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"Rigi Meetings":

From

to

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“Rigi Meetings”: From WDK to the Design Society

A report written on the occasion of the20th anniversary of the Design SocietyRigi-Kaltbad, Switzerland

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1 Introduction

For those who initiated the Design Society in 1999/2000, the term “Rigi Meetings” stands for a sequence of events which started with a dialogue about the design of Machine Elements but gradually changed to a concern and initiative about design as a science, as a teaching challenge and as industrial practice, preparing the ground for the foundation of the Design Society.

Vladimir Hubka (**Fig. 1**) was the core person establishing the discussion and working group WDK (Workshop Design-Konstruktion) in 1978. This very small and informal group initiated the bi-annual series of International Conferences on Engineering Design (ICEDs), which after the first in Rome 1981 quickly gained reputation and attraction of both speakers and audience from West and East and the West, thus initiating a scientific dialogue between the two political blocks of those days already twenty years before the walls fell. .

Fig. 1: Vladimir Hubka on Mount Rigi (1995)

Characteristics of the MeKoME/ Rigi Meetings were a kind of "guided engineering anarchy", the missing of ranking orders, adequate time for discussions, the walk-and-talk sessions during the meetings – all of which fostered open discussions between established and experienced researchers on one side, and both youngsters and people with new ideas and approaches outside the research mainstream on the other side. In a nutshell:
If an idea "survived" the discussions on Mount Rigi it couldn't be that bad …

As the interest in what we now call “Design Science” grew, WDK took up an Italian German initiative MeKoME (Methodisches Konstruieren der Maschinenelemente, progettazione metodica degli elementi delle machine, *methodical design of Machine Elements*) and, after initial meetings in Arese (near Milano) 1984 and in Rome 1985, the WDK/MeKoME group met every year in the Hotel Alpina on Mount Rigi, Switzerland.

Gradually the Rigi attendees got involved into discussing and planning of ICED conferences, and the topics at Rigi became more and more devoted to the questions concerning the identity of a Design Science and its empowerment. This development is mirrored in the growing group of persons present at Rigi who by their presentations and discussions brought in a wider perspective, crystallising the need for a robust formalised organisation of the ICED conferences, and an organisation for extended initiatives.

The WDK and Rigi initiative led in the period 1981 – 2001 to 13 ICED conferences in the WDK staging, but also inspired several workshop series, symposia and cooperations – all carried by the friendly spirit of informal cooperation developed and cultivated at Rigi.

This report tells about this period of preparation efforts leading to establishing the Design Society – a truly worldwide community. Its foundation was difficult and risky, the future uncertain – but worthwhile!

2 Background: WDK – MeKoME – Alpina – Rigi

WDK (Workshop Design-Konstruktion) was an informal group of scientists in the field of Engineering Design Research, originally formed in 1978 and in the first place consisting of:

- Dr. Vladimir Hubka, Eidgenössische Technische Hochschule (ETH) Zürich, Switzerland, 1924-2006 (**Fig. 1**)
- Prof. civ.ing. tekn dr Mogens Myrup Andreasen, Danmarks Tekniske Universitet (DTU), Lyngby/København, Denmark, *1939 (**Fig. 14**)
- Prof. Ing. Umberto Pighini, Universita degli Studi di Roma “La Sapienza”, Italy, 1938-2002 (**Fig. 2**)

Among other activities, the group initiated the first International Conference on Engineering Design (ICED `81) in Rome, Italy, organised by Umberto Pighini, held on 09.-13.03.1981. After ICED ´81 in Rome the WDK group was complemented by:

- Prof. W. Ernst Eder, Royal Military College of Canada, Kingston, Ontario, 1930-2017 (**Fig. 7**)

Fig. 2: Umberto Pighini (1994)

Dr. Vladimir Hubka was clearly the core person in forming the group, bringing people together, convincing people to host ICED events, forming an engineering designers’ community.

In the 1950s and 1960s Hubka had worked as a designer in the Czechoslovak Socialist Republic (CSSR) with a professional background in heavy machinery. He was interested in developing and establishing a theoretical background for the “art of designing” (as it was seen in the past) but could not publish his ideas for political reasons.

Things lit up during the so-called Prague Spring in 1968. In the summer of 1968 Vladimir Hubka was allowed to visit the Danish Technical University (DTU) to cooperate with design researchers there, among them the young Mogens Andreasen. During Hubka’s stay in Denmark Warsaw Pact troops invaded his home country; this made him decide to stay in the West – luckily his family was with him, and he could be employed at DTU. Two years later Hubka moved to the Swiss Federal University of Technology (ETH) in Zürich where he stayed until the end of his professional life.

Hubka was soon building up a network of researchers and teachers interested in Engineering Design. WDK was founded in 1978 when the original group (Hubka, Andreasen, Pighini) met in Hubka’s summer cottage in Halden, Switzerland, for discussions and planning of further activities – one of them organising a conference on Engineering Design which eventually became the ICED conference series.

One notable concern of Vladimir Hubka was always to integrate scientists from Eastern Europe as good as possible. As if he was aware of a changing political climate early, after the ICED conference series – until today taking place in the uneven years – was successful

and growing[1], he initiated “intermediate” ICED conferences in Eastern Europe, picking the most open countries there as a start:

- 6th International Conference on Engineering Design (ICED ’88) held 23.-25.08.1988 in Budapest, Hungary, organised by Jenö Barátossy
- 8th International Conference on Engineering Design (ICED ’90), held 28.-31.08.1990 in Dubrovnik, at that time Yugoslavia, organised by Aurel Kostelić

After the iron curtain had opened, having the 10th International Conference on Engineering Design (ICED ’95) in Prague, now Czech Republic (22.-24.08.1995), was fulfilling an important ambition of Vladimir Hubka. He and Ernst Eder were even planning to retire from their integrating role in Design Science – which luckily did not work out yet at that time.

WDK was also the title of a book series that, among other publications, incorporated the proceedings of all ICED conferences until 2001. A list of all WDK publications (WDK 1-28) is in the appendix. After the transition from WDK to the Design Society it was decided to continue this book series so that the first Design Society publication was numbered DS 29.

To publish the WDK book series (with the exception of some ICED proceedings which because of partner institutions were published elsewhere, however still carrying a WDK designation) Vladimir Hubka founded an own small publishing company, Edition HEURISTA, publishing the book series WDK (Workshop Design-Konstruktion).

Since the mid 1980ies the original WDK group was stepwise enlarged, however without any formalism; it was more a question of who was invited by Vladimir Hubka and who showed engagement.

The first steps were taken under the headline MeKoME (Methodisches Konstruieren der Maschinenelemente, progettazione metodica degli elementi delle machine, *methodical design of Machine Elements*).

The first MeKoME Workshop was organised by Prof. Ing. Edoardo Rovida and Prof. Dr. Gian Francesco Biggioggero of Politecnico di Milano, Italy. It took place on 12.-13.09.1984 at the Centro Direzionale Alfa Romeo in Arese, Italy. It was followed by the second MeKoME Workshop 28.-29.03.1985 at Prof. Umberto Pighini’s home university Universita degli Studi di Roma “La Sapienza”, Italy.

Since 1986 the MeKoME group met regularly in March every year on Mount Rigi at Lake Lucerne, Switzerland (**Fig. 3**). The location was Hotel Alpina (**Fig. 4**), right next to the rack railway station in Rigi-Kaltbad (altitude 1.453 m above sea level) – the hotel being owned by Vladimir Hubka’s son Luboš Martin (1950-2002, **Fig. 5**).

Because of enlarging the group over time (and, of course, increasing interest of scientists to take part) it became so big that participants were more or less packed like sardines in a tin in the relatively small lecture room of Hotel Alpina (**Fig. 6**) …

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[1] After the 1st International Conference on Engineering Design (ICED ´81), held 09.-13.03.1981 in Rome: 2nd International Conference on Engineering Design (ICED ´83), held 15.-18.08.1983 in Lyngby/København, Denmark; 3rd International Conference on Engineering Design (ICED ´85), held 26.-28.08.1985 in Hamburg, Germany; 4th International Conference on Engineering Design (ICED ´87), held 17.-20.08.1987 in Boston, MA, USA.

Fig. 3: Rigi panorama with Lake Lucerne (right) and Lake Zug (bottom left) [postcard motif]

Fig. 4: Hotel Alpina on Mount Rigi, Rigi-Kaltbad, Switzerland (1995)

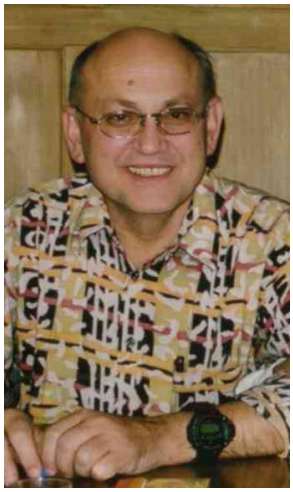

Fig. 5: Luboš Martin Hubka, son of Vladimir Hubka, landlord of Hotel Alpina

Fig. 6: Lecture room in Hotel Alpina with (from left to right) Mogens Andreasen, Sándor Vajna, Ken Wallace (with Christian Weber hidden behind), Harald Meerkamm, Peter Engler, Aurel Kostelić (1993)

With the group becoming larger and ever more international, the workshops developed from its MeKoME (i.e. Machine Elements) origins more and more towards general discussions about Design Theory and Design Methodology, different approaches to it, its promotion in research and teaching, design as a science, computer support, Design for X (DfX), etc. Increasingly planning forthcoming International Conferences on Engineering Design (ICEDs) became an issue. Along with this development the workshop language changed from primarily German to English.

As the MeKoME designation gradually faded out the workshops became known just as the "Alpina Meetings/Workshops" or "Rigi Meetings/Workshops". Because "Rigi Meetings" became a fixed term it will be used throughout this paper from 1986 (the first time the original MeKoME workshops actually took place on Mount Rigi).

The meetings on Mount Rigi were quite informal:

- The agenda only roughly pre-defined.
- Everybody brought transparencies (no PowerPoint at that time …), copies of them and/or of statements or articles about what he[2] currently worked on, quite often including "work in progress".
- Therefore, it is sometimes not so easy to distinguish between contributions that were actually presented to the audience and contributions that were "just" brought along.
- "Walk and talk" in the snow with the sun shining on Mount Rigi (**Fig. 7**).

[2] In the beginning there were no "she" participants. This only changed in 2000/2001 when Dr. Lucienne Blessing, Prof. Margareta Norell-Bergendahl and Prof. Susan Finger joined in.

- The obligatory walk to Känzeli – a famous viewing balcony overlooking both Lake Lucerne and Lake Zug.
- A lot of time for in-depth discussions – with many of the topics probably worth re-visiting still today.
- As you could not escape the venue anymore after the last rack railway left Rigi-Kaltbad at around 7 pm: Serious discussions ongoing in the evenings (**Fig. 8**), but also musical performances, e.g. of Gian Francesco Biggioggero, Karlheinz Roth (who were both trained musicians), Hans Seifert and Sándor Vajna – with the other participants ususally joining in with their voices (see examples in **Fig. 12**, **Fig. 13**, **Fig. 20**).
- Having the coffee on the terrace of Hotel Alpina in the sunshine, looking at the clouds over Lake Lucerne from above.
- Last, but not least: The legendary Schwyzer Chaasfondue (Swiss cheese fondue) at the end of the second day.

Apart from the ICED series of conferences and the MeKoME/Rigi Meetings, the WDK group also inspired members to organise several other workshops, even conferences dedicated to particular topics, some of which survive until today. **Fig. 17** shows an overview from the perspective of 1999.

Fig. 7: Ernst Eder and Vladimir Hubka during “walk and talk” in the snow on Mount Rigi (1993)

Fig. 8: Christian Weber, Lucienne Blessing, Dorian Marjanović and Steve Culley at the bar of Hotel Alpina (2000?)

Fig. 9: View from Mount Rigi onto Lake Lucerne

3 Report of the MeKoME/Rigi Meetings 1984-2000

By tradition, Machine Elements used to be the core area of Engineering Design in German-speaking countries, Scandinavia, the Netherlands, Italy and Eastern Europe – in teaching, but also in major parts of research. In the 1970ies, after early beginnings in Eastern Germany mainly by Hansen of the Ilmenau School[3], the books of V. Hubka 1973[4] and 1976[5], W.G. Rodenacker 1971[6], R. Koller 1976[7], G. Pahl & W. Beitz 1977[8] on Design Methodology and Theory of Machine Systems, inspired new opportunities and challenges to this area, concerning the design process, systematics of Machine Elements, identifying space for new solutions, etc. At the same time the emerging computer support of design processes (CAD, CAE, …) brought new topics to both research and teaching.

Therefore, MeKoME (Methodisches Konstruieren der Maschinenelemente, progettazione metodica degli elementi delle machine, *methodical design of Machine Elements*) became a hot topic in the 1980ies. When it was taken up by the WDK group additional scientists/teachers – from the traditional area of Machine Elements – were attracted to the then new field of Design Theory and Methodology.

As the MeKoME/Rigi Meetings of the WDK group gained a good reputation and empowerment, topics changed from Machine Elements to more general issues (Design Theory and Methodology, Design for X, computer support, first ideas about Design Science), finally resulting in founding the Design Society.

In the following sections a brief report of the MeKoME/ Rigi Meetings until 2000 is given. Some effort was put into collecting the topics discussed and contributions presented at these “original” workshps on Mount Rigi. Some of the contributions are briefly commented. The source of these comments is personal files and impressions of the authors. The comments are meant to illustrate the wide span of topics (of which some look familiar even today) and the – often intensive – discussions at the “old-style” MeKoME/Rigi Meetings, they shall not degrade the other, uncommented contributions. Also, no systematic participants’ lists were kept.

Therefore apologies to everybody who may not be mentioned or commented upon even though he or she attended a meeting and maybe even gave an important presentation.

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3 Hansen, F.: Konstruktionssystematik – eine Arbeitsweise für fortschrittliche Konstrukteure *(Systematic Design – a [New] Way of Working for Advanced Designers)*. VEB Verlag Technik, Berlin 1955.

4 Hubka, V.: Theorie der Maschinensysteme *(Theory of Machine Systems)*. Springer, Berlin-Heidelberg 1973.

5 Hubka, V.: Theorie der Konstruktionsprozesse *(Theory of Engineering Design Processes)*. Springer, Berlin-Heidelberg 1976.

6 Rodenacker, W.G.: Methodisches Konstruieren *(Methodical Design)*. Springer, Berlin-Heidelberg, 1970.

7 Koller, R.: Konstruktionsmethode für den Maschinen-, Geräte- und Apparatebau *(Design Methodology for Machine, Apparatus and Instrumentation Design)*. Springer, Berlin-Heidelberg 1976.

8 Pahl, G.; Beitz, W.: Konstruktionslehre *(Engineering Design)*. Springer, Berlin-Heidelberg, 1977.

3.1 Methodical Design of Machine Elements (1984-1986)

MeKoME Workshop 1984

Date: 12.-13.09.1984
Venue: Centro Direzionale Alfa Romeo in Arese, Italy

The first workshop on MeKoME (Methodisches Konstruieren der Maschinenelemente, progettazione metodica degli elementi delle machine, *methodical design of Machine Elements*) was organised by Prof. Ing. Edoardo Rovida and Prof. Dr. Gian Francesco Biggioggero of Politecnico di Milano, Italy – including acquiring the venue at the Centro Direzionale Alfa Romeo in Arese, Italy.

Workshop languages were German and Italian.

