Zeitschrift: IABSE reports = Rapports AIPC = IVBH Berichte
Band: 52 (1986)

Artikel: Human and organizational aspects
Autor: Knoll, Franz
DOI: https://doi.org/10.5169/seals-40362

Nutzungsbedingungen
Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. Mehr erfahren

Conditions d'utilisation
L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. En savoir plus

Terms of use
The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. Find out more

Download PDF: 26.11.2025

ETH-Bibliothek Zürich, E-Periodica, https://www.e-periodica.ch

Human and Organizational Aspects

Moderator: Franz Knoll, Dr. sc. tech.
Nicolet, Chartrand, Knoll + Associés; Montréal, PQ, Canada

Panelists: Aksel G. Frandsen, Techn. Dir.
Cowiconsult; Copenhagen, Denmark

Shigeo Hanayasu, Senior Research Officer
Res. Inst. of Industrial Safety; Tokyo, Japan

Robert E. Melchers, Senior Lecturer
Monash Univ.; Clayton, Vic., Australia

Andrzej S. Nowak, Assoc. Prof.
Univ. of Michigan; Ann Arbor, MI, USA

Carl J. Turkstra, Prof. Dr.
Polytechnic Inst. of New York; New York, NY, USA

Lac Vu Hong, Quality Assurance Mgr.
SPIE Batignolles; Puteaux, France

Taking part in the discussion from the floor:
J. Augustyn, Poland
T.K. Cheung, Hong Kong
D. Clyde, Australia
W. Colenbrander, Netherlands
R.A. Dorton, Canada
M. Kersken-Bradley, Fed. Rep. of Germany
D.J. Lee, UK
J. Menzies, UK
A.G. Meseguer, Spain
S. Ono, Japan
R. Rackwitz, Fed. Rep. of Germany
K. Sriskandan, UK
B.P. Wex, UK
J. Wynhoven, Australia

F. KNOLL, Canada, MODERATOR
We shall subdivide our discussion into two periods. The first few minutes I would like to spend with questions directed to the three lecturers that we have just heard: Then we shall proceed to a more general discussion on the theme of this Seminar, which is "human factors and their influence on quality assurance".

J. WYNHOVEN, Australia
My question is directed to Mr. Frandsen who has delivered an excellent paper very appropriate to my own practice. What was the reaction of the staff, particularly the junior staff, to a formal Q.A. document? Since its introduction, has there been a decrease in the number of problems?

A.G. FRANDSEN, Denmark
The staff reacted positively up to now. We have not had the system for very long but mainly it consists of well known procedures from the past, so it does not change very much. But they can now see it in a more systematic way. Whether we can notice a lower rate of mistakes since we have introduced the system? I must say that it is too early to state anything about that. The system has been functioning for a very short time until now, so we cannot tell if it improves the performance, but we hope so.

J. AUGUSTYN, Poland
Mr. Hanayasu stated that the number of accidents increases with the age of the workers and decreases with their experience. How should we understand this, since the oldest ones are also the most experienced ones?

S. HANAYASU, Japan
In this case, due to the shortage of workforces, many older workers with less experience participated in the projects and they were the main sources of the accidents, which resulted in the reported accident situation.

W. COLENBRANDER, The Netherlands
I was very pleased with the paper of Mr. Frandsen. I recognized a lot of it in my own experience. He mentioned audits and I would like to ask him: Do you think audits are possible within the company or is it necessary to go for external audits?

A.G. FRANDSEN, Denmark
We perform audits within the company and it is possible within the company if you have independent people to do it. I think it might have a reverse effect if you took people in from outside in order to make these audits. It might be necessary in very rare cases, but I would not recommend that.

R.A. DORTON, Canada
I also was very interested in Mr. Frandsen's paper and particularly the idea of moving the checking up front. I think this is very significant. We do a two phase checking in our bridge design office, we do the detailed computational checking, though many people think those checkings are not very important. But the most significant part is our preliminary review. We have the designer in the beginning of the project justify his selection of the structural type before a group of senior engineers, and also establish what analytical technique he is going to use and have it reviewed by senior

people. I think this is very important and I was wondering if Mr. Frandsen could indicate, within his organization, how he is moving up front this review process, because there seems to be one quality assurance engineer for a project.

