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AN APPROACH TO AN EXPERIMENTAL INDUSTRIAL PSYCHOLOGY

A short survey of industrial psychology research in England since the First World War is given. Results of some investigations preformed at the Applied Psychology Research Unit in Cambridge are presented in detail.

There is, of course, no time to attempt a complete survey of Psychology or Psychological research in England. As in many other countries in Europe most professional psychologists are working in the Educational field, many more are concerned with Child Psychology in one form or another, generally working in clinics and concerned with behavioural difficulties of young children. The third main group consists of the Clinical Psychologists who are linked with Psychiatrists generally working in hospitals and largely concerned with the development of diagnostic tests of mental disorder. Very few psychologists indeed are engaged in theoretical experimental work on traditional problems, but in ones and twos in a number of Universities there are traditional studies being carried out on perception, memory, learning, and so on. The largest single group by far of Experimental Psyhologists is in Cambridge, and it is about the work of this group that I shall talk in much greater detail later. A special word needs to be said about Industrial Psychology in England at the present time. It is nearly true to say that more papers are published which describe what Industrial Psyhologists ought to be doing than papers describing what Industrial Psychologists have actually done. This is representative of the confusion that Industrial Psychology is in England. The reason for this is a very long story, and it is a particulary sad story since after the 1914–18 war there developed in England a school of Industrial Psychology which, I think, has never been bettered in any country at any time. Because of the nature of its methods Psychological experiments have not fitted in easily with the demands of manufacture and the routine of factory practice. Just the same, in certain areas of research some very favourable investigations were carried out between the two wars. These were experimental studies of hours of work, rest pauses, output fluctua-

tions during the day, the week and the year, fatigue in heavy work and eyestrain in visually exacting work such as temperature, ventilation, lighting and noise. Many of the results of these studies have so passed into current practice that their origin is often forgotten. Most of the results were entirely sound and of considerable importance. The first report was issued in 1919. In the first ten years, 52 reports were issued. In the second ten years 31, and in the last ten years of its existence in the Industrial Health Research Board issued only seven reports. Thus, in fact, by about the beginning of the Second World War, after this immensely vigourous start, there was virtually no experimental psyhological research being done in industry.

Today, most psychologists working in industry are concerned with the attempt to match people to jobs, with training and, unfortunately, with work which indirectly puts them in a position to affect wages, but very little of the present effort is concerned with the study of industrial work itself. At the beginning of the recent War the University Department od Psychology in Cambridge was a relatively small, mainly teaching establishment. One of the problems which became important in Britain in the very early stages of the War was that of trying to find methods for selecting persons who would become, with training, good fighter and bomber pilots. The familiar methods of personnel selection by means of tests were extensively used and it became clear that even if this method was entirely successful, the skill of piloting aircraft was so complex, that either we shoud have an insufficient number of pilots, or the trainig period would become excessively long. A new research Unit was therefore set up in Cambridge to examine these problems from an entirely different point of view. The new Unit of Applied Psychology was not part of the University, but was a Unit of the Medical Research Council, a research organisation almost entirely financed by the Government.

Put very simply, the Unit tried to analyse skilled behaviour with a view to re-designing these complex military skills so as to make them easier to carry out and, so that therefore, more persons would be able to do them. This Unit has now become the largest single group of experimental psychologists in England and until very recently, when he retired, it was directed by Professor Sir Frederic Bartlett. Bartlett undertook a complete review of the factors involved in human skilled behaviour. He interpreted the term skill very broadly, meaning it to include behaviour ranging from a simple response to a simple stimulus, up to complex motor behaviour such as the organisation of the control of air traffic. But for the most part, the laboratory was in fact concerned with what are usually known as sensory-motor skills, that is the kind of skill which is common in industry and the handling of military equipment.

The work of the Unit has been dominated by four strict principles.

Firstly, no studies were undertaken unless they could be experimental studies capable of quantitative description. This meant that many topics which have been popular in Psychology, and many topics which many people considered to be of great importance, have been neglected. There have been practically no studies in Social Psychology and none at all on problems of personality and temperament. These omissions have occurred not because they are considered to be unimportant, but because at the present time it is not felt that experimental techniques of a sound nature are available. Although this strictly experimental approach, with a complete rejection of unscientific methods has led to a somewhat restricted area of activity, most of the results have in the main been absolutely indisputable.