Everybody received a small booklet of articles, sent to participants/contributors ***before*** the workshop as preparation material (title: "Progettazione metodica degli elementi delle machine" which is the Italian translation of "MeKoME" or "*methodical design of Machine Elements*"). It contained:

- Ehrlenspiel, K.: Vorschläge zur Integration von methodischem Konstruieren und Maschinenelementen.
  (Proposals for the integration of methodical design and Machine Elements.)
- Hubka, V.: Methodisches Konstruieren von Maschinenelementen.
  (Methodical design of Machine Elements.)
- Pahl, G.: Förderung der Kreativität im Grundlagenfach Maschinenelemente durch methodisches Konstruieren.
  (Promoting creativity in the basic course Machine Elements through methodical design.)
- Koller, R.: Entwicklung einer Systematik für Verbindungen – ein Beitrag zur Konstruktionsmethodik.
  (Development of a taxonomy of connections – a contribution to Design Methodology.)
- Roth, K.: Stellungnahme zur Problematik "Methodisches Konstruieren von Maschinenelementen".*(Opinion on the problem of methodical design of Machine Elements.)*
- Pighini, U.: Stellungnahme zu den Vorschlägen. *(Opinion on the proposals.)*[9]
- Biggioggero, G.F.; Rovida, E.: Proposte sulla progettazione metodica di manovellismi. / Vorschläge für methodisches Konstruieren von Kurbeltrieben (in Italian and German).
  (Proposals for the methodical design of crank mechanisms.)

The main message of the contributions about the methodical design of machine elements was that concepts from Design Theory and Methodology (especially "function", "function structure", "solution principles", "organs") could help the systematisation, the design/application and teaching of machine elements.

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[9] This contribution is missing in the booklet – probably because of an error when copying the material.

Obviously there were some more contributions at the workshop itself. The authors have copies of:

- Nannenberg, S.: Die Dynamik als integrierender Bestandteil des Entwurfsprozesses. *(Dynamics as an integral part of the design process.)*
- Seifert, H.; Weber, C.[10]: Maschinenelemente in Lehre und Forschung – Fortschritte durch methodisches Konstruieren. *(Machine Elements in teaching and research – progress through methodical design.)*

After the MeKoME Workshop 1984 a questionnaire was sent to the participants asking about research work in the field of Machine Elements.

The authors of this paper do not have reliable information about who attended the workshop in addition to the presenters named above. Definitely there must have been attendants from the Alfa Romeo company (which was still independent at that time before the Italian state as its owner sold it to the Fiat empire in 1986), but no names are conveyed.

MeKoME Workshop 1985

Date: 28.-29.03.1985
Venue: Consiglio Nazionale delle Ricerche (National Research Council), Rome, Italy

The second workshop on MeKoME (Methodisches Konstruieren der Maschinenelemente, *methodical design of Machine Elements*) was organised and hosted by Prof. Ing. Umberto Pighini, Universita degli Studi di Roma “La Sapienza”, Italy; it took place in the buildings of the National Research Council of Italy in Rome, very close to “La Sapienza”.

The agenda comprised the following contributions:

- Pighini, U.: Information about the outcome of the questionnaire on research activities in the field of machine elements. (Unfortunately the authors do not have material or notes about this contribution, except that answers came from Germany, Switzerland, Italy, the Netherlands, Yugoslavia, Poland and even China [Shanxi University].)
- Hubka, V.: Methodisches Konstruieren von Maschinenelementen. *(Methodical design of Machine Elements.)*
- Pighini, U.: Methodisches Konstruieren von Bremsen. *(Methodical design of brakes.)*
- Biggioggero, G.F.; Rovida, E.: Osservazioni sulla progettazione metodica di organi per intercettaziione di fluidi. *(Observations on the methodical design of organs for fluid interception [= hydraulic valves].)*
- van den Kroonenberg, H.H., University of Twente, the Netherlands: Methodische Konstruktion von Verbindungen. *(Methodical design of connections.)*

[10] Co-author of the paper, but not present at the actual meeting.

- Weber, C.: Die Funktionsstruktur als neuartiges Instrument zur logischen Beschreibung von Störwirkungen an realen Maschinen, dargestellt am Beispiel des Zahnrad-Umlaufgetriebes.
  (The function structure as a novel instrument for the logical description of interferences on real machines, illustrated by the example of a planetary gear transmission)
- Rovida, E.: Proposte per il gruppo MeKoME – Vorschläge für die MeKoME-Gruppe (in Italian and German). *(Proposals for the MeKoME group.)*
- Nannenberg, S.: Von der Funktionsstruktur zur Organstruktur zu a) Baustruktur und b) Simulationsmodell.
  (From function structure to organ structure to a) part structure and b) simulation model.)

One more contribution, related to a slightly different field, was:

- Hubka, V.: Fertigungsgerechtes Konstruieren – Abriss einer neuen Disziplin.
  (Design for manufacturing – outline of a new discipline.)

  Hubka proposed to describe manufacturing technologies in a standardised way for use by designers, based on his Theory of Technical Systems[4]: Manufacturing processes analogue to technical processes of products and manufacturing systems in analogy to technical systems with conclusions for the design of products. In hindsight, this idea looks still interesting today but was never taken up seriously.

The MeKoME Workshop 1985 was quite an elaborate event with both German and English as conference languages, simultaneous translation to Italian and ample room for discussions (which were also translated).

Again, the authors of this paper do not have reliable information about who attended the workshop in addition to the presenters named above.

Rigi Meeting 1986

Date: 03.-04.03.1986
Venue: Hotel Alpina on Mount Rigi, Switzerland

The third MeKoME Workshop was the first held at the Hotel Alpina on Mount Rigi, Switzerland, where it stayed for a long time. Therefore, this and the subsequent workshops/meetings will from now on called “Rigi Meeting” in the headline.

As a theme Vladimir Hubka proposed **“Methodical design of Machine Elements – new aims and goals for the future”**. This was, of course, the core topic of the 1986 workshop; however, in addition the application of CAD for embodiment design and one – at that time new –aspect of Design for X, namely Design for Reliability, were investigated.

The following contributions were presented (some of them obviously stemming from the 1984 and/or 1985 workshops – which had had, however, other audiences):

- Koller, R.: Entwicklung einer Systematik für Verbindungen
  – ein Beitrag zur Konstruktionsmethodik.
  (Development of a taxonomy of connections – a contribution to Design Methodology.)

- Before this contribution (which was already discussed in 1984) R. Koller gave a presentation on Gestaltsynthese. (*Embodiment design as synthesis.*)
- Ehrlenspiel, K.: Methodische Lösungssuche durch Variantenbildung am Beispiel Wellenversatz-ausgleichender Kupplungen. *(Methodical search for solutions through [systematic] variation [shown] on the example of shaft-offset compensating couplings.)*
- Seifert, H.; Weber, C.: Maschinenelemente in Lehre und Forschung – Fortschritte durch methodisches Konstruieren. *(Machine Elements in teaching and research – progress through methodical design.)*
- Weber, C.: Ein Beitrag zur integralen Betrachtungsweise von methodischem Konstruieren und Maschinenelementen. *(A contribution to the integral view on methodical design and Machine Elements.)*
- Biggioggero, G.F.; Rovida, E.: Proposal for the methodical design of interference connections.
- Pighini, U.; di Francesco, G.[10]: Some considerations on the methodological design of brakes.
- Koller, R.: Entwicklung eines generellen Ordnungs- und Suchmerkmalsystems für Bauteile. *(Development of a general classification and search feature system for components.)*
- Hubka, V.: Einige Fragen zum methodischen Konstruieren von Maschinenelementen. *(Some questions concerning the methodical design of Machine Elements.)*
- Engler, P.: Entwurfstechnik am Reißbrett oder mit 2D- und 3D-CAD? (*Design technique on the drawing board or with 2D and 3D CAD?)*

  This contribution investigated changes and also new opportunities by going from traditional to computer-supported 2D and finally 3D design techniques.
- Ferreirinha, P.: (No title and no copy of the contribution exist; personal notes about the content show that it was on the design of Machine Elements using expert systems.)
- Pighini, U.; di Francesco, G.: Design for reliability.
- Birolini, A.: Zuverlässigkeitssicherung technischer Systeme. *(Reliability assurance of technical systems.)*

The last two contributions opened an additional view on Design for X (DfX), at that time quite new, and sparked off a couple of dedicated workshops which were, however, organised and held outside the WDK/MeKoME/Rigi framework.

At the 1986 Rigi Meeting for the first time ICED planning matters were discussed, with two ICEDs forthcoming:

- 4th International Conference on Engineering Design (ICED ´87), 17.-20.08.1987, Boston, MA, USA, organised by W.E. Eder in cooperation with the American Society of Mechanical Engineers, ASME – the first venture of ICED into the USA.
- 5th International Conference on Engineering Design (ICED ´88), 23.-25.08.1988, Budapest, Hungary, organised by J. Barátossy – this was the first of the two “interme-

diate" ICEDs in even years, on purpose located in an Eastern European country by V. Hubka.

Unfortunately, the authors of this paper do not have information about who might have attended the Rigi Meeting in 1986 apart from the presenters named above.

During the meeting it was decided to collect significant contributions on the methodical design of Machine Elements (= MeKoME) in a book, published by HEURISTA in the WDK series:

WDK 14, ed. by V. Hubka
"Methodisches Konstruieren der Maschinenelemente"
(Methodical Design of Machine Elements)
Edition HEURISTA, Zurich 1987
ISBN 3 – 85693 – 016 – 7

For this purpose the contributions of the MeKoME/Rigi Workshops 1984-1986 were edited and revised. In addition, reprints of journal articles and conference papers related to the subject were incorporated (of course with the consent of authors, editors and publishers).

3.2 Design Theory and Methodology, Computers, DfX (1987-1992)

As can be seen from the programmes of the Rigi Meetings from 1987 onwards, the topic of methodical design of Machine Elements (MeKoME) was more and more replaced by general discussions about Design Theory and Methodology or Design Science, repectively, Design for X (DfX) and, increasingly over time, computer support. Also, Hotel Alpina on Mount Rigi, Switzerland, remained the venue of the meetings for a long time.

Rigi Meeting 1987

Date: 09.-10.03.1987
Venue: Hotel Alpina on Mount Rigi, Switzerland

In the fourth workshop of the original MeKoME group methodical procedures and establishing a systematic view on Machine Elements are increasingly complemented by the topic of computer applications in design. A new dimension of design methodology, namely the description of design entities based upon information theory, is under development as precondition for CAD applications.

The following contributions were presented and discussed:

- Hubka, V.: Idee einer verbesserten Kategorisierung des Konstruktionswissens.
  (Idea of an improved categorisation of design knowledge.)

  This presentation was significant because Vladimir Hubka sketched a categorisation of design knowledge which some years later became the "circle of design science" (**Fig. 10**), first published during ICED ´88[11] and later in the Design Science books of V. Hubka and W.E. Eder[12]. In a way it was a first step towards formulating a science of design.

[11] Hubka, V.; Schregenberger, J.W.: Eine neue Systematik konstruktionswissenschaftlicher Aussagen – ihre Struktur und Funktion. *(A new systematic order for design-scientific statements – its*

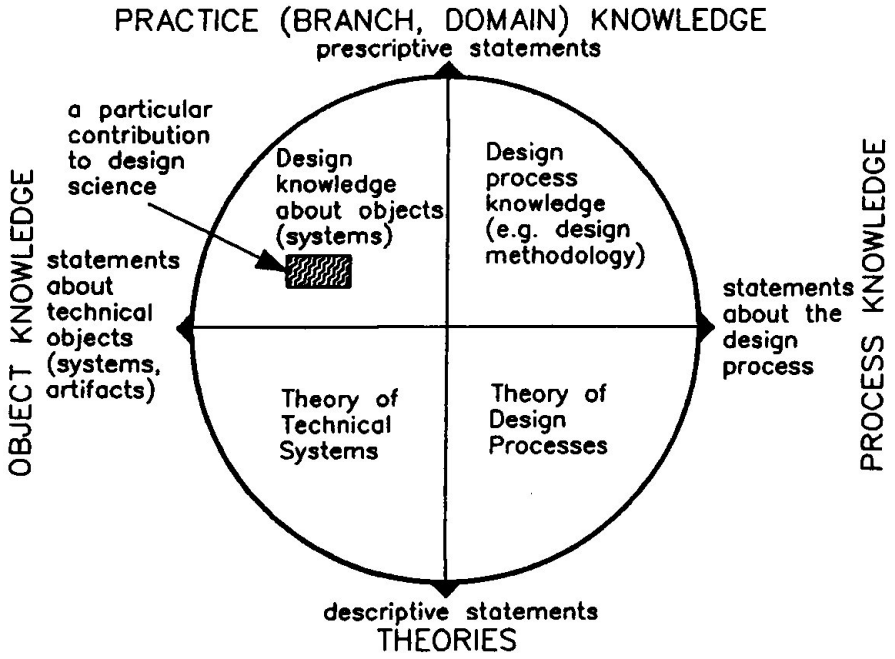

Fig. 10: Main categories of Design Science (here the English version taken from Hubka, V.; Eder, W.E.: Design Science. Springer, London 1996)

- Roth, K.: Die Behandlung der Information in der Konstruktionsmethodik.
  (The treatment of information in Design Methodology.)

  Based on Shannon's Information/Communication Theory[13] this contribution on one hand reasoned about systems/products that serve information processing. On the other hand the information content of design results in different stages was analysed – with remarkable results; for the example of a rotary pump[14] the information content was counted from digital files as:

  – $5 \cdot 10$ Byte for representing the main function
  – $2 \cdot 10^2$ Byte for the principle solution
  – $2 \cdot 10^3$ Byte for the first layout drawing (2D)
  – $5 \cdot 10^5$ Byte $\approx$ 500 kByte for the final layout drawing (2D)

  Interesting: Today's 3D CAD models are much bigger – for products of comparable complexity ca. 50-70 MByte. Do these models really contain so much more information?

structure and function.) In: WDK 16, Proceedings of the 5th International Conference on Engineering Design (ICED ´88), Vol. 1, pp. 103-117.

12 Hubka, V.; Eder, W.E.: Einführung in die Konstruktionswissenschaft. Springer, Berlin-Heidelberg 1992. English version: Hubka, V.; Eder, W.E.: Design Science. Springer, London 1996.

13 Shannon, C.E.; Weaver, W.: The Mathematical Theory of Communication. University of Illinois Press, Champaign, IL, USA.

14 This analysis based on: Franke, H.-J.: Konstruktionsmethodik – Konstruktionspraxis – eine kurze Betrachtung. *(Design Methodology – Design Practice – a short examination.)* In: WDK 12, Proceedings of the 3rd International Conference on Engineering Design (ICED ´85), Vol. 2, pp. 910-924.

