

The development of research in the field of biomedical technology

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The development of research in the
field of biomedical technology

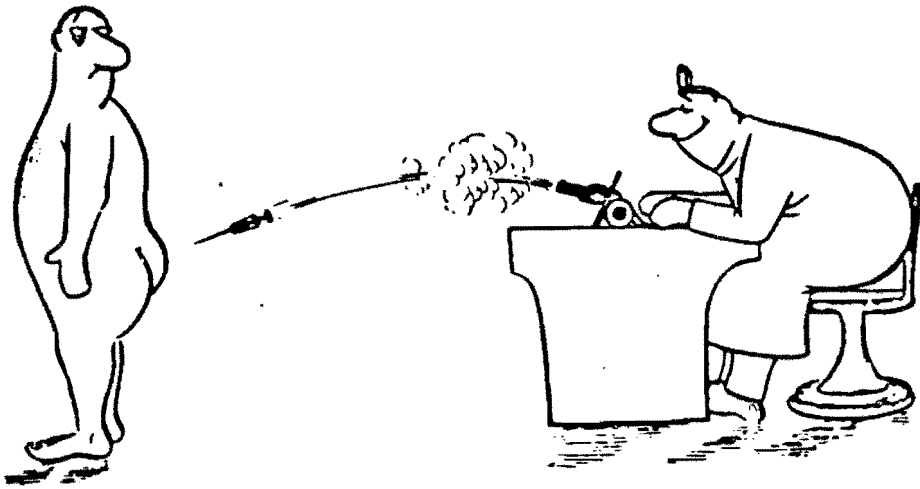
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slide 1



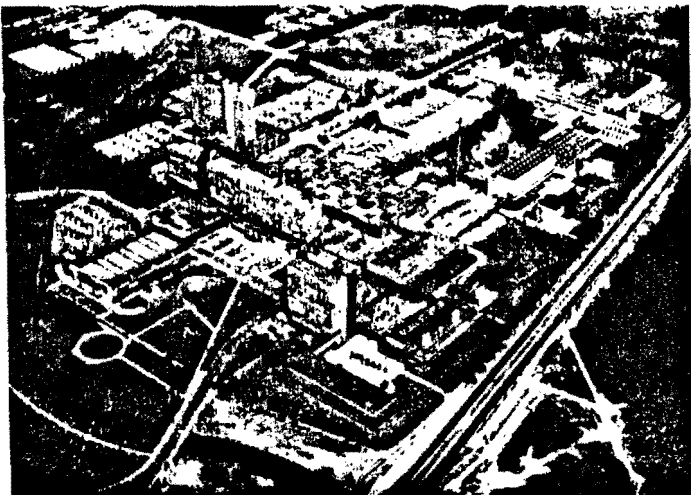
A product of biomedical technology

IN THE NETHERLANDS

- = 15% of the total research
→ health care
- universities / industry / other centres
3 / 1 / 1
- = 45 million Dutch guilders annually
→ biomedical technology
- Eindhoven University
> 50 full time manyear/year

slide 2

slide 3



Eindhoven University
of Technology
The Netherlands
BMGT/tb/ml/85.568/b
September 1985

BIOMEDICAL AND HEALTHCARE TECHNOLOGY

The development of research in the field of biomedical technology.

Lecture by A. Brouwers on the European Community Workshop on the Methodology of Economic Appraisal of Health Technology, Birmingham, September 1985 (Ref. BMGT/85.407).

-
- Defining the term biomedical technology quite often provokes long discussions.
 - Being not so useful in general, I would like to avoid this.
 - At our Eindhoven University of Technology this term is to be understood as all our activities by means of which scientific and technical knowledge and skills are applied to problems in health care and biology.

slide 1: A product of biomedical technology

Yust to give an example

slide 2: In the Netherlands

- From the total research capacity in the Netherlands in the order of 15% is directed to the field of health care.
- This research effort is divided over universities, industry, and other research centres in a ratio of 3 to 1 to 1.
- The annual investments in biomedical engineering research amounts 45 mlj. Dutch guilders (RAWB 1983) so about 11 mlj. English pounds.
- At our University alone the research capacity directed to biomedical technology is more than 50 full time manyear per year.

slide 3: THE

- This picture shows you the Eindhoven University of Technology.

