfortunately, what they had in common was the fact that they were or could be not sustained. They did indeed flourish some time ago; but they then dried up. Or their number had substantially shrunk to a non significant one. What re-

(2) The source of this information is a document I got from my visit to Toyota Company in 2003 with my Japanese students.

(3) *ibidem*

(4) He stated that during a TV program when interviewed about the huge savings Toyota has realized thanks to CI

mains to be witnessed by visitors are some vestiges, signs or traces of past successes.

So I have thus observed chains of successive and sustained improvements in big corporations in Japan and sporadic or islands of improvements in the majority of small manufacturing businesses in Japan as well as in some large corporations in France.

So why are some improvement programs successful and other not? In other words, if some companies have been able to sustain their improvement results, why others do not?

Brief literature review on approaches to kaizen

The literature reveals the following patterns in approaches to kaizen programs. Early approaches are mainly descriptive and emphasize the benefit of kaizen activities (Imai, 1991; Nemoto, 1983), close to some of today's empirical studies (Brunet & New, 2003). Recent trends includes knowledge and costing approaches (Delbrige & Barton, 2002; Modarress, Ansari, Lockwood, 2005). We do have also approaches that emphasize the implementation and transfer of kaizen techniques in different managerial and cultural settings (Recht & Wilderom, 1988; Cole, 1983; Abdul-Azia, Chan, Metcalfe, 2003). Others examine the role kaizen plays (Sverker, 1992; Imai, 1991; Lillrandk, 1991) or should play (Webb 1993). Some others even oppose kaizen to continuous improvement.

Unfortunately, none of the mentioned approaches focuses on examining the relationship between kaizen, QCC and suggestions systems (not just suggestions). Monden (1983, 1997)'s description of the Toyota production system is interesting since he shows that kaizen at Toyota is made within the framework of QCC and SS. But his approach is purely descriptive. He does not deal explicitly with the question, "what would happen to Toyota improvement activities

outside these formal frameworks?” That is, he does not try to clearly generalize the facts by showing and/or establishing a relationship between SS, QCC and the success of a kaizen program. In fact, is there any relationship between SS, QCC and kaizen? The answer seems self-evident since suggestions are ideas for improvement, and QCC aims at improvements. Can a company make improvements without having any QCC and/or SS structures? If the answer is obviously yes, can such a success be sustained even though there are no formal improvement structures?

What is kaizen?

“What is kaizen? Kaizen was created in Japan following World War II. The word Kaizen means continuous improvement. It comes from the Japanese words Kai meaning school and Zen meaning wisdom” (Steve Hudgik, www.graphicproducts.com/tutorials/kaizen/index.php). Hudgik’s etymological explanation of the word kaizen is very misleading. It needs being fixed.

For anyone with some written knowledge of the Japanese language, kaizen has nothing to do with the Zen School of thinking. In Japanese, kaizen simply means improvement. The word is made in fact of the two kanji “kai” and “zen”. But the two kanji mean “modify, change, reform, amend, etc.” and “good, right, virtue”, respectively (Halpern, 1990, p.137 & p.1068). Kaizen⁽⁵⁾ means modification in order to make better, i.e. improvement.

At the work place, the word kaizen has exactly the same meaning as in ordinary Japanese. But I dare add that in the framework of 5S, the 5th S *shitsuke* (躰) requires the discipline of making improvements not only once but continu-

(5) The Chinese character “Kai = 改” is also read “arata” and as such, it is the stem in/of the verb “aratameru= 改(める)” which means to reform, renew, redo, change, revise, improve.

ously. Continuous improvement in Japanese is renzoku or renzokuteki kaizen (連続の改善). The word continuous improvement was in all probabilities coined by academics or consultants to make the West understand that improvement in the Japanese work environment is always a continuous process. In the Japanese language, kaizen does not always mean per se continuous improvement!⁽⁶⁾

It is known that suggestions can be made independently, by an individual worker outside a formalized structure such as SS or QCC. And this is something that can happen in any company, be it in Japan or not. *We contend that such suggestions would never lead to a chain of improvements or continuous improvements.* Second, we know that suggestions for improvements can also be an emanation of organized or formal structures, such as QCC and SS. *We think that such improvements can be sustained over a long period of time and can thus qualify as continuous.* One can take among many others the case of improvement successes at the Toyota Company as one of the best illustrations.

