

1991 International System Dynamics Conference

Address by Professor Dr. Erich Zahn
Society President 1990-91

*26 August 1991
Boeing No 4*

Erich Zahn is the current president of the System Dynamics Society. He is full-time Professor for General Management and Corporate Planning and Managing Director of the Betriebswirtschaftliches Institut at the University of Stuttgart. His areas of Research and Consultancy are Strategic Management, Technology Management, Information Management and System Dynamics Modelling. He holds positions as a member of the board of directors of several German companies.

Ladies and Gentlemen,

as current President of the System Dynamics Society, I feel very much honored to give an opening address at this 1991 International System Dynamics conference particularly as there are so many important guests here. This shows me that our scientific community is widely respected in this country.

On behalf of the System Dynamics Society, I thank you very much for coming here. My thanks also go to the Asian Institute of Technology (AIT) for placing at our disposal this nice conference facilities, to the generous sponsors of this conference and last but not least to our society member, Dr. Khalid Saeed as well as his colleagues at AIT for their fantastic organizing work. You have set a new standard which will be a rather high hurdle for organizers of future conferences.

It may be possible that some people in this distinguished audience are not familiar with background, purposes and work of our society. Therefore some short remarks may be allowed.

The System Dynamics Society is an international scholarly organization whose membership encompasses teachers and researchers from various disciplines as well as consultants and professionals in government and industry. What ties us together is the promise of using system perspective and computer simulation to understand problems arising in complex social systems and to enhance policy analysis and design.

According to the founding constitution, the purposes of the System Dynamics Society are:

- to identify, extend, and unify knowledge contributing to the understanding of feedback control systems in society;
- to promote the design of structures and policies to improve the behavior of such systems;
- to promote the development of the field of system dynamics and the interchange of information about systems as they are found in all fields of endeavor;
- to promote the dissemination of information on such topics to the general public;
- to encourage and develop educational programs in the behavior of systems.

System Dynamics, the methodology that brought us together here at Bangkok, has already had a history of more than 30 years. It was invented in the late 50s at M.I.T. by Jay Forrester. The beginning and evolution of System Dynamics is a fascinating story. Those of you who are not familiar, but interested in it may read the little booklet "The Beginning of Systems Dynamics". In this printed banquet talk at the Stuttgart conference in 1989, Jay Forrester describes his thoughts when he developed System Dynamics and the challenges ahead we have to meet when we will manage complex systems more effectively.

Decision processes in social systems are seemingly becoming more complex and unexpected or unwished side effects of short-sighted decision making are increasingly becoming more and more obvious. The growing deterioration of our natural environment is one example for such side effects.

The modern factory and its changing competitive environment is an example for the growing complexity of social systems. Today's industrial enterprises are confronted with the challenge to meet such goals as long capacity using time, low production costs, fast product development, low

inventory, high flexibility and fast delivery at the same time. Companies that are able to do this are called "world class manufacturer". In order to become such a "world class manufacturer", management at first has to understand the dynamics of the company and its competitive environment as a whole. But, do we have the concepts available that help us to gain a better understanding?

It is claimed that the "value chain" is such a concept. While Michael Porter from Harvard Business School deserves a lot of credit for popularizing the "value chain" concept, it was the consulting firm McKinsey & Company that pioneered the application of this approach, which it called the "Business System" in the 70s. Even McKinsey can't take full credit for inventing this type of analysis, however, since it is really just an effective application of the general approach known as system analysis. If you go back to the basics in the literature you finally may find Jay Forrester's article "Industrial Dynamics: A Major Breakthrough for Decision Makers", published 1958 in Harvard Business Review. Here the interdependence of the various stages of activities of getting products to the end-user are described.

