Project
Modernization, Values, and Orientations towards Technologies within the German Public

Perception and Attitudes towards Risks and Hazards of Genetic Engineering within the German Public

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Within the framework of this Concerted Action a couple of working papers have been prepared. Some of them are already released, others will be printed during the next weeks. At the moment the list includes:

Nr. 29 Tibor Kliment, Ortwin Renn und Jürgen Hampel 1994: »Chancen und Risiken der Gentechnologie aus der Sicht der Bevölkerung«. (ISBN 3-930241-30-7)

Nr. 87 Jürgen Hampel et al. 1997: Einstellungen zur Gentechnik. Tabellenband zum Biotech-Survey des Forschungsverbunds »Chancen und Risiken der Gentechnik aus der Sicht der Öffentlichkeit«. (ISBN 3-932013-10-7)

Nr. 99 Jürgen Hampel und Uwe Pfenning 1998: »Biotechnology and Public Perception of Technology. The German Case«. (ISBN 3-932013-24-7)

Nr. 106 Michael M. Zwick 1998: »Wertorientierung und Technikeinstellungen im Prozeß gesellschaftlicher Modernisierung. Das Beispiel der Gentechnik«. Abschlußbericht aus dem Projekt »Chancen und Risiken der Gentechnik aus der Sicht der Öffentlichkeit« der Akademie für Technikfolgenabschätzung in Baden-Württemberg«. (ISBN 3-932013-32-8)

Nr. 108 Gerhard Keck 1998: »Wahrnehmung der Gentechnik aus der Sicht von Schülerinnen und Schülern.« (ISBN 3-932013-34-4)

Nr. 111 Jürgen Hampel 1997: »Die europäische Öffentlichkeit und die Gentechnik - Einstellungen zur Gentechnik im internationalen Vergleich.« (ISBN 3-932013-37-9)

This report is based on a lecture presented at the Annual Meeting of the *Society for Risk Analysis Europe (SRA)* Stockholm, June 16, 1997. I like to thank Ortwin Renn for various comments and constructive criticism, which led to the improvement of this paper. I owe Juergen Hampel special gratitude, for managing the Concerted Action, and providing me with quantitative data. Last but not least thanks to Ortwin Renn, Johnny Huber, and Sabine Mücke for proof-reading the paper and improving its legibility. The author takes full responsibility for the theses reported. The conclusions drawn in this paper need not be identical to the opinion of the Center of Technology Assessment in Baden-Württemberg.

1. Introduction

»Which resources do people mobilize for gaining orientation and jugdement ability if they are confronted with a new and not yet well known phenomenon as for example genetic engineering?« This is a central question of a sub-project within the concerted action »perception and attitudes towards risks and hazards of genetic engineering within the German public«. Amongst German public, most people feel unfamiliar with genetic engineering, although public discussion seems intensified during the last months. On one hand, the proceedings of cloning animals, the controversy about the release of genetically designed plants on approval, or the rising public demand for labeling genetically manipulated food might have affected people's opinion. On the other hand, one can imagine that genetic engineering can be perceived as a *symbol* and be embedded in a wider semantic context, too: A key-technology that stands for modernization, for the business-world, economic, ecological and risk globalization, even for a technocratic remodelling of the world, might induce feelings of presumption, uncertainty of risks and detriments, and could arouse assoziations to the history of nuclear power or the proceedings during the infamous Third Reich.

In fact, we can only speculate about the pictures, people sketch out about the phenomenon of genetic engineering, and we do so with regard to the mechanisms of gaining orientation and value judgement.

Thus, the sub-project pursues two main objectives: First to clarify the semantic space of that technology in public opinion based on qualitative data, and, second, to develop hypotheses and instruments answering the question of how and why people judge genetic engineering as they do. Hereby we particularly discuss what concepts of risk are available and to which extent the assumptions of risks and hazards are used in constructing value judgements. To explain the variations in assessing genetic engineering and its risks, we secondly pursued a cultural approach: Inspired by insights derived by qualitative data we assume that orientations and judgements are borrowed from specific value patterns.