Department	Scientist (manyear/year)
• Electrical eng.	3,6
• Chemical eng.	5,2
• Mechanical eng.	6,4
• Technical physics	8,0
• Architecture	0,1
• Industrial eng.	5,8
• Institute for Perception Research	25
total	54,1

slide 4

slide 5

IDEA-FINDING → NEW RESEARCH

- objectives ?
- criteria ?
- methods ?
- recourses ?
- organisations ?

slide 6

SOME DETERMING FACTORS

→ NEW RESEARCH

- local history
- availability of facilities
- disciplinary framework
- vision on man and society
- specific vision on what
is significant research
- coincidences
- research financing
- research partners
- some influences

slide 4: The research capacity of the THE

- As you can see in this slide our research capacity is spread out over various departments. The main subjects of research I outlined in this leaflet, you can get a copy of it after this talk.
- In this talk I will draw your attention to the very difficult process of idea-finding for new research activities in such a structure.

slide 5: Idea-finding new research

- For the given research capacity one can ask questions as:
 - Which objectives are important for research development?
 - Which criteria can play a role in this respect?
 - What methods can be helpful in finding such objectives or criteria?
 - Which resources might be useful?
 - How can we organise the reconnaissances and the decision making on this subject?
- All of you, being researchers yourself, will know that these are difficult questions. It would be fruitful once on a workshop like this to ask all the participants which processes led to the choices of their subjects for research. Certainly I cannot give you all the answers. What I can say about the idea-finding for new projects is based on our own struggles with these questions in the last decade.
- I skipped my original idea of presenting you a few of our concrete cases of systematic idea-finding. It would take too much time. I will restrict myself to give you some general aspects of this problem area. Above all I want to break a lance for more systematic attention to these questions.

slide 6: Determing factors → new research

- The existing culture in our institutions for research and education is continually giving rise to new significant research.
- To a great extent this is determined by aspects as:
 - local history,
 - availability of facilities
 - specific disciplinary framework
 (as a general rule one single field rather than a multidisciplinary field)

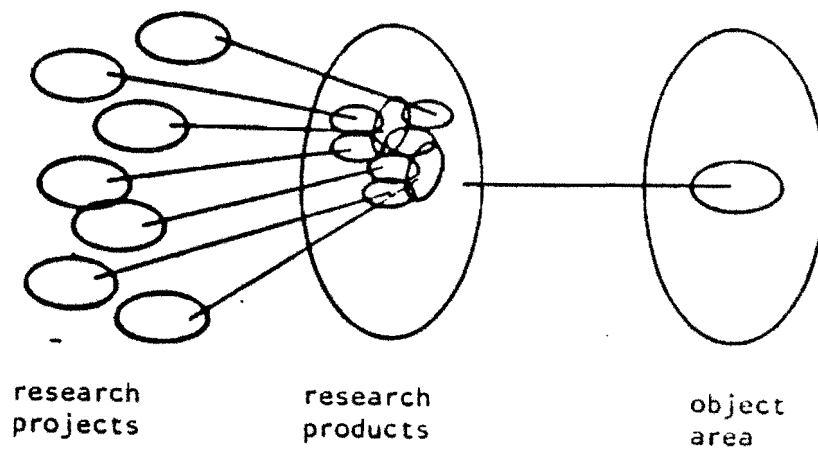
slide 7

RESEARCH CHARACTERISTICS

- limited aims
- self chosen
- from a specific scope
- using specific tools
- with specific constraints
- closed system

slide 8

RESEARCH PROGRAMMES AT A UNIVERSITY



- specific vision on man and society
- quite often dominated by that a specific vision on what is considered to be significant as new research
- coincidences
- possibilities for research financing
- research partners within range
- influences from scientific periodicals and meetings (and for a given research group this mostly a very specific collection as well).