By the way, of the QCC and SS, which one contributes best to improvement program results? Can a company succeed in its implementation of improvement programs without QCC and/or without SS? If yes, can it sustain its successes? What is the likelihood of a company featuring only QCC or only SS to make improvements? Which is easier to implement, QCC or SS? Who are the true contributors to improvements: engineers, line operators or consultants? Tentative answers to those questions will be drawn from the analysis of two research surveys we realized in Japan.⁽⁷⁾

(6) Some companies in Japan are now using the expression “renzokuteki kaizen” (continuous improvement) instead of kaizen only in order to make things clear or to emphasize that improvements should be made continuously, not only once.

(7) We revisited the data base of our research survey results we conducted in a large scale in 1993 to explore some aspect that we have not yet exploited or explored. A similar survey, but of a very limited scale done in Wakayama in 2003 did confirm the results obtained 10 years earlier. The present paper will focus of the data of the first survey.

Relationship between QCC & SS structures

QCC and SS are formal structures that an organization can set up in order to deal with improvement issues. A company may feature QCC only, SS only or both QCC & SS. Let them be referred to as QCC companies, SS companies and QCC/SS companies. Companies can be thus classified into three groups.

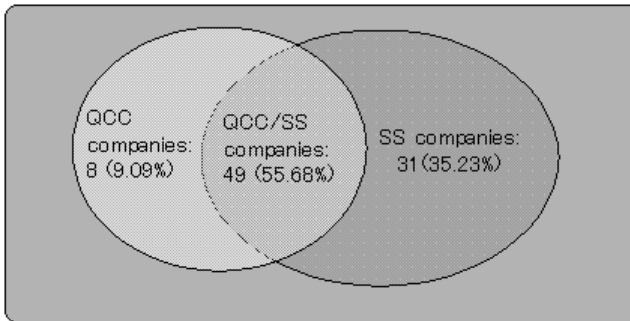
Table-1 Relationship between QCC, SS, QCC/SS companies

Total QCC/SS companies	49
Total QCC companies	57
% of QCC companies that have SS	85.96%
Total SS companies	80
% of SS that have QCC	61.25%

According to the survey findings, 85.96% of QCC companies have SS programs and 61.25% of SS enterprises possess QCC. There seems thus to be more SS companies than QCC or QCC/SS companies. The following observations are also worth mentioning. Second, most QCC companies (85.96%) are SS enterprises. Third, about two thirds of SS companies (61.25%) are also of the type QCC (see Table-1).

Table-1 has unfortunately the disadvantage of including most elements into two groups and thus counting them twice. In fact, any QCC/SS company is identified as belonging to the QCC group on the one hand and to the SS category on the other hand. A close analysis reveals that of the 88 companies that have at least one of the improvement structures, about 56%, 35% and 10% do have QCC/SS, SS and QCC structures respectively (Figure-1)

Figure-1: Relationship between QCC and SS.



Relationship between QCC, SS & improvement

The three types aim each at becoming improvement companies (IC). On the other hand, it is well known that most improvements (especially in the JIT production environment) are made through and/or within the framework of QCC and/or SS structures.

Data from the survey strongly suggest that each of the three types is likely to become IC. But, is it possible to compare the degree of that likelihood to make improvement between the three groups? This is a delicate issue since the path that leads to deal with that matter seems slippery, misleading and full of ambush. Once again, our tentative answer will be based on the analysis of the survey data.

