

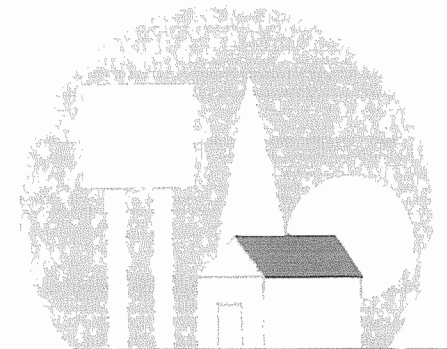
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**High-Tech in Kibbutz Industry :  
Structural Factors and Social  
Implications**

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**High-Tech in Kibbutz Industry :  
A Case Study**

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*High-tech in kibbutz industry:  
Structural factors and social implications\**

Contrary to the fast pace of technological innovation there are big differences in the rate of diffusion and application of those technologies in advanced industrial nations. An illustration of such differences is the case of industrial robots. The number of robots in Japan in 1982 was roughly four times the number in the U.S. (14,000 versus 3,500 in 1982). The ratio of robots per capita is the highest in Sweden.

The number of C.N.C. machines in U.S. industry is also considerably lagging behind the number in Japan and in several European countries. In addition to widely-discussed economic factors, are there also social factors which can help explain such differences?

There is considerable controversy over the organizational implications of the use of new industrial technologies and over their impact on the skill level of the industrial worker.

New approaches in organizational and management theory stress the need for a transition from hierarchical control to worker commitment (Welton 1985; Welton-Sussman 1987). In Germany, Kern and Schuman (1986) even foresee the possibility of an end to the division of labour and they stress the need "new concepts of production" overcoming the old Tayloristic approach. "Higher

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\* The factual background for this article is based on an on-going research on the implications of the introduction of new technologies in kibbutz industry conducted by the author and M. Palgi with the participation of J. Weiss.

productivity cannot be attained under present conditions without a more considerate, enlightened treatment of human labour - that is something that capital too must learn" (Kern and Schuman 1986, p. 1621).

On the other hand, a series of researchers stress the "de-skilling" implication of the new technologies. Following Bravermann (1974) they believe that management will use the new technologies to further its control over production at the expense of worker's skill and autonomy (Shaiken 1984; Nobel 1984).

In her cross-national comparative study, Kelley (1986) found no conclusive evidence to support neither the de-skilling nor the skill-upgrading theories. The differences in work organization and degree of division of labour can be explained by a series of nation and plant specific factors. She distinguishes between three basic strategies in the use of new technologies: (1) the scientific management approach leading to de-skilling; (2) the techno-centric participative approach leading to skill-upgrading; and (3) a worker centered participative approach. This last approach "implies a radical decentralization of control and responsibilities in production, providing for an unambiguously skill-upgrading effect on production roles and allowing for the greatest flexibility in adapting the technology to new uses and in speedily solving implementation problems" (p. 240).

While Kelley did not find cases in which the worker-centered participatory approach was fully implemented it seems that the process of introduction of new technologies in kibbutz industries fits this approach.

In the 260 kibbutz communities, with a population of 120,000, the members collectively own the means of production and share the income. The management of the communities and of the economic organizations, such as factories which are part of them, is based on direct and participatory democracy. Decisions are taken by assemblies and committees, and officers and managers are elected for

limited periods. Following a fast process of industrialization, most of members active in production, work in factories.

Cross-national comparative studies have shown the relatively high degree of worker participation in decision making, the relatively high level of worker commitment and motivation and the contrasting low level of alienation (Tannenbaum et al. 1974; Bartolke, et al. 1985; Leviatan and Rosner 1980).

The rate of introduction of advanced computerized automation in the small and medium-sized kibbutz factories has been outstanding in comparison with the overall rate in Israeli industry. While the 300 kibbutz plants employ only 6% of the total industrial workforce in Israel, they use 60% of the industrial robots. The diffusion of computerized numerical control devices is also much larger than in the overall industry level. (The rate of investment out of the gross income is generally superior to that in the overall Israeli industry).

An analysis of the structural factors that can explain this fast introduction of new industrial technologies reveals interesting similarities with countries, like Japan and Sweden, that have the highest rates of diffusion.