- Koller, R.: Systematisches Konstruieren und Ordnen von Spannverbindungen. *(Systematic design and arrangement of clamping connections.)*
- Ehrlenspiel, K.: Methodisches Entwerfen am Beispiel eines Planetenradträgers. *(Methodical embodiment design using the example of a planet wheel carrier.)*
- Andreasen, M.M.: Wiederholtes Suchen und Auffinden technischer Lösungen. *(Repeatedly searching and finding technical solutions.)*
- Pighini, U.: Development of the conceptual phase in the methodological design of braking systems.
- Eder, W.E.: Systemvergleiche Europa vs. angelsächsische Länder (USA, UK) in Bezug auf Konstruieren. *(System comparisons Europe vs. Anglo-Saxon countries (USA, UK) in terms of engineering design.)*

  A conclusion that to some extent prevails until today was that engineering in the USA is much more mathematical than in Europe and that Engineering Design is not considered as “scientific”, therefore rarely taught at universities.
- Seifert, H.: Neue Entwurfsmethoden im Werkzeug- und Maschinenbau durch CAD. *(New design methods in tool and machine design enabled by CAD.)*

  Seifert showed two concrete examples of volume-based 3D CAD modelling in order to demonstrate new functionalities for designers: Design of bent components with subsequent stepwise calculation of the blank plate and, from this, derivation of the tool design (progressive dies); semi-automated design of stationary Diesel engines using pre-defined CAD modules.
- Weber, C.: Einsatz des Computers in der Konstruktion aus konstruktionsmethodischer Sicht. *(Use of the computer in design from a design methodological point of view.)*
- Biggioggero, G.F.; Rovida, E.: Vorschläge zur Schaffung einer Datenbank für das methodische Konstruieren von Wellen mit Expertensystemen. *(Proposals for the creation of a database for the methodical design of shafts with expert systems.)*
- Hubka, V.; Ferreirinha, P.: System CADOBS auf Personal Computer. *(System CADOBS on a Personal Computer.)*

From the invitation letter sent by Vladimir Hubka and from the authors’ own notes further participants of the 1987 Rigi Meeting (without own presentations) were: Alessandro Birolini, E. Castelli, A. Donnarumma, Peter Engler, Giulio di Francesco, Dieter Kammel, G. Paolini and E. Zamponi.

Rigi Meeting 1988

Date: 17.-18.03.1988
Venue: Hotel Alpina on Mount Rigi, Switzerland

In this 5th edition of the MeKoMe/Rigi Workshops the original theme of MeKoME was almost completely absent. Besides computer support and DfX topics, an additional focus was set on methodical embodiment design[15] (with and without computers) – an area that was (and still is) often dismissed in the research community, albeit very important in design practice. In this context, interesting discussions about design parameters (characteristics) and their relations to concepts and to production processes were performed.

The following contributions were presented and discussed:

- Koller, R.: Methodisches Gestalten. *(Methodical embodiment design.)*
- Roth, K.: Konstruktionsschritte des Rechners.
  (Design steps [to be performed] by the computer.)
- Pighini, U.: Fertigungsgerechtes Konstruieren. *(Design for manufacturing.)*
- Engler, P.: Zeichnungssatz erstellen – Daten für die Fertigung erzeugen.
  (Creating a set of drawings – generating data for manufacturing.)

  Engler proposed “technische Formelemente” (technical form elements) as a means to link CAD models with manufacturing planning. With this concept he was very close to what became later the so-called Feature Technology. He also reasoned about these form elements as a mechanism to bring functional information into CAD models – a question which is still unsolved today.
- Dvoracek, J.V.: Statement about the role of materials in design and engineering.
- Biggioggero, G.F.[10]; Rovida, E.: Bemerkungen über die technische Kommunikation.
  (Remarks on technical communication.)
- Kissling, U.: Praxisgerechte Maschinenbauberechnungen auf Computern.
  (*Practical calculations for mechanical engineering using computers.)*

  This must have been one of the first demonstrations of the KISSsoft tool, a software that helps calculating and dimensioning Machine Elements on a Personal Computer and that still exists today.
- Ferreirinha, P.; Hubka, V.; Andreasen, M; Rosenberg, R.: Rechnerunterstütztes Entwerfen und Detaillieren von Konstruktionsgruppen.
  (Computer-aided design and detailing of design groups.)
- Weber, C.: Einsatz des Computers in der Konstruktion aus konstruktionsmethodischer Sicht – Aktualisierung des Beitrages aus 1987. *(Use of the computer in design from a design methodological point of view – update of the contribution from 1987.)*

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[15] “Gestaltung” in the German language; this term is broader than “embodiment design” and cannot be properly translated. Similarly, “Gestalt” is more than “form and dimension”.

- Biggioggero, G.F.[10]; Rovida, E.: Vorschläge für die Tätigkeit einer Arbeitsgruppe Re-Mo zum Studium des Repräsentierens und Modellierens beim methodischen Konstruieren (einschließlich Fragebogen für den internationalen Vergleich). *(Proposals for the activities of a working group Re-Mo on the study of representation and modelling in methodical design [including a questionnaire for international comparison].)*

  In its core, this initiative aimed at a standardisation of technical elements on several levels of design: Not only for drawings – where a lot of standardisation already exists – but also for sketches of solution principles/organs. Some workshops were organised on the topic (see below and **Fig. 17**). The issue is still unsolved today (despite the fact that we all use some sort of sketches both in practice and teaching).

From the invitation letter sent by Vladimir Hubka and the authors' notes further participants of the 1988 Rigi Meeting were (without own presentations): E. Castelli, Ernst Eder and Aurel Kostelić.

Quite interesting: Obviously sparked off by the previous Rigi Meetings and discussed at the "intermediate" ICED '88 in Budapest, Hungary (23.-25.08.1988), a first attempt was made to establish so-called WDK task groups (in some letters also called "expert groups"), very similar to what became Special Interest Groups (SIGs) of the Design Society more than 10 years later. **Table 1** shows the task/expert groups as planned in 1988.

Table 1: Task/expert groups as planned by the WDK group in 1988

Abbreviation	Topic	To be chaired by
MeKoME	Methodical design of Machine Elements	U. Pighini
MePro	Design Methodology and CAD of complex systems, e.g. plants or equipment	J. Baratossy
EVAD	Evaluation, decision [making] and optimisation in design	J. Eekels
TTS	Theory of Technical Systems	V. Hubka
ReMo	Representations and modelling in Engineering Design	E. Rovida
DeMa	Management of Engineering Design processes	K. Holt
DE	Engineering Design Education	W.E. Eder
DeSc	General problems of Design Science	V. Hubka
DeFQ	Special design knowledge – Design for Quality	A. Kostelić
DeFMa	Special design knowledge – Design for Manufacturing	M.M. Andreasen
DeFRe	Special design knowledge – Design for Reliability	A. Birolini
DeFCo	Special design knowledge – Design for Cost	H.H. Ott
CAD	Computer-Aided Design	J. Stanek
---	Design Methodology general	M.M. Andreasen
---	Industrial Design	H. Seeger
---	Knowledge-based systems in Engineering Design	P. Ferreirinha

Some work was actually taken up, mostly in the form of dedicated workshops (see also **Fig. 17** further down):

- The topic “Theory of Technical Systems” (TTS) was treated in workshops in Zürich, Switzerland, and Lyngby/København, Denmark, already from 1982, but closed 1985.
- Four workshops on Evaluation, decision making and optimisation in design (EVAD) were arranged already 1985-1988 in Delft, the Netherlands, by Johan Eekels.
- Two workshops on representations and modelling in Engineering Design (ReMo) were held in Italy 1987 and 1989.
- Three workshops on Design for X (DfX) topics took place in Lyngby/København, Denmark, 1992 to 1994.
- In 1992 H. Meerkamm, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany, started the symposia on Fertigungsgerechtes Konstruieren (Design for Manufacturing); these symposia proved to be very successful indeed, the series still exists today (as DfX symposia), now in turn organised by S. Wartzack, Erlangen, D. Krause, TU Hamburg, and K. Paetzold, Univ. of the German Armed Forces, Munich, endorsed by the Design Society.
- Stanislav Hosnedl, in cooperation with Ernst Eder, established later workshops on Engineering Education, held at the University of West Bohemia, Plzen, Czech Republic.

These initiatives were the forerunner of the Special Interest Groups (SIGs) that were established after the founding of the Design Society.

Rigi Meeting 1989

Date: 16.-17.03.1989
Venue: Hotel Alpina on Mount Rigi, Switzerland

For the 6th Rigi Meeting **“Design methods – further development in view of CAD”** was announced as a dedicated theme (other than MeKoME, methodical design of Machine Elements). Basically similar topics as in the previous year were discussed. The term “Gestalt”[15] was debated: its relation to “form”, its relations to design parameters (characteristics), the use of “Gestaltelemente” questioned. Aurel Kostelić’s presentation stood out because of its wide span of design/development/industry/quality concerns, pointing to later workshops’ focusses on Design Science.

The following contributions were presented and discussed:

- Hubka, V.; Schregenberger, J.W.: Eine Ordnung konstruktionswissenschaftlicher Aussagen. *(An order of statements in engineering design science.)*
- Eder, W.E.: (Title and focus of contribution not documented.)
- Ognjanović, M.: Gear transmission design using CAD methods.
- Koller, R.: Die Elemente und Parameter der Konstruktion. > (*Elements and parameters of Engineering Design.*)
- Roth, K.: Ermitteln überbestimmter Lagerungen und Führungen mit der Schluss-Matrix. (*Determination of over-determined bearings and guidances applying the conclusion matrix method.*)

- Seifert, H.: Wachsender industrieller Computereinsatz – Forderungen an die Ingenieurausbildung.[16]
  (Growing industrial use of computers – requirements of Engineering Education.)
- Stanek, J.: CAD und Methodisches Konstruiren – die heutigen Werkzeuge und deren Anwendung. *(CAD and methodical design – today's tools and their application.)*
- Engler, P.: (No title is documented; personal notes about the content show that it was on adaptive design.)
- Meerkamm, H.: Konstruktionssystem “mfk”. *(Design [support] system “mfk”.)*

  The design support system “mfk”, developed at the Chair of Engineering Design of Friedrich-Alexander Universität Erlangen-Nürnberg, Germany, was a major effort over many years to develop the prototype of an “intelligent” CAD system based on the current findings of Design Theory and Methodology. It started with the evaluation of the manufacturability of CAD models and, in later development stages, could also make proposals for improvements. A lot could be learned from these investigations – both with regard to software development (and its limitations at that time) and with regard to gaps in the theoretical base.
- Biggioggero, G.F.; Rovida, E.: Vorschlag für das Studium der Geschichte der Technik. (*A proposition for the study of technical history.*)
- Bercsey, T.; Horváth, I.[10]: Ismeretfeldolgozás és intelligens rendszerek a tervezésben. (*Knowledge processing and intelligent systems within product development.*)
- Vajna, S.: Methodische Vorbereitung, Einführung und Einsatz der CAD/CAM-Technologie. *(Methodical preparation, introduction and use of the CAD/CAM technology.)*
- Kostelić, A.: CAD and Design Methodology – a practical user approach of needful transformations of the design process, up to the new techniques and technological conditions and developing trends.

  The contribution points to a broad view upon designing. Besides its role as contribution to fulfilling a company’s business strategies, first of all technology and CAD, but also showing quality and environmental responsibilities are underlined. The paper points to broadening the series of International Conferences on Engineering Design (ICEDs) from the WDK to the Design Society style and it also anticipates the palette of topics implied later to the extremely successful series of DESIGN conferences in Croatia.

An addition to the presenters listed above, József Hegyháti of the Budapest University of Technology and Economics attended the Rigi Meeting 1989 who later became State Secretary in the government of Prime Minister József Antall.

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[16] Based on a contribution for the conference “Berechnung im Automobilbau 1988” *(“Calculation in automotive engineering 1988”)*, Würzburg, Germany, 09.-10.11.1988. VDI Berichte 699, VDI, Düsseldorf 1988.

Rigi Meeting 1990

Date: 15.-16.03.1990
Venue: Hotel Alpina on Mount Rigi, Switzerland

The theme of the 7th Rigi Meeting, stated by V. Hubka in the invitation, was quite general and – interestingly – strongly oriented towards the Machine Elements roots of the group again: **"MeKoME presentations at ICED '90 in Dubrovnik, Yugoslavia, and at ICED '91 in Zürich, Switzerland"**.

From the notes of the authors it can be seen that the 1990 edition of the meeting had again very intensive and interesting discussions – most of them ***not*** connected to the methodical design of Machine Elements anymore but to more general topics in Design Science:

- From "Design for Manufacturing (DfM)" to "Design for X (DfX)"
- Contributions of design methodology to DfX
- Embodiment design ("Gestalten"): How to come from functions and organs to the final "Gestalt"?
- Precision engineering – microsystems engineering – mechatronics
- Prospects and limits of designing with computers
- Use and sequence of models used in the design process
- Representations and models in early phases of design: Define special symbols / a symbolic language – also to be used by computers?

As it turned out, the following contributions were presented and discussed:

- Bercsey, T.: Technologien und Modelle des Konstruktionsprozesses. *(Technologies and models of the design process.)*
- Engler, P.: Feinwerktechnik. *(Precision engineering.)*[17]
- Vajna, S.: Darstellung eines ganzheitlichen und interdisziplinären CIM-Modells. (*Presentation of a holistic and interdisciplinary CIM model.)*
- Ognjanović, M.: Attached building of CAD-packages for Machine Elements modelling.
- Seifert, H.: Entwurf von Getriebewellen mit PROLOG. *(Design of gear shafts with PROLOG.)*[17]
- Stanek, J.: CAD als Informationsverwalter. *(CAD as an information management instrument.)*
- Dietzsch, C.R.: Practical application of theoretical evaluation for shaft-hub connections.[17]
- Andreasen, M.M.: Design for manufacturing (overview).

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[17] Based on a contribution submitted and accepted for the forthcoming 7th International Conference on Engineering Design (ICED ´90), 28.-31.08.1990, Dubrovnik, Yugoslavia (the second of two "intermediate" ICEDs in even years (1988, 1990), on purpose located in an Eastern European country by V. Hubka).

- Andreasen, M.M.: Introduction to form design (“Gestalten”).
  In this lecture used: Jakobsen, K.[10]: The interrelation between product shape, material and production method.[18]
- Meerkamm, H.: CAD und fertigungsgerechtes Konstruieren.
  (CAD and Design for Manufacturing.)[17]
- Biggioggero, G.F.[10]; Rovida, E.: Betrachtungen und Vorschläge zu Gruppe Re-Mo (Repräsentieren und Modellieren beim methodischen Konstruieren).
  (Reflections and suggestions for the working group Re-Mo [representation and modelling in methodical design].)[17]
- Kostelić, A.: Relation design process – product quality (Design for Quality).

In addition, Christian Weber gave an overview over his research and teaching activities at the new affiliation in Saarbrücken, Germany:

- Weber, C.: Konstruktions- und Fertigungstechnik an der Universität des Saarlandes in Saarbrücken. *(Design and manufacturing engineering at Saarland University, Saarbrücken, Germany.)*

From the invitation letter sent by Vladimir Hubka and from the authors’ notes further participants of the 1990 Rigi Meeting were (without own presentations): Ernst Eder, Pedro Ferreirinha, Peter Engler and Rudolf Koller.

Rigi Meeting 1991

Date: 14.-15.03.1991
Venue: Hotel Alpina on Mount Rigi, Switzerland

The 8th Rigi Meeting carried again a dedicated theme: **“Linking functional and production-oriented design”** (however, not taken up by all contributions …). Basically, the topics of the two previous years were discussed: Fundamentals of “Gestalt/Gestaltung”[15], including the relations to production processes (DfX), and computer support in engineering design. In detail:

- Weber, C.: Ableitung von Rechenmodellen für mechanische Systeme aus Funktionsstrukturen und Gleichungen physikalischer Effekte. *(Derivation of calculation models for mechanical systems from functional structures and equations of physical effects.)*[19]

  Although Weber had published some of the ideas in earlier contributions for MeKoME Workshops (1985, 1986) and for ICEDs, this presentation was a concentrated effort to show a more rigorous formalisation of function structures based on the four-pole/multi-pole theory, at the same time using these formalised structures to derive transfer functions of the respective technical system semi-automatically (including dynamic effects).
- Koller, R.: CAD- und Expertensysteme in der Konstruktion.
  (CAD and expert systems in design.)

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[18] Based on a contribution from the 6th International Conference on Engineering Design (ICED ´89), 22.-25.08.1989, Harrogate, UK.