2. Material and Methods

The interpretations are based on 48 qualitative interviews. 24 of them were carried out in 1995, 24 in the winter 1996/1997. Due to the attempt, to construct a »grounded theory«[1] of how people think about genetic engineering, an interview guidance plan was developed meant to match the appropriate thematic frame. On one hand, the interviews were focussed on orientations towards technologies, on the other hand, the

open questionnaire offered a wide frame for respondents to depict and narrate experiences they had made with technologies during their life-course. The questions on how orientations towards technologies emerge, focused on the perception of the parent's occupational or private experiences with technologies, on the interview partner's playing behaviour during childhood, on the experiences made in school, on vocational training, on experiences within the own profession, on leasure time activities, and on the most recent impressions on contemporary issues. All these responses provided important informations answering our key-question: »Which are the resources people use to mobilize in gaining orientation and jugdement ability when a new and not yet well known phenomenon, as for example genetic engineering appears?«

The research was based on the assumption that people use to activate proved and habitualized »lifeworld«-ressources[2] treating ambient phenomena. Therefore all the interview partners were asked about their views of nature, of human beings and the concept of the world, analogies to similar technologies, optimism or pessimism of the future, their understanding of progress, where loyalties or oppositions in modernization were expressed, about their emotions, aesthetical preferences, their conception of quality of life, their private or occupational objectives, about the political responsibility and performance according to the future of the society. When they were asked »what do you think about genetic engineering«, they were given the possibility to mention any other thoughts, feelings or reasons towards this subject, for example religious, political, or risk specific ideas. Furthermore, the question deliberately did not focus on a special field of application. It was up to the respondents to refer to any aspect of genetic engineering in their responses. The interviews took from 40 to 150 minutes with an average of 1 hour.

In a sense of constructivistic procedure, no definition of genetic engineering was prescribed. According to the so-called »thomas-theorem«[3], genetic engineering is, what people believe genetic engineering to be.

The empirical results are based on an intensive evaluation of 48 narrative open interviews with lay people and »professionals« in the field of genetic engineering. Since the main attention was directed to public orientations and value judgements, two thirds of the interview partners were sampled from laypersons and one third from professionals and semi-professionals.

The interview partners were selected using the method of a »theoretical sampling«[4]. To gain a higly valid impression about the semantic space of genetic engineering in the public, it was necessary to interview people »as heterogeneous as possible«. With regard to some questions, it seemed to be advisable to distinguish between »professio-

nals« and »laypersons«. In contrast to »professionals« laypersons do neither have professional knowledge nor are they working as experts in the field of genetic engineering. However, it was necessary to introduce a third category: Between »laypersons« and »professionals« there exists a grey area of people who do not belong to any of these two categories. They are called semi-professionals. »Semi-professionals« are planning or carrying out large scale technological projects. But also people, who are dealing with technical or economical risks within their profession, who are directly involved with biotechnological projects but who are not biologists or other technical experts, belong to this group. They may be involved in genetic engineering projects in the role of politicians, financers or traders or any other kind of stakeholders or interest groups. These people have specific viewpoints and interests, in some regards they differ from the two other types and constitute a category of their own.

The theoretical sample was drawn from people with as different attributes as possible. First, we chose people of different socio-demographic characteristics like age, sex, occupation, level of education, marital status, and so on. Second, due to Bourdieus' analytical scheme, we payed attention to select people with a diverse composition of economic, social and cultural resources.[5] As it seems to be possible that technologically centered orientations are related to specific value orientation pattern - symbolized as lifestyles - some interviews were made with people showing a salient lifestyle - for instance punks, ravers, or people demonstrating a particular preference for technical artifacts with a high symbolic value, for instance cars.

This procedure guarantees a high variation of the empirical data. The process of identifying respondents was continued, until we found a saturation with respect to aspects, arguments, and value judgements towards genetic engineering. Even thereafter, some more interviews were conducted, first to gain more certainty about impregnation of variance, secondly to improve the empirical opportunity to typify characteristic patterns of orientation towards genetic engineering.

The analysis of the data is rather complicated and time-consuming. Thus work is still in progress. First of all it was necessary to transcript the material. Secondly an appropriate analytical scheme was constructed to interpret »topic by topic«. During the empirical work, I developed »characterization sheets« for analyzing and typologizing data, one for each topic and each case. Until now concepts of genetic engineering have been completed for all 48 interviews according to the scheme shown in the first table (Fig. 1).