A.G. FRANDSEN, Denmark
First of all we want the people responsible for the project to try to foresee all the possible difficulties they will encounter during the project phase. That is the most important thing. Very often you can imagine what will happen and you should put it into your planning and make precautions for taking up these difficulties. I agree with you that phase checking is a good thing because you can avoid the major mistakes on earlier stages and you can avoid checking too much before it is really necessary, when you have all the details. I think this is what we should do and not just to check the final result and then maybe have to redo much work. So I very much agree to the usefulness of checking in more phases, but I think the most important thing is to foresee the problems in the planning phase.

S. ONO, Japan
Mr. Vu Hong gave a lecture in which he referred to the decision making mainly by the top executive, going down to the bottom. I suppose this is a very customary or traditional method in Western society, but here in Japan we have another pyramid system, shortly expressed "bottom-up", that is the lowest level worker can produce any improvement proposal to be raised up to the top executive of the pyramid structure of any organization. This system may sound a bit time consuming to Western people, but this is something like the democracy, so it is very effective in another sense to gain the majority of the consent of the working people.

My question: Do you also have such a system in France? I suppose any recorder system is indispensable and in my company's experience, small gifts to the working circle has been very successful to inspire field workers to lead them to more profit oriented sides.

L. VU HONG, France
In our system the condition is that the decision should be pushed down to the lowest level, where the work is performed. What we require is that the project first be divided into sub-projects and into sub-sub-projects down to the responsibility of one single man. But we have also the obligation for all people from one level to report the performance back to the higher level. That is the feedback from the bottom to the top.

MODERATOR
What we have heard are some very important and interesting comments on how different systems, the Japanese system and the French system in this case, work with positive and also with negative incentives.

If perhaps somebody from the audience could shed some more light on this question - I think it is very important because it is very closely related to the human feelings that, after all, the workers must have towards their work.

D.J. LEE, UK
I could make a contribution, although I am a consulting engineer, on the basis of some research done in Britain on contracting. I think it bears on the point you were raising about decisions coming down

and feedback coming up. It appears that unless management imposes a safety procedure, very little happens. For example the wearing of safety equipment, even safety helmets, although that is an obligation. In fact, it is not always applied - it depends on the management of a contractor to impose this procedure. The problem is that a worker, particularly in Western Europe, can have a "macho" image. He does not need safety equipment, he is a tough Rambo type man. This image must be destroyed if safety is to be applied. The best contractors get better results if they rigorously apply a sensible procedure which is respected right through the organization.

MODERATOR
We have heard of imposing safety measures that need to be applied. Now could we have some enlightenment on how they are being imposed? We have heard our Japanese colleague say that small gifts are being offered to people who do the right thing. How does European management impose safety measures and make people do the things they are required to do?

L. VU HONG, France
I consider the safety aspect or safety measure to be implemented on site in our system as an aspect of personnel management. It is a requirement of the directive. This means that the responsibility for the personnel management in safety measures should be pushed down e.g. to a foreman, on the condition that we have all the requirements clearly defined. And then, the audit will go through the system periodically to verify in all aspects including safety, that the safety requirements have been respected and the procedure has been established and implemented by the foreman who is responsible for it.

M. KERSKEN-BRADLEY, FR Germany
If I understood Mr. Umeda's lecture yesterday correctly, the main procedure or the main philosophy in Japan is that quality assurance procedures are more or less integrated. I have the impression, that in Japanese companies there is actually no specific quality assurance officer and there is no quality assurance department in the sense which was brought forth by Mr. Frandsen and by Dr. Hillemeier yesterday for instance. However, this would imply that you actually cannot perform an internal auditing, or do you have other procedures? I can very well imagine internal quality control and quality assurance in an integrated manner. There are tendencies in our country to consider this approach. However, for the auditing function we need something separate from the normal routine operation.

S. ONO, Japan
In reality we have some auditing systems, some auditing sections, but they are not a positively acting group and they believe that quality must be made up during the fabrication process. So they only promote or encourage the people to adhere to the fabrication procedure. But they arrange for example, statistical data to encourage the foremen or workmen or managers to present them what are suitable procedures.