[19] Based on a contribution submitted and accepted for the forthcoming 8th International Conference on Engineering Design (ICED ´91), 27.-29.08.1991, Zürich, Switzerland.

- Roth, K.: Übergang von der Funktionsstruktur zur Baustruktur und zu den Funktionseinheiten. *(Transition from the functional structure to the building structure and to the functional units.)*
- Andreasen, M.M.: Wirkflächenstruktur als Ausgangspunkt für die Prozesswahl. *(Structure of working surfaces as a starting point for process selection.)*
- Ferreirinha, P.: Skelettstrukturen [in CAD]. *(Skeleton structures [in CAD].)*
- Rovida, E.: Lagebericht – Re-Mo-Gruppe (Repräsentieren und Modellieren beim methodischen Konstruieren) und die symbolische Darstellung beim Konstruieren. *(Position statement on the Re-Mo group [representation and modelling in methodical design] and symbolic representations in the design process.)*[19]

The previous five presentations (from Karlheinz Roth to Edoardo Rovida) were reason for an intensive discussion on representations, models and symbols useful in methodical design with additional input and proposals from all sides.

- Breiing, A.: Die Prinzipskizze als Ausgangsdokument der Konzeptphase. *(The sketch of principle as the starting document of the concept phase.)*
- Pighini, U.: MeKoME group – an expert group with a past and with an important future.[19]

  Umberto Pighini's contribution was a balance of the MeKoME Meetings from Milano 1984 and Rome 1985 to Rigi 1991. The aims of the group were summarised as follows:

  - Introduction of the principles of methodical design to the field of Machine Elements
  - Development of a new systematic of Machine Elements
  - Development of design catalogues
  - Development of Expert Systems for the optimal design of Machine Elements
  - Coordination of the [research] work of the MeKoME group's members
  - Organisation of meetings, workshops, seminars, conferences
  - Spreading scientific findings concerning the subject

  In the discussion it was not clear whether the MeKoME trail should be continued in the WDK/Rigi group – which had already moved to a quite different, more general direction – or be followed separately in a dedicated task/expert group (see **Table 1**). As it turned out, some years later the MeKoME issue came back with a vengeance because new scientists in Germany took it up (see section on the Rigi Meeting 1997).

The programme of the Rigi Meeting 1991 was complemented by three shorter presentations about current projects of participants:

- Engler, P.: Bericht über das CIM-Labor im Neutechnikum Buchs. *(Report on the CIM laboratory at Neutechnikum Buchs, Switzerland.)*
- Kammel, D.: Bericht über das Projekt "Zuverlässigkeit bei Konstruktionen des Hochbaus". *(Report on the project "reliability in structural civil engineering design".)*
- Vajna, S.: Personalqualifikationen für CIM. *(Personnel qualifications for CIM.)*

From the invitation letter sent by Vladimir Hubka and from the authors' notes further participants of the 1991 Rigi Meeting were (without own presentations): Ernst Eder, Stanislav Hosnedl, Aurel Kostelić and Harald Meerkamm.

Rigi Meeting 1992

Date: 26.-27.03.1992
Venue: Hotel Alpina on Mount Rigi, Switzerland

For the 9th Rigi Meeting **"Konzipieren und Entwerfen mit Computersystemen"** ***("Conceptualising and designing using computer systems")*** was given as a theme – this time well met by most of the contributions.

The following contributions were presented and discussed:

- Meerkamm, H.: Konstruktionssystem "mfk" – durchgängige Unterstützung im gesamten Konstruktionsprozess.
  (Design system "mfk" – integrated support throughout the whole design process.)
- Krause, D.: Rechnerunterstütztes Konstruieren in der Konzeptphase.
  (Computer-aided design in the conceptual phase.)

The previous two presentations showed the latest developments of the design support system "mfk" of the Chair of Engineering Design at Friedrich-Alexander Universität Erlangen-Nürnberg, Germany. In these, the step into earlier stages of the design process (functions, principles) was taken which had enormous consequences for data structures (more exactly: for ***new/extended*** data structures as no existing CAx system was able to handle conceptual information).

The two presentations were staged like the Design Debates that were introduced to the International DESIGN conferences in Dubrovnik much later. Direct objection statements were presented by the "opponents":

  - Peter Engler
  - Alois Breiing
  - Mogens Andreasen

- Andreasen, M.M.: Designing on a "Designers Workbench" (DWB).
- Weber, C.: Feature-based design.

  In this contribution Weber propagated the so-called Feature Technology as a means to enhance CAD models (which were almost exclusively capturing geometric information) with design-related, namely functional information (which was – and mainly still is – non-existent in digital models).[20] This contribution again sparked off an intensive discussion about "features", their theoretic background (if any) and their usefulness in design.

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[20] "Features" were defined as information elements that link syntax (here: geometrical information) with semantic (background information). In its original form, Feature Technology had manufacturing information as semantic; the new issue now was having functional information as semantic. In the end, this whole development stream led to a "zoo" of features with semantic information from function, calculation, manufacturing, assembly, testing, …

- Seifert, H.: Short report on his book project "Konstruktionslehre" *(Engineering Design)* under special consideration of its logical foundation.
- Koller, R.: Short report on an industrial project developing a search system for components in a company making vehicle seats.
- Bercsey, T.; Vajna, S.: Theorie, Strategien und Methoden für eine erweiterte und intelligente Rechnerunterstützung des Konstruktionsprozesses. *(Theory, strategies and methods for an advanced and intelligent computer support of the design process.)*

  In this contribution Bercsey and Vajna foresaw what we are currently discussing as a new way of computer-supportes design based on Machine Learning techniques:[21]

  "Computer systems to support synthesis, therefore 'intelligent' systems'" have to follow foremost the strategy:

  – "For the majority of tasks they need stored historical data (e.g. a product model),
  – they utilise pattern recognition,
  – in order to draw conclusions from these patterns …"
- Rovida, E.: Vorschläge für ein Schema des methodischen Konstruktionsprozesses. *(Proposals for a [general] scheme of the methodical design process.)*
- Kammel, D.: Bericht über das Projekt "Zuverlässigkeit bei Konstruktionen des Hochbaus". *(Report on the project "reliability in structural civil engineering design".)*
- Ognjanović, M; Rosić, B.[10]: Multicriteria optimisation in conceptual design.

According to the notes of the authors, at this Rigi Meeting the first workshop "Fertigungsgerechtes Konstruieren" *(Design for Manufacturing)* was announced, organised by H. Meerkamm, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany, to take place later in the year (15.-16.10.1992).

From the invitation letter sent by Vladimir Hubka and from own notes further participants of the 1992 Rigi Meeting were (without own presentations): Alois Breiing, E. Castelli, Ernst Eder, Peter Engler, Pedro Ferreirinha, Stanislav Hosnedl, Aurel Kostelić and Umberto Pighini. Invited were also Manfred Flemming and Jan Stanek, but it is not clear whether they actually attended.

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[21] Shortened translation from German by CW.

3.3 Design Science Emerging (1993-1997)

Beginning with the Rigi Meeting in 1993, questions of consolidating the knowledge generated so far and forecasting future trends and potential activities of the WDK group. For 1993 four questions were asked in advance which also influenced all subsequent Rigi Meetings:

1. Beurteilung der bisherigen Entwicklung *(evaluation of the development [in Design Science] so far)*
2. Stellungnahme zum Modell der Konstruktionswissenschaft *(opinions about the model of Design Science)* – related to **Fig. 10**
3. Trends der zukünftigen Entwicklung *(future trends)*
4. Situation in der Konstruktionspraxis *(situation in design practice)*

At the same time the group was enlarged by scientists from the UK (starting with Ken Wallace taking part in 1993 for the first time) which brought additional views and approaches.

In the meetings borders between lectures and discussions were fluent; the lists of contributions below try to cover, besides formal lectures, major interventions during discussions.

Rigi Meeting 1993

Date: 25.-26.03.1993
Venue: Hotel Alpina on Mount Rigi, Switzerland

During the 10th Rigi Meeting the following presentations and interventions were discussed:

- Hubka, V.: Design Science, design knowledge and its limits.

  It may be noted that the first version (in German) of Vladimir Hubka's and Ernst Eder's book "Design Science" had just been published in 1992; these findings were the base of V. Hubka's introductory lecture.

- Eder, W.E.: Overview over Quality Function Deployment (QFD); does this method (and do other methods) belong to Design Science or are they outside?

- Andreasen, M.M.: Unsystematic thoughts on Design Science and Design Methodology.

  This contribution was structured into the four themes given beforehand (see above) which, according to the progress of the workshop, were presented at different times:

  1 Evaluation of the state of art in Design Science: some thoughts on ICED contributions
  2 Attitudes to the model of Design Science: Theories behind Design Research
  3 Trends in Design Science: my thoughts about the future
  4 Situation in design practice: design practice in Denmark

  The contribution presented a wealth of both critical remarks to the present state of Design Theory and Methodology as well as projections into the future – too much to be discussed here in detail. Some keywords:

  – Design Theory and Methodology was seen as "declining area".
  – "Growing areas": Design for X, design support systems, product development (instead of engineering design).
  – "Missing areas": Design for materials, links to related fields (e.g. solid and fluid mechanics, mechanisms, …), integration of methods created in industry.

- Engler, P.: Intervention based on trends observed in design practice.
- Eder, W.E.: Design Research and design practice in the USA.
- Breiing, A.: Trends in der zukünftigen Entwicklung von Konstruktionswissenschaft und -praxis. *(Trends in the future development of Design Science and design practice.)*

  Breiing saw the challenges of future work in Design Science in:

  – Applicability of the methodology and related methods for computer support
  – Development of knowledge-based design systems
  – Better links between design, manufacturing and quality management
- Wallace, K.M.: Engineering Design Research.

  In this contribution, Wallace introduces “Design Research” as a topic. In spite of the power of Hubka’s model of Design Science presented at Rigi in 1987 (see **Fig. 10**), it is evident that an explanation is missing about how this science reproduces itself. Treatment of Design Research became a very important part of the empowering of ICED conferences (contributions, evaluation, chairing), e.g. articulated in the strategic note for ICED ´97 in Tampere, Finland, and practised in the Summer School on Engineering Design Research (SSEDR, see below under Rigi Meeting 2000).
- Kostelić, A.: Design Science development depending on general and different particular developments.

  Kostelić presented again a very broad spectrum of ideas for the development of Design Science. He points out “the need for change and transformation, beginning with elementary philosophical approaches, including new themes, involving new technics, technologies and knowledge, but transforming some classic segments and basis (like machine elements) as well”. Especially for the articulation of a Design Research Methodology the elementary philosophical approaches are important, delivering the language for reasoning and discussions.
- Pighini, U.: Research work in the field of Design Science at the University of Rome “La Sapienza”, Italy.
- Pighini, U.: Design for property, design for quality.
- Rovida, E.: Report on the Re-Mo activities (representation and modelling in methodical design).
- Meerkamm, H.: Situation Konstruktionspraxis und zukünftige Trends auf dem Gebiet der Konstruktionsforschung.
  (Situation in design practice and future trends in the field of Design Research.)

  Meerkamm stated that we do not need a new Design Methodology but a consolidation[22] of the existing instruments, e.g. drawing together the multitude of DfX methods. He also sent a reminder about integrating teamwork and computer-support aspects into Design Theory and Methodology.

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[22] In the original text: “Verbesserung und Verfeinerung”, i.e. “improvement and refinement”.

- Vajna, S.; Bercsey, T.[10]; Schlottmann D.[10]: Thesen zur zukünftigen Entwicklung der Konstruktionswissenschaften und ihrer Rechnerunterstützung.
  (Theses on the future development of Design Sciences and their computer support.)

  This paper sketched the co-existence of future Design Science with a rapidly increasing computer support for the whole design process (and beyond), thus making e.g. DfX becoming more and more automated as well as the generation and recording of knowledge along the process.

- Weber, C.: The relationship between function and shape.[23]

  This contribution again took up the Feature technology as a means to link (CAD-) geometry with functional information. Both a top-down and a bottom-up approach was investigated, leading to “functional features” and “design features”, respectively.

- Ferreirinha, P.: Statement on Design Science and its future.

- Engler, P.: Situation in design practice in Switzerland.

- Wallace, K.M.: Situation in the UK – changes in design practice, design education, design campaigns.

In the files of the authors there are two more papers of which it is not clear whether they were actually presented or “just” distributed to the participants:

- Blessing, L.T.M.[10]; Chakrabarti, A.[10]; Wallace, K.M.: Some issues in Engineering Design Research.[24]

  This very short information sketched the first ideas towards the Design Research Methodology (DRM)[25].

- Pighini, U.: Design for Property, Design for Quality.

  In this quite elaborate scriptum Pighini starts from Vladimir Hubka’s theory of properties and links different approaches to Design for X (DfX) with these: Aesthetic properties, safety, reliability, ergonomic properties, environmental compatibility, compliance with standards, manufacturability, maintenance properties, transportation, product liquidation, etc. In the end “Design for Quality” is defined as considering the totality of required properties.

In addition to the presenters named above Dieter Kammel attended the Rigi Meeting 1993 and took part in the discussions.

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23 Based on a contribution submitted and accepted for the forthcoming 9th International Conference on Engineering Design (ICED ´93), 17.-19.08.1993, the Hague, the Netherlands.

24 Based on an article at the OU/SERC Design Methods Workshop, organised by the Open University and the Society for Environmental Research and Conservation (SERC), held at the Open University, Milton Keynes, UK, England, on 18.11.1992.

25 Later published in the book Blessing, L.T.M.; Chakrabarti, A.: DRM – a Design Research Methodology, Springer, London, 2009.

Towards the end of the workshop ICED matters were discussed:

- Planning the forthcoming 9th International Conference on Engineering Design (ICED '93) in the Hague, Netherlands (17.-19.08.1993), organised by N.F.M. Roozenburg)
- First considerations about the 10th International Conference on Engineering Design (ICED '95) which was planned (but not yet confirmed) for Prague, Czech Republic (turned out 22.-24.08.1995)

Rigi Meeting 1994 – Vladimir Hubka's 70th birthday

Date: 28.-29.03.1994
Venue: Hotel Alpina on Mount Rigi, Switzerland

The 11th Rigi Meeting was a very special event because Vladimir Hubka celebrated his 70th birthday on the second day (29.03.1994). Because of this special occasion the event had a very open programme and also a particularly strong attendance: Apart from the presenters named below Stanislav Hosnedl, Dieter Kammel, Gerhard Pahl, Jan Stanek and Ken Wallace were present; some of the attendees even brought their families (e.g. S. Vajna, C. Weber). Birthday celebrations were, of course, also reason for extended social activities in the afternoon and evening of the second day (**Fig. 11**, **Fig. 13**, **Fig. 14**).

Vladimir Hubka had proposed as a theme: **"Zukünftige Forschung und Lehre des Konstruierens"** ***("Future research and teaching of engineering design")***.

The following contributions were presented and discussed:

- Andreasen, M.M.: Personal conclusions about Design Science from Rigi 1993.
- Beitz, W.: Qualitätssicherung durch Konstruktionsmethodik.
  (Quality assurance through methodical design.)[26]
- Koller, R.: Produktneutrale vs. produktspezifische Konstruktionsprozesse.
  (Product-neutral vs. product-specific design processes.)
- Hubka, V.: Allgemeine Konstruktionswissenschaft und spezielle Konstruktionswissenschaften. *(General Design Science and specialised design sciences.)*[27]

The two previous contributions sparked off a discussion about the relation between general Design Theory and Methodology and specialised theories/methodologies – a question that is still not finally answered.