Of the 72 companies that qualified themselves as IC, i.e. those crediting themselves with some improvement, 70.8% are QCC companies while 93% are SS enterprises as shown in Table-2

Table-2: Relationship between IC, QCC, SS and QCC/SS companies

Total number of IC	72 (100%)
Number of QCC companies that are also IC <i>Percentage of QCC companies that are IC</i>	51 70.8%
Number of SS companies that are also IC <i>Percentage of SS companies that are IC</i>	67 93%
Number of QCC/SS companies that are also IC <i>Percentage of QCC/SS companies that are IC</i>	47 65%

From Table-2, one can clearly deduce the number of companies featuring QCC only, SS only or none of the two formal improvement structures. Since there are 47 QCC/SS, there must be 4 companies featuring only QCC and 20 companies with SS structure only. Only one IC company has neither a QCC nor an SS structure (see Figure-3):

In fact, Table-2 leaves the impression that among IC

1. the share of QCC/SS companies, though being per se a large majority (65%) is numerically speaking the less important
2. QCC companies make up a larger majority (70%);
3. SS companies have the biggest share (93%).

It would however be unfortunately misleading to think that the likelihood to make improvements is

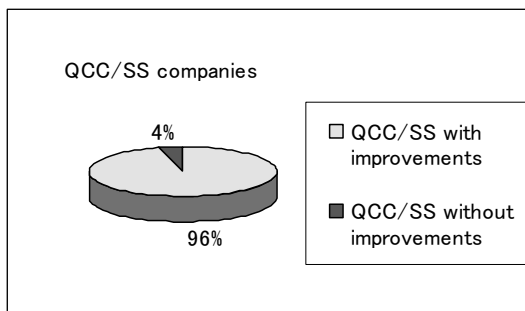
- a. high with companies featuring both QCC and SS;
- b. higher among companies that have switched to QCC only;
- c. the highest for SS companies.

Table-3: IC within QCC, SS and QCC/SS companies

Total number of QCC companies	57
Number of QCC that are IC	51
% of QCC companies that are also IC	89.5%
Total number of SS companies	80
Number of SS companies that are IC	67
% of SS companies that are also IC	76.1%
Total number of QCC/SS companies	49
Number of QCC/SS companies that are IC	47
% of QCC/SS companies that are also IC	95.6%

Table-2 compares cases of IC of each category with the total number of IC but not each group with the two others. Every group is considered independently, without any reference to the others, with regard to the total number of IC only.

Figure-2: Relationship between QCC/SS and improvements



Therefore it would be difficult to draw for the moment any sound conclusion based on comparing QCC, SS and QCC/SS companies as regards the likelihood of making improvements. Data concerning each group hold without any reference to others, and in that sense, can be said to convey an absolute information, instead

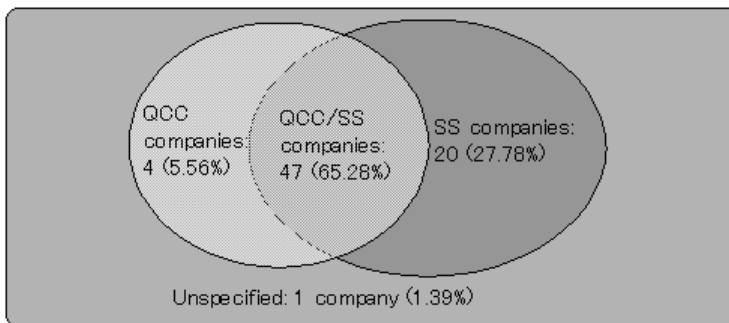
of a relative one. No sound correlation can be easily established between the groups based on interpretation of data contained in Table 2.

Table-3 displays the results of digging into each category to see how many of their respective members did make some improvements. At this level, the most striking fact is that almost all QCC/SS companies, i.e. 47 out of 49 (96%) credited themselves with some kind of improvement whereas only two thirds of SS companies did (see also Figure 2).