Some of the social factors pushing toward the introduction of new technologies in the kibbutz are similar to Sweden:

1. Out of value-based considerations, the kibbutz system limits severely the use of foreign labour, e.g. the employment of hired workers from outside the kibbutz. While the values guiding the Swedish policy to minimize the employment of foreign workers are different, the outcome is similar: a voluntary shortage of labour in industry.

2. A rather high level of education and social welfare creates a high level of aspiration toward self-realization in work and reluctance to perform routine and

alienating tasks. In both settings these factors led in the past to the development of a socio-technical approach aiming at organizational and technological changes: e.g. avoidance of assembly-line technologies, introduction of autonomous and semi-autonomous work groups, etc. The introduction of new technologies was therefore seen as another way to attract educated young adults to industrial work.

There are societal similarities between the kibbutz and Japan which help to overcome some of the major obstacles to the introduction of new technologies, such as: organizational rigidity, adversary relations between management and worker, job insecurity, etc.

The features of the Japanese system of industrial organization which can be compared with the kibbutz can be found mainly in the large corporations. Among them are: (a) lifelong working-place security; (b) a sophisticated system of professional education to assure adaptation to rapid technological changes; (c) open opportunities for mobility within the enterprise - both horizontal, through job enlargement, and vertical, through ascent in the hierarchy; (d) relatively small hierarchical differences, there being little distance between the various levels of hierarchy; (e) the "quality circle" approach representing only one example of unofficial possibilities of workers' participation at a place of work. (Shira, 1983).

All these characteristics can be found - although on a much more intensive level - in the kibbutz enterprises:

- (a) The kibbutz is responsible for lifelong satisfaction of the demands of all its members, the change of place of work having no influence on the degree of this satisfaction - in particular not on material living conditions.
- (b) The kibbutzim have a sophisticated system of adult education. A change of the place of work is not exceptional but rather common. There is an official system of rotation for public office and management.

- (c) The formal hierarchy is flat. Since the office of manager brings with it more difficulties than advantages, there are more opportunities for mobility than there is the readiness to use them.
- (d) The differences between the levels of hierarchy manifest themselves only in work. Since the manager is elected and since he is only able to implement jointly taken decisions, he generally enjoys a high degree of legitimation. Social relations are informal and not restricted to working hours.
- (e) Participation of the members in decisions is both direct and indirect - through voting for manager and management - and both informal in the working group and formal through participation in the assembly of factory and kibbutz. The "self-management" in a kibbutz is thus integrative since it unites the different levels of participation, not only of workers on the board of directors, but also the decision-making process at all levels (Tannenbaum et. al. 1974).

In conclusion, the relatively high rate of diffusion of new technologies in kibbutz industry can be explained both by factors motivating management towards the introduction of new technologies - as is the case in Sweden - and by factors helping to overcome social obstacles in this process - as in the case in Japan.

#### *Relatively high rate of diffusion in kibbutz industry*

This rate has been high in spite of a number of limitations resulting from the kibbutz structure, such as the difficulties of finding in a single, small community the professional manpower needed, limitations in risk-taking and in availability of investment-capital.

Due to the support of nationwide and regional organizational kibbutz movement networks in financing and professional training, it has been possible to at least partially overcome these difficulties.

But from a theoretical point of view, we can conclude that there seems to be a high degree of structural compatibility between the kibbutz structure and values and the social conditions that can facilitate the introduction of new technologies.

#### *The implementation of the worker-centered participation approach*

An important feature of the worker-centered approach is worker's participation in the decisions about the introduction of new technologies. Generally new and important investments will be discussed first with the workers concerned and then the decision will be taken by the plant assembly. The first approval will be given by the kibbutz economic committee and afterwards by the general assembly in the framework of the overall investment plan.

In the process of introducing new technologies, and in particular industrial robots, additional forms of participation have been devised. Following the initiative of the federation of kibbutz industries, an institute for industrial robots was established to promote the introduction of this new technology. Before a decision is taken to introduce such industrial robots, the kibbutz members are informed of the advantages and problems of using this technology, assisted by explanations by the institute, to avoid arousing fears and prejudices. The institute aims to provide information to kibbutz plants about the opportunities offered by industrial robots and other advanced technologies and to advise them in the decision-making process related to their introduction. They seek to assist the kibbutz plants in the choice of technologies that are the most appropriate to the solution of their problems, and devise programs for training the necessary technical personnel.