T.K. CHEUNG, Hong Kong
If I may make an observation on Mr. Knoll's question about implementation of safety measures among the labour force. I suppose you can only do that with regard to the cultural background of the society

in which you work and Mr. Lee has mentioned that question very well among the British as opposed to Continental workers. In Hong Kong there are similar attitudes. So one of the things the Hong Kong Government has tried to do in recent years is to try to change the public image by way of publicity campaigns through television, e.g. making people have the image that wearing safety helmets is a fashionable thing rather than something, you know, that destroys their manly image. I would like to know some more about that from other countries. Whether these campaigns in Hong Kong have been successful, I might be able to tell you that in a few years' time.

MODERATOR
We shall now go on to the second section of the discussion, where we are open to all subjects related to the theme of this Seminar. Thank you very much.

B.P. WEX, UK
I am delighted that so much attention is given to the question of human error in quality assurance. I am very pleased to see that statistics at last have borne out what practicing designers have been saying for years. Probabilistic theory is a very nice mathematical exercise, but for goodness sake, let's get down to the two really important matters in reliability; number one is correctness of engineering concept and number two, is human error.

S. ONO, Japan
To strengthen our successful example of the Japanese quality control system, I would like to introduce a famous book written by Dr. Ezra Bogerl some years ago, titled "Japan as No. 1" and in this book he takes up 3 or 4 tips for success. So try to read that book when you return to your country.

A.G. MESEGUER, Spain
This is a minor remark to Mr. Nowak's definition of error "a deviation of acceptable practice". I think that progress is based on deviations from acceptable practice. So I think that something should be added to this definition in order to separate what is an error and what is an innovative way of progressing, because both are deviations from acceptable practices.

A. NOWAK, USA
The question of the definition of human error has been the subject of extensive discussions and what I presented is definitely not the full definition. We tried to develop a comprehensive definition, but as I indicated, defining errors as a departure from acceptable practice immediately raises the question "what acceptable practice is"? By the way, we first had it as accepted practice, then the word acceptable was preferred. It is a definition which could and in the future probably will be modified to include some other aspects.

A.G. MESEGUER, Spain
May I suggest just to complete the definition this way: "A deviation of acceptable practice leading to an undesirable result".

K. SRISKANDAN, UK
Two short questions to Messrs. Melchers and Nowak.

Prof. Melchers had an equation for the total cost optimization, one item of which was on cost of control. I would like to know when this

work would be completed and if it comes up with some practical conclusions?

And to Mr. Nowak: One of his recommendations was to bring something about error control into codes. Could he expand on that?

R. MELCHERS, Australia
I am not really quite sure what you are driving at. Are you asking me to tell you when the whole of this work will be finished in the future? Is that what you are suggesting?

K. SRISKANDAN, UK
Yes, in a way in which practicing engineers could then use the results to decide how much resources to put into error control and how to divide that between error control in design, error control in construction and control in use.

R. MELCHERS, Australia
It is evident from my remarks that what we are doing and looking at is very elementary and we have a long way to go yet. Now the question, I think, we have to answer for ourselves is whether this line of research is a worthwhile task to pursue; if so then we can put some resources into it. If we decide it is not worthwhile, it will never be finished. I am sorry that is ducking the issue, but I cannot tell you that it is going to take 2 or 3 years or whatever, because it really depends on how much effort we put into it.

B.P. WEX, UK
To enlarge slightly on my last remark in the light of what Mr. Sriskandan said. I think they are both right. Prof. Melchers' work and his colleagues' has to go on. In the meantime, the checking system that Mr. Sriskandan's organization has set up to chase human errors also has to go on. His is the current practical solution, while Prof. Melchers is doing the research, which we hope will give us the necessary theoretical insight for the scientific solution.

A. NOWAK, USA
The issue of how should we handle human error in design codes is extremely important, delicate, involves a lot of politics too. The present codes are based on the assumption that the people will not make errors and you may say that safety factors or safety reserve in the code gives us some shield, some cover which covers some errors. Well, this is so. But there is no allowance for making errors there.