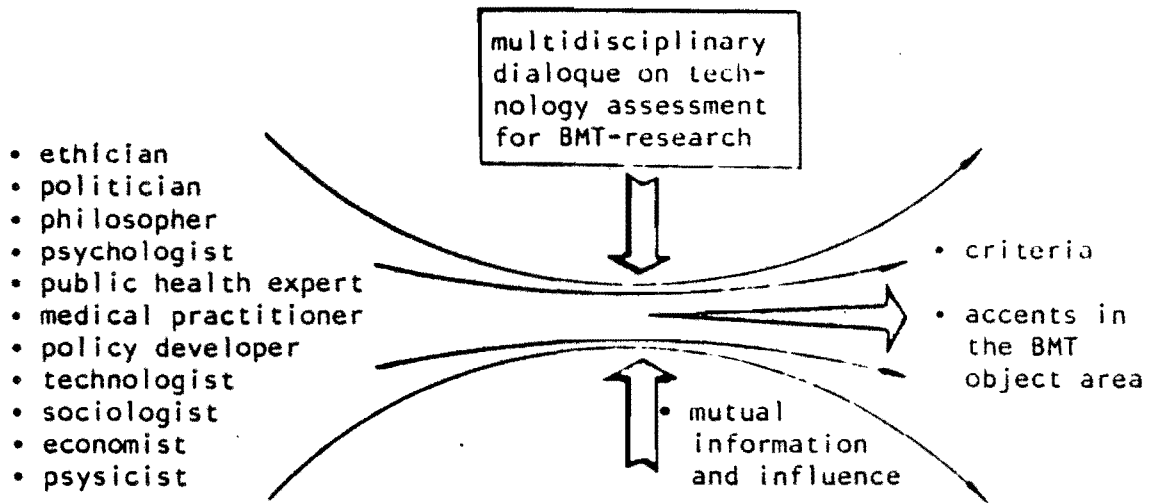
slide 7: Research characteristics

- Looking for improvements in the processes of idea-finding for new research activities one can start from the following (a bit provocative) characteristic picture:
 - A researcher (generally speaking) is directed to limited aims within a limited area of the total reality of a given field.
 - He works with specific tools of his own discipline, but also with specific constraints as well.
 - A research group mostly works on problems self chosen within the range of its own scope.
 - To a great extend a research process is enacted as a closed system.
- These statements should not be understood as a plea for changing the attitudes of researchers nor for changing their immediate scientific environment. Something like that would hardly be possible. Research projects do belong where the needed knowledge and skills are available at the highest levels. Well and this one normally finds in the monodisciplinary groups of experts at our universities. We have to accept the limitations going with this situation.

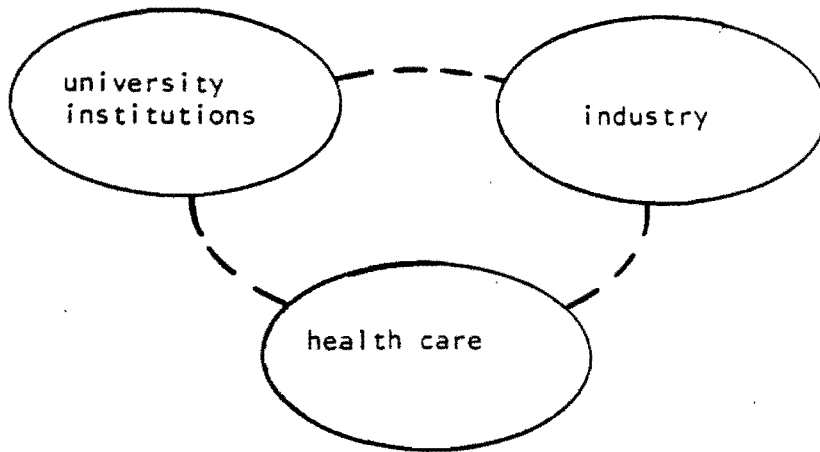
slide 8: Research programmes at a university

- However the objects of research we should try to select increasingly from a wider vistas than those present in the research groups alone. Moreover we should grow structures of research projects, all fitting as good as possible in the research groups, but with reachable research products fitting in one object area. Multidisciplinary steering frameworks are needed to realise such structures and to provide the necessary

slide 9



slide 10



coordination between such a set of research projects. You may call this some general wishful statements.