Fig. 1: Characterization Sheet of Genetic Engineering

T06: Mrs. H., 63 y. married, 1 child, basic education, housewife					
Field of Application	**Aspects**	**Criteria**	**Evaluation**	**Argument**	**Quality of Evaluation**
1. Genfood	Food in general	naturalness trust control	negative	not natural (labeling required)	emotional (distrust) value rational
2. Prenatal-human genetics	in-vitro-fertilization	naturalness presump-tions	negative	not natural presumption: humankind against nature	value rational (nature as standard)
Summary: Mrs. H. feels not very good informed about genetic engineering. Her negative evaluation of this technology extends to two fields of application - genfood and i.v.-fertilization, and is mainly based on value-rational reasoning. Hereby, nature and naturalness play the role of a rather universal criterion.					

Complete Transcript about Genetic Engineering; Interview No. 6

T06.1.418 »What do you think about genetic engineering?«

T06.1.418 »Oh these - how one call it? - genetic manipulations? I'm against it! I think, this is not only concerning food. This is too unnatural to me, thus - I don't know how to express it - I don't have any trust in such food. If they were labelled, I wouldn't buy them.«

T06.1.429 »Should they be labelled?«

T06.1.429 »Yes, absolutely.«

T06.1.429 »What other fields of application do you think of?«

T06.1.430 »So, for instance test-tube babies - I am really against it, too! I think, one should not work against nature in such a way.« (Pause)

T06.1.433 »Something else, that you remember about genetic engineering?«

T06.1.433 »Nothing, at the moment.«

T06.1.434 »Where and how do you have informed yourself about genetic engineering?«

T06.1.435 »Oh, only through TV and magazines.«

T06.1.437 »Would you say that you feel well informed?«

T06.1.437 »No, not so good. One is not informed as long as food is not labelled. I can only feel being informed, if I know 'yes, this is genetically modified and that one is not'. Then I'll really choose a natural one, which is grown like in earlier days. Such food I can trust.«

Views of nature, opinions about risks, expectations or rather benefits, attitudes towards future - optimism or pessimism -, and progress, by which loyalty or opposition in modernization is expressed, were analyzed for the first 24 interviews. Each »type« is structured the same way: It consists of one row and six columns for each thematic area.

For the purpose of demonstration, figure 1 contains an example which is not very complex but is - as we will see - somehow significant for public orientations towards genetic engineering. However, in some cases these »characterization sheets« stretch out over one and a half pages.

The first column contains the label of the subject area - for instance »genfood«. Since most people are not used to argue in a very abstract format, the second column contains the example on which the subject area has been expressed - maybe »tomatoes«. The third column describes the specific standards that are constructed by the interview partners to handle and judge a topic, for example »nature«. The fourth column represents direction and intensity of the value judgement on a scale between 1 i.e.»very good«, 4 meaning »sceptical« or »ambivalent« to 7, meaning »very negative«. The arguments used by the respondents are listed in the fifth column, for instance »unnatural«. Last but not least, the »logical status« of the value judgement was written into the sixth column, for example »value rational«, »emotional«, »instrumental-rational«, »ethical«, »categorical« or »aesthetical«. All information of each »prototype« was transferred into a large data base providing an interface to a statistical package as a means to gain an easy access to analyze the data, compare different cases, identify specific patterns, and explore the data for appropriate typologies. However, statistical data analysis must be used with caution since it is not allowed to draw any quantitative generalization from the qualitative data. This kind of qualitative material can claim to offer a very comprehensive perspective of orientations towards genetic engineering. It provides a highly valid understanding of what the semantic space around biotechnology is, and what the most crucial resources are that people mobilize in order to gain orientation and judgement.

The methodical design was completed by a quantitative survey, based on a German-wide representative sample of 1.501 16 year-old and older persons, carried out in 1997. Within this survey a couple of items and scales - for example views of nature and value orientation patterns - were tested, whose constructions were drawn out of qualitative data. The analyses presented in chapter 5 rely on this biotech-survey.

3. General Orientations towards Genetic Engineering within the German Public

How do people perceive genetic engineering? With respect to the double character of genetic engineering - application to concrete fields and its symbolic meaning - the investigation of the opinions that the public associates with this technology, is not trivial. If we discuss technological risks, the prevalent views on technology and its predominantely perceived applications will probably influence the result.