The *second* principle on which Bartlett insisted was that useful information about skilled behaviour could only be obtained if skill was regarded as a unitary activity of a human being, and not as a collection of psychological bits and pieces which might or might not add up. Repeated experiments have shown that many of the results of earlier work in the field of sensory-motor behaviour failed to be confirmed when the elements examined were set into a pattern of total behaviour. For example, for nearly half a century it had been expected that the reaction time to a visual stimulus was about a quarter of a second. This fact had been checked and repeated many times over, but always under the same general conditions. I. e. it was treated as an item of behaviour in its own right. When, however, it became necessary to examine reaction times as part of some other kind of activity such as driving a car, it was found that the reaction time set within a framework of skilled behaviour was nearer to half a second. More important it was found that the reaction time was a function of immediately preceeding behaviour and not merely of the nature of the stimulus to which the response was made. Similarly, older findings of the duration of limb movements measured in isolation, were found to be quite innaccurate when the same limb movement was measured as a part of a series of movements. Again, the duration of visual fixation which, when measured in isolation, was accepted as being about a third of a second, was found in some cases to require as much as one second when the eye movements and eye fixations were made naturally, as part of some other form of behaviour. Thus, although many of the researches at Cambridge have been concerned with the analysis of elements which comprise skilled behaviour, they have always been made against the background of a unitary skill. Thus, for example, the most important studies of reaction time have been made in the course of studies of tracking a moving object liable to sudden changes of direction.

The *third* principle has been that the Unit would not undertake »ad hoc« studies of a restricted nature. That is to say, it would not readily compare the efficiency of two pieces of equipment unless time was alowed for a study to be made of general principles underlying the use of the equipment. It was thought that far too many studies have been made in the U. S. A, which altough indicating that one machine or system was more efficient than another, contributed nothing at all to our general fund of knowledge about human behaviour.

Finally. Bartlett insisted that principles of skill applied generally to all skills and to all human beings. Research, therefore, has been more concerned with the similarities between individuals than with the individual differences. It has been fully recognised that all human behaviour is subject to variation from one person to another, but it was felt that the fundamental principles of human behaviour must be common to all individuals, just as are the fundamental principles of Physiology.

The caracter of the research work of the Cambridge Unit has depended upon certain important theoretical formulations regarding the nature of human skill. Fundamentally skill is considered to be a means of maintaining control over an environment which is liable to change either continuously or at intervals of time. If we consider a common skill such as driving a motor car, in order to maintain the desired relationship between the human driver and the physical environment three functions must be considered.

1. The collection of information regarding changes in the environment.
2. The mental organisation of this information.
3. The control of the environment by means of suitable, i. e. adaptive responses.

Now during the War experimental psychology both here and in the United States made enormous strides. And I would like to survey very briefly an area of work which I think might be most relevant to the present topic. All the impetus was military, and there is a very real problem as to how much of the results, or the techniques, or the outlook which developed, is likely to be relevant in the industrial field. This area is what the Americans call human engineering and which has come to be fairly sharply defined. In England with our rather more modest and moderate approach, essentially the same kind of problems have been studied, under the distinctly more general heading of studies of human skill. The studies of skill are in general broader and have more theoretical emphasis than the human engineering studies of the United States, though there is very much overlap.

The central feature of this work was a full recognition for the first time in psychology, that factors affecting the maintainance of human

skill were at least as important as those determining learning and those contributing to deterioration.

Two main aspects regarding the maintainance of skill received particular attention, and the problems concerning them became known as problems of display and problems of control.

The word display describes in one word all the sources of sensory information which provide the signals for that kind of action which is called skilled behaviour. It might be a single light, or a series of flashes which, when transcribed, form a message, or a collection of verbal messages. It might be a bank of instrument dials, or a football field seen from the point of view of one of the players. It is a convenient term which circumscribes one particular feature of a skill, and which leaves out environmental factors which affect but which do not necessarily belong to the skill.

In most of the skills of life, displays are not designed with a psychological concept of display in mind. Sometimes- as in sailing for example – they occur naturally with no possibility of design. But usually design is present, though incidental to some other aim. For instance, a lathe is built primarily to cut metal, and this production objective in the skill dominates the design of the display features of lathe-operating. But one of the most interesting developments in psychology in recent years has been the discovery that the objective aim might be more easily or more efficiently achieved if displays were designed as much with the human operator in mind as with the objective.