- Each researcher and in general each research or development group covers (I repeat) a very specific part in a total problem area. One always can distinguish strong points, characterising the research activities, and giving it a position in an overall picture. For each research project however one can always find weak points and constraints too, established from a broader scope of the reality.
- Now for improvements in the processes of idea finding for new projects first of all ways have to be found to structure a wider scope for the decision making than present in a given research group alone. I will present you some pictures now which may give some feeling for our approach in this respect.

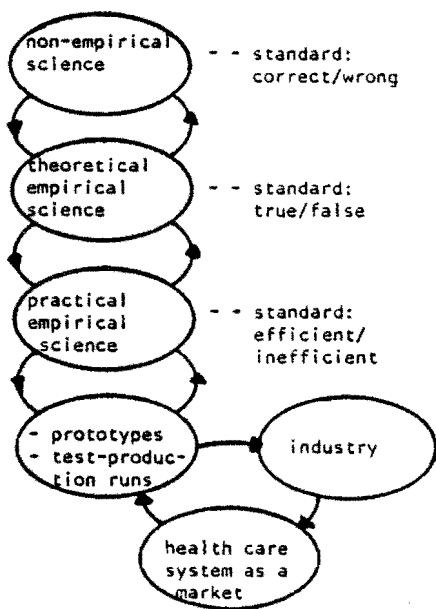
slide 9: A multidisciplinary dialogue

- We can't avoid of course to look for the future in multidisciplinary setups
- This picture gives an impression of the process of a multidisciplinary reconnaissance of a complex problem area. Such a reconnaissance with a variety of experts we experienced to be a very difficult process. For our cases such a reconnaissance lasted 1 to 2 year.
- At first sight the process of bringing such a set of experts close enough together on a complex subject, looks simple. However to make it really productive much care is needed for such a communication proces. We even developed a special working procedure for it, called SAM, explained in our paper.

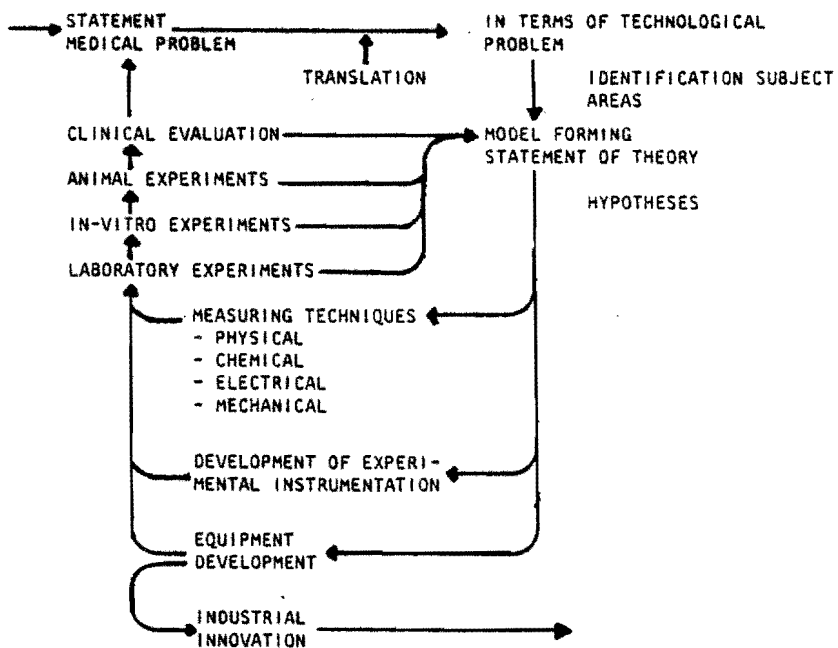
slide 10: Three different worlds

- In general, all of you will agree to that, more effective interaction between these different worlds has to be realised. We strongly believe that this will lead to better choices in research projects. The question remains how to realise this. Looking for answers to this question of course one has to look more in detail to these systems.