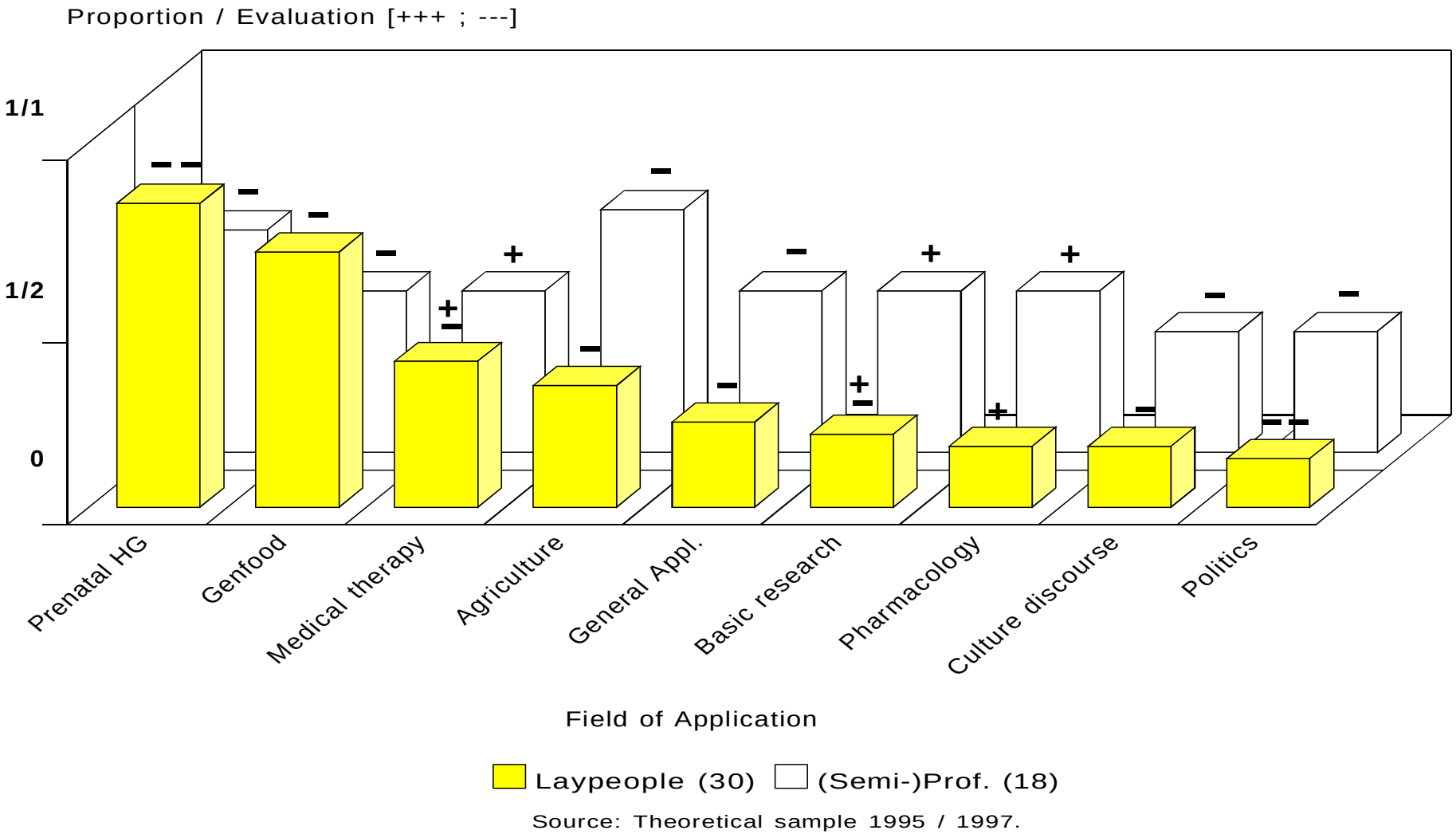
The first row of the following table (fig. 2) shows the most important fields of application as reported by laypersons. The second row shows the proportion of applications as reported by semi-professionals and professionals. Above each bar, the direction of the value judgement is symbolized, where the range extends from triple plus, meaning »very positive« to triple minus, standing for »very negative«.

