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THE INTRODUCTION OF NEW OR ADVANCED TECHNOLOGY: THE ROLE OF THE INDUSTRIAL PSYCHOLOGIST *

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ABSTRACT

The purpose of this article is to discuss the role that the industrial psychologist must and can play in the introduction of new or advanced technology. In the article attention is given to three topics: *firstly,* the rationale behind the industrial psychologist's contribution which finds its foundation in the discrepancy which usually arises between the expected and actual performance of a technology after its introduction; *secondly* a suggested methodology to assist the industrial psychologist in fulfilling his/her role in this respect; and *thirdly,* the major responsibilities of the industrial psychologist in this regard.

OPSOMMING

Die doel van hierdie artikel is om die rol wat die bedryfsielkundige moet en kan speel in die implementering van nuwe of gevorderde tegnologie aan te toon. In die artikel word die volgende drie aspekte bespreek: *eerstens,* die rasionaal onderliggend aan die bedryfsielkundige se bydrae wat sy oorsprong vind in die verskil wat gewoonlik ontstaan tussen die verwagte en werklike prestasie van 'n tegnologie na implementering; *tweedens,* 'n voorgestelde metodologie wat die bedryfsielkundige kan gebruik om sy/haar rol in hierdie verband te kan vervul; en *derdens* die belangrikste verantwoordelikhede van die bedryfsielkundige in hierdie hoedanigheid.

The introduction of new or advanced technology has traditionally been perceived to be the prerogative of the engineer au fait with the technology and/or line management. The industrial psychologist (or in the organizational environment, the human resource, manpower or personnel specialist) was either not awarded a role in this process or he/she did not perceive himself/herself as being able to make any contribution.

The purpose of this article is to discuss the role that the industrial psychologist must and can play in this regard. The article gives attention to three main topics:

- the rationale behind the industrial psychologist's contribution. This rationale finds its foundation in the discrepancy which usually arises between the expected and actual performance of a technology after its introduction;
- a suggested methodology to assist the industrial psychologist in fulfilling his/her role in this respect; and
- the nature of the industrial psychologist's contribution when fulfilling his/her role in this area.

THE RATIONALE UNDERLYING THE INDUSTRIAL PSYCHOLOGIST'S CONTRIBUTION: THE DISCREPANCY BETWEEN EXPECTED AND ACTUAL WORK PERFORMANCE

Technology in this context is used in a broad sense to include all means used by the organization to produce its output. It includes physical, chemical, logical (or knowledge related) and operational technologies.
The introduction of new or advanced (that is, computer aided) technology is often pursued as one means of improving work performance. The expected work performance improvement can be depicted as in Figure 1.

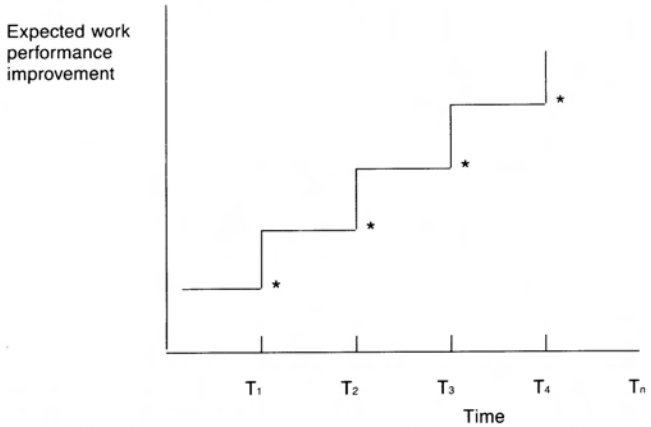

Figure 1: Expected work performance improvement through the introduction of new or advanced technology
* Introduction

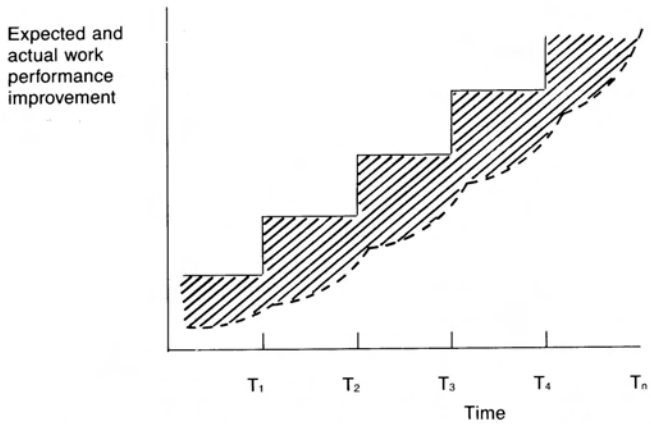

Figure 2: Comparison of expected and actual work performance improvement through the introduction of new or advanced technology*

