

RESEARCH, DEVELOPMENT AND STANDARDIZATION WORK IN THE NORDIC COUNTRIES 1990
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0. ABSTRACT

In 1985 the Nordic Council of Ministers initiated a generic five years activity plan for the field of information technology, including the construction industry as one of the target groups. At the initial stage of the plan a state of the art report and a programme for R&D activities were carried out by NBS-DATA - the working group for information technology appointed by the Nordic Building Research Cooperation Group.

As a conclusion of the Nordic activity plan and as a support for the selection for further more limited project funding a follow up state of the art survey was carried out by NBS-DATA in 1989. The report was published in spring 1990. It includes a list of on-going or recently completed R&D projects.

1. DEVELOPMENT TRENDS IN THE NORDIC COUNTRIES

All through a number of years companies in the Nordic construction industries have implemented an increasing number of computer systems. Especially over the latest two years the growth rates have been considerably high. 70-80% of all firms actually are supposed to use computers as a functional support. At the same time professionals have acquired familiarity with the use of different types of systems aimed at information processing in building. Implementations reflect mainly the actual system market and the use in general mirrors the basic performance profiles of the systems. Applications mostly are oriented at isolated functions as a support for calculations, administrative tasks, drawing production, etc. As a consequence the benefits and the problems of the implementations remain in the company. It is also recognized for quite a number of installations not to satisfy the original expectations aimed at the ease of the professional task.

The isolation gap

About ten years ago investments in computer systems almost exclusively were dedicated for the use in large companies. Today everybody has got the possibilities to share the benefits of the technological developments based on a relevant set of competence. But professionals agree on the fact that it can be very demanding to invest in computer systems and currently upgrade their functional profile according to the necessities in the company. Normally no big problems are connected to the use of systems supporting isolated building functions. According to widespread experiences isolated application seems to restrain convincing rationalization effects and in consequence economical benefits for the company. At the same time, isolated application actually does not at all challenge integration in a professional project oriented collaborationship. There actually exists a hindering gap between the technological potential and the way the main part of users deal with and understand information technological tools.

The nineties - the decade of integration.

An increasing awareness to overcome the isolation gap and thereby to reach more efficient use of computer systems can be demonstrated among the construction industries in all Nordic countries. These objectives may be realized by the means of information formalization and consequently affect the integration of all adequate parts of the information processing in building. Integration in principle can be recognized as two dimensions, constituting an overall entity:

- Across the different professional domains, representing the parties involved in building and
- throughout the entire building process - from the initial inception to the production stage, the building in use and its final demolition.

Communications in focus.

According to a wide opinion the success of an expected integration era depends on communications. It is a question of well designed interfaces between all communication elements to be linked together. Information technological integration implies three different communication types being developed for the use in a building professional everyday situation:

- The technical communication part providing plain communications between different computer systems. This implies neutral information processing facilities among systems of different design. A long range of pilot projects have gradually been carried out in the different Nordic countries. On an exclusively technical level the problem seems to be definitely irrelevant for the construction industry. By introducing the universe of building related concepts to the purely computer technical framework it becomes no longer indifferent how the information structure appeals to parties involved in building. It is of essential importance for the future of building to exert an influence - especially within the field of relevant standardization efforts - e.g. the STEP developments.
- The hybrid communication part providing communications between the professional user and the computer system. Even the really enormous progress since the beginning of the eighties cannot hide the missing development of languages feasible as a convincing communication tool between the professional user and the computer system. Actually a babylonian language confusion is the predominating impression among professionals. It is expected to become a huge problem to specify a building professional framework providing a language structure everybody understands and consequently is willing to use. The users of the nineties are not expected to be system operators, but professionals in possession of

thoroughly building oriented competence. Easy and direct operation of all systems supporting a large variety of professional qualifications will be requested.

The human communication part providing mutual understanding among professionals. Once more and again this part is expected to unveil as the communication problem number one. It implies a fundamental development task for the nineties. A building conceptual framework partly suitable for automated communication patterns, partly providing a reasonable convergence of the different horizons of understanding among the users of building information. Basically it is just a technical problem to create identical horizons aimed at the communications between machines (computers) - depending on the proper will of the different system developers. Human beings on the other hand always are forced to meet communicative situations based on their personal background and consequently different horizons of understanding. This problem will definitely be met in situations related to the development and use of product models: Information users belonging to very different professional domains are supposed to create and use automated project information, integrated in the product model and aimed at the use - and understanding - of all other parties involved in the concrete building process.