The expectation that the introduction of new technologies will help to overcome the labour shortage problem has generally worked out. In an exploratory survey in 14 plants that introduced high tech, there is overall agreement about the rise in productivity effect. Informants in five plants reported

that after the technological change they have no more labour shortages; in seven other plants, the situation improved. While all the plants report a rise in output, only in one plant the number of workers increased and in six it decreased. Seven plants report an increase in the number of younger workers, and in nine plants the readiness of kibbutz members to work in industry has increased (Weiss 1987).

We have no details about the factors that contributed to this change in attitude, but we can at least partly relate it to an improvement in work conditions and work content (Eleven out of 14 plants reported an improvement in working conditions, while six reported an improvement in work content and shift work. There was almost no change in the number of shifts, but in nine plants the number of worker in each shift decreased.

Although we have no conclusive evidence on the impact of new technology on the division of tasks and utilization of skills, it seems that an integrative, non-Tayloristic approach was strengthened, especially for C.N.C. technology. As reported in M. Palgi's article in this volume, in the plant studied, the programming is performed in the production department and not in a special and separate department. Technicians and engineers take an active part in production work. A similar situation was found also in other kibbutz plants (Rosner 1986).

It seems that the introduction of new technologies led in many plants to an increase in the autonomy of different sub-units. This trend toward decentralization and increased worker-participation in the framework of work groups and departments fit also the recommendations of the socio-technical department of the kibbutz industrial association. E.g. one of the kibbutz plastic plants has recently installed a new fully automated and computerized extension producing p.v.c. compounds used as raw materials for various plastic products.

Following these technological changes a team of the kibbutz industry association's socio-technical department was asked to study the organizational

structure of the plant and to suggest changes, if necessary. The main suggestion has been the decentralization of the decision-making process, by dividing the plant in two autonomous units: (a) division producing reinforced flexible hoses with 30 workers in four different departments; (b) the compound-producing automated division with only ten workers. The reasons for the creation of this division seems to be not only the difference in products and market conditions that also existed before the technological changes. The higher degree of autonomy is probably needed to deal with the specific requirements and problems of the new technology.

Previously, the main formal participatory decision-making body was the worker-assembly convening once a month. The new recommendations are to convene once a month worker-assemblies in the framework of the divisions and only once in three months the general plant-wide assembly. More authority is also given to the division-managers, and the major functions of the central plant-wide office-holders, e.g. the production-manager, is now of coordination between relatively autonomous units.

This single example might illustrate a certain potential of decentralization and even de-hierarchization of the new technologies, but no conclusive evidence is available at this stage.

But even in this single case in a small kibbutz factory, we can remark similarities with findings reported after visits in 16 large American plants that have introduced advanced manufacturing technology (Walton and Susman 1987): "Most of the plants we visited have reduced the number of (hierarchical) layers ... They have upgraded supervisors and assigned them functions previously performed by second-level managers."

Although the trends are similar, we can assume that in kibbutz plants, due to the relative high level of participation and limited hierarchy, only rather small organizational changes will be needed to adapt to the new conditions.

There is also almost no evidence of conflicts related to the introduction of advanced manufacturing technologies and to their implementation. On the other hand, these processes create other and new problems for the kibbutz and its industry, such as higher dependence on professional and scientific knowledge held by a certain part of the workforce, dependence on the ability to mobilize financial resources, and greater dependence on the changes in the international market.

But it seems that even in this early stage the encounter between the kibbutz and high-tech can be seen as a valuable experiment to overcome the conflict between human and business values.

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## HIGH-TECH AND THE KIBBUTZ INDUSTRY:

### A CASE STUDY

Michal Palgi

The emergence of new technologies has brought with it pessimistic and optimistic predictions as to its effects on the workers and the organization. Both workers and employers might expect positive and negative results from its introduction.