___ : Expected improvement
____: Actual improvement
//// : Discrepancy
* : Curvilinear nature of actual improvement graph indicates a learning effect

*Adaptation and update of a paper delivered at the 5th National Congress of the Psychologicial Association of South Africa, 7-9 September 1987 in Cape Town.

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Most often, however, expected work performance improvement is not realized and in this respect the graph given in Figure 2 holds true. In general it has been estimated that 50 per cent of all implementations fail, and that only between 40 to 70 per cent of the potential productivity improvement inherent in any new technology is realized (Lupton, 1986). "Muddling through" seems to be the general approach towards introducing new technology (Blackler & Brown, 1986). In terms of a general model of human work performance proposed by Veldsman (1983a), the discrepancy between expected and actual performance can be explained partially in the following ways:

(i) a change in technological environment, i.e. the introduction of a new technology, which is not accompanied by:

  (a) a change in the social environments, both formal and informal, to ensure that the social environments are congruent with the technological environment. The previously established congruence between the different environments making up the work performance situation is thus disturbed.

  (b) the interaction fit between the work performance agent (i.e. the individual, work group or department) and work performance situation is not adjusted.

  (c) the role of facilitator (i.e. the manager or supervisor) in managing or supervising the interaction fit is not reviewed.

  A common attitude is that technology is the given and that the other environments, agent and facilitator *will have to adjust automatically* to the new technology. Additionally, it is usually believed that there is only one way in which people in particular can be organized around the technology. This attitude is usually called technological determinism (e.g. Blackler & Brown, 1986).

(ii) a change in the technological environment impinges on a work performance agent who is *human in nature* implying that:

  (a) the persons concerned have a certain psychological involvement, commitment and investment in the total work performance configuration.

  (b) the persons concerned can make or break the successful introduction of the technology since it is the work performance agent that does the work in the final instance and has to use the technology. Where employees are organized into a union, this "leverage" becomes even greater.

  Even if all of the aspects raised under point (i) are considered carefully, the introduction of the new technology will fail if the nature of the work performance agent as human being is ignored because of the resistance to change offered to the imposed changes by the persons concerned.

From the above it can thus be concluded that if the nature of the organization as a psycho-socio-technical system is ignored, then the expected work performance improvement through the introduction of a new or advanced technology will not be achieved (see Turnage, 1990, p. 174 for a similar argument). This conclusion, which provides the underlying rationale for the industrial psychologist's contribution in this area, has found its initial empirical support in the Coch and French (1948) and Trist and Bamford (1951) studies. These studies showed that the industrial psychologist, can, or rather indeed must, make a contribution.

Subsequent studies over the years have reinforced this point, so much so that this contribution in recent publications (e.g. Blackler & Brown, 1986; Davis, 1986; Heller, 1986; 1987; Institute of Personnel Management, 1983; Kanawaty, 1981; Kozlowski, 1987; Lawler, 1986; Legge & Mumford, 1978; London & MacDuffie, 1987; Mauer, 1987; McLoughlin et al, 1985; Preece & Harrison, 1988; Templer, 1985; Turnage, 1990; Wall et al., 1987), conferences (e.g. Lupton, 1986) and special journal issues (e.g. Journal of Applied Behavioural Science, 1986, *22*(3), Journal of Occupational Psychology, 1988, *61*(1), Personnel Review, 1989, *18*(5) is accepted as being indisputable.

At least two major findings stem from the above quoted research over the years in this area:

- *Finding 1:* With any new technology, one gets the best out of the technology when one gets the best out of one's employees. This empirically based finding reinforces the theoretical point made above concerning the organization as a sociotechnical system.

- *Finding 2:* Employees make things work. They often choose whether to make them work or not. This empirically based finding underlines the other theoretical point made above that the organization is a psychological system.