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[26] Based on a contribution submitted and accepted for the VDI conference „Wege zum erfolgreichen Qualitätsmanagement in der Produktentwicklung" *(Paths towards a successful quality management in product development)*, 24.-25.02.1994, Berlin. Proceedings VDI-Berichte Nr. 1106, VDI-Verlag, Düsseldorf 1994.

[27] Based on articles in VDI-Z 116 (1974) Nr. 11 and 13, on an article in VDI-Z 131 (1989) Nr. 3 and on [HuEd-1992].

- Flemming, M.; Breiing, A.: Neue Verfahren und Produkte durch neue Impulse in Forschung und Lehre.
  (New processes and products through new impulses in research and teaching.)

  In this contribution, among other things, the issue of "Design for Materials" was taken up – characterised as a "missing area" by Mogens Andreasen one year ago.

- Beitz, W.: Teaching systematic design – procedures and experiences.[28]

- Wallace, K.M.: Design Research.

  In this contribution experiences form Cambridge University's Engineering Design Centre (EDC) aiming at applying design research leads Wallace to four basic questions of Design Research: What is a successful product? How is it successfully produced? How do we improve our chances to be successful? What research methodology should be used?

- Meerkamm, H.: Konstruktionssysteme – Notwendigkeit, Anforderungen, Lösungsansätze. *(Design [support] systems – necessity, requirements, approaches.)*

- Weber, C.: Integration methodisches/rechnerunterstütztes Konstruieren – (persönliche) Thesen und Ansätze. *(Integration methodical / computer aided design – (personal) theses and approaches.)*

- Seifert, H.: Entwurf von Variantenkonstruktionen – ein Lösungsansatz auf klassenlogischer Basis. *(Variational design – a solution approach on a class logical basis.)*

- Bercsey, T.; Vajna, S.: Ein autogenetischer Ansatz für die Konstruktionstheorie als Beitrag zur vollständigen Beschreibung des Konstruktionsprozesses.
  (*An autogenetic approach to Design Theory as a contribution to the holistic description of the design process.)*

  This was the first presentation on a Design Theory that follows the concept of developing things by evolution procedures as observed in nature. In particular, two aspects were investigated: The "degree of replication" as a (reciprocally proportional) measure of innovation (both in nature and engineering) and "autogenetics" as a development strategy (again both in nature and engineering) leading from lower to higher complexity. In autogenetics the evolution procedure is driven by the differences between the actual state of the development, coded in the so-called fitness function, and the requirements of the customer, coded in the so-called target function. The procedure is not to be mixed up with Bionics (or Biomimetic): Autogenetics applies evolution ***procedures*** whereas Bionics transfers developed ***solutions***.

- Ferreirinha, P.: Konstruktionswissen und seine Strukturierung.
  (Design knowledge and its structure.)

- Engler, P.: Organ und Organismus als funktionsorientierte Konstruktionsbausteine.
  (Organ and organism as function-oriented design modules.)

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[28] Based on an article in the International Journal of Applied Engineering Education 4 (1988) 3, pp. 217-220.

Towards the end of the 1994 edition of the Rigi Meeting ICED matters were discussed:

- Programme and organisation of the forthcoming 10th International Conference on Engineering Design (ICED ´95), to be held 22.-24.08.1995, in Prague, Czech Republic, mainly organised by Vladimir Hubka himself

Fig. 11: Vladimir Hubka's 70th birthday at the Rigi Meeting 1994; Harald Meerkamm handing over a present with Sándor Vajna observing the scene in the background

Fig. 12: Vladimir Hubka's 70th birthday during the Rigi Meeting 1994; Hans Seifert playing the bandoneon, all others singing along

Fig. 13: Vladimir Hubka, Wolfgang Beitz and Gerhard Pahl singing together ("Aber der Wagen der rollt …")

Fig. 14: Prost – Skål – Na zdraví, Vladimir Hubka and Mogens Andreasen at the latter's 70th birthday during the Rigi Meeting 1994

On the occasion of Vladimir Hubka's 70the birthday and in recognition of his contributions to Design Science, the Journal of Engineering Design published a special edition (Journal of Engineering Design, vol. 5 [1994], issue 2) with contributions of D.F. Sheldon, K. Hongo & A. Amirfazli, M.M. Andreasen, K. Ehrlenspiel, W. Beitz, W.E. Eder, L. Hein and H. Meerkamm.[29]

[29] List of articles and full-text download under: https://www.tandfonline.com/toc/cjen20/5/2?nav=tocList.

Rigi Meeting 1995

Date: 27.-28.03.1995
Venue: Hotel Alpina on Mount Rigi, Switzerland

The theme proposed in Vladimir Hubka's invitation to the 12th Rigi Meeting was **"ICED conferences under change?"**.

A later call, mailed by Mogens Andreasen, proposed the following, more detailed structure of the workshop:

Theme 1: Computer-Supported Design (CSD)
Theme 2: Design for X (DfX)
Theme 3: Representation, modelling
Theme 4: Design Science

The following contributions were presented and discussed (not necessarily in the order listed below) – many, but not all of them addressing the overall theme(s) of the workshop:

- Andreasen, M.M.: Some conclusions of current interest from workshops.

  Based on several investigations and conclusions from previous Rigi Meetings, from ICED conferences, from a number of workshops held at different locations on a variety of topics (DfX, computer support, representation and modelling, evaluation, see also **Fig. 17**), the author justified the four themes spread out before the workshop and proposed them as a thematic structure of future ICEDs.

- Engler, P.: Gedanken und Erfahrungen zu Computer-Supported Design und DfX im Hinblick auf die ICED-Konferenzen. *(Reflections and experiences on Computer-Supported Design and DfX with regard to ICED conferences.)*

  This contribution was a plea to bring (again) more practice-related content into future ICED conferences. Seen from today, it is quite interesting that Engler at a very early stage foresaw some developments that are very prominent today, e.g.:

  - The role of the Internet for design activities
  - Replacing experiments by simulations as a way to "Robust Design"
  - Expert systems qualified as a hype with decreasing importance
  - Design of mechatronic instead of mechanical systems
  - Much more design ***with*** components instead of ***of*** components

- Storath, E.: Möglichkeiten moderner Wissensbereitstellung und -verarbeitung. *(Potentials of modern knowledge provision and processing.)*

- Vajna, S.: Entwicklung eines ganzheitlichen Vorgehensmodells zur durchgängigen Beschreibung, Optimierung und Rechnerunterstützung des Produktentstehungsprozesses und zur Weiterentwicklung von CAx-Technologien. *(Development of a holistic process model for the consistent description, optimisation and computer support of the product creation process and for the further development of CAx technologies.)*

- Weber, C.: Status report Feature-based design.

- Breiing, A.: Suche von Konstruktionslösungen mit Suchstrategien der Künstlichen Intelligenz (KI). *(Search for design solutions using search strategies from the area of Artificial Intelligence (AI)).*
- Biggioggero, G.F.[10]; Galli, P.[10]; Rovida, E.: Methodisches Konstruieren – eine Anwendungssoftware. *(Methodical design – an application software.)*
- Meerkamm, H.: Komplexität DfX versus Möglichkeiten rechnerunterstützter Informationssysteme.
  (DfX complexity versus potentials of computer-assisted information systems.)
- Pighini, U.: DfX – basic considerations.
- Bercsey, T.; Dupcsak, Z.[10]: Education and practical application of DfX techniques.
- Riitahuhta, A.: DfX in one-of-a-kind production.
- Duffy, A.H.B.; Andreasen, M.M.: Enhancing the Evolution of Design Science.[30]

  This contribution formulated a view upon Design Science based upon what is seen as the challenges, commenting upon research approaches, and showing the need for a research community. In addition, a comparative investigation of four competing conferences was presented, balancing the power and weaknesses of ICEDs.

  The contribution also contained an approach for a scientifically sound sequence and classification of models derived from reality and (to be) used in Design Research (**Fig. 15**). Until today, a lot of disorientation can be observed in this respect.[31]
- Birkhofer, H.: Zusammenhang Konstruktionsmethodik – Konstruktionspraxis – Konstruktionswissen. *(Relations between design methodology – design practice – design knowledge.)* Essence see **Fig. 16**.

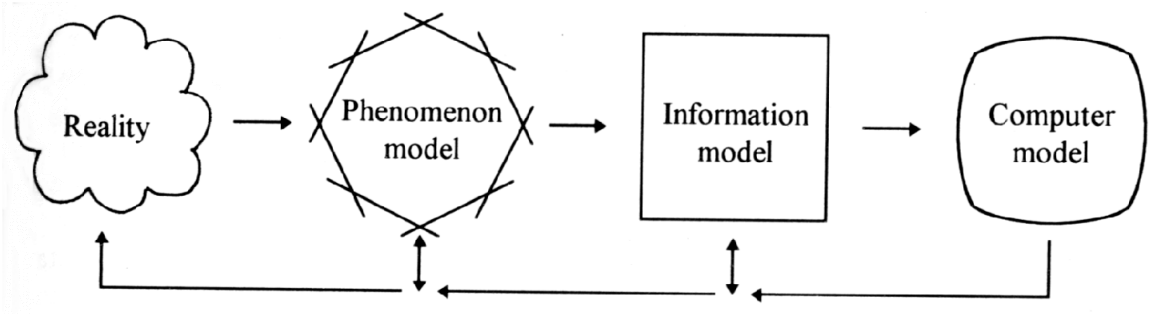

Fig. 15: Design modelling research approach [Duffy/Andreasen[30]]

[30] A quite far-reaching proposal to be presented at the forthcoming 10th International Conference on Engineering Design (ICED ´95), 22.-24.08.1995, Prague, Czech Republic.

[31] Self-criticism of C. Weber: From this picture I learned that “features” cannot be found in real products, not even as phenomena derived from reality. They are just information elements. In the case of “design features” and “functional features” the underlying phenomena might at best be described as “function carriers” or “organs”.

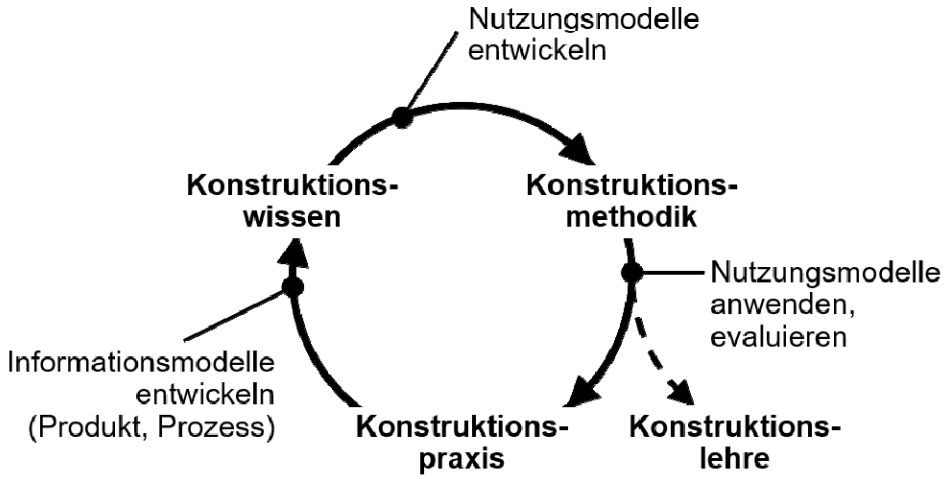

Fig. 16: Relations between design methodology – design practice – design knowledge
[H. Birkhofer: Zusammenhang Konstruktionsmethodik – Konstruktionspraxis – Konstruktionswissen, 12th Rigi Meeting 1995, figure drawn from personal notes of C. Weber]

- Dwarakanath, S.[10]; Wallace, K.M.: Design decision making process – observations from individual and group design experiments.[32]
- Roth, K.: Anordnung von Stützkräften, um Teile eindeutig zu halten und zu führen. *(Arrangement of support forces in order to retain and guide components in a definite way.)*
- Koller, R.: Zusammenhang zwischen Konstruktionsmethodik und Patenten. *(Relations between design methodology and patents.)*
- Seifert, H.: Überlegungen zu Anpassungskonstruktion und Innovation – gezeigt an zwei Beispielen. *(Reflections on adaptive design and innovation - shown in two examples.)*

As the authors' notes are fragmentary, there is no reliable information about who attended the Rigi Meeting 1995 in addition to the presenters named above.

Rigi Meeting 1996

Date: 21.-22.03.1996
Venue: Hotel Alpina on Mount Rigi, Switzerland

At the 13th Rigi Meeting the following contributions were presented and discussed:

- Engler, P.: Öko-Management, Öko-Design, Öko-Bilanz. *(Eco management, eco design, eco balance.)*
- Pighini, U.: Different approaches to designing for cost.

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[32] Based on a contribution submitted and accepted for the forthcoming 10th International Conference on Engineering Design (ICED ´95), 22.-24.08.1995, Prague, Czech Republic.

- Ferreirinha, P.: Herstellkostenberechnung (HKB).
  (Calculation of manufacturing cost [using the HKB software].)

  The HKB software was explained and demonstrated. It was a very early (first launched in 1985!), PC-based tool for the calculation of manufacturing cost. Originally, the software was intended for designers; later, after some commercial success, it turned out that it was mostly used by manufacturing planners.

- Meerkamm, H.; Storath, E.[10]: Design for X – the interference between product and process, a potential for engineering networks.

- Breiing, A.: Feedback to the previous contribution of Meerkamm, H.

- Wallace, K.M.: Reflections on the Design Research at Cambridge EDC [Engineering Design Centre] 1991-1995.

- Rovida, E.: Vorschlag eines Handbuches für den europäischen Konstrukteur.
  (Proposal of a manual for European design engineers.)

- Birkhofer, H.: Perspektiven der Maschinenelemente-Lehre für ein moderne, konstruktiv orientierte Ingenieurausbildung. *(Perspectives of teaching Machine Elements for a modern, design-oriented Engineering Education.)*

- Andreasen, M.M.; de Araujo, C.S.[10]; Riitahuhta, A.: World class design by world class methods.[33]

- Pahl, G.: Konstruieren – ein iterativer und interdisziplinärer Produktentwicklungsprozess.
  (Designing – an iterative and interdisciplinary product development process.)

- Eder, W.E.: Benchmarking – Bedeutung für Konstruktion und Konstruktionswissenschaft. *(Benchmarking – significance for designing and design science.)*

- Borusíková, I.[10]; Hosnedl. S.; Wilhelm, W.[10]: TQM-Methoden aus dem Gesichtspunkt der Konstruktionslehre.
  (TQM methods seen from the perspective of Design Theory and Methodology.)[34]

- Pulkkinen, A.[10]; Paasiala, P.[10]; Riitahuhta, A.: Engineering design aspects on fuel supply system of Diesel power plant.

- Seifert, H.: Technische Innovation – ihre Definition aus konstruktionsmethodischer Sicht.
  (Technical innovation – its definition from the perspective of Design Theory and Methodology.)

- Koller, R.: Erfinden von technischen Produkten und Patentrecht.
  (Inventing technical products and patent legislation.)

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[33] The title of this contribution is identical with the headline of the forthcoming 11th International Conference on Engineering Design (ICED ´97), to be held 19.-21.08.1997 in Tampere, Finland.

[34] Based on a contribution for the 10th International Conference on Engineering Design (ICED ´95), 22.-24.08.1995, Prague, Czech Republic.

Also discussed at the 1996 edition of the Rigi Meeting:

- Programme and organisation of the forthcoming 11th International Conference on Engineering Design (ICED ´97), to be held 19.-21.08.1997 in Tampere, Finland, organised by Asko Riitahuhta

In addition to the presenters named above Sándor Vajna attended the workshop and took part in the discussions.