Looking at this process from the workers point of view, the positive and negative outcomes are mainly, but not only, to do with their quality of working life. The jobs that they will be doing will be more varied as a result of smaller series of production and the manufacturing more flexible. They might be "reskilled" - i.e. learn new types of work, to control and manage new types of machines and also use different manual and mental skills at work - in their workplace. For some this might be a challenge for others it could be a threat to the orderly, secure, stable lifestyle they lead.

In the "new technologies era" the workers could control the machine and their line of production by the computer. Thus they could get more information about their own work and the work of others. This on the one hand may give them more leeway for autonomous decision-making but on the other hand their employers would be able to supervise them more closely through their control on the the general computer system.

Writing all this in the conditional tense is because the way the organization functions with the introduction of high-tech depends on the ideology and policy of the employers. If the employers believe that the workers are to be trusted both in the programming of the machine and keeping the secrets of the company then they would let them have full control of the machines. If the employers come from a

standpoint that does not trust the workers then they would "deskill" them. The workers would be allowed only to press the buttons and keep an eye on the machine. When trouble occurs or a change in production is necessary the experts will have to be called in...

Maybe the greatest negative effect, from the workers point of view, of the introduction of high-tech to the workplace is their fear of unemployment. The machines are much faster, produce more accurately with less waste and can do almost all the work people do. The insecurity in employment and the need to change the type of work or occupation several times in a life time (as a result of changing technologies) bring about a resentment towards the "new machine age".

Looking at these effects from the employers point of view, we can see that their hopes and fears are focused mainly on issues of efficiency: a. Efficiency in production - from the point of view of production they hope for better quality, higher quantity, less waste, less workers and more flexibility in the products they can manufacture. They fear the heavy investments that high-tech incurs and the difficulties in adjusting the organization to the new machinery. b. Efficiency in management - from this point of view they hope to be better informed, to know what is going on in their organization, to be able to control the workers and the relatively complex production from their own office. On the other hand they fear the experts who might try to control the whole organization, who might demand to be more involved in decision-making and the general running of the firm and on whom they are so dependent. In addition, also the workers at the shopfloor would have access to many secrets of the firm and thus deprive the employers of the power of knowledge. The difficulties in recruiting expert workforce and the expense of the new machines are additional burdens.

We can sum all that has been written above about the anticipated effects of the introduction of high-tech to the production process in the following chart.

ANTICIPATED EFFECTS OF HIGH-TECHNOLOGY

	<u>POSITIVE</u>	<u>NEGATIVE</u>
<u>WORKERS:</u>	<ul style="list-style-type: none"> <li>- varied job opportunities</li> <li>- reskilling</li> <li>- more control and autonomy</li> <li>- more information</li> <li>- better work conditions: clean, not heavy, flexible</li> </ul>	<ul style="list-style-type: none"> <li>- unemployment</li> <li>- deskilling</li> <li>- totally controlled</li> <li>- frequent change of occupation</li> </ul>
<u>EMPLOYERS:</u>	<ul style="list-style-type: none"> <li>- better information and communication</li> <li>- more control</li> <li>- development of new production lines</li> <li>- faster production</li> <li>- more accurate products</li> <li>- less waste</li> <li>- flexible manufacturing: small series</li> <li>- less workers</li> </ul>	<ul style="list-style-type: none"> <li>- no secrecy</li> <li>- not enough skilled labor</li> <li>- heavy investments</li> <li>- difficulties in acclimat- izing to tech changes</li> <li>- decentralized organization</li> <li>- less control</li> <li>- dependency on experts</li> </ul>

All in all, it can be seen that the policy of introducing the high-tech and the type of organization of work that will evolve from it depends on the fears and hopes, trust and mistrust between the different bodies in the plant.



## THE STUDY\*

In view of the written above, it would be of utmost interest to check how these effects emerge in communities that have no direct salary for their workers and no fear of unemployment - the kibbutzim.

The kibbutzim have started out as agrarian communities governed by some basic values that have in many ways moulded its structure and living norms. These values, relevant to the present discussion, are, socialism (which includes the idea of self labor and self management), and equality.