Furthermore, Figure 3 can be thought of as the integrated level of Tables 2 & 3. It sheds the light on the fact that the large majority of companies with improvements are those featuring both QCC and SS (65%). In other words, the probability of making some improvements seems the highest in companies featuring both QCC and SS.

Another observation worth mentioning is the fact that numerically speaking there are more SS than QCC companies.

Figure-3: Distribution of IC with regard to QCC and SS



The explanation behind this may lie in the fact that SS structures seem easier to carry out. For many companies, what is needed is just to install suggestions boxes and to motivate people to become more creative and pour in suggestions.

In fact, SS seem to require neither special organizational structures nor special time. They require the top management interest; the incentives for improvement and commitment of employees.⁽⁸⁾ Introducing QCC can come next as the latter would probably require to be given more thought to. When should QCC activities take place? How many members should a QCC have? How long should a QCC meeting last? And so on.

I think that SS can be carried out without the need to have any QCC but the latter seem to be always accompanied by the former. That may shed the light on the fact that the number of SS companies that are also QCC companies is lower (61%) than that of QCC enterprises that, at the same time, feature SS (85.9%). One should be very careful in interpreting the data about QCC and SS in Figure 3. A wrong reading may lead to thinking that “the likelihood for companies to turn IC is far higher in SS companies (27%) than in QCC enterprises (5.5%)”. Such statement would contradict earlier observations based on Table 2.

The truth is that an analytical look at Figure 3 reveals that the ratio of QCC/SS to QCC only and SS only companies is 11.7 to 1 and 2.33 to 1 respectively. This suggests that QCC companies are highly prone to becoming SS companies (Table 4). And we know that QCC/SS companies have the highest probability of becoming IC (Figure-1, Figure-2 and Figure 3).

(8) Monden description of the SS organization at Toyota shows that things are not that simple. The organization structure of SS should match that of the company as whole. Otherwise, they will fail. In other words, management people at all levels of the organization should be part of SS structure. This is what may be referred to as formal involvement of management in SS activities.

Table-4: Ratio relationship between IC, QCC, SS and QCC/SS

	Ratio of QCC/SS companies to	
	QCC companies only	SS companies only
All companies involved	6.12 to 1	1.5 to 1
Within IC	11 to 1	2.5 to 1

The most important lesson that may be learned from the data interpretation is that without QCC and SS which can be thought of permanent structures of improvement activities, the likelihood of making improvement is very slight.

Improvement architects

The study and practice of JIT have convinced academics and practitioners that the line workers are at the center of improvement activities. If I have to keep my trust in JIT theories and practice, the importance of line workers cannot be neglected and should be out of any doubt. But for the case of the survey, one should not forget that the survey focused mainly on the number of companies that have made some kinds of improvement and not on the nature or the value of those improvements themselves. Examining the value of improvement is of or close to the field of value engineering which is was out of the scope, the object and/or objective of the present survey.

However, in order to get a glimpse of the real contributors to improvement, let us just try to find out whether there is *a correlation between improvements, their yen values, their authors and the number of CI*. The yen values of improvements were obtained by the yen values of suggestions because an improvement may be the result of applying suggestions (Table-5).

Table-5 Total contribution to values of improvement by job category

Contributors	Companies	Range of Yen Contribution	
		From	To
Engineers	12	16,243,000	16,653,000
Operators	17	16,747,000	17,257,000
Consultants	1	30,000	30,000
Others	1	100,000	100,000

A keen and detailed analysis of the survey findings (Tables 5 & 6) lead to the following observations. Improvement was made by engineers only, the line operators only and by consultants only in six, ten and zero 25%, 41.6% and 0% companies. That represents 25%; 41.6% and 0%. 18 other companies mentioned engineers and line workers as having contributed together to improvements made. In two companies improvement was done by the three types of actors, i.e., engineers, line operators and consultants. Only a firm mentioned to have made some improvement thanks to consultants and operators.