Rigi Meeting 1997

Date: 20.-21.03.1997
Venue: Hotel Alpina on Mount Rigi, Switzerland

The theme of the 14th Rigi Meeting was defined as **"Neue Auffassung von Maschinenelementen"** ***("New perception of Machine Elements")***. It was sparked off by Herbert Birkhofer's presentation in the previous Rigi Meeting – in a way coming back to the MeKoME origins of the group. It may also be noted that shortly after the 1997 Rigi Meeting Herbert Birkhofer, together with Albert Albers, organised a workshop "Die Zukunft der Maschinenelemente-Lehre" *("The future of teaching Machine Elements")*, held 23.-24.04.1997 at Schloss (castle) Heiligenberg near Darmstadt, Germany. This workshop was attended by some members of the WDK/Rigi group, but in addition had a larger audience from German professors in teaching Machine Elements and/or Engineering Design. In due course, "Arbeitskreis [neue Lehre] Maschinenelemente" (AKME, *study group [new teaching of] Machine Elements*) was founded, separately from the WDK/MeKoME group.

One of the outcomes of this workshop in Germany was the so-called Heiligenberg Manifesto[35]. Thus, the original MeKoME orientation of the Rigi Meetings had a notable influence on reforming the teaching of Machine Elements, especially in the German-speaking countries (where this issue is a major topic in Engineering Education): Expansion of the concept of Machine Elements to non-mechanical elements (sensors, actors, …); bringing findings of Design Theory and Methodology into Machine Elements teaching; more designing ***with*** Machine Elements instead of ***of*** Machine Elements; more project work – strengthening the role of Machine Elements teaching as an important integrating factor in Engineering Education in total.

At the 14th Rigi Meeting the following contributions were presented and discussed:

- Hubka, V.: Einführung in die Thematik. *(Introduction into the main theme.)*
- Birkhofer, H.: Neue Auffassung der Maschinenelemente (-Lehre).
  (New perception of [teaching] Machine Elements.)
- Eder, W.E.: Neue Interpretation der Maschinenelemente – Schlüsse für die Konstrukteursausbildung. *(New interpretation of Machine Elements – conclusions for teaching [engineering] designers.)*

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[35] Albers, A.; Birkhofer, H. (eds.): Proceedings of the Workshop "Die Zukunft der Maschinenelemente-Lehre" – Heiligenberger Manifest, Vorträge, Workshopergebnisse. *(The future of teaching machine elements – Heiligenberg manifesto, lectures, workshop results.)* Schloß Heiligenberg, 23.-24.04.1997.

- Weber, C.; Vajna, S.: A new approach to Design Elements – a proposal to structure the knowledge.
- Lindemann, U.: Einführung in die Maschinenelemente – ein neues Vorlesungskonzept. *(Introduction to Machine Elements – a new lecturing concept.)*
- Ferreirinha, P.: (No title and no copy of the contribution exist; personal notes about the content show that it was on searching for solution/machine elements according to design situations.)
- Engler, P.: Konstruktionselemente und Festigkeitslehre [in der Lehre]. *(Design Elements and strength of materials [in teaching].)*
- Breiing, A.: Maschinenelemente – minimierter Lehraufwand bei möglichst hohem Lehrinhalt. *(Machine Elements – how to minimise teaching effort with the highest possible content.)*

After the contributions listed above and intensive discussions, the group split up into five working groups on different aspects of Machine Elements and Machine Elements teaching, results to be presented on the next day:

– Terminology:	A. Breiing; E. Rovida
– Teaching aims and pedagogic aspects:	U. Lindemann; P. Engler
– Properties:	H. Birkhofer; H. Meerkamm
– Link to Design Theory and Methodology:	M.M. Andreasen; C. Weber
– Computer support:	P. Ferreirinha; S. Vajna

Apart from the Machine Elements theme, there were some more contributions:

- Andreasen, M.M.; Mortensen, N.H.[10]: Getting from organ to part structure.
- Meerkamm, H.: DfX – Strukturierung und Bewertung, ein Thema ohne Ende? *(DfX – structuring and evaluation, a theme without end?)*
- Vajna, S.: Integrierte Produktentwicklung. *(Integrated Product Development.)*

  Based on earlier work from the "Copenhagen school"[36], Vajna explained his extended concept of Integrated Product Development (IPD or IPE for the German term "Integrierte Produktentwicklung"). As new elements it contained continuous computer support and a flexible network structure of tasks, activities and resources. Based on these ideas also teaching concepts were developed which later led to an extremely successful, still existing course of studies in "Integrated Design Engineering" at the author's home university, Otto-von-Guericke-Universität Magdeburg, Germany. The concept was also the origin of a series of workshops on the topic, held at the Otto-von-Guericke-Universität Magdeburg from 1996 bi-annually, later tri-annually, and still existing today.
- Marsh, R.[10]; Wallace, K.M.: Observations on the role of experience in the design process.

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[36] Andreasen, M.M.; Hein, L.: Integrated Product Development. Springer, Berlin-Heidelberg 1987.

- Pulkkinnen, A.[10]; Vainio-Mattila, M.[10]; Riitahuhta, A.: Modelling life-cycle activities and information of a plant piping system.

In the files of the authors there are some more papers of which it is not clear whether they were actually presented or additional material provided by participants without presentations:

- Calabró, S.[10]; Menzio, G.[10]; Rovida, E.: The contribution of historical technical drawings to modern design.
- Koller, R.: Wege zur Innovation technischer Produkte.
  (Ways to innovation of technical products.)

Again on the agenda of the meeting:

  – Final programme of the forthcoming 11th International Conference on Engineering Design (ICED '97), to be held on 19.-21.08.1997 in Tampere, Finland, organised by A. Riitahuhta

3.4 Developing the Idea of a New Society (1998-2000)

Sparked off by the discussions on future directions in research and teaching and on the further development of WDK and ICED conferences, also structural changes came into focus – culminating in 1999 and, finally, leading to the foundation of a new society – the Design Society in 2000.

The reasons for this move were manifold: Make the initiative that already had grown considerably even more visible; make it independent of individuals; have a formal body to manage conferences like ICEDs (in terms of organisation and finances) that had become too big to continue on a "private" base.

Rigi Meeting 1998

Date: 26.-27.03.1998
Venue: Hotel Alpina on Mount Rigi, Switzerland

For the 15th Rigi Meeting Vladimir Hubka had proposed **"New perception of Machine Elements"** and in addition **"Zukünftige Themen weiterer Veranstaltungen WDK"** ***("Future themes of further events WDK")*** – both themes more or less continuations of last year's issues.

The following contributions were presented and discussed:

- Birkhofer, H.: Overview over developments in the area of "New perception of Machine Elements" since last year.
- Birkhofer, H.: Konstruieren mit Maschinenelementen – in 30 Sekunden zum kalkulierten 3D-Grobentwurf. *(Designing with Machine Elements – coming to a 3D preliminary design including calculation within 30 seconds.)*
- Hosnedl, S.: Approach of our university [University of West Bohemia, Plzen, Czech Republic] to Machine Elements.
- Meerkamm, H.: Wissensbasiertes Auswählen und Gestalten einer optimalen Baustruktur. *(Knowledge-based selection and design of an optimal layout structure.)*

- Andreasen, M.M.; Riitahuhta, A.: Modular engineering, part 1: What is modularisation?
- Riitahuhta, A.; Andreasen, M.M.: Modular engineering, part 2: Metrics for modularisation.

The two previous articles brought the topic of modularisation and product architecture – still a "hot topic" today – onto the agenda of the WDK group. It was put into the context of Design Science (in Andreasen's contribution) and confronted with customers', companies' and society's needs (in Riitahuhta's contribution).

- Seifert, H.: (No title and no copy of the contribution exist; personal notes about the content show that it was on the systematic innovation process of existing products using the optimisation of an internal combustion engine as an example.)
- Pighini, U.; Papa, E.[10]: New approach to design tactics.
- Meerkamm, H.: Spannungsfeld Konstruktionsmethodik – Rechnerunterstützung – Kreativität. *(Design Methodology – computer support – creativity as an area of conflicts.)*
- Weber, C.: Konstruktionswissenschaft und CAD-Entwicklung, Teil 1: Bestandsaufnahme, Arbeitsgebiete für die Zukunft. *(Design Science and CAD development, part 1: State and fields for future activities.)*
- Vajna, S.: Konstruktionswissenschaft und CAD-Entwicklung, Teil 2: Veränderte Arbeitsmethoden durch CAx-Anwendung. *(Design Science and CAD development, part 2: Modified working methods through CAx application.)*
- Ferreirinha, P.: Ein Wissensmodell für den Konstrukteur.
  (A knowledge model for the engineering designer.)
- Engler, P.: Umkonstruktion bestehender Bauteile auf alternative Fertigungsverfahren durch wirkflächenorientierte Gestaltung und verfahrensspezifische Richtlinien.
  (*Redesign of existing components for alternative manufacturing technologies through working-surfaces-oriented design and process-specific guidelines.*)
- Eder, W.E.: Konstruktionswissen für den Konstrukteur in der Praxis.
  (Design knowledge for the engineering designer in practice.)
- Breiing, A.: Technisches Design eingebettet im Konstruktionsprozess – eine Selbstverständlichkeit oder neu entdeckt? *(Industrial design embedded into the product development process – a matter of course or rediscovered?)*
- Wallace, K.M.: Future direction of Design Research.

During the meeting, Dorian Marjanović as the successor of Aurel Kostelić at the design department of the University of Zagreb, Croatia, announced the 5th International DESIGN Conference, to be held in Dubrovnik, Croatia, 19.-22.05.1998 – after four events of more national character since 1981. This was – after a very difficult time due to the war in former Yugoslavia – the (re-) start of an extremely successful series of conferences, held every two years in the even years, i.e. between ICEDs. The DESIGN conference still exists, is still growing, still organised by the University of Zagreb, now endorsed by the Design Society.

Towards the end of the 1998 edition of the Rigi Meeting:

- Udo Lindemann explained details of the programme and organisation of the forthcoming 12th International Conference on Engineering Design (ICED '99), to be held 24.-26.08.1999 at Technische Universität München, Germany, organised by a team consisting of Udo Lindemann, Herbert Birkhofer, Harald Meerkamm and Sándor Vajna.

Rigi Meeting 1999

Date: 25.-26.03.1999
Venue: Hotel Alpina on Mount Rigi, Switzerland

Initially, there was no dedicated theme for the 16th Rigi Meeting other than **"Research reports"** and again ICED matters. However, when the workshop programme evolved, the issue of **"The future of WDK and ICED"** (and of Design Research in general) emerged – a first important step towards the decision of founding the Design Society one year later. The following contributions were presented and discussed:

- Birkhofer, H.: Erste Erfahrungen aus der "neuen" Maschinenelemente-Lehre an der Technischen Universität Darmstadt. *(First experiences with the "new" way of teaching Machine Elements at Technische Universität Darmstadt.)*
- Breiing: A.: Einige Gedanken zum Fortbestand der Entwicklungskultur in Mitteleuropa. *(Some thoughts on the continuance of the development culture in central Europe.)*
- Engler, P.: FMEA in der Produktentwicklung. *(FMEA in product development.)*
- Koller, R.: Messen von Plagiaten. *(Measuring plagiarism.)*
- Weber, C.: Brief report on what happened in the field of "Design Science and CAD development" since the last Rigi Meeting.
- Wallace, K.M.: Brief report of the NSF [National Science Foundation of the United States of America] workshop "Future Design Research".
- Meerkamm, H.: Steps towards consolidating the results of Design Research.
- Andreasen, M.M.: The need for Engineering Design Research consolidation.
- Ferreirinha, P.: (No title and no copy of the contribution exist; personal notes about the content show that it was on consolidating the knowledge in the area of Engineering Design and, on this base, building knowledge-based systems for education and practice.)
- Andreasen, M.M.: The future of WDK and ICED.

Apart from the presenters named above, Ernst Eder, Udo Lindemann, Umberto Pighini, Edoardo Rovida and Sándor Vajna also attended the 1999 Rigi Meeting.

Sparked off by the contributions of Ken Wallace, Harald Meerkamm and – in particular – Mogens Andreasen, discussions on of the future of WDK and ICED were the most prominent, very open and effective. Achievements (**Fig. 17**), strengths and weaknesses of WDK and the ICED conference series were analysed, but also new/revised challenges expressed and necessary changes discussed.

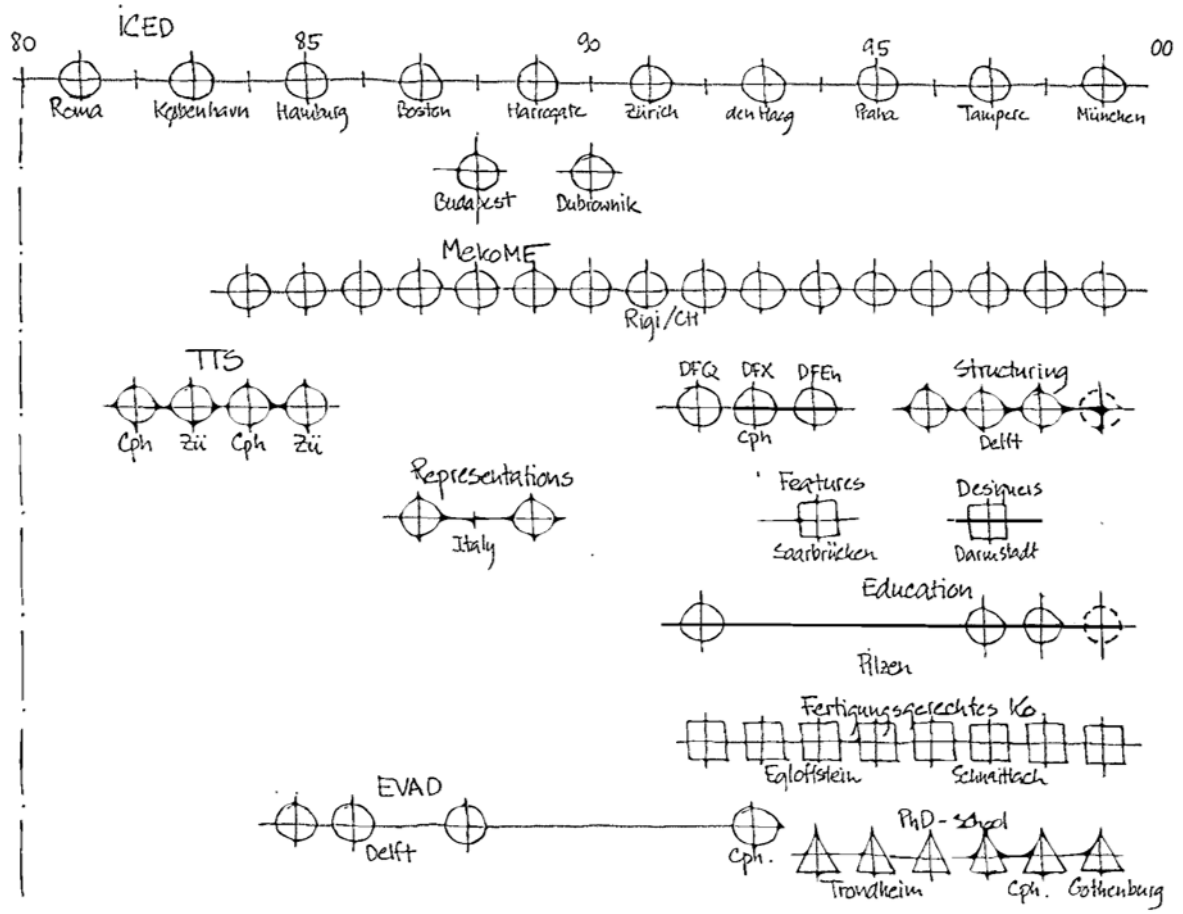

Fig. 17: Balance of the WDK activities in terms of conferences and workshops [Andreasen, M.M., The future of WDK and ICED, 16th Rigi Meeting 1999]

Mogens Andreasen's view in his contribution "The future of WDK and ICED" found broad consensus:

- Listen to the voice of our "customers": PhD-students, industry, senior researchers
- New organisation: Constitution, registration, structure, thematic clusters
- New tasks: Coordinated event structure, lobbying and promotion, contracts with publishers, fundraising, cooperation with related societies, newsletter, journal
- New culture: Consolidating design professionalism, sharing industry's agenda, movable/flexible, integrating other disciplines
- New mission: Responsible for the consolidation of our area, responsible for coming industrial needs, leading/influencing development

It was considered important to maintain as much as possible of the informal network structure of WDK; as formulated in Mogens Andreasen's contribution:

- A network organisation without borders: as little fixed structures, laws and rules as possible[37]
- Value basis: e.g. articulated goals and missions, inclusion of participants

[37] In the original text, albeit coined with view on the WDK tradition: "***no*** fixed structure, ***no*** laws, ***no*** rules". This could, of course, not be continued so strictly within a formalised organisation like the Design Society.