Given that the industrial psychologist must play a role in the introduction of new or advanced technology, the next question is, "How?". This question leads to the next major theme of the article: a suggested methodology that can be used by the industrial psychologist in this area.

A SUGGESTED METHODOLOGY FOR THE INDUSTRIAL PSYCHOLOGIST TO ASSIST WITH THE INTRODUCTION OF A NEW OR ADVANCED TECHNOLOGY

Over the years the Human Resources Laboratory of the Chamber of Mines of South Africa Research Organization has been involved in a number of technologies considered for or actually implemented in the gold mining industry, for example non-explosive methods of mining; hydraulic props for underground support of strata; hydraulic drills to replace pneumatic drills; the backfill system as an additional means for underground support; and the gold analyser as replacement for chip sampling.

During these years a methodology has evolved to deal with the human issues surrounding the introduction of a new technology (De Bruyn, 1976; Veldsman, 1983b; 1985a; 1985b). This methodology is based on the assumption that organizations are psycho-socio-technical systems (Cherns, 1976; 1987; Emery, 1978) and principles pertaining to organizational change (e.g. Lippitt *et al.*, 1986; Nadler, 1987).

The adopted methodology is illustrated in the model given in Figure 3.

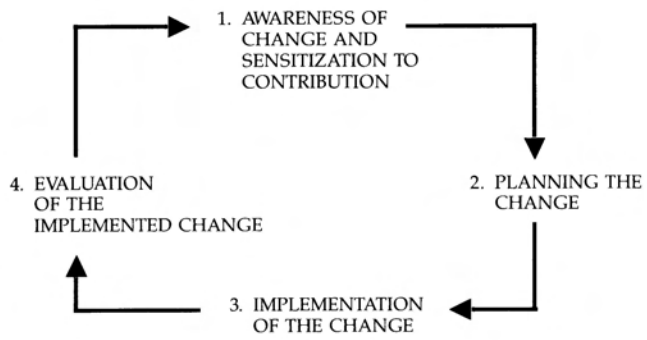

Figure 3: Model of introduction of new or advanced technology

The issues related to the introduction of any technological innovation are embedded in one underlying theme: *the successful introduction of any new technology is the result of the carefully*

managed introduction thereof until the technology is fully integrated into the organization. The managed introduction of technology (i) must satisfy some preconditions, and (ii) must follow a number of guidelines. These two topics are discussed below in turn, after which the different phases depicted in Figure 3 are discussed in more detail.

(i) Preconditions required for the managed introduction of technologies

(a) visible top management support throughout the implementation;

(b) a real, perceived need for and commitment to such change;

(c) the linking to and justification of the introduction in terms of the organization's overall goals, long term planning and a future desired state.

(d) the realization that the technical and social (human resource) dimensions of the organization are interdependent;

(e) favourable conditions to create the right climate for the technological innovation which would in turn affect the degree of employee involvement that would be possible. Table 1 gives some of these conditions.

(f) the allocation of sufficient resources to support the introduction.

TABLE 1

CONDITIONS REQUIRED TO ENHANCE THE SUCCESSFUL INTRODUCTION OF TECHNOLOGICAL INNOVATIONS

PRECONDITION	FAVOURABLE LOW → HIGH
Health of industry/individual firm	Highly profitable → Fighting for survival
Focus of interest of employees	Conditions of service → Quality of working life
Commitment of employees to firm	Low → High
Nature of management/union relationship	Conflict only → Collaboration/problem solving as well
Legitimacy of union as signalled by management to union	Rejected → Accepted
Trust of employees in management	Low → High
Management/supervisory style	Autocratic → Democratic
View of employees held by management	Irresponsible, unmotivated, untrainable → Responsible, motivated, highly talented
Effectiveness of management/worker communication structures	Low → High
Concentration of decision-making power/ authority at top	High → Low
Agreement between management and employees about 'best' economic system	Low → High
Job security	Low → High
Work cycle inter-dependence	Low → High

(ii) Guidelines with respect to the managed introduction of technologies

An introduction of new technology can only qualify as a *managed* introduction if the following guidelines are adhered to:

(a) objectives for the introduction are set;

(b) the introduction is planned and does not take place by default, i.e. a detailed implementation strategy is devised;

(c) there is full and open communication and consultation throughout the introductory period;

(d) the necessary organizational structure is setup in support of the introduction, using an interactive multidisciplinary team approach throughout the implementation;

(e) creating a management information system to keep track of the achievement of implementation objectives and the reactions of employees to the implementation. The system must have a short feedback cycle so that corrective actions can be taken rapidly.