How should and could the errors be handled? This is the subject of the current research. I would like just to mention one option which is considered: If you have various contractors who have experience ranging from "very experienced" to "rather poor performance" you can have a certain ranking of those companies and depending on their experience in the past, they can use different safety factors. They can use different allowable stresses. The company with higher experience may save on material or may save on some other cost, while the one which has a bad record, has to go and provide the extra safety precautions. But this is just one option and all these various situations have to be considered.

R. RACKWITZ, FR Germany
Most of the discussion was concerned with finding out errors. What about avoiding them, for example by expert systems. Could you

comment on that?

R. MELCHERS, Australia
It seems that certain expert systems are a worthwhile thing to look at. The medical profession, with the limiting constraints of knowing what sort of diseases they are looking at and the sort of symptons that may arise, has done reasonably well in that area. I know there is some work going on in the mechanical engineering field for example, trying to use expert systems in design. There is also some work going on in the civil engineering industry and with the architects. I have not yet seen anything terribly successful in that area. But by all means, let it go on. I think, there is scope there. It would have been nice perhaps to have a contribution in that area.

J. MENZIES, UK
I would like to comment on the remark made by Mr. Nowak suggesting that more experienced contractors and designers be allowed to use different, i.e. lower, safety factors. Investigations of failures which we have made in the U.K. have indicated that if the safety factors in design had been higher, the failures would still have occurred.

R.A. DORTON, Canada
We have brought up again this question of the fallibility of professional engineers compared to students. There is an interesting aspect on the accuracy of work and it is very much a function of the organization from a human point of view. If work is being checked within a very small group, where the checker knows the designer, the designer is not very thorough. If the checking group is within the organization, but remote from the designing group, the engineer wants to be right, so he is more careful in his design. If the work is being done outside, being checked externally completely, the organization or the company, is very careful to see that they have got the job right before they are prepared to let it go out. So this whole question of how we are going to model human errors, is very much a function of the organization and the checking system that is being used.

J. WYNHOVEN, Australia
My question is directed to Mr. Hanayasu and it is to do with risk and safety. If one does not take risks, one does not achieve aims either and I noticed in the records here, that in constructing these two railway projects, deaths at the rate of 1 in every 8 km and 1 in every 4 km were achieved, but of course, there were probably remarkable engineering achievements. In Australia those sort of records would result in people just stopping work, but of course we do not achieve as much. What is the Japanese attitude to those deaths?

S. HANAYASU, Japan
In Japan we have every year more than 1000 deaths due to accidents in the construction industry. But today we are not thinking that such a large number of deaths as well as the high rate of accidents in the reported railway construction projects are acceptable to our society. Therefore, every party involved in construction works such as order initiators, contractors, labour inspectors and workers are very enthusiastic about preventing accidents from taking place. Hence, I think the attitude of people toward safety is positive.

J. WYNHOVEN, Australia
Perhaps, if I put the question slightly differently. When those accidents occurred, did it result in the workers stopping work and saying, until the safety is improved, we will not continue. In Australia that is what would happen. They would just stop work.

S. HANAYASU, Japan
It is up to the situation of accidents. If the appropriate amendment measures are taken in accordance with the accident situation, workers will be able to start their works. The contractors, in general, are serious about safety of construction sites, particularly in case of the accident, to improve the work places. Also labour inspectors have the right to order a contractor to stop his work if the work place was not improved properly. Therefore, it is very seldom that workers stop their work of their own will because of the remaining risks on the site.

D. CLYDE, Australia
As the father of a woman civil engineer, I would raise a social and cultural problem. I believe that engineering could be improved by having more women in the profession, particularly in relation to the macho image that Mr. Lee spoke about. My daughter is a construction engineer for a very large area in the South West of Western Australia for the Main Roads Department and she is totally accepted by the men. I believe women can improve the whole atmosphere of engineering and that women are much more reliable than men in a lot of tasks. - Perhaps Dr. Kersken-Bradley could comment on that.

M. KERSKEN-BRADLEY, FR Germany
I think you did more than I could ever do.

MODERATOR
We shall close this Seminar now and move on to the Prince Room to hear the final closing session. Thank you very much.