EXPERIENCE TRANSFER IN THE NORWEGIAN PUBLIC ROADS ADMINISTRATION

I. Markey & H. Østlid
Norwegian Public Roads Administration, Technology Department, Oslo, Norway
ian.markey@vegvesen.no & havard.ostlid@vegvesen.no

ABSTRACT

The Norwegian Public Roads Administration has developed an experience transfer system to help retain and further develop the best of their methods, technology and technical solutions and at the same time identify the most important topics for research and development within their area of responsibility. The main results of this system will be in the form of readily available reliable information and swift updating of guidelines, rules and regulations.

KEY WORDS

EXPERIENCE TRANSFER / TECHNOLOGY MANAGEMENT /KNOWLEDGE FILTER

1. INTRODUCTION

Managing intellectual capital and transfer of experience and knowledge is becoming one of the most important challenges in any organization; the ability to identify good practices from bad practices is a constant struggle. In recent years a large number of theories and methods have been proposed, some better than others, but on the whole the systems work better in theory than in practise. The Norwegian Public Roads Administration (NPRA) started a project in 1999 called: "Experience Transfer in the Norwegian Public Roads Administration". The project aimed at the following end result:

1. Create a system helping to retain and further develop the best of our methods, technology and technical solutions and at the same time identifying the most important topics for research and development within our area of responsibility. The information within this system should be made readily accessible for all relevant personnel.

2. The results of this system should be transferred to our guidelines, rules and regulations as soon as possible.

This project is now finished and in operation. The paper describes how the system operates and discusses future developments and various advantages and disadvantages of the system. One important aspect that is discussed in detail is how such a system can be maintained and continuously updated and developed.

2. GENERAL

There are two problems associated with experience transfer. The first is experience and the second is transfer. The problem with experience resides in its identification, description, evaluation and suitability for new projects. How do we judge if a certain experience or method will lead to a good, bad or an average long-term solution? As for transfer, the easiest way to ensure that certain knowledge is transferred to the engineering

community is by incorporating it into national standards or recommendations. However, to get it incorporated requires that the information is reliable. So in order to successfully transfer experience we need a method to evaluate technology reliably. The experience transfer system contains such a method.

Today's world is moving fast, maybe too fast. Our market driven economy requires that every few years products change colour and wrapping and that materials properties are apparently better. Is this good? Is this progress? What criteria are used to evaluate these questions? Can we use the sales figures as an indication of quality? Does an increased market share translate to progress? Experience with these products/solutions is the only reliable way to ascertain if they meet our requirements.

Experience transfer must not be left to chance. Top management must select the priority areas and insure that the fruits of the system are completely documented and incorporated into guidelines and regulations. Training schemes must also be organised to ensure that this filtered knowledge is put into practice. Priority areas may change over time but certain basic principles will always apply:

- acceptable level of safety
- increased efficiency or cost saving
- core activities of the organisation
- maintaining a high level of competence as well as updating standards and guidelines
- areas that are very dependent on individual persons

3. PROCESS CODE - WORK DESCRIPTIONS

In Norway, activities related to the construction, operation and maintenance of the road network are categorised and described with a standard text in a document called the "Process Code". Here a main process of, for example, maintaining bridge and ferry structures is first described in general and then in increasing detail as the process is sub-divided again and again into specific work descriptions. This is illustrated in Figure 1. It should be noted that the requirements given in any process/activity also apply for its subordinate processes.