The display was regarded as those elements of the machine or equipment or system which provided the human operator with information necessary for the maintainance of the skill. Instrument panels, scales, warning lights etc. are one way of providing this information, and because this particular display elements were designed by human beings in the first place, they became the centre of studies aimed at trying to ensure that they provided information which could be interpreted easily, accurately and speedily.

Since apart from speech, most information comes through vision, emphasis was placed on the studies of visual displays. The central display problem is that of legibility in the broad sense of the word. There are always a number of ways in which the same information can be visually presented. It may not always be worth while re-building equipment so as to get a small increase in efficiency, but it is worth while ensuring that the best methods are incorporated into new designs. As a result of this work, we now have a sound knowledge about the principles on which dial scales should be designed, the relative merits of moving pointers versus moving scales, scales versus numeral counters, vertical versus horizontal scales. We know a fair

amount about the optimal physical design of numbers and letters, of pointers, of light intensities of warning signals, and of the spatial arrangement of indicators and so on.

Much of this work initiated as it was by the fighting Services is fairly specific, but the most general principle, that the *way* in which information is provided for an operative by a machine or system, is a relevant for efficiency as the *meaning* of the information, has wide applications in industry. These applications go far beyond the design of dial scales. In a sense, the most useful feature of the war work that can be carried over into the industrial field is the attitude of mind, because quite frequently specific examples turn out to be matters of common sense, once one knows what one is looking for. Sometimes a real ignorance of human ability is involved. Let me give an example.

I recently visited a power house control room, the four walls of which were completely covered by recording and indicating instruments of many different kinds. Since I had no idea of the significance of most of them, I asked the engineer which was the most important signal with which he would be likely to deal. He said that if at certain points in the plant too much heat or pressure for example was being developed, a bell would sound in the control room and a red light would come on indicating the source of the trouble. Once the bell sounded, the most important thing was of course speed on the part of the controller. But he added that that sort of thing rarely happened. At that moment a bell went off with a loud clang! I don't know how many seconds went by before the appropriate red lamp was located, but it was too many for absolute safety, and far more than it need have been. For one thing there were already several red lamps on in the normal course of events and having no critical significance. But the main criticism I had was that the actual time intervals which would be involved were under-estimated in the design. We all accept that the quickness of the hand deceives the eye, but equipment is rarely designed accordingly. The eye is relatively fast moving organ. But as you all know it sees nothing while it is moving. With certain exceptions it sees only from a stationary position, and it has to be stationary for not less than about one third of a second, and sometimes for nearly one second. If perception which is to lead to action, depends on a judgement involving two or more fixation points, each of which may have to be fixed more than once, well over a second may be taken up by the visual elements only. To this might have to be added a reaction time between hearing a warning noise and the beginning of visual search, and another time between the collecting of the relevant visual information, and the beginning of the appropriate action, and yet another time between the initiating of the action and the moment at which it becomes effec-

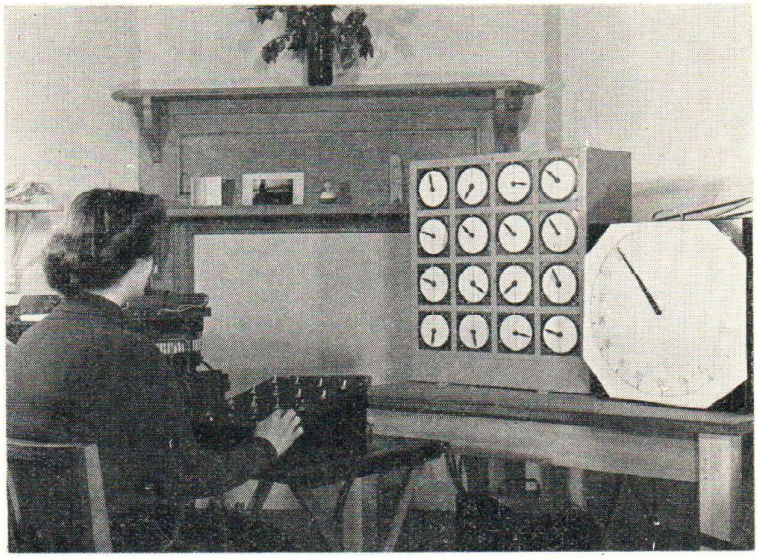

Fig. 1. One example of the type of equipment used in studies of human skill at the Aplied Psychology Research Unit, Cambridge, England. — The small pointers all revolve at different controlled speeds. The subject responds to the display changes by holding down the correct switch while the pointers pass the 0^0 and 180^0 positions. Failure to respond to a signal at the right time causes the pointer to stop. Pointers remain stopped until the subject locates it and presses the correct switch. — Because of the relative speeds of the pointers, the distribution of the time interval between successive signals is approximately exponential. The mean interval size and the number of pointers in the display can be varied. — The large clock provides the subject with a continuous objective indication of his success at the task.