The communities that were built in order to fulfill these and other values are self-managed, with no salaried work. Work and consumption are organized on a cooperative basis and there is no direct dependency between work and the satisfaction of needs. The consumption expenses for all members represent the price of labor. Labor costs are considered fixed costs, since the labor market is relatively closed, with 90 percent of the workers coming from among the kibbutz members. In face of these conditions, the use of labor saving technologies will not reduce the cost of salaried work. Also, new labor-saving technologies will not cause unemployment, but rather a different social distribution of work such as, increase in services or shortening the working hours. Therefore, the question whether to introduce high-tech has a slightly different meaning in the kibbutz. Looking at the introduction of robots for industrial use in Israel, we find the share of the kibbutzim is 60% while their percentage in the Israeli population is 3.5%.

The questions we wanted an answer to were:

- a. What are the considerations for introducing high-tech in plants of the kibbutz? Are they the same as in other places?
- b. How does the new technology affect the people in the plant, their adjustment, feeling of belonging, their participation in decision making and their influence on what happens in their work place?

This study has been divided into two parts. The first was a small survey that has been carried out in 14 kibbutz plants. It tried to find out why they have introduced high-tech, what were their expectations from it and to what extent they were fulfilled. The questionnaires were sent to key-personnel and were to give us some ideas for questions asked in the second part of the research.

The second part was a case study of one plant. We have decided to start with an indepth study of one plant in order to get an insight of the issues relevant to the introduction of high-tech to kibbutz industry. The plant chosen is one that has been studied by us twice before. Once in 1969 and once in 1977. All the data from the previous studies is available to us. In this paper we shall concentrate on the comparison of the plant of 1987 with the plant of 10 years earlier. We realize that not all changes in the plant are due to the technological ones. We shall describe the social and organizational changes that have occurred and try to give them our interpretation. In this part of the study we used questionnaires for the workers, which were similar to those distributed in the earlier study, we have interviewed the manager, the production manager on the organizational and social changes in the plant. We still need to interview some of the workers that have been working in the plant during both studies.

## THE FINDINGS

The findings from the 14 kibbutzim survey will serve us in order to answer our first question. Why is high technology introduced to kibbutz plants? Table 1 will show the answers given by kibbutz plants.

\* I want to thank Menachem Rosner and Israel Weis who have been my partners in this study.

Table 1: Considerations for Introducing High Tech in Kibbutz Plants according to its importance (1 the most important, 3 the least)

<u>THE CONSIDERATIONS</u>	<u>T H E R A T I N G S</u>		
	<u>1.first</u>	<u>2.second</u>	<u>3.third</u>
increased production	7	2	0
improved quality	5	3	3
cheaper costs per product	0	3	4
better work conditions	2	4	3
change in shift work	0	1	2
better quality of work	0	1	2
<hr/>			
total number of plants	14	14	14

Each plant could give three ratings. The first was the most important consideration. It can be seen from the table that the total number of times that issues of work efficiency have been mentioned (27) is bigger than the total number of times that QWL issues have been mentioned (15). Also, only two plants have mentioned work conditions as their first consideration, while all the rest mentioned as theirs increased production and improved quality of product.

All in all, we can see that the considerations for introducing high-tech to kibbutz plants are similar to those out of the kibbutz, but the weight of those not connected directly to production is relatively high (more than a third).

The second question that the plants were asked to answer was: To what extent do you find that the introduction of high-tech has brought about the anticipated changes?

Table 2: The Extent to Which the Introduction of High Tech in Kibbutz Plants has Brought About the Anticipated Changes

<u>T H E C H A N G E S</u>	<u>T H E I R F R E Q U E N C Y</u>				<u>total</u>
	<u>not at all</u>	<u>a little</u>	<u>a certain extent</u>	<u>very much</u>	
increased production	0	1	3	10	14
improved quality	0	2	6	6	14
cheaper costs per product	2	0	6	6	14
better work conditions	3	0	9	2	14
change in shift work	3	3	6	2	14
better quality of work	1	7	3	3	14

It can be seen from table 2 that the expectations concerning production have almost always been realized while those concerning the work of people have in some cases not been.

Let us combine the two lower categories (not at all and a little) and the two upper categories and then look at all the efficiency consideration in comparison to all the QWL considerations. We find that in the efficiency categories only in 5 out of 42 cases the anticipated changes have not occurred or occurred to a small extent while in 37 they did occur. In the QWL categories we find that in 17 out of the 42 cases the anticipated changes have not occurred or occurred to a small extent.