Table-6 Exclusive contribution to improvement values by job category

Contributors	Companies	Range of Yen Contribution	
		From	To
Engineers only	6	1,113,000	1,113,000
Operators only	10	1,587,000	1,687,000
Consultants only	0	0	0
Engineers & operators	6	15,130,000	15,540,000
Operator and consultants	1	30,000	30,000
Others	1	100,000	100,000
Total	24	17,960,000	18,470,000

It is very unfortunate that the majority of IC did not (want to) indicate or do not know how much yen they gained from improvements. Of the 26 IC that

reported the yen values of their suggestions only 24 will be taken into account. Two companies will be excluded. Although both indicated the yen value of their suggestions, one of the them did not deal with question about improvement while the other said it made no improvement.

As for the yen values of improvements, engineers were said to have contributed in 12 companies for a total amount varying between 16,243,000 and 16,653,000 yen; operators in 17 companies for a sum situated between 16,747,000 and 17,257,000 yen. Consultants' contribution to improvement was mentioned in only company for a total amount of 30,000 yen.

Table-6 pictures the detailed and exclusive contributions by each group of improvement architects. In six companies, contribution to improvement was by engineers only and that represents an amount of 1,113,000 yen. In 10 companies, only operators did make improvements worth 1,587,000 ~ 1,687,000 yen. There is not single case improvement authored by consultants only. In the nine remaining companies, contribution to improvement was made by operators and engineers or by operators and consultants.

If one does not take into account the three extremely high values of 10 million, five million and one million yen, the contribution by both operators and engineers falls to between 130,000 and 540,000 yen. But everyone knows that there is no need to do so because those high values indicate an orientation toward progress.

Numerically speaking, only consultants seem not to play an important and productive role in improvement activities. In fact, it seems that the least involved people concerning improvements surveyed companies have realized are consultants. Is that due to the fact, because of the lack of sufficient funds small companies usually suffer from, the small and mid-size manufacturing enterprises can hardly afford to hire consultants? Or does it mean that consultants do not really

play any important role in improvements made at the work place? Either question can be answered by yes or by no since both a yes- or no-answer is worth defending. The question is that you can do it without consultants. Rely much more on your internal expertise first and as the last resort for sustained results.

Which group(s), between engineers, operators and consultants, can be considered the true contributors to improvements a company can make? Concerning that matter, I think no firm conclusion could be drawn based on the survey findings, because there seem to be not enough data to strongly support it. However, Tables 5 & 6 suggest that companies where those who have their hands on machines, i.e., operators and those who design/make production machines and/or processes, i.e., engineers cooperate are quantitatively and qualitatively the most successful in improvements.

Factory visit observations and collected data confirm those impressions or tentative conclusions/lessons. In Germany, where operators are looked at like dummies, we could not expect to find a real system of suggestions or QCC capable of competing with Japanese such organizations. Technical aspects of JIT knowledge are much more paid attention to.

Many environments outside Japan present structures similar to Japanese manufacturing sector where JIT is not dominant as well as Japanese management features. QCC have been identified at Japanese subsidiaries and some very French companies in such settings in France.

QCC at some French companies we have visited do not seem to include all employees since they are an engineering-driven companies. It involves mainly engineers. No clear quantification of improvement has been provided. They seem to make more innovation than improvements.

A Japanese subsidiary in a foreign environment can work the Japanese way. Suggestions system and QCC may exist. Suggestions may pour in like a

Japanese company in Japan (case of Toyota in the USA (Cole, 1983)).

In some other three or five plants visited in France, QCC seemed to have been more active in the past than at the time of our visits. It was at the moment I have realized the importance of management commitment to QCC and SS and their formal organization. In other words, if CI needs QCC and SS, the latter need management's full support in order to sustain continuous improvement.