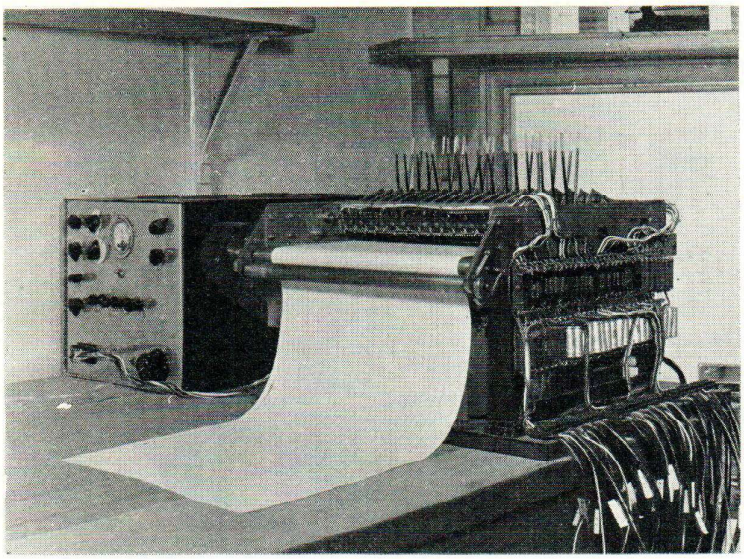

Fig. 2. 32 channel Biro pen recorder giving a permanent record of the temporal relationships between signals and responses, thus permitting a detailed clinical analysis to be made of the subject's performance from second to second, as well as a statistical analysis of overall score. Paper speed can be varied from 1 cm/5 secs. to 2 cm/1 sec in several steps.

tive. That is the time required to turn a wheel, or press a button or throw a switch. Almost always these times are under-estimated by designers without reference to the literature on the subject.

Studies have also been made in auditory displays and a number of interesting papers have been published on problems concerned with listening to more than one voice speaking at the same time, a situation which arises in air traffic control. Important findings have been made relating to certain time factors in the presentation of messages and to the specific localisation of the messages.

The problems of the organisation of information conducted via the sense organs has proved to be most difficult, and it is a subject about which we have least information. Also from a psychological point of view it is probably the most important problem in skill studies. Research so far is mainly centred around the question of the amount of information that a human being can deal with. It is one thing to say that there is a limit to what a human being can take in, the prediction of that limit to a given set of efficiency criteria is proving to be a difficult but fascinating problem.

The attribute that is common to most displays is that they are continuously changing. Objects change position with regular or irregular velocities, sounds change pitch or loudness, signals occur and cease. The skilled operator attending to this changing mass of information is alerted to select those changes which demand a change in his behaviour if the skill is to be adequately maintained. In order to do this he must know which parts of the skill are most worth while attending to, and for how long any part can be safely neglected. This leads to a key question in research in this field. In designing displays or any work what are the limiting factors which determine how frequently critical signals can be permitted to occur?

The term »critical signal« itself requires a brief explanation. The changing events of visual displays consist very largely of objects moving along courses or tracks which are often predictable from relatively little information, or of events which develop in fairly predictable ways. Vehicles in traffic, or dial pointers do not normally make frequent sudden and unexpected changes in course. Usually, therefore, not every signal change that occurs is important. What is important though, is that the observer *should* notice any sudden change and that he *should* notice when, for example, a moving object is likely to reach some point when action would be desirable. These are the critical signals to which response *must* be made. In many cases, particularly in industrial skills, the rate at which critical signals occur is known and can often be controlled. The organisation of information is closely bound up with the time available and several studies have been made to try to classify this relationship.

Perhaps the simplest illustration of this point, and one which rarely occurs outside the laboratory, would be that of a single series of stimuli equi-distant in time. In such a case one would expect, and one finds, that responses can be accurrately made at a fast rate. The timing problem is simple because it is evident in the situation that the durations of time to be estimated are constant. The case which is a little more complex is that of a single series of unequally spaced signals. But this is still relatively easy to deal with, because the order in which the stimuli are to be dealt with is still given, and if the order is given, only a single duration need ever be considered at once.