(f) set-up a reward system to give recognition to employees that made a positive contribution towards the adoption and use of the new technology.

Awareness of change and sensitization to contribution
The industrial psychologist must keep himself/herself informed of possible technological innovations being considered by top management and/or Technical Planning Departments either at plant or at Head Office level. In most cases this would imply:

(a) ensuring that the human resource (or manpower) department is represented at top management level; and

(b) serving on those committees in Technical Planning Departments which take strategic decisions about technological innovations (Institute of Personnel Management, 1983).

The awareness mode exercised by the industrial psychologist can be characterized more in terms of a mode of passivity, reactivity and monitoring. Thus, if the industrial psychologist wishes to promote his/her contribution more aggressively, he/she must also pursue a sensitization mode. He/she must

TABLE 2

SOCIO-TECHNICAL ISSUES TO CONSIDER WHEN PLANNING THE INTRODUCTION OF NEW TECHNOLOGY

	TECHNICAL DIMENSION (Emphasis on introduction of new *technology*)	SOCIAL (OR HUMAN RESOURCE) DIMENSION (Emphasis on *people* side of technology)
Strategic planning level	* Which technological system? Technology plan	* What type of organization and management system? Design plan * What type of human resources? Manning specifications plan * How do current human resources compare to future required human resources? Human resources deficiency
	SOCIO–TECHNICAL ORGANIZATION PLAN (ORGANIZATION)	
Tactical/managerial level	* How, when, at what rate and how extensively will technological system be phased in? Scheduling plan * What manufacturers and equipment? Equipping plan	* How, when and at what rate must gap between current and future management system be closed? Management system and organization culture plan * How, when and at what rate must gap between current and future required human resources be closed? Plan of types of systems required to attract, develop and retain required human resources and their respective priorities
	OVERALL IMPLEMENTATION PLAN	
Operational level	* How, when, at what rate and how extensively will technological subsystems be phased into organization? Technical implementation plan. * How will technical success of implementation be monitored and evaluated? Technical evaluation plan	* What organizational arrangements are required, i.e. job/work group/interface/organizational (re)design? * What are the skill requirements for these organizational arrangements and thus the selection criteria? What selection instruments must be used? * What (re)training must be provided? * At what rate and in what quantity must the required human resources be delivered? * What are the promotional routes and career paths? * What are the conditions of service? * How safe and healthy is the new technology? Is it ergonomically sound? * How ready is the organization for the change and what interventions may be required to prepare it? Readiness assessment * How will the human success of the implementation be monitored and evaluated? Human resource evaluation plan.
	ORGANIZATION IMPLEMENTATION PLAN (including an "introduction to change" programme)	

sensitize the abovementioned key groups to his/her potential contribution. In this way he/she will establish a definite perception that his/her contribution is essential (Blackler & Brown, 1986, Legge, 1989).

This can be done in two ways:

(a) by conducting in-house seminars with the above key groups to review and discuss, for example, past empirical studies which show the importance of the human factor in any technology and technological innovation, and/or which human resource aspects should be considered during technological innovation;

(b) by conducting in-house studies to identify possible negative outcomes of organizational arrangements for the existing technology within the organization, e.g. high absenteeism, high labour turnover, high job dissatisfaction, low job commitment, as well as high intra-work group and inter-departmental conflict. The findings can be fed back to the abovementioned key groups to fuel a desire to change.

The industrial psychologist is therefore largely to blame if the human dimension is ignored during a technological innovation if he/she has not ensured that he/she is aware of an impending innovation and has not sensitized others about the importance of the human factor (Legge, 1989). (Of course, the industrial psychologist can not be blamed if he/she is not allowed to make his/her contribution).

Planning the change

In order to ensure the managed introduction of a technological innovation strategic, tactical and operational planning has to take place. Table 2 depicts the issues that have to be considered at the strategic, tactical and operational planning levels regarding the socio-technical dimensions when considering the introduction of a technology (e.g. Herschowitz, 1988; Institute of Personnel Management, 1983. See also Blackler & Brown, 1987 for a different approach in this regard).