Unfortunately, with the job mobility of the West, one might rightly wonder whether QCC and SS may have the same level of sustained results as they do in Japan. On the other hand the costs of suggestions are known to very low in Japan; they are not costly at all. What would have happen to companies with costly QCC activities (and low productivity)?

Consultants will never make continuous improvements. Consultants will never inundate a company with suggestions. They can just provide a company with a direction for improvements and sustained successes. CI can be based on QCC and SS, the only permanent structures of continuous improvement. QCC and SS can only be based on internal experts, i.e. operators, engineers, and managers. Not on outside consultant who can only suggest specific and sporadic improvements, which most of the time would qualify as innovation.

The conclusion we have reached on QCC and SS and their relationship to CI may seem obvious in the academic (or consulting) settings. But in the business world, they seem to need more explanation, more clarification. Don't be surprised when you contact the real world of business and feel sometimes their incredibility in their application. Try to tell German engineers that workers are experts from which you can tap good ideas for improvement!

Summary and lessons (to be) learned

Improvements can be made without setting up any QCC and SS program. However, QCC and SS being by their nature and purpose improvement structures, it seems almost impossible to sustain improvements without their support. And for me, sustained improvements have the same connotation as continuous improvements.

The analysis of the survey findings has strongly suggested that *companies sporting both QCC and SS are the most likely to make improvements, and even, important or substantial improvements*. The survey results clearly suggest also that *setting up both QCC and SS will result in more successes than sporting either QCC only or SS only*.

What the survey results do not and can't show is the fact that *for the kaizen results or its successes to be sustained, improvement structures should be permanent and part of the formal organization*, as is the case at the Toyota.

I strongly believe that one can be successful by chance. But I contend that no one can sustain successes over a long period of time by chance. That is why building improvement structures and keeping them running continuously must imply that *those structures need being taken care of, and committed in by line-operators, and by management layers (from middle to the top management)*. It seems very important to emphasize that these are not mechanical structures that can be automated. *QCC and SS structures should be integrated part of the whole organization and as such they need being managed and well managed in order to be productive. Resources should be committed so as to make them successful and to sustain their successes*.

The following lessons may be drawn from the combination of the survey

findings, our observations, experience and study of the JIT system:

1. Any organization that fails to set up permanent improvement structures can be successful with improvement activities. Unfortunately, its success would be only ephemeral.
2. Any organization that sets up improvement structures, but fails to manage them can experience some successes, but can not expect lasting or less sustained successes.
3. Any organization that fails to commit the necessary resources to managing improvement structures can not expect itself to sustain successes.
4. Any organization that relies mainly on outside expertise to make improvements would have more chance of make significant improvements but such improvements can hardly be sustained, i.e. it can't be continuous. Outside expertise may be, and is often necessary in setting up improvement structures; but their operation and management should be in the hands of the company.

Besides, from the study of the JIT management, we know that

1. improvement activities are the most efficient when involving every one concerned with the company;
2. one of the most valuable source of improvement is made of those people who have their hands and mind on the machines/processes they handle every day, i.e., line workers.
3. one can work with consultants to make innovations, but has to work with his/her workforce to make improvement, especially continuous improvements. That is because if the work force would become part of those permanent improvement structures.

While we did identify some manufacturing companies especially in France that rely on the expertise and knowledge of all their workforce to make

improvements, we could also see few structured and well managed QCC and S⁽⁹⁾ S. So no doubt that improvements made seem sporadic and un-sustained. Our contact with some companies in Germany confirmed the fact that German engineers do seem neither to trust nor to rely on operators. In such a context, continuous improvements seem to leave place to innovations. And innovation by its very nature is not a continuous process.

The paper main objective was to show that there is no kaizen if there are no supporting structures like QCC and SS. And those structures would not contribute to kaizen successes if they are not part of the whole organization and if they are not managed.

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(9) We have in mind among many others the sites of SteelCase in Sarrebourg, Caterpillar in Grenoble.

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