Experiment shows this to be very little problem, so long as responses are not required at rates beyond what the effector system is capable of achieving. Operating a sewing machine involves primarily this type of matching. A third case which is much more complex is that in which several series of stimuli are concurrently occurring and all of them have to be matched by series of appropriate responses. This is the machine-minding, or the driving, or the pedestrian situation, and it is the situation most frequently met with in daily life. Not only do we have to decide when to begin to prepare a response to a particular stimulus, but first we have to determine which is the best stimulus to respond to next. Usualy this is not given as immediate sense data and it must be decided by comparing several estimates of duration. Once this degree of complexity is reached a further complication is almost present. Considering all the series of signals together, the time intervals between them are very rarely equal but more often than not will tend to have an exponential distribution. That is short intervals will occur very much more frequently than long ones, and far more than half of the intervals will be shorter than average interval. In this situation even if the average rate at which signals occur is constant, we have to deal with continually changing durations of time. If we do not deal with them quickly enough the whole temporal pattern of events will change so that everything that we had decided up to that moment must be erased. Then we must begin again with the new set of temporal conditions. Again they must be sorted out, and response determined in an amount of time which is finite but always changing.

Relatively few skilled actions or responses seem to be made without reference to preceding or succeeding events. As a result they are not always made at what is objectively the best moment. More often the skilled operator times the movement so that it occurs at what is psychologically the best moment. If, for example, it becomes apparent that two events will objectively and optimally require action at the same moment, and if this is physically not possible, one act will probably be advanced in time. Obviously this is psychologically sound, though objectively the act advanced is not strictly accurate. It is this continuous

assessment in advance of the future temporal conditions which will be available, in order to time present action more suitably, which shows very clearly in laboratory experiments. But equally it can be shown that present action is affected by previous action in the sense that the effector mechanisms must be freed from the effects of one response before a second can be initiated. There are thus at least three factors influencing the time at which a response will be made. One is the time elapsed since the effector system was previously in use; another is the time until the effector system is expected to be required again, and thirdly of course, is the moment which is objectively most suitable for the response. These three factors are assessed and balanced in such a way as to maintain the skill at an adequate level. This (assessment) requires what can only be described as the perception of durations. The ability to manipulate time-limits which are objectively laid down, plays a large part in determining the level of skill attained.

One would expect that this somewhat delicate balance of temporal factors which the skilled operator creates would be subject to many disrupting forces. Whilst there are naturally large individual differences in the ability to tolerate disturbing tendencies, a number of such forces have been investigated which when present in sufficient strength will break down any degree of skill. I will mention three to which we have given some attention, all of them, in different way associated with shortage of time.

Firstly, the average rate at which events in the series require action appears to exert an influence on the component parts of the series independently of local temporal conditions around any single event. If things happen too fast in general, specific temporal situation which could normally be dealt with become liable to error. Secondly, independently of both the average rate of occurrence of events, and of local temporal conditions, performance is affected by the number of factors which need to be considered before a response can be adequately made. This is analogous, I think, to the degree of choice in classical choice reaction-time experiments. The third determining factor is the temporal conditions prevailing at any given moment in the series. I have already described some of the important elements in this; the relationship of previous and succeeding events to the one being immediately dealt with. But I think it should be emphasized that these conditions are the results of interaction between the performer of the skill and the events predetermined in the skill itself. A point comes in the developing process in which one is attending when action will be necessary. That action is determined by the process. But the moment of initiation on the process is under personal control. Thus in skill we tend to create the temporal conditions within which we shall have to operate. Good

timing essentially provides us with more time; the skilled performer makes things easy for himself.

I have dealt at length with the problem in skill adaptation to time limits because it is a subject with which I am personally concerned.

The third function in skilled behaviour to which I referred is the control of the environment, and here also as a result of war time allied studies we know a fair amount.