slide 11



slide 12

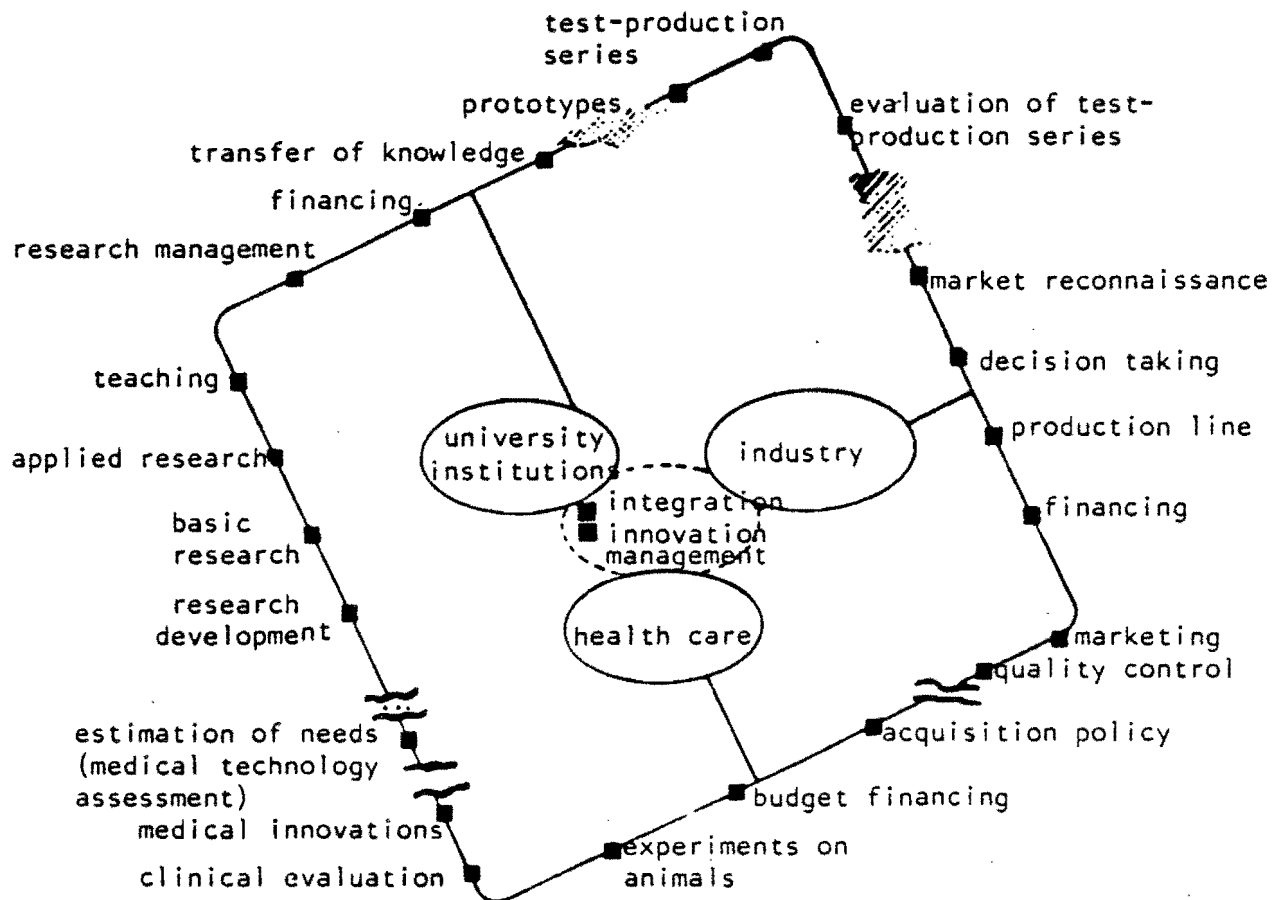


slide 11: Forms of sciences

- All of you will know the different realities in an university. What you may not be aware of so much is the tremendous gap between the so very different worlds of the more fundamental researchers and those active in applied research. This gap you can find in each discipline. Our research management interventions mostly are aimed to bridge the gaps of this kind.
- Between the medical clinicians and the applied researchers in technology there one finds in general a lot of interactions going on. They understand one another. Here many specific questions of medical doctors quit frequently lead to the development of new technical devices.
- However in many occasions the new devices coming out of this process turn out to be not so effective in the long run. Quit often one has to conclude that obviously one was lacking sufficient enough fundamental insight in the given subject looked to it from a wider frame work. The problem field of pressure sores, decubitus, turned out to be a good example for this phenomenon.
- Unfortunately the communication between the medical clinicians on one hand and the more fundamental researchers in technology and also in the medical basic sciences (such as fysiology, anatomy, chemistry) on the other hand we experienced to be much more difficult.
- Developing new research projects requires a lot of attention to these aspects.