The most important question at the social-operational planning level is that of dealing with the required organizational arrangements, since all of the other aspects at this planning level flow from this aspect. Such planning requires:

(a) an analysis of the organizational arrangements required for the new technology; and

(b) the adaptation of existing organizational arrangements and/or designing of organizational arrangements for the new technology.

Details on how to conduct such an analysis and adaptation can not be provided here because of space constraints. An important point to stress, however, is that the success of the adaptation/design of any organizational arrangements is a function of the extent to which an integrated design approach is followed. The application of such an integrated design model requires adherence to at least the following design principles *simultaneously* to achieve an integrated design.

(i) *design content (or intrinsic design) congruence* (Cummings, 1978, p.629; Porter et al., 1975, pp.308-311). This requires that employees' preferences with regard to the characteristics of the organizational arrangements must match the actual levels of characteristics designed into the arrangements *(principle of employee-design congruence).*

(ii) *design context (or extrinsic design) congruence.* This requires the following. *Firstly,* the characteristics designed into a given type of organizational arrangement must match the characteristics present in its related types of organizational arrangements (London & MacDuffie, 1987; Porter et al., 1975, pp.308-311) *(principle of inter-organizational arrangements' congruence).*

This principle is based on the fact that the different types of organizational arrangements are interdependent and thus interact. Figure 4 depicts their interdependencies.

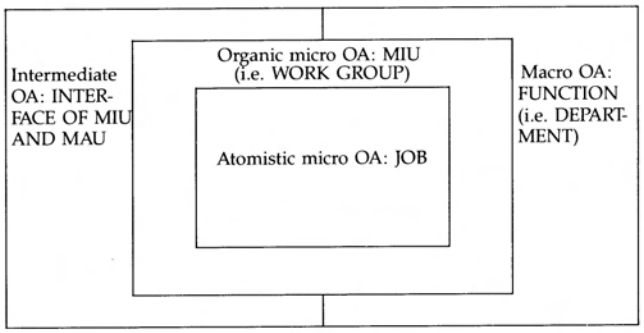

Figure 4: Interdepencencies of organizational arrangements (OA)
MIU: Micro Organizational Unit
MAU: Macro Organizational Unit

According to this principle, and as illustrated in Figure 4, if say a high degree of autonomy is built into a job, the work group of which the job forms part must have a commensurate degree of autonomy. The design of a highly autonomous work group would only be successful if the department to which it belongs, is also characterized by a relatively high degree of autonomy.

Secondly, the typical management style followed at the level at which the adaptation/design is performed, must be congruent with the characteristics built into the organizational arrangements (Driver, 1981; Walton & Susman, 1987) *(principle of management style-design congruence.)* High autonomy, for example, presupposes a more participative management style. If this style is not followed, the design will fail when implemented.

Thirdly, the personnel systems related to the organizational arrangements under consideration must be supportive of the intended design (Cherns, 1976, p.790; Cummings, 1978, p.63; London & MacDuffie, 1987; Walton & Susman, 1987) *(principle of personnel systems-design congruence.)* High autonomy given to a work group implies that the work group should have a say in, for example, the selection of prospective team members, have a role in the training of new team members and should be rewarded via a team based reward system.

Adherence to these three extrinsic design principles simultaneously will ensure a high degree of design context congruence.

An intergrated design approach will have been achieved only if *both* design content *and* design context congruence have been achieved. Figure 5 summarizes the suggested integrated approach.

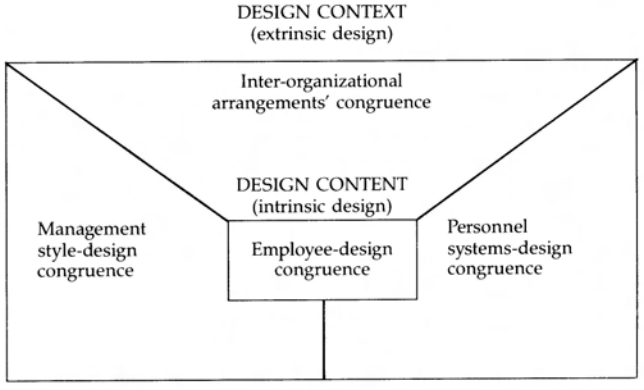

Figure 5: An integrated design approach

Implementation of the change
Once a decision has been reached as to which organizational arrangements to use for a new technology, the new organizational arrangements have to be implemented. Implementation will be discussed under the following headings:

- implementation content,
- implementation process,
- implementation context, and
- a suggested implementation package structure

Implementation content

This element refers in the first instance to the new organizational arrangements to be implemented resulting from the previous step. These organizational arrangements cover both the technical and social arrangements. The former refers to the accommodation that has to be made within the organization for the technology itself. The latter demarcates the ways in which individuals, work groups, sections, departments and/or the organization as a whole must be arranged around the technology. The new organizational arrangements will, in short, indicate who must do what, when and where, with what, with whom and for how long.

If an integrated design approach is followed, the implementation content will, however, include not only the new organizational arrangements for the existing/new technology, but will also consist of the following:

- adjustments to related organizational arrangements to match the new organizational arrangements
- possible adjustments in management style to suit the new arrangements, and
- possible changes in personnel systems to fit the arrangements.

Implementation Process

This process consists of at least five steps.

Step 1: Develop an implementation programme, preferably in conjunction with the key employees (and their representatives) to be affected by the change. These employees ideally should already have been involved during the analysis and adjusting/designing steps (See previous step). Early involvement would increase the probability of a greater commitment to the new organizational arrangements. The programme has to be drawn up within the limits laid down by the following parameters.

(a) **Initial point of implementation**
This parameter is only important if the technology has a 'spill over' effect onto more than one organizational level. One of three approaches can be followed in this instance:

- 'top level down' (from the highest 'spill over' level down),
- 'bottom up' (from the lowest 'spill over' level up), or
- 'middle outwards' (from the level at which the technology is resident or has to be introduced outwards to the 'spill-over' levels up and down).

(b) **Depth of implementation**
This parameter refers to the extent of implementation:

- limited (that is, only *one or a few* jobs, work groups, sections or departments initially affected) or
- extensive (that is, *from the beginning all* of the jobs, work groups, sections and departments concerned).

(c) **Identification of possible implementation facilitators**
These are individuals with high social status within the organization and who may be used as implementation catalysts.

(d) **Timing of the implementation**
It may be better to implement the new organizational arrangements at one time rather than another during the course of a year (for example, during a regular off-peak period, if it does exist).

(e) **General characteristics of the employees to be affected by the implementation**
This parameter could refer, for example, to the literacy level of the employees concerned.

(f) **Method of implementation**
One of three methods can be followed:

- phased (a step by step implementation)
- parallel cutover (the existing organizational arrangements are maintained simultaneously with the new organizational arrangements for a given time period)
- "tornado"/"cold turkey" (an immediate implementation).

Step 2: Mould the implementation content into an 'introduction to change' programme to arrive at an implementation package. (This term will be used to indicate the moulded implementation content). The rationale for and nature of such a programme will be discussed in the following section.

Step 3: Test run the implementation package and make adjustments if required.

Step 4: Obtain managerial approval for the implementation package.

Step 5: Run the implementation package.

Implementation context

Any implementation takes place within a certain context. This context comprises all of the employees to be affected, directly or indirectly, by the implementation, *as well as* any managers and employee representative bodies that have the authority (or influence) to facilitate or thwart the intended implementation. In order to increase the probability for success of the implementation management commitment to and support for the implementation must be certain, whereas the employees to be affected must be willing to change. Throughout the change control over organizational processes must be maintained.

Thus three problems of change can be distinguished within the implementation context: power, individual anxiety and organizational control (Nadler, 1987). The emphasis here is on the second problem, that of individual anxiety.

A procedure called HOPITC has been proposed by De Bruyn (1981) to assess the prevailing 'human and organizational climate' before, during and after an implementation. The need for the continuous monitoring of this climate also has been underlined by Coldwell's (1985) model of attitudinal reactions during the introduction of a technological innovation. Implementers can guide the innovation in terms of this model by pre-empting the expected attitudinal reactions of employees during a particular implementation phase. An unfavourable pre-implementation climate may even necessitate prior intervention to bring about a more favourable climate for the intended innovation. The underlying philosophy of HOPITC is that any change within the organization must be accompanied by a change programme. Thus any implementation should not be implemented on an *ad hoc* unplanned basis, but be introduced to also take account of the implementation context.