The development of professional competence.

Throughout the eighties the main part of all Nordic building professionals got in contact with some kind of computer system. In the same period the development of competence mostly was aimed at system operation, often based on very complex system structures. As operational competence often used to be considered as an ultimate goal, the result in many cases provided the establishment of corporate data processing ghettos. Up to the present it is exceptional to develop information technological competence as a system independent approach, aimed at the professional application domain. As a consequence the main burden related to corporate professional competence remains in the company - whatever familiarity the employees were able to review related to the keyboard and the mouse. If the integration approach of the nineties is expected to succeed, it is of importance to generate competence based on a generic horizon of understanding the relationship between building and IT.

The development of the professional roles.

Up to the present, dealing with computer generated project information was the domain of consultants and contractors. The philosophy of integration implies an extension of the cast in question. It is expected to become a crucial task to integrate the role of the client. Clients traditionally are not supposed to be fairly interested in project information processing, and most of the documentation might be considered as irrelevant for proper use. Obviously the interests are concentrated on the final result - the building in use. The introduction of a product model as the core for information processing in the future the traditional situation will totally change. The client will be challenged both to create and to get proper use of the product model - especially related to quality control, information processing for operation and maintenance, etc. The development of the roles in longer terms obviously will change the organizational patterns in building process. The actual trend aimed at the integration of all roles (or the main part) within the same company is by far expected to be the final answer on the question of organizational changes. It is more likely to be interpreted as a case of emergency based on the technological confusions related to system communications.

A pioneering spirit.

The role of the pioneers was crucial for the introduction of IT in the construction industry of the Nordic countries. Both large companies with a heavy potential of R&D, and an untold number of stand alone enthusiasts were guiding their fellow colleagues through the roaring eighties of a brave new computer world - a decade of exiting discoveries and a growing understanding for the new ways to deal with the problems of building. We shall be grateful for their initial efforts. Still their prestige as technological front runners will not count for a very long time. It is fading away with the diffusion and application of computer systems in the entire construction industry. But they played the crucial part by stimulating the development and by mediating the important message about the usefulness of computer systems in the process of building.

But believe it or not - the part of the pioneers is not yet played out. They will get more necessary than ever, when the integration attempts of the nineties have to be carried out in practice!

A new understanding of the planning concept.

Integration and formalization of information processing in the planning process for building is generally understood as a subordinate goal for the better utilization of the IT potential. On a higher level the goal converts towards a better planning support aimed at more beneficial technical and functional quality in building. However, ultimate intentions should concern the quality of live in our built environment.

It seems needless and naive to believe IT utilized exclusively within a superior ethical framework. To reach the objective of beneficial and fruitful technologies in the long end it might be necessary to consider technology as a goal in itself.

IT uses language, sign, writing and communication as media in a formalization and standardization process within the dedicated application domain of building. That means primarily a limitation of linguistic ambiguity and diversification and in the last end a confrontation between lifespace and systemspace. Translated to a planning strategy it will mean either to create conditions to avoid the undesirable by the means of continuing linguistic limitations - call it unambiguity by control and standardization - or to create conditions for something desirable, sometimes unexpected, with manyfold expressions rooted i real live.

As a consequence we have to understand IT utilized for building as one of the main topics of the political planning discourse in the construction industry - concerning everybody, everywhere and on all levels of personal and organizational influences.

2. CONCLUSIONS

* A large number of different information technological tools are introduced and in use among Nordic construction companies. They mostly are applied within an individual corporate framework. A new development stage based on more integrated information processing is growing in all Nordic countries. To overcome a convincing integration approach it becomes necessary, within the entire construction industry to concentrate attention on the development of a generic professional framework aimed at the formalization of information processing in building.

* As information technologies actually have reached a convincing development and maturing stage it becomes self-evident to get it in use as wide as possible for building applications. Anyhow, future development in the field of design and construction might not primarily be dependent on the more or less technological progress. It merely will be a matter for the parties involved in building to specify objectives partly based on the potentials of IT partly based on visions aimed at the benefit and efficiency in building.