- Decentralisation: activities based on initiatives
- Informal leadership: leader roles are taken, not given; ad-hoc groups
- Mutual dependencies: base of the network, the network as such “offers nothing”
- Transparency: e.g. realistic view on strengths and weaknesses

Dreams/visions:

- To see a new generation take over
- To see consolidation
- To transfer the momentum and power of the present [WDK] activities
- To see a paradigm of Design Research and a recognised theory foundation be developed

As a result of these discussions, a preparation group for further steps was established, led by Mogens Andreasen, Harald Meerkamm and Ken Wallace. Its main task was to fathom ways for the transformation of WDK into some more formalised structure, also with new aims, to be ready for the 2000 Rigi Meeting and to be publically announced at the 13th International Conference on Engineering Design (ICED ’01) in Glasgow.

As already stated above, all these activities proved to be a first important – maybe ***the*** first and decisive – step towards founding the Design Society one year later.

Again discussing future ICEDs was on the agenda during the last day of the 16th Rigi Meeting 1999:

- Final programme and organisation of the 12th International Conference on Engineering Design (ICED ’99), organised by a team consisting of Udo Lindemann, Herbert Birkhofer, Harald Meerkamm and Sándor Vajna, to be held at the (new) building of Technische Universität München, Germany, on 24.-26.08.1999
- First thoughts on the 13th International Conference on Engineering Design (ICED ’01), organised by a team consisting of Steve Culley, Alex Duffy, Chris McMahon and Ken Wallace, eventually held in Glasgow, UK, Scotland, on 21.-23.08.2001

Rigi Meeting 2000: Foundation of the Design Society

Date: 23.-24.03.2000
Venue: Hotel Alpina on Mount Rigi, Switzerland

The programme of the 17th Rigi Meeting held a couple of research-focussed contributions, but the dominating theme was: **“The Future of WDK and ICED: What – who – when – how?”**

It would be the last “old-style” Rigi Meeting before a new organisation took over – the Design Society.

The first block of contributions (in the morning of the first day) was directly related to the past and future of WDK and ICED:

- Andreasen, M.M.: Balancing ICED ’99.
- Meerkamm, H.: Review ICED ‘99 – best processes.
- Eder, W.E.: Design education.

- Birkhofer, H.: Life-cycle design.
- Duffy, A.H.B.: Design coordination.
- McMahon, C.A.; Lowe, A.[10]; Culley, S.; Shah, T.[10]: An analysis of ICED ’99 papers related to information and knowledge management.
- McMahon, C.A.; Lowe, A.[10]; Culley, S.; Shah, T.[10]: Key terms and document classification on ICED papers.
- Breiing, A.: Methodische Vorgehensweisen – sind die Inhalte der Konstruktionsmethodik zu überdenken? *(Methodical approaches – do we have to reconsider the contents of Design Methodology?)*
- Andreasen, M.M.; Pulkkinnen, A.[10]: Modular Engineering at ICED ’99.
- Vajna, S.: Knowledge processing and application at ICED ’99.

The second block of contributions (morning of the second day) had more general character:

- Culley, S.: Information for engineering designers.
- Weber, C.; Werner, H.[10]: A new approach to modelling products and product development processes.

  This contribution was the first-ever presentation of the concept of describing products and development/design processes via product characteristics (design parameters, “internal properties” in the terminology of Hubka[4] and Hubka/Eder[12]) and properties (behavioural parameters, “external properties”) that became later known as the CPM/PDD (Characteristics-Properties Modelling / Property-Driven Development/Design) approach. In principle, this approach took a lot from ideas previously discussed at the MeKoME/ Rigi Meetings and also from Weber’s investigation of “design features” and “functional features”.
- Ferreirinha, P.: A contribution to the Theory of Technical Systems.
- Calabró, S.[10]; Menzio, G.[10]; de Alberti, L.[10]; Rovida, E.: Didactic museums in Engineering Education.
- Engler, P.: Berechnung von Wirkketten. *(Calculation of working chains.)*
- Cantamessa, M.: Design methods and tools with respect to industrial practice.
- Vajna, S.: Maschinenelemente für die rechnerintegrierte Produktentwicklung. *(Machine Elements for computer-integrated product development.)*
- Blessing, L.T.M.: Design Research Methodology (DRM) before 2000.
- Birkhofer, H.: Globalisation of Design Research – how to improve our cooperation and some reasons for doing so.
- Birkhofer, H.: Short report on the 3rd meeting of Arbeitskreis [neue Lehre] Maschinenelemente (AKME, *study group [new teaching of] Machine Elements*), held one month ago (23.-24.02.2000) at Kloster Lichtenthal, Baden-Baden, Germany

- Announcements of conferences, workshops and other events organised by or with participation of members of the group:
  - Marjanović, D.: Preview of the 6th International DESIGN conference, to be held 23.-26.05.2000 in Dubrovnik, Croatia
  - Vajna, S.; Weber, C. (programme chairs): VDI[38] conference "Informationsverarbeitung in der Konstruktion 2000" *("Information processing in Engineering Design")*, to be held 09.-10.11.2000 during the fair "Systems 2000" in Munich, Germany
  - McMahon, C.A.: 22nd SEED Annual Design Conference and 7th National Conference on Product Design, "Integrating Design Education Beyond 2000" to be held 06.-07.09.2000 at the University of Sussex, Brighton, UK, England
  - Meerkamm, H.: 11th Symposium Fertigungsgerechtes Konstruieren *(Design for Manufacturing)*, to be held 12.-13.10.2000 in Schnaittach (near Elangen), Germany
  - Hosnedl, S.: Workshop on Design Methodology and Computer-Aided Design, planned for autumn
  - Vajna, S.: 3rd workshop "Integrierte Produktentwicklung" *("Integrated Product Development")*, to be held 28.-29.09.2000 in Magdeburg, Germany
  - Andreasen, M.M.; Blessing, L.T.M.; Weber, C.: 2nd Summer School on Engineering Design Research (SSEDR 2000), first week to be held 10.-14.07.2000 at Kolloquienzentrum Spelzenklamm, Homburg/Saar (near Saarbrücken), Germany, second week 28.08.-01.09.2000 at Kloster Lichtenthal, Baden-Baden, Germany.
    This course for PhD/doctoral candidates was founded by Mogens Andreasen in 1990, in the early years mainly for Scandinavian participants. From 1999 Lucienne Blessing brought in her Design Research Methodology (DRM)[25], and at the same time the course was opened for a broader audience from all over Europe (therefore the new count as number 1 in 1999). In 2000 Christian Weber joined the organising team, and at the same time the course found its two-week format. SSEDR still exists today, endorsed by the Design Society, and supported by many colleagues throughout Europe hosting the course and contributing to it.
    Main issue of the course until today is to make PhD/doctoral candidates who are working in Design Research better qualified and equipped for their research by helping them select a theoretical foundation, develop a research approach, and encouraging discussion and collaboration.

The most important issue of the 17th Rigi Meeting 2000 was, of course, the official foundation of a new society – the Design Society. This was formally executed in the afternoon of the first day (23.03.2000, session between 14:30 h and 17:30 h), followed by a celebration dinner at the restaurant of Hotel Alpina. Many important decisions were taken, most of them still valid today.

One could say: Founding the Design Society in 2000 was a millennium decision …

[38] VDI: Verein Deutscher Ingenieure, Association of German Engineers.

The persons present at the Rigi Meeting 2000 are the founding members of the Design Society (in alphabetical order):

Mogens M. Andreasen, Herbert Birkhofer, Lucienne Blessing, Alois Breiing, Marco Cantamessa, Steve Culley, Alex Duffy, W. Ernst Eder, Peter Engler, Pedro Ferreirinha, Vladimir Hubka, Stanislav Hosnedl, Udo Lindemann, Chris McMahon, Dorian Marjanović, Harald Meerkamm, Umberto Pighini, Asko Riitahuhta, Edoardo Rovida, Sándor Vajna, Christian Weber, Kristin Wood.

In the meeting, at first Steve Culley, Alex Duffy, Chris McMahon and Ken Wallace as the organisers, reported on the state of planning the 13th International Conference on Engineering Design (ICED ’01), to be held in Glasgow, Scotland, on 21.-23.08.2001.

- It was decided that ICED ’01 would be the last under the auspices of WDK, at the same time the first of the Design Society.
- Thereafter, the right of the ICED conference series brand would go to the Design Society as an asset.
- ICED ’01 would be used to bring the founding of the Design Society to a broader professional public.
- General Meetings of the Design Society would be organised on a bi-annual basis, held at ICED conferences, starting with the 14th International Conference on Engineering Design (ICED ‘03)
- The WDK series of books shall be continued under the banner of the Design Society (see also appendix for the list of WDK books). The last WDK book will be WDK 28, containing the Proceedings of the 13th International Conference on Engineering Design (ICED ‘01). The first Design Society book will be DS 29 which turned out to be the Proceedings of the 3rd International Seminar and Workshop on Engineering Design in Integrated Product Development, EDIProD 2002, held on 10.-12.10.2002 in Zielona Góra, Poland, edited by Ryszard Rohatynski.

Ken Wallace then reported on the work and recommendations of the preparation group (Mogens Andreasen, Harald Meerkamm and Ken Wallace) that was installed in the previous year:

- As there was no truly international legislation (and still isn’t), even a truly international society like the Design Society must have a formal “home” in one particular country.
- It was recommended and decided to register the Design Society as a Scottish Charity (which it still is), with Alex Duffy as the contact person to the Scottish authorities. This had, on one hand, practical reasons (Alex!); on the other hand, the UK/Scottish legislation turned out to be the most open towards management and signature authorisation given to citizens of foreign countries.
- A draft constitution of the Design Society was presented and discussed (which, in principle, still is in place today).

- It arranged for the leading bodies of the society (again, still in place today):
  - The Board of Management (BM), consisting of five members
  - The Advisory Board (AB), consisting of up to 27 members.
- The office terms were to be limited to a maximum of two terms (i.e. max. 2x4 years in the case of the BM, max. 2x6 years in the case of the AB).
- As there was no substantial membership yet and, consequently, no elections possible, the offices in the first two years were appointed based on consensus of the founding members, with a clever scheme to replace half of the Board of Management (BM) members and a third of the Advisory Board (AB) members by elections at the General Meetings to be held bi-annually at ICED conferences, starting from 2003.
- The founding Board of Management (BM) consisted of:
  - Herbert Birkhofer, Technische Universität Darmstadt, Germany, founding President of the Design Society
  - Alex H.B. Duffy, University of Strathclyde, Glasgow, UK, Scotland, Vice President
  - Marco Cantamessa, Politecnico di Torino, Italy, Secretary
  - Lucienne T.M. Blessing, University of Cambridge, UK, England
  - Kristin L. Wood, University of Texas, Austin, TX, USA
- The first Advisory Board (AB) was to be appointed during the coming year, after finding enough pioneers from across the world to help starting the Design Society.

The session ended with the formal handover from Vladimir Hubka as the leader of the original WDK group to Herbert Birkhofer as the President elect of the Design Society (**Fig. 18**). The due celebration dinner took place on the evening of 23.03.2000 in the restaurant of Hotel Alpina (**Fig. 19**, **Fig. 20**).

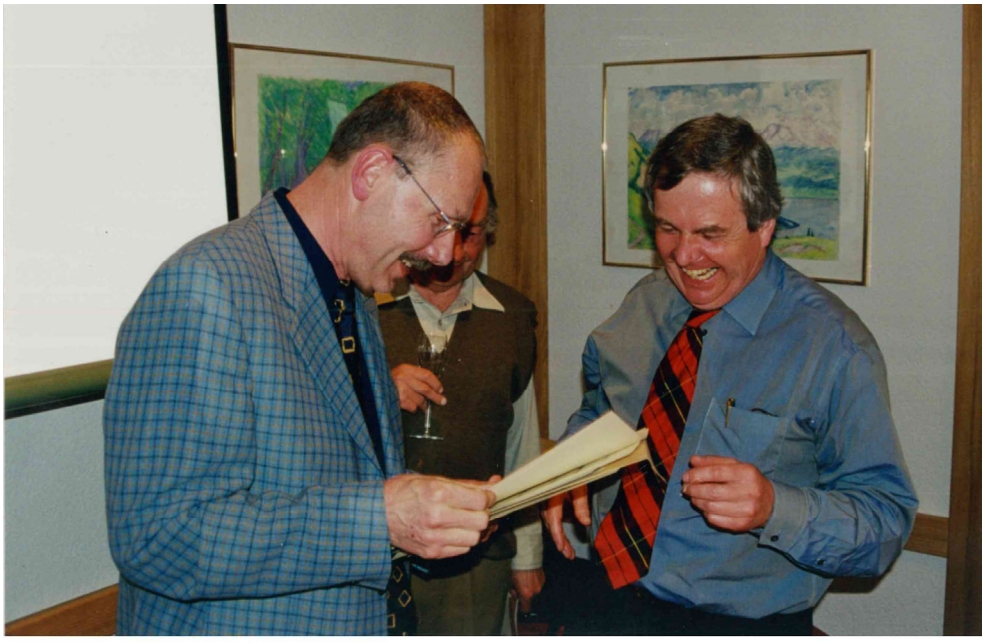

Fig. 18: Official handover from Vladimir Hubka, chairman of WDK (in the middle, unfortunately half hidden in this picture), to Herbert Birkhofer (left), founding President of the Design Society, facilitated by Ken Wallace (right), head of the transition preparation group, on 23.03.2000 in the lecture room of Hotel Alpina on Mount Rigi

Fig. 19: The first Board of Management of the Design Society (apart from the founding President Herbert Birkhofer) at the bar of Hotel Alpina on Mount Rigi in the evening of 23.03.2000; left to right: Kristin Wood, Marco Cantamessa, Alex Duffy, Lucienne Blessing

Fig. 20: Sándor Vajna playing the bagpipe to celebrate the founding of the Design Society at the restaurant of Hotel Alpina on Mount Rigi 23.03.2000

4 The Design Society Rigi Meetings on Mount Rigi after 2000

After the founding of the Design Society in 2000, it was decided to maintain the location of Hotel Alpina on Mount Rigi for the first couple of joint meetings of the Board of Management (BM) and the Advisory Board (AB). As explained before, the members of both boards were appointed in the first place, with a dedicated scheme to replace them successively by members elected by Design Society members at the General Meetings.