slide 12: Process of BMT-research

- This picture tries to give you an impression of the multidisciplinary nature of research in the field of biomedical engineering. Normally a complete team of researchers from a variety of disciplines is needed. In general you have to grow an interuniversity cooperation to cover all the elements in such a research program. For each new research project in this field all elements shown here have to be considered.
- Our remarks yust made on the different forms of sciences do play a role here as well. Leaving a project to a fundamental group alone means that the research remains directed to the elements shown on the right side of this scheme. More applied researchers have there interest and strong points dominantly situated in the middle and left part of this scheme.



POINTS FOR RESEARCH DEVELOPMENTS

- multidisciplinary approach
- ethics
- ergonomics
- organisational aspects
- economics
- research attention elsewhere
- good fit in the own group

- In general, especially at universities, it is a not so easy task of research management to keep a good balance in the attention for all these research elements.

slide 13: The interconnection

- Here I sketch briefly the interconnection centring on innovation in the field of biomedical and health care technology. It is described in our paper. I should like to draw your attention to more gaps in this process which must be bridged before we can realise a merry go round effect for innovations in this field. Especially the gap between the research world and industry we found to be extremely difficult to bridge in many of our cases.
- It is accepted as a reality that we experience an industrial push of new technologies in the health care systems (shown here in the bottem part).

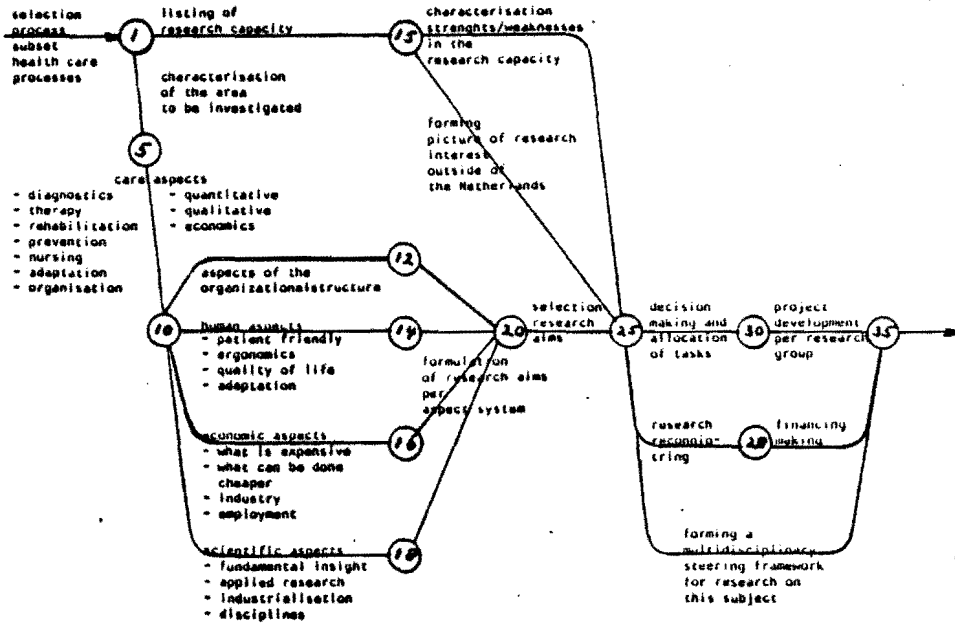
These new technologies in health care systems are subject to studies of medical technology assessment and economic appraisal. All of you know a lot more about this than I do. Although these studies are not so easy you managed to develop effective methods and to sort out tangible information in these complex realities. Your work in this field is considered to be increasingly succesful and useful.