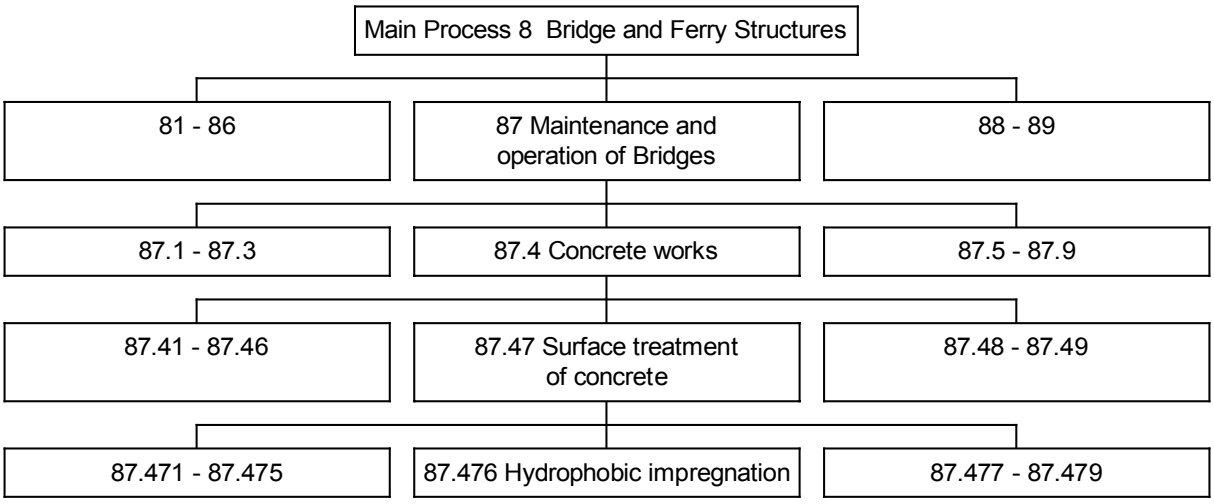

Figure 1 Location of activity/work description "hydrophobic impregnation" in the Process Code

In the “Process Code”, each activity, work process, material etc., has a specific number or number combination, which makes it easy to locate both manually and electronically. The description has the following standard layout:

a) Description of the work
b) Material requirements
c) Requirements for craftsmanship/production/execution
d) Sampling/testing
e) Tolerances
f) Rules/units of measurement

An example of standard text from a work description is given below:

Main Process 3, Rock Tunnels

31.3 Pre-injection (Standard Code text)

a) The work includes injection in order to stabilize or minimize water inflow and also includes drilling of injection holes and control holes, cleaning out and water loss measurements, choice of approved injection material is defined in special descriptions. The work also includes actual injection.
The standard limit for injection to be applied is defined in the relevant description document.
The work also includes pre-injection when water leakage occurs during pilot boring or from water leakage from normal drill holes.
The work also includes production of reports showing all relevant details of position of boreholes, lengths, directions, packer positions, pressures and used quantity of injection materials.

f) The quantity is measured as injected material in unit: kg.

4. EXPERIENCE COLLECTION AND FILTER

Only a small portion of the technology that is used, or will be used, is developed in Norway. However, every country can, and should contribute to the common pool of knowledge through research and development. The activity of gathering knowledge should be guided by personnel with high level competence in the core activities of the company and by using the available sources for gathering new technology. These are:

- *national and international contacts*
- *internet, study tours and conferences*
- *technical articles and research reports*
- *specifications and guidelines from other countries*
- *product information from manufacturers*

} *Sources of information*

New technology needs to be evaluated and adjusted to the local conditions. It may require further development and testing in demonstration projects before it is adopted. It is also important that major decisions concerning the use of new technology are taken at a high level in the organization and are based upon recommendations of qualified personnel.

Much has been written about technology management in the last decade and many theories have been developed. However, their implementation has not always been easy or successful.

Experience has clearly shown that the problem is normally not lack of knowledge but the ability to put it into practical use. Knowledge alone is no guarantee for competence, in fact such an assumption is a common mistake.

The experience transfer system was developed around these relatively straightforward steps but relies much more on feedback from the actual users of the system. The users will single out methods or technologies needing updating/improvement, in addition to feeding the system with their own practical experience.

Modern technology allows for this tremendous flow of incoming information from around the world and from within our own organisation. However, all this information or knowledge cannot be used directly or even assimilated by all the employees, so it is necessary to introduce a filter. While the word filter may have a negative connotation attached to it, censorship of information etc., the filter is necessary:

- to perform a quality control
- to synthesise the information
- to shield employees from sub-standard solutions

In fact this filter is quite similar to the current practice of writing specifications, rules and regulations. With today's access to information through the Internet this filtering is probably one of the greatest challenges in our field of work.