In this context, by the term controls we refer to the means by which an operator modifies the behaviour of a machine or the appearance of a display. Steering wheels, joysticks, brake levers, accelerator pedals, the controls by which machine tools are adjusted, switches, knobs, etc. Here research centred around such aspects as the direction of control movements in relation to the desired effect, the extent of movement to achieve a given machine modification, the type of control to achieve that modification. An illustration of the close linkage that there is between problems of controls and of displays can be seen in the fact that we are as yet very uncertain as to the relative importance of the various mechanisms involved in making a simple adjustive movement of a control. For instance, imagine a barrel being filled with a prescribed weight of an unevenly flowing material descending from a hopper through a pipe. On the pipe there is a valve operated by a small handwheel. The barrel stands on a weighing machine with a scale of the usual pointerdial type. The permitted weight error tolerance may easily be plus or minus one degree of arc. One can see at once that this presents both a display and a control problem. Where are the critical points? Is it the visual discrimination that is most important, or is it the sensitivity of the sense organs within the muscles controlling wrist movement, or is it those mechanisms concerned with the ability to anticipate from visual information when to begin, and at what rate to continue, wrist movement? In many such cases we do not even know what knowledge would be most useful regarding human abilities, to permit the best designs of bio-mechanical systems.

Very many of the studies to which I have referred have been highly theoretical studies carried out in the laboratory, but we are confident that they provide a basis for Applied Psychological research in industry of a far reaching nature. The central applied problem as we see it, which is most likely to be solved with certainty in the near future, is that of designing industrial work so that it can be performed more efficiently, more easily, and with less fatigue.

We are, therefore, left with the major question: are these studies relevant to industry, and I mean not only the studies which have already have been done, but those which will come. One thing I am certain of. Neither the psychologists, nor industry alone can give the answer. Only the psychologists are competent to say what kind of know-

ledge they are likely to be able to provide, and only industry can say what knowledge it is likely to need. I would like to conclude this talk by outlining what I think are some of the important considerations in this kind of transaction.

One illusion which is common in England needs to be disposed of at the outset. I don't know who started it, probably psychologists, but it has certainly been encouraged to some extent by industry. This is the illusion that a psychologist can walk around a factory and point out the ways, just like that, in which things are being done wrongly. A feeling developed after the war that we people had a large amount of secret know-how, which could be passed across the tea table and which would double productivity. This is quite ridiculous. No psychologist can ever be of value in industry unless he has a training also as a engineer, or he works with an engineer who is sympathetic to human problems, or unless he has first made himself very familiar with the industrial processes with which he is concerned.

But we have to face the importat question of whether psychologists are of any value in industry.

It seems to me that several questions have to be faced. Firstly, how important does industry assess human factors in production to be for whatever reason? Both at present, and in the forseeable future? This question has to be considered on financial grounds, on political in the broadest sense, on ethical, and on engineering grounds.

If the answer is that the human factor, relative to others, is trivial, then there is no role for psychologists in industry. But on the whole the internal evidence is to the contrary. We are in fact still seeing in England the development in companies of personnel departments, time study departments and so on.

A second question to be answered then is this. Can these departments deal with the human factors problems which exist or are likely to develop? I am not sure we need go back as far as thirty years before we come to the time when the majority of industrial concerns believed that general managers could deal with production engineering problems, with personnel, with medical, with time study problems. Of course it is perfectly true that part of the answer must come from psychologists. If we could say that we had certain highly specialised techniques which if applied by experts could make substantial improvements in productive efficiency, then I have no doubt that many companies would be interested. But this is not a tennis match where the ball gets pushed from one side of the court to the other. We are dealing with a problem with which no progress will ever be made if each side blames the other for inactivity or merely waits for the other to act. Assuming then that industry is perhaps still interested in the role of the psychologist, another question can be posed.

How far is it possible for industry to define the area of problem with which it feels unlikely to be able to cope itself? And this leads to the thorny but extremely important question of short term versus long term psychological research in industry. I believe that great harm will be done if one comes to accept that experimental psychology of the kind I have been talking about means the testing of equipment with a view partly to measuring its efficiency, and partly to suggest ways in which it could cheaply be improved. A certain amount of this is necessary, and it is legitimate short term work. But it is bad for two reasons. It is an unnecessarily slow way of acquiring scientific knowledge about human behaviour and ability, because the knowledge will come incidentally, piece-meal and unrelated. Secondly, the psychologist merely becomes a house-maid tidying up after someone else.