- However nobody will have doubts about the needs, which the industry has for a similar attention to there processes of idea finding for new medical products. For this purpose the industry has its tools of statiegic management and product marketing. But we experience quit a gap between these industrial reconaissance and the findings in all these studies of economic appraisal and medical technology assessment. We strongly beleive that more interactions between these two sets of activities will be very fruitful, macro economically speaking.
- Well and in the same line it will be very worthwhile to find ways to considerations from MTA and economic appraisal already in the course of development of new research at our universities.

slide 14: Starting points

- To find some general criteria or objectives for the development of new research we started a special reconaissance with a large number of

slide 15



slide 16

A ROLE FOR ECONOMIC APPRAISAL

- not much utilized yet
- integrated in our working procedures
- not in using economists methods
- but in increasing joined operations

different experts in various fields. This communication process, following our SAM procedure, produced over a hundred suggestions.

- From this reconnaissance a small list of main points was obtained, which any how should be considered in each process of project development. They are listed in this slide. More details are discussed in the paper.

slide 15: Working scheme

- I am still dealing with methods to grow a wider vistas than those present in one research group alone. In this working scheme I give a sketch of how we believe that a reconnoitring of a certain area in health care can be structured. May I again refer to our paper for a more detailed description.
- If we are really willing to leave our more or less isolated research situations and grow indeed an European cooperation in this field, working schemes like the one given here have to be adopted.
- Most of the ideas and methods presented here are created in interaction with project developments for given research groups. In this respect it is a so called bottom up approach. However for many reasons we have to structure also a top down policy in this field. The main reason for that being the fact that in most cases the needed total pictures can not be organised from one institution alone.
- In a top down approach, among other things, ways have to be found to select part areas in health care which should obtain more priorities for research development. Health care systems form a complex field, difficult to survey. One has to decide upon a method for reduction of the total area. Well chosen part areas should be made subject of MTA-studies in wide multidisciplinary setups. The European Community might provide a suitable frame work for structuring such a top down policy.

slide 16: Economic appraisal

- I wanted to conclude with some final remarks on economical aspects. Much about this has been said yesterday already. Yust for completeness I will still mention our points in this respect.

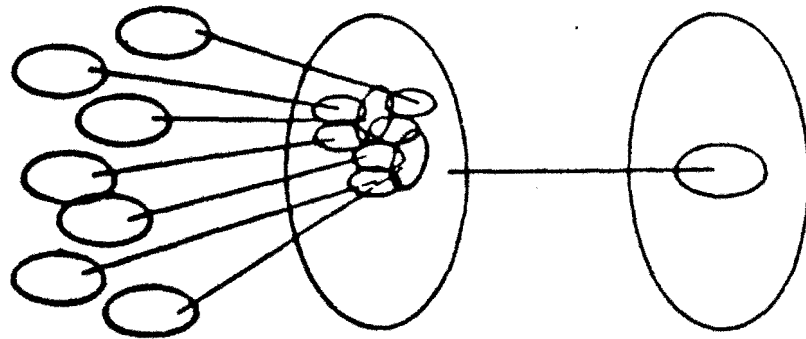
- Developing new BMT activities economic aspects usually are not neglected but in general do not have a very strong influence yet. Ways have to be found to improve this situation.
- In general it will be certainly economical to find ways to MTA consideration already in the course of development of new research. In such an approach the economical appraisal of several alternatives has to be incorporated as well. In our working procedures presented here you find already the need for cooperation with economists in developing new research.
- Economy being a not so easy discipline in itself one cannot believe that outsiders once can utilize the methods of the economists so easily on their own. We are pleading for more continuous processes of interactions, directed to mutual decisions for new activities in this field, where economists fit in themselves with the applications of their methodology. In this field improvement cannot be obtained really if we are not finding each other in actual fruitful cooperations.

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BIOMEDICAL AND HEALTH CARE TECHNOLOGY

Some aspects of a research programme at a university.



research	projects in various research groups	coherence in objectives	object area
criteria	scientific standards in research groups	standards for management of a research programme	needs of society
judgement	in research groups	in steering framework for research programme	from a wide vistas on a relevant part of society
experience in the university	sufficient	not much	very poor
improvements	not needed	<ul style="list-style-type: none"> • contacts with large industries with research division of their own • contacts with well known research institutions 	<ul style="list-style-type: none"> • medical technology assessment reconnaissances in wide multi-disciplinary setups • interuniversity cooperation