The rationale of such a change programme is to minimize or overcome any resistance to change which may detract from

the successful implementation of the innovation. Some of the reasons for resistance to change are (e.g. Nadler, 1987; Szilagyi & Wallace 1983):

(i) fear of loss of earning power (i.e., retrenchment)
(ii) potential disruptions of comfortable social patterns
(iii) possible disruption of normal work routine
(iv) fear of uncertainties because of unknowns
(v) resistance from groups with established norms which might be disrupted.

The change programme may make use of different methods to overcome any resistance to change. Table 3 depicts some of the methods that can be used to overcome resistance, when they can be used, as well as their advantages and disadvantages (see also Moerdyk & Fone, 1987; 1988; Nadler, 1987).

The implementation content thus has to be converted/moulded in a form suitable to its implementation context and must make use of the most appropriate method(s) to minimize/overcome any resistance to change. The moulded content can be called a change programme or, as in the present context, an implementation package.

Suggested implementation package structure

Irrespective of the change method used, an implementation package must cover at least the following topics:

(i) rationale for proposed change:
  – objectives of job/work/group/section/department/organization

TABLE 3
METHODS OF OVERCOMING RESISTANCE TO CHANGE

Method	Commonly used situations	Advantages	Disadvantages
Education and communication about change	Where there is a lack of information or inaccurate information and analysis	Once persuaded, people will often help with the implementation of the change	Can be very time-consuming if a vast number of people are involved
Participation and involvement in change	Where the initiators do not have all the information they need to design the change, and where others have considerable power to resist	People who participate will be committed to implementing change, and any relevant information they have will be integrated into the implementation	Can be very time-consuming if participators design an inappropriate change
Facilitation and support, e.g. emotional support, retraining	Where people are resisting because of adjustment problems	No other approach works as well with adjustment problems	Can be time-consuming, expensive, and still fail
Negotiation and agreement	Where someone or some group will clearly lose out in a change, and where that group has considerable power to resist	Sometimes it is a relatively easy way to avoid major resistance	Can be too expensive in many cases if it alerts others to negotiate for compliance
Manipulation and cooptation	Where other tactics will not work, or are too expensive	It can be a relatively quick and inexpensive solution to resistance problems	Can lead to future problems if people feel manipulated
Explicit and/or implicit coercion by superiors	Where speed is essential, and the change initiators possess considerable power	It is speedy, and can overcome any kind of resistance	Can be risky if it leaves people annoyed with the initiators

(Source: Szilagyi & Wallace, 1983, p. 544)

TABLE 4
EVALUATION OF IMPLEMENTED ORGANIZATIONAL ARRANGEMENTS (OA)

Evaluation dimension	Aspects
1. Why?	To determine the effectiveness of the implemented OA.
2. Where?	The levels at which the OA were implemented, i.e. the level at which the technology is resident and the levels onto which the technology has a spill-over effect.
3. Who?	All employees directly affected by implemented OA.
4. When?	After the implementation of the OA ('After' comparison).
	4.1 *Technical OA:* Do implemented OA function the way they are supposed to function?
	4.2 *Social OA:*
	4.2.1 *Design criteria:* Are the design criteria present in the implement OA to the extent they were intended when OA were designed?
	4.2.2 *Design Context:* What are the present characteristics of the OA interacting with the OA to be changed, as well as the current management style used and personnel systems in force as pertaining to the OA under consideration? Have all of these changed after the implementation in the expected direction so as to be in congruence with the implemented OA?
	4.2.3 *Impact of OA:* What is the impact of the characteristics of OA in terms of e.g. work performance, job satisfaction, cohesion, morale, grievances, accidents, absenteeism, turnover.
5. How?	*Options:* Observation, Interviews, Questionnaire, Work Performance, and Employee Behavioural Indices.