There is a case for, and a place for, modifications. But the only serious contribution that I think psychologists are likely to make to industry will have to be at the design stage. Put crudely, the engineer will have to say: I am designing a system which is intended to do so and so. At such and such points I think that a human operator might be better than an automatic device which is equally feasible. With what reliability expressed quantitavely will human being operate? The psychologist might THEN be able to say: If you can arrange the input of information or material to the operative in such a way, and if the system will tolerate the manipulation of it in such a way, then the reliability will be as follows. Or it could be done in this other way which might be cheaper, but the operating reliability will be less by so much.

Now this may sound ideal, and at this moment in history it is in most cases, simply because we don't know enough. But the availability of the knowledge is almost entirely a matter of time. The techniques of investigation have been tested and they are basically sound. Furtermore this knowledge can itself be used creatively. After all, all the varieties of human skill, are merely different combinations of the same set of basic abilities. Although many of these abilities will not combine easily in a large number of persons, a great many will, and thus new skills can be created, and demands upon ability made by new designs can be assessed.

I think that an integral part of such a programme would have to be what one might call laboratory experiment on the shop floor. Almost all the biological sciences are having to come to this, and the case for it in anatomy for example, has been brilliantly expounded in England, by professor Le Gros Clark, who has many times been driven to point out the difference between a corpse and a living body.

In psychology there is this difference also. No matter what one says, laboratory studies remain laboratory studies. Isolated, aloof, and desperately pure. So pure as to be inhumanly pure, which is rather a pity for a study of human behaviour. But at the most critical stages of a study, laboratory experiment is essential because it is pure, and one can be confident that one knows what factors are being handled.

But the time always comes when one has learned all that one can from the corpse, and it is time to look at the living body. The question must be faced: Does the result obtained in pure culture in the laboratory equally hold true in the conditions of daily life? Daily life, in the truest sense, is a bad medium for scientific experiment, because daily everything changes. But the next best thing to it, is often the shop floor: the »technologically prepared situation«. Here we can vary, repeat, control, measure.

I would insist that every laboratory finding should be checked under shop floor conditions or the nearest equivalent. In many cases, this would be a nuisance to industry, but it is essential if a role for experimental psychology in industry is to be developed. On the other hand it is likely to save money and human efforts in the long run, and in the short run the technique can often be used to provide local information of purely local interest, which might otherwise be impossible to obtain.

In practice one would have to begin modestly, and in a modest way there are one or two cases in which the programme I outlined is working. But very much more research is needed, and the correct research will not be done unless some interest in it is shown by industry. That is a dilemma. WE have a little to offer now, but we can promise a lot more. Industry may feel that its psychological problems must be solved at once, and that having solved them it will have none in ten, twenty or thirty years'time. Although few people would subscribe to that, many are disappointed because we cannot provide all the answers now. I share their disappointment. But I think it would be a great pity if disappointment became disillusion next, because if that happened there would be a serious danger of experimental psychology becoming partly a sterile study of mental curiosities – of which there is already much – and partly military arm.

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Sadržaj

O EKSPERIMENTALNOJ INDUSTRIJSKOJ PSIHOLOGIJI

Autor daje kratak pregled razvoja industrijske psihologije u Engleskoj, od vremena Prvoga svjetskog rata do sada. U tom prikazu osobito se zadržava na istraživanjima Odjela za primijenjenu psihologiju Savjeta za medicinska istraživanja u Cambridgeu, koji je odjel osnovan u toku prošlog rata za vojne potrebe.

Glavno je područje ispitivanja tog odjela analiza senzorno-motornih sposobnosti i vještina, koje su od najveće važnosti kako u vojnoj službi tako i pri industrijskom radu. Pri tim istraživanjima pošlo se od novih metodoloških principa kao što je na pr. striktno ograničenje na probleme, koji se mogu eksperimentalno ispitati i kvantitativno odrediti, sintetično ispitivanje spretnosti u cjelini aktivitcta čovjcka, ispitivanje općih principa, koji se nalaze u osnovi pojedinačnih spretnosti i vještina.

Opravdanost i upotrebljivost takvog pristupanja problemima primijenjene psihologije ilustrira autor rezultatima, koji su do sada postignuti u njegovu odjelu.

Na kraju daje autor perspektivu daljeg razvoja industrijske psihologije u Engleskoj. Kako bi psihologija stvarno mogla prodrijeti u industriju, potrebno je, da se ostvari uska suradnja psihologa i inženjera, a laboratorijska psihologijska istraživanja treba da se što više približe prilikama stvarnog života.

Istraživačka jedinica za primijenjenu psihologiju
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