These findings might be the outcome of the relatively low place that QWL considerations take in the overall considerations. In the previous table (table 1) we saw that QWL considerations were usually not among the first for introducing high-tech. This can be as a result of the relatively high QWL that already existed in the

kibbutzim or that efficiency considerations were also higher in the kibbutz. We have no other research results from other societies to compare it with but believe that they might show the same trend. We assume that they might even score lower on the weight they put on QWL issues.

After examining selected results from the small survey we have carried out we shall now consider the case-study in Kibbutz Nof.

Nof Industries are among the oldest in the Kibbutz Haartzi federation. They began in 1944 as a small workshop with three to five workers producing parts for water taps. The workshop was originally situated in a neighboring community, but in 1949 it was moved into the kibbutz yard with its 15 workers, slowly developing both the variety and type of its products.

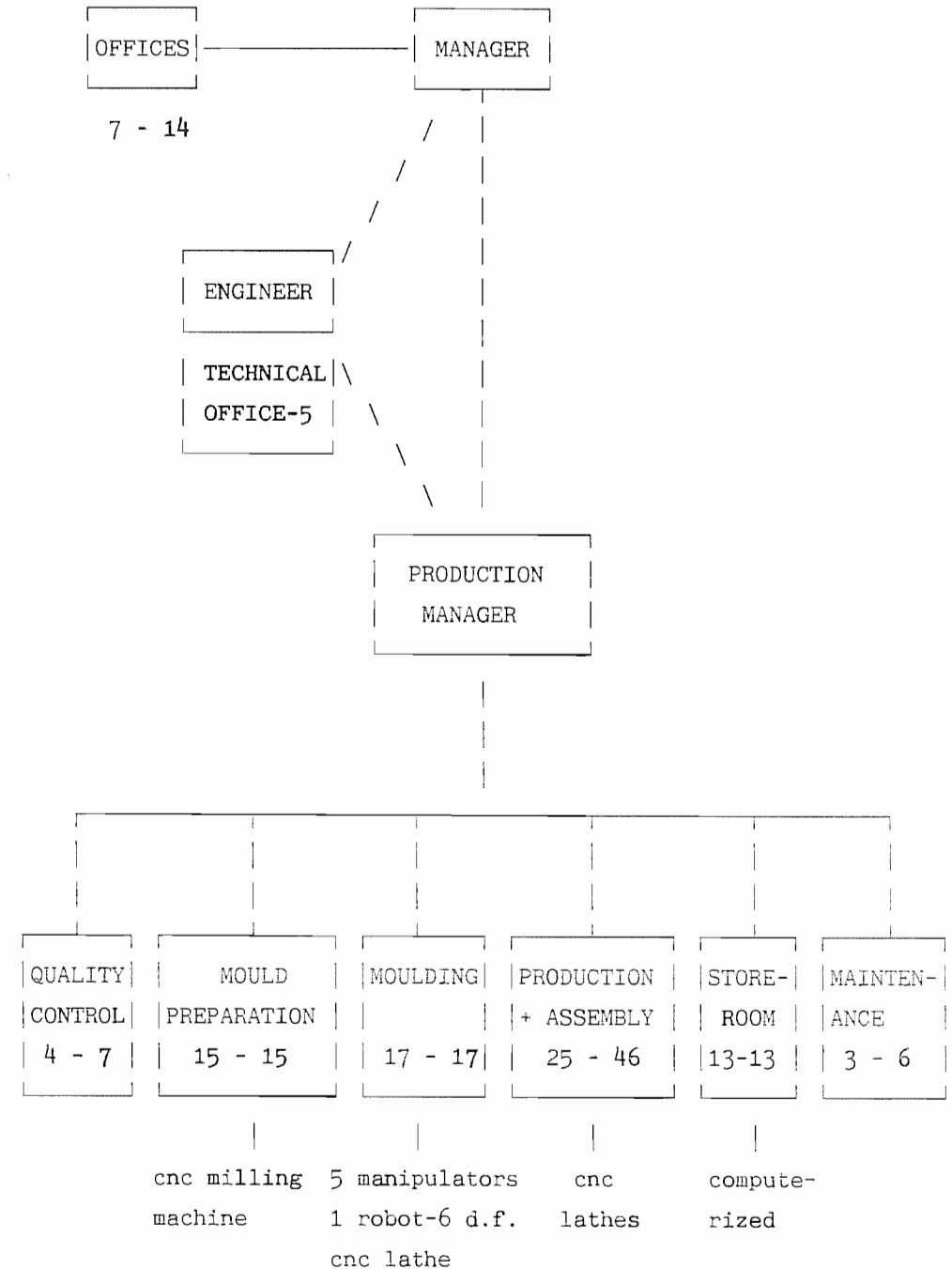
Today, it is a well established metal factory with 120 workers from two different kibbutzim. During the last ten years, five manipulators with two degrees of freedom were introduced to aid production. In addition, during the last five years a robot with six degrees of freedom and a few C.N.C. lathes were acquired. The store-room was also completely computerized. The factory, during the last ten years has:

- a. physically grown - the buildings are spread on a third more area than they used to.
- b. grown in the number of workers - from 80 workers in 1977 to 120 workers in 1987.
- c. Ownership is now split among two kibbutzim whose members are the workforce of the plant.
- d. New, computerized machinery has been introduced to the factory.

The following chart outlines the organizational layout of the factory. It shows its structure in 1977 and in 1987.

NOF INDUSTRIES - ORGANIZATIONAL CHART

1977 - 1987



All bold typing represents numbers and departments that were only in 1987.

From the chart it is possible to see the production process. The plans for the new products are prepared in the technical office. From there they are brought to the mould preparation department where the engineer and technicians programme the milling machine for the preparation of the new mould. From there the mould passes on to the moulding department where almost all the work is computerized. In the past the workers had to install the material and moulds into the furnace but now all is done by the manipulators and the robot. From there the products go to the production and assembly department where they get their finishing touches, are assembled and packed. From there they are put into the storeroom. Also some of the products from the other departments are kept in the storeroom until they are needed. Quality control is done several times during the production process. First when the products pass from the mould preparation department to the moulding department than when they pass from the moulding to the production department and lastly when the finished product comes out.

The organizational changes during the last ten years are quite clear from the chart. The number of workers in the offices and production services have increased by 90% (17 in 1977 and 32 in 1987). In the actual preparation of the moulds and the moulding department there was no increase in workers. There the machines have replaced people. This is very relevant to our discussion as the work in these departments was mostly physical and uncomfortable. There was always a problem to find workers to man them and the outcome was that all young men had to give half a year turn there. Each of the departments that has computerized machines is able to do its own programming. If in 1977 there was one engineer, in 1987 there were eight engineers and highly qualified technicians.

In Nof industries, the main considerations for introducing the new machinery were two:

1. The machines used in the factory became old and had to be replaced.
  2. With the old machinery there was much physical work and ecological hazards.
- The plant invited the kibbutz federation socio-technical team to asses the possibilities of change. The team, together with the workers looked at the technological options that were feasible from both the economic and social points of view. After deciding which machines they wanted they started to introduce them by stages. It can be seen that in this particular industry the economic and human considerations were interlinked. The plant found it hard both to produce with old machines and to recruit workers for them.

After describing the organizational changes in the plant we shall examine what happens to the workers in this plant. It is important to remembr that in the kibbutz society there are no material rewards for work. The only rewards are either connected to the content of work or to the social environment (intrinsic and extrinsic). It can, therefore, be understood why these rewards are so valued. We shall examine here work monotony and autonomy in the plant, opportunities at work and democratic practices in the plant.

In order to examine the monotony of the work and the autonomy of the worker we have asked a few questions:

1. Do you do the same type of work all day long?  
The scale goes from 1. always to 5. never.
2. Can you leave your machine unattended? 1. never, 5. always.
3. To what extent is the pace of your work determined by the machine?  
1. to a great extent, 5. to a very small extent.
4. To what extent is the quality of your work determined by the machine? Categories as in 3.
5. How is your work load? 1. very heavy, 5. very light.