- disadvantages of present situation which result in a failure to achieve the above objectives
- advantages of proposed change which will lead to the achievement of the objectives

(ii) explanation of new organizational arrangements with an indication of which employees will be affected and how

(iii) implementation strategy, referring *inter alia* to: point of implementation, depth of implementation, method of implementation with its accompanying time-table

(iv) implications of change for:
- related organizational arrangements affected by adopted/new organizational arrangements
- conditions of service (e.g. hours of work, remuneration, selection, promotion, career routes)
- management style.

Evaluation of the implemented change

The implementation of the new organizational arrangements must be followed by an evaluation of their success once they have been implemented. Evaluation in this respect refers to the evaluation of the implemented organizational arrangements and their consequences. It does *not* refer to the continuous attitudinal monitoring of the implementation context by means of HOPITC. This attitudinal monitoring, however, supplements the evaluation.

Table 4 indicates the dimensions to be considered when setting up and conducting an evaluation of the implemented organizational arrangements in particular.

As was indicated in Figure 3, the evaluation findings may reactivate the cycle of steps related to the introduction of new or advanced technology.

NATURE OF THE INDUSTRIAL PSYCHOLOGIST'S ROLE

Against the backdrop of the above suggested methodology, Table 5 lists some of the major responsibilities the industrial psychologist has in fulfilling his/her role in this area successfully.

TABLE 5
MAJOR RESPONSIBILITIES OF THE INDUSTRIAL PSYCHOLOGIST REGARDING THE INTRODUCTION OF NEW/ADVANCED TECHNOLOGY

STEPS	MAJOR RESPONSIBILITIES
1. Awareness of change and sensitization to contribution	1.1 Inculcate into the organizational culture the values of: "change can and must be managed"; "change has both a technical and human side"; "people operate technology". 1.2 Expose the widest possible audience in the organization to the contributions that the Industrial Psychologist can make in this area both as an (internal) change agent and as a specialist vis a vis other parties in the organization. 1.3 Identify and gain representation on organizational units that make decisions pertaining to technological innovations.
2. Planning the change	2.1 Provide advice on mechanisms to gain acceptance of and commitment to the pending innovation. 2.2 Audit the pre-introduction climate to assess whether the right preconditions exist (see Table 1). If not, provide advice on possible interventions to change the preconditions in a favourable direction. 2.3 Set up the necessary mechanisms to elicit employee involvement during both this phase, as well as the implementation phase. 2.4 Ensure that the communication channels in the organization are functioning effectively. 2.5 Negotiate and/or consult with the union regarding the imminent change. 2.6 Conduct a team building exercise with the multi-disciplinary project team doing the planning for and overseeing of the implementation to break down (traditional) organizational barriers. 2.7 Conduct own strategic, tactical and operational planning (see Table 2), convert this into action plans, set up the necessary structures to execute these plans and allocate the necessary resources.
3. Implementation of change	3.1 Ensure that the implementation content is converted into an implementation programme (i.e. an introduction to change programme) with the necessary in-built mechanisms to minimize/overcome any resistance to change. 3.2 Ensure that the rate and depth of implementation do not disrupt the delicate balance between the states of readiness/adoption of the technical and human sides of the organization. 3.3 Monitor continuously the human and organizational climate. If it becomes unfavourable, provide advice on possible interventions to remedy the situation.
4. Evaluation of the implemented change	4.1 Set-up a management information system to monitor the successfulness of the proposed and implemented organizational arrangements. If necessary, suggest corrective actions. 4.2 Provide advice on when the technology in a human and organizational sense has become a fully integrated part of the organization which would indicate the dissolving of the project team.

CONCLUSION

The purpose of this article was to discuss the role that the industrial psychologist must and can play in the introduction of new or advanced technology. The article gave attention to three main topics:

- the rationale behind the industrial psychologist's contribution. Here it was argued that the justification of the industrial psychologist's contribution arises from the fact that the organization is a psycho-socio-technical system,
- a suggested methodology to guide the industrial psychologist in fulfilling his/her role in this respect. The steps contained in this methodology were briefly reviewed, and
- a description of the nature of the industrial psychologist's role before and during the introduction of new technology. The more important responsibilities in this area were listed.

The main argument of the article is thus: the industrial psychologist must take up the challenge in assisting with the introduction of new or advanced technology for the sake of the resource for which he/she serves as a "representative", viz. the human resources of the organization. Only in this way will he/she justify the rationale for his/her contribution: the closing of the gap between the expected and actual performance of the new technology.

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