5. SYSTEM DESCRIPTION

The Norwegian Public Roads Administration decided in 1999 to establish a system for information and experience transfer. The system will in no way solve all the problems, but will hopefully help develop an active and critical attitude to both old and new information.

The main philosophy of the system is that relevant information has to be at your fingertips at all times when you work, or at least only a touch of a button away. The information should also have passed a quality control and be placed into the system on a continuous basis.

The system is organised around an electronic copy of our current "Process Code". In this way the employees are immediately familiar with its structure. In addition, a table similar to the one shown in Table 1 is included under each activity/work description. By clicking on the text in the table, which has a hypertext link, information will be displayed or a question or a message may be sent to one or more of the persons listed in the right hand column. These links will contain the most recent reports and updated knowledge on the activity in question. The contact people frequently function as technology watchdogs in a manner previously described under technology management. They are also performing the above-mentioned filter. Their most difficult task is of course to find and separate out the bad and half bad information and only place high quality information and experience in the system.

Table 1 - Example of what type of information may be placed after each work description to help experience transfer and to update other relevant information.

Official memos and regulations No./Date	Internal reports, guidelines special reports	Project reports, finished projects	Information for next revision of rules and regulations	Contact persons within own organisation
645/010101/ 35 432/030499/ 99	IR 2126 021 R 2151	SVR Fv. 427/ 2000	-Key words - "freezing" - "admixtures"	K.B.Pedersen E.Iversen P.Jensen O.Hansen S.Pettersen B.K.Kluver

To obtain information from the user, technical, economical and operational reports from finished projects must be submitted to a central office in the Road Directorate. The reports are then taken through a process of evaluation by relevant personnel. These reports contain sets of information where specific data is given on all relevant details and also on specific experience with anything from materials to methods to economy.

The whole time we are talking about experience transfer. However, the system does not actually do that, it only filters and categorises knowledge. For transfer to occur someone has to be able to and willing to receive this knowledge. The system does however contribute to transfer by:

- making reliable knowledge easily accessible
- assisting in the revision and updating of National Standards and Recommendations.

6. UPDATING - FUTURE DEVELOPMENTS

The first few years of system operation will reveal technical problems and areas of improvement, which will be identified through user feedback and system statistics/error logs. In addition, new information will be continuously added to the system. However, it will not be possible for users to keep track of all these changes with the resulting risk that outdated information may be used in new projects. While listing all changes in a "what's new" section may help, an alternative or additional way is for users to subscribe to the activities/work descriptions of interest to them. In this way they will receive e-mail when changes occur.

A major challenge for the system will be to justify the relatively high costs of maintaining and updating the system. The continuous emergence of new materials and techniques will result in areas of the system becoming outdated. If the quality of information in the system drops too low then confidence in the system also drops and quite quickly the system will become obsolete. Continuous collection and filtering of data requires time and competent experts (technology watchdogs) and if this is performed in all areas of the system, it becomes very expensive. Costs saved through the use of the system will be in the form of improved quality solutions for construction and repair, but the costs saved by these improvements are often difficult to document.

7. CONCLUSIONS

The experience transfer system described here will not make NPRA dependent on computers and independent of humans. Computers are just the tools necessary to implement the system while humans will still decide what methods, technology and technical solutions are best, right and wrong. This discerning ability to use knowledge must continue to lie with humans and never be handed over to machines.

Experience transfer should be a permanent responsibility of all employees. Top management must select the priority areas and provide the necessary tools and resources to facilitate experience transfer. The employees are responsible for keeping themselves up-to-date and their own level of competence. A successful transfer and utilization of technology requires a systematic effort from the company as a whole.

The greatest challenge of all is to accept that such a system is necessary and then willingness to allocate sufficient resources to make it work.