**Table 3: Monotony and autonomy at work - a comparison between 1977 and 1987.**

	1 9 7 7			*	1 9 8 7		
	MEAN	SD	N		MEAN	SD	N
1. Do the same work	3.26	1.08	50		2.74	1.32	35
2. Leave machine unattended	3.56	1.05	51		3.14	0.93	35
3. Pace machine determined	3.67	1.26	51	*	2.52	1.14	35
4. Quality machine deter.	3.49	1.00	51	*	2.47	1.06	35
5. Work load	2.54	0.71	51		2.90	0.68	35

\* In a t-test the difference between the two sample means is significant ( $\alpha < 0.05$ )

From the table it is very clear that the workers perceive their work now more monotonous more binding and more machine determined than they did in 1977. People are more depended on the machine for their freedom to leave ,for the pace and quality of their work. Also they report heavier work load in 1987.

When we looked at the social relations among the workers and between the workers and their supervisors we found no difference between the two times of measurement. Also there were almost no conflicts reported between the different groups and individuals in the plant.

Another issue we have tried to measure was the opportunities given to the workers in their work. Again we found no difference between the measures of 1977 and 1987 in the opportunities for doing interesting work, for using ones skills or for learning new things. At least from this respect it does not seem that the technological changes have deskilled the workers in this plant.

One of the most important aspects of kibbutz life is self-management. It has tried to maintain it both in the social and

the production spheres. One of the dangers of the introduction of new technologies is that many issues would be decided by the "experts" and not be brought to public discussions. We have tried to examine this point by asking several questions about the authority of the workers assembly on different issues. The workers assembly is the central decision-making body in the plant, and we wanted to see if its power has diminished, stayed the same or increased during these ten years.

The question was: In what way does the workers assembly deal with the following issues.... On each issue there was the possibility to answer one of the following:

1. Does not deal at all.
2. Hears information.
3. Approves decisions.
4. Discusses and recommends.
5. Discusses and decides.

**Table 4: Authority of Workers Assembly - A Comparison Between 1977 and 1987.**

	1 9 7 6			*	1 9 8 6		
	MEAN	SD	N		MEAN	SD	N
Yearly production plan	2.66	1.02	42		2.19	0.63	35
Investment plan	3.35	1.09	43	*	2.87	0.99	35
Training plan	3.02	1.13	43	*	2.06	0.96	35
Election of management	4.29	0.93	42	*	3.27	1.37	35
Election of committees	4.10	1.08	43	*	3.21	1.14	35
Internal work organization	2.50	1.41	41	*	1.97	1.34	35

\*In a t-test the difference between the two sample means is significant ( $\alpha < 0.05$ )

It can be seen from table 4 that the authority of the assembly on all issues has been reduced. Even on issues such as the election of the committees active on the plant and on the election of the manager its authority is diminished. It does not seem possible that this is only

a result of the introduction of advanced technology. It seems more feasible that the size of the factory (which has increased by 50%) and the partnership with another kibbutz are at least partially to account for it.

### C O N C L U S I O N S

After looking at the optimistic and pessimistic expectations from the introduction of high-tech to the factory, we have tried to look into the process and its effects in the kibbutz industries. First we looked at the general considerations for this technical changes and in view of them their outcomes. Then, we examined some of the findings of a case study of an industrial plant in the kibbutz. In this plant, that has been studied in 1977 and in 1987 we saw that the introduction of high-tech has not brought with it unemployment, on the contrary employment increased and so did production. The opportunities for workers to do interesting work, use their skill and learn new things have not diminished during the years, but also have not increased. On the other hand we found that workers did more repetitive work and their quality and quantity of work was mainly determined by the machine. The seemingly contradictory findings of more repetitive work but not less interesting can be explained if one does not forget that we are dealing with averages. Some of the work is very repetitive and some is but a little. This we can see from the relatively high S.D. of this variable.

The workers have a heavier work load now and are more constrained by the machine. The participation of the workers in decision-making is lower than it used to be in 1977.

All in all it can be seen that there are many issues that Nof Industries have to take into consideration. It seems that it has not by passed many of the ill effects that could occur with the introduction of new technologies. We are well aware that other factors (like size and joint ownership) have also contributed to the present situation.