Today's business practice and literature explores that "time" is a scarce resource, which should be used more strategically. But how can this be done? Again, deeper insights in dynamic mechanisms are a prerequisite. Where do we get this from? If we look for help in the traditional literature we won't find much. But to look at the System Dynamics literature is certainly a better advice. Here again you will end up at Forrester's article mentioned above which tells you that "to be able to determine some of the dynamic characteristics of production distribution systems" you "must also know the delays in the flow of information and goods".

Neglecting the effect of delays in information feedback will lead to wrong decisions when managing complex systems. This hypothesis has been proved in laboratory experiments, and it is explained by John Sterman in his article "Misperceptions of Feedback in Dynamic Decision Making", published 1989 in "Organizational Behavior and Human Decision Processes".

In order to improve our understanding for managing complex systems, approaches such as System Dynamics need to join the mainstream of business education. "Business-focused courses ... should show how System Dynamics deals with the richness and complexity of real business problems, rather than trivializing them" (H. Weil, 1989).

Macrobehavior is always generated by microstructure. Complex systems such as national economies are sometimes heavily influenced by external events, e.g. by an international monetary crisis. But primarily the behavior is caused endogenously by the interactions of local structures and decision making policies. This hypothesis has been proved by Jay Forrester and his research team when working at the System Dynamics National Model for more than 15 years. They have shown how local policies governing decentralized decisions in an economy create observed overall economic behavior (Forrester, 1989).

System Dynamics modelling may contribute to improve our understanding of economic and social systems and thereby may help to develop policies for controlling the behavior of such systems more effectively and efficiently.

Traditionally, problems in these areas often have been tackled from a very narrow perspective. Not surprisingly effects have turned out to be counter-productive. This has been especially harmful in developing countries. Therefore, our problem solving knowledge has to be improved, especially here -

apparently a fruitful field for System Dynamics applications.

The power of System Dynamics as a tool for designing more effective development policies has already been demonstrated frequently. I only like to mention Khalid Saeed's work. For example, he has done widely respected modelling work in areas such as long-term growth in developing countries, problems in Asian agriculture, wage determination, income distribution, and the design of change, or managing technology for development.

Concerning the last topic he has analysed, from a system perspective criteria for the selection and implementation of technologies appropriate to developing countries. He concluded, that "the efficacy of a technology and the distribution of its benefits do not appear to depend on the technology per se, but are seen as aspects of the management of technology". Consequently, he demands, that "development plans must provide means for both making an appropriate technological choice and generating a suitable management strategy to obtain maximum and widespread benefits from that choice, while avoiding the creation of dysfunctional social or environmental conditions" (Khalid Saeed, 1990).

A major part of the papers contributed to this conference are devoted to what could be called a program for research and development in developing countries. Taking into account the many unsolved and still growing problems in this field of endeavor there should be no doubts that R&D activities for generating problem solving knowledge should be intensified. I wish that this conference may help to stimulate learning processes concerning the problematique which is typical for developing countries.

Learning as an individual, but especially as an organization is becoming more important for the management of social systems. Some industrial leaders assume that "the rate at which organizations learn may become the only sustainable source of competitive advantage" (Stata, 1989).

Generally speaking, learning organizations will probably become a synonym for successful organizations. Therefore, the great challenge to meet for successfully managing social systems is to build organizations that enhance their capability and willingness to learn.

The "New Management Style Project" at M.I.T. tried to answer the question how such learning organizations can be built. Results of this project indicate that organizational leaders who have to take new roles as designers, teachers, and stewards will need new skills and that these skills may be developed with the help of tools such as the system dynamic approach.

The implicit general purpose of this conference is to learn more about the management of complex systems and to demonstrate how system dynamics modelling can help to support this learning. The various sessions encompass a rather broad spectrum of topics, ranging from general methodological themes to concrete policies for controlling real systems. I hope that every participant of the conference will find what he expects. I wish that our discussions will be interesting and fruitful. The quality of a conference depends not only on the quality of presentations and discussions, but also on its social program. I am sure that our hosts have done their best for our well-being. Therefore, I shall thank them in beforehand.