* By using IT the construction industry in the Nordic Countries actually meets challenges implying the setting of long term goals. To reach the goals dialogue and collaboration on a sector level are becoming a necessity, and a current adjustment of the goals will be requested. At the same time there will emerge a need for integration results on a very concrete and practical level, to illustrate the potential of IT related to building.

* There is a need for a number of fundamental building related developments especially aimed at integration attempts. They should be specified and carried out in an international context - as e.g. STEP - followed and influenced by the participation from the R&D community in the Nordic countries. The relevant developments should be specified as flexible as possible to ensure operational taking over according to national, corporate and even individual interests.

* Communication is the keyword for the successful, further development of IT tools. The related communicative media is language - constituting the determining factor for all formalization attempt in a building and construction context, and at the same time criteria for the possible implantations in computer systems. Even the fact that language represents our most common media cannot hide our deep ignorance of the more essential language oriented coherence.

* The messages and results of future developments should be mediated appealing to the needs of practice. Everybody should be able to draw off the benefits of the current developments under comprehensive circumstances. The construction industry has to take care and be aware of the importance of its structural network based on professional knowledge and ability - to lose it will mean to lose its identity in the same run.

* It is necessary to improve the R&D potential in the construction industries of the Nordic countries. Extended development resources are needed to reach the goal of integration and hereby contribute to the improvement of quality in building. To a wide extent it will be necessary to rise the means by the industry itself. But without a continuing and goal oriented support by public bodies it will hardly be possible to create a break through in search for results for the benefits of both the construction industry and society.

3. THE RECOMMENDATIONS TO THE NORDIC COUNCIL OF THE MINISTERS

The circumstances of the nineties.

The most essential development task for the coming years is to strengthen the consciousness of the construction industry at aims reaching longer than inside corporate problems related to actual marketed system technologies. To

ensure a continuing innovation process for the benefit of the construction industry as a whole, it becomes necessary to reconsider the professional principles for information processing in building. Principles, aimed at increasing integration of information processing over the total process of building and across professional skills and domains. This means the introduction of long termed, generic initiatives implying coordinated activities and innovative thinking. Extended parts of the task will deal with relatively abstract problems, the meaning and relevance of which might be rather difficult to understand and mediate.

In this context it becomes important to understand IT as a tool to reach building oriented objectives. Integrated information processing and product modelling as an example are conditioning the possibilities to provide better technical and functional qualities in building and at the same time to moderate building costs.

Technological innovation by integration will be closely connected to the findings reached by the international R&D community. It becomes rather important for the development in the Nordic countries to be able to stimulate contact and collaboration with the relevant environments in both Europe and the rest of the world.

A challenge of similar dimensions is the establishment of an extended network of contacts to practice. Without the backing of the companies and individuals of the construction industry it becomes nearly useless to prepare a theoretical framework for integration in building.

A framework for the project support of the Council of Nordic Ministers.
After the closing down of the dedicated information technological development programme, future support aimed at projects dealing with the relationship between building and IT will be accessible based on more generally industry oriented funding. This means increasing competition among a relatively larger number of projects from far different industrial branches. On this background it seems important to place support in a strategic and overall vision on needed developments. As a guideline for this approach NBS-DATA proposes to support generic attempts aimed at an increasing integration of information processing based on IT in the Nordic construction industries on two distinctly different areas: **Conditioning and mediating.**

- **Conditioning** attempts are intended for the clarification the more fundamental problems with importance for the long termed development of the professional principles in building, and aimed at increasing efficiency in the construction industry by the means of IT.

As an example this might include fundamental studies and analysis concerning the building conceptual development aimed at information processing, conditions for communication and collaboration in building, organizational development scenarios, etc.

- **Mediating** attempts for the understanding of the practical importance and corporate advantages based on cooperative oriented and generic integration initiatives. It will be needed to build on a consciousness implying the need of generic attempts to ensure the full benefit of IT within the frame of the dedicated building task.

The contributions might consist in the provision of special resources to essential projects to ensure efficient mediation among professionals in both Nordic and International environments. The tools for mediation might be Nordic conferences and symposia, comprehensive publications, production of videotapes, etc.