The first three joint BM and AB meetings of the newly founded Design Society took place on Mount Rigi in the Hotel Alpina[39]:

- 22.-23.03.2001
- 11.-12.03.2002
- 14.-15.03.2003

Thereafter the joint meetings of BM and AB, later supplemented also by the leaders of Special Interest Groups (SIGs) and of Branches, were held in other places around the world, starting with Donostia/San Sebastián in Spain/Basque Country, organised by AB member Tim Smithers.

There were several reasons for the decision to leave Mount Rigi and go to other places: The size of the group had by far outgrown the available space in the Hotel Alpina; the location on Mount Rigi is not easy to reach; finally, after the early death of the landlord of Hotel Alpina, Vladimir Hubka's son Luboš Martin, the hotel went into different hands, so the personal link was cut.

However, the Design Society decided to keep the March dates for their strategic meetings between the Board of Management and the Advisory Board – later also including the leaders of Special Interest Groups and Branches – and also to keep the name "Rigi Meetings", independent of where they actually took place.

The first Advisory Board of the Design Society which – together with the Board of Management – gathered in Hotel Alpina on Mount Rigi in 2001, consisted of (**Fig. 21**):

> Mogens M. Andreasen, Pedro Ferreirinha, Susan Finger, John Gero, Crispin Hales, Stanislav Hosnedl, Udo Lindemann, Harald Meerkamm, Dorian Marjanović, Margareta Norell-Bergendahl, Umberto Pighini, Asko Riitahuhta, Ryszard Rohatynski, Norbert Roozenburg, Andrew Samuel, Warren Seering, Derek Sheldon, Tim Smithers, Tetsuo Tomiyama, Sándor Vajna, Ken Wallace, Christian Weber

At the 2001 meeting, Andrew Samuel was elected as the first Chairman of the Advisory Board (**Fig. 22**).

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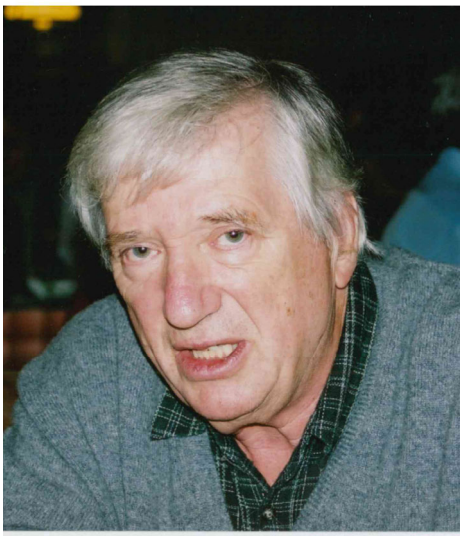
[39] In hindsight it is not clear to the authors how on earth all these people fitted into the lecture room of the hotel …

Fig. 21: The members of the first Board of Management (BM) and the first Advisory Board (AB) of the Design Society at the first Design Society Rigi Meeting 2001 on Mount Rigi; from left to right: Stanislav Hosnedl, Gerlinde Nintzel (TU Darmstadt), Alex Duffy, Dorian Marjanović, Margareta Norell-Bergendahl, Norbert Roozenburg, Kristin Wood, Tim Smithers, Harald Meerkamm, Warren Seering, Christian Weber, Mogens Andreasen, Ryszard Rohatynski, Tetsuo Tomiyama, Susan Finger, Udo Lindemann, Crispin Hales, Asko Riitahuhta, Lucienne Blessing, Sándor Vajna, Andrew Samuel, Ernst Eder, Umberto Pighini, Vladimir Hubka, Ken Wallace, Marco Cantamessa, Herbert Birkhofer

Fig. 22: Andrew Samuel, first Chairman of the Advisory Board (2001)



The first two Rigi Meetings under the auspices of the Design Society (2001, 2002) were dominated by strategic and organisational issues, e.g.:

- How to organise the world-spanning cooperative work between office bearers? Internal operations?
- What services to develop for members of the Design Society? Benefits of membership?
- Events, Special Interest Groups (SIGs), Branches?
- Mode of publishing proceedings?
- Publicity, website, newsletter, …
- Financial issues (membership fee, event fees, …), business plan, how to support administration?
- Discussion about programmes and organisation of forthcoming ICEDs:
  - 13th International Conference on Engineering Design (ICED ’01), organised by a team consisting of S. Culley, A. Duffy, C. McMahon and K. Wallace, to be held in Glasgow, UK, Scotland, on 21.-23.08.2001[40]
  - 14th International Conference on Engineering Design (ICED ’03), organised by Margareta Norell-Bergendahl and a team of Kungliga Tekniska Högskolan (KTH), Stockholm, Sweden, scheduled for 19.-21.08.2003
- Until today, discussing options for the location of future ICEDs and, at a later stage, concrete bids is a very important issue at Rigi Meetings.

All officials of the Design Society were researchers (and not managers) and mainly interested in science. Therefore, it was decided to (re-) introduce at least one “Science Day” at future Rigi Meetings, starting from 2003. This is another tradition that is maintained until today.

As mentioned before, from 2004 the Design Society Rigi Meetings took place elsewhere, sometimes in places connected to forthcoming ICED events:

- 2004 Donostia/San Sebastián, Spain/Basque Country
- 2005 Barcelona, Spain/Catalonia
- 2006 Heraklion, Crete
- 2007 Lyngby/København, Denmark
- 2008 Eltville, Germany
- 2009 Cambridge, MA, USA (at the Massachusetts Institute of Technology, MIT)

In 2010 the Design Society Rigi Meeting came back to Mount Rigi to commemorate the 10th anniversary of the founding of the Design Society (**Fig. 23**). Because of the size of the group the meeting took place in the largest hotel in Rigi-Kaltbad, Rigi Hostellerie – 50 m besides the old Alpina location.

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[40] At ICED ‘01 in Glasgow, a second joint meeting of the Board of Management and the Advisory Board took place, also mainly dedicated to management affairs.

Fig. 23: Participants of the Design Society Rigi Meeting 2010 – back on Mount Rigi; from left to right: Warren Seering, Tim McAloone, Yoram Reich, Asko Riitahuhta, Kristi Shea, Panos Papalambros, Christian Weber, Herbert Birkhofer, Petra Badke-Schaub, Margareta Norell-Bergendahl, Lucienne Blessing, Bill Ion, Amaresh Chakrabarti, Jean-François Boujut, John Clarkson, Tetsuo Tomiyama, Udo Lindemann, Dorain Marjanoviç, Norbert Roozenburg, Chris McMahon, Ken Wallace, Steve Eppinger, Toshiharu Taura, Sándor Vajna

The authors appreciate the decision of the Design Society Board of Management and Advisory Board to return to Mount Rigi in 2020 to commemorate the 20th anniversary of the Design Society (which now is as old as the millennium). The venue will be the same as in 2010 – meanwhile extensively renovated and now called “Hotel Rigi Kaltbad”. The unique atmosphere on Mount Rigi will probably be the same as in the 34 years before the 2020 event.

5 Balance

How to balance the early MeKoME/Alpina/Rigi period? What to balance? Some views:

Vladimir Hubka’s efforts

Hubka was an idealistic pioneer. He was on a crusade for Design Science, and the ships he established were the WDK group, the MeKoME/Rigi Meetings, the series of International Conferences on Engineering Design (ICEDs) and his theories and books. It is no secret that the acceptance of Hubka’s contributions was reluctant and he was often disappointed about the few reactions (and references) to his work, even at the Rigi Meetings. But we all eagerly utilised the framework he offered to us.

The impact on us

As the WDK group was gradually extended at and via the Rigi Meetings and the ICED conferences, it was possible to integrate both the well-established capacities in the field and (at that time) young scientists, at the same time broadening the range of countries and cultures. Many of us benefitted from knowing each other and cooperating in conferences, workshops,

publications. Some long-term collaborations and friendships developed, some of us gained reputation and, in consequence, attractive positions with the help of WDK, the Rigi Meetings and organising ICED conferences.

We all felt comfortable within this informal community of interested and interesting persons, not only discussing but also producing some remarkable results. Practically everybody was prepared to host and support ICEDs, to create and organise workshops and PhD courses on dedicated topics, everything based on gentlemen-agreements, often connected with high financial risk and considerable efforts.

Creating a new organisation

The Rigi Meetings sparked off intensive discussions about the future, both in terms of content (elements and procedures of a Design Science) and in terms of organisation. After very thoughtful preparations by a small group, led by Mogens Andreasen, Harald Meerkamm and Ken Wallace, the result was the foundation of the Design Society at the Rigi Meeting 2000. This was a risky step into an uncertain future. It has to be regarded highly that this step was taken with active participation and in absolute consent with Vladimir Hubka and the other founders of WDK.

The dreams/visions as formulated in 1999 were:

- To see a new generation take over
- To see consolidation
- To transfer the momentum and power of the present [WDK] activities
- To see a paradigm of Design Research and a recognised theory foundation be developed

Today, 20 years after the Design Society was actually founded, we may ask: Which of the challenges have been met successfully, which visions fulfilled, what is still to be desired?

The authors are optimistic that we are on a good way: Even though we now have structures and rules (which was a bit of a threat in the beginning, see under Rigi Meeting 1999), a lot of the friendly, cooperative, respectful atmosphere has been transferred into the new organisation:

- We have in fact a new and active generation at the helm, bringing in new ideas, structures and methods.
- We have an even increased momentum via the activities of Special Interest Groups (SIGs), Branches of the Design Society and a broad spectrum of workshops, all organised by members – some of them carried over from pre-Design-Society days (like the International DESIGN conferences in Dubrovnik, Croatia, and the series of DfX symposia in Germany), some new.
- We have a broad set of courses organised by members to train PhD/doctoral candidates in scientific rigour and to attract them to the Design Society – again some carried over (e.g. the Summer School on Engineering Design Research, SSEDR), some new (like the Summer School on Integrated Product Development, ipdISS).
- What is maybe most important: We see a remarkable amount of young researches at our conferences and workshops as the even next generation to take over in the future.

Appendix

List of persons attending the MeKoME/Rigi Meetings (affiliations at the respective time)

Andreasen, Mogens Myrup, Prof. civ.ing. dr tech, Danmarks Tekniske Universitet (DTU), Lyngby/København, Denmark

Badke-Schaub, Petra G., Prof. Dr., Technische Universiteit Delft, the Netherlands

Barátossy, Jenö, Prof., Budapesti Müszaki és Gazdaságtudományi Egyetem (Budapest University of Technology and Economics), Hungary

Beitz, Wolfgang, Prof. Dr.-Ing. Dr.-Ing. E.h., Technische Universität Berlin, Germany

Bercsey, Tibor, Prof. Dr.-Ing. habil., Budapesti Müszaki és Gazdaságtudományi Egyetem (Budapest University of Technology and Economics), Hungary

Biggioggero, Gian Francesco, Prof. Dr., Politecnico di Milano, Italy

Birkhofer, Herbert, Prof. Dr.-Ing., Technische Universität Darmstadt, Germany, Founding President of the Design Society 2001-2003

Birolini, Alessandro, Prof. Dr. sc.techn., Eidgenössische Technische Hochschule (ETH) Zürich, Switzerland

Blessing, Lucienne T.M., Prof. Dr.-Ing., University of Cambridge, UK, England, Assistant Director of the Engineering Design Centre (EDC), from 01.09.2000 Professor at Technische Universität Berlin, Germany

Breiing, Alois, Prof. Dr., Eidgenössische Technische Hochschule (ETH) Zürich, Switzerland

Boujut, Jean-François, PhD, Prof., Institut National Polytechnique de Grenoble (INPG), France

Cantamessa, Marco, Prof., Politecnico di Torino, Italy

Castelli, E., Prof. Ing., Politecnico di Milano, Italy

Chakrabarti, Amaresh, PhD, Prof., Indian Institute of Science (IISc), Bangalore, India

Clarkson, P. John, PhD, Dr. h.c., Prof., University of Cambridge, UK, England, Director of the Engineering Design Centre (EDC, successor of Wallace, K.M. since 2004)

Culley, Stephen J., Prof., University of Bath, UK, England

Dietzsch, Claudius R., Schweizerische Industrie-Gesellschaft (SIG), Neuhausen am Rheinfall, Switzerland

di Francesco, Giulio, Prof. Ing., Universita degli Studi di Roma “La Sapienza”, Italy

Donnarumma, A. Prof. Ing. Universita degli Studi di Napoli, Italy

Duffy, Alex H.B., PhD, Prof., University of Strathclyde, Glasgow, UK, Scotland, President of the Design Society 2003-2007

Dvoracek, J.V., Dvoracek Engineering, Zürich, Switzerland

Eder, W. Ernst, Prof., Royal Military College of Canada, Kingston, Ontario

Eekels, Johannes (Johan), Prof. Dr., Delft University of Technology, the Netherlands

Ehrlenspiel, Klaus, Prof. Dr.-Ing., Technische Universität München, Germany

Engler, Peter, Prof., Neu-Technikum Buchs, Switzerland

Eppinger, Steven D., PhD, Prof., Massachusetts Institute of Technology (MIT), Cambridge, MA, USA

Ferreirinha, Pedro, disciple of V. Hubka at ETH Zürich, founded the MIRAKON company ca. 1985 with a software for early cost calculation during design (HKB – Herstellkostenberechnung), at first situated in Bühler (close to St. Gallen), Switzerland, now in Trogen, Switzerland

Flemming, Manfred, Prof. Dr.-Ing. Dr.-Ing. E.h., Eidgenössische Technische Hochschule (ETH) Zürich, Switzerland

Finger, Susan, Prof., Carnegie Mellon University, Pittsburgh, PA, USA

Gero, John, Prof., University of Sydney, Australia

Hales, Crispin, PhD, Tryodyne Inc., Northbrook, IL, USA

Hegyháti, József, Dr.-Ing., Budapesti Müszaki és Gazdaságtudományi Egyetem (Budapest University of Technology and Economics), Hungary

Holt, Knut, Prof., the Norwegian Institute of Technology, Trondheim, Norway

Hosnedl, Stanislav, Prof., Západočeská univerzita v Plzni (University of West Bohemia, Plzen), Czech Republic

Hubka, Vladimir, Dr., Eidgenössische Technische Hochschule (ETH) Zürich, Switzerland

Ion, William (Bill), Prof., University of Strathclyde, Glasgow, UK, Scotland

Kammel, Dieter, Dipl.-Ing., Eidgenössische Technische Hochschule (ETH) Zürich, Switzerland

Kissling, Ulrich, Dr.-Ing., L. Kissling & Co AG Maschinenfabrik, Zürich, Switzerland

Koller, Rudolf, Prof. Dr.-Ing., Rheinisch-Westfälische Technische Hochschule (RWTH) Aachen, Germany

Kostelić, Aurel, Prof. Dr., Sveučilište u Zagrebu (University of Zagreb), Yugoslavia, later Croatia

Krause, Dieter, Dipl.-Ing., Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany, doctoral candidate of Meerkamm, Harald, now Professor at Technische Universität Hamburg, Germany

Lindemann, Udo, Prof. Dr.-Ing., Technische Universität München, Germany, President of the Design Society 2007-2009

Marjanović, Dorian, Prof. Dr., Sveučilište u Zagrebu (University of Zagreb), Yugoslavia, later Croatia, President of the Design Society 2013-2017

McAloone, Tim, C., PhD, Prof., Danmarks Tekniske Universitet (DTU), Lyngby/København, Denmark, President of the Design Society since 2019

McMahon, Christopher Alan, PhD, Prof., University of Bristol, President of the Design Society 2009-2013

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