Most interview partners were not used to discuss genetic engineering in an abstract, theoretical way. Even in the case of sweeping statements, these judgements were exemplified by refering to concrete applications. Amongst the group of laypersons, the view of genetic engineering seemed to be dominated by two applications: 25 of the 30 laypersons mentioned »prenatal human genetics«: This topic covers prenatal diagnostics, manipulations of the germline, cloning of human beings, and in-vitro fertilization. It arouses the most negative judgements among all interview partners. The second application that seems to affect laypublic opinion, is »genfood«. A little bit more than two thirds of the laypersons and a smaller portion of semi-professionals and professionals listed this application, associated with moderate negative connotation.

The most important field of application mentioned by semi-professionals and professionals has been agricultural application, including topics like nutrition of the world or manipulating domestic animals or plants. Value judgements are rather negative, partly because of the risks of proliferation of genetically modified organisms, or because of the perception of a somehow »wrong logic«: Many interview partners, speaking on this topic - laypersons as well as professionals - insisted that hunger in third world countries has been a consequence of political and economic malfunction, and there is no need for solving these problems by technological means.

In contrast, the production of drugs by genetic technology, which is more or less approved by both groups, is mentioned only by one sixth of laypersons and a bit more than half of the semi-professionals and professionals. The same pattern seems to be right for the application of genetic engineering in medicine particular for cancer therapy.

Fig. 2: Reported Fields of Application by Groups of Interview Partners



Source: Theoretical sample 1995 / 1997.

In all of our subpopulations instrumentally-based conclusions were rather positive, whereas categorical, ideological or system-critical based evaluations were particularly negative.

The data analysis so far justifies a first conclusion: There seems to be only a small difference between professionals and the lay public in perceiving genetic engineering: All in all laypersons come to a slightly negative, the protagonists of the other group to a sceptical or an ambivalent overall judgement. Among professionals, the perception of genetic engineering extends to a larger range of application, whereas the view of the lay public is rather clearly shaped by only two fields of application - prenatal human genetics and genfood. Both are evaluated predominantly negatively.

Judgements vary also with respect to the basis of evaluation: In essence, judgements based on instrumental-rational reasoning lead to a more positive view on genetic engineering than all other kinds of judgements. Instrumental-rational reasoning, however, plays a remarkable role only among semi-professionals and professionals. On the part of the laypersons, only one fourth of the judgements are based on instrumental-rational thinking, however, the clear majority of judgements is »lifeworld-based«, which includes value-rational, ethical, religious, aesthetical or emotional reasoning.

The rather small differences between the view of professionals and the lay public may be surprising. However, the group of professionals has been defined extensively. It consists of all persons who are biologists, and who have a professional knowledge about this technology. If we selected only these persons who actually work in genetic engineering, especially in highly responsible positions, we would find much more enthusiasm, extending at least to the field of application in which these persons do active work. In these cases, approval is marked not only by material interests but also by their professional ability to form their environment in a relevant and desirable way. More or less, all these people can be characterized as pure or at least moderate technocrats: Appropriate strategies for solving problems are predominantly considered to be technical ones. For instance, interview No. 7 shows a considerable euphoria. Mr. H. is 44 years old. He is working as head of the public-relation-department in a large German car-company: *»Due to my modest knowledge, ... like the renewable energies, I understand genetic engineering as a great chance to save the whole world...«.*

4. Risks and Hazards: The Reasons for Scepticism

With regard to the semi-professionals and professionals, risk seems to be the key-variable in dealing with genetic engineering. As the next table (fig. 3) shows, every professional, three quarters of the semi-professionals but only every second layperson mentioned one or more risks in connection with genetic engineering. In average, laypersons mentioned 1.6, semi-professionals 2 and professionals 3 different kinds of risk.

More important than the number of risks is the question: »What understanding of risk governs the thinking of each of the three groups?« One distinction is whether risks are reported as technical risks or social hazards. Two thirds of the interviewed laypersons, each second professional but only one quarter of semi-professionals refered to social hazards. An assessment of quantitative risks was absent among the German public: None of our laypersons, and only a small portion of semi-professionals and professionals tried to estimate risks in a quantifiable manner. Only one quarter of laypersons and semi-professionals, but four of six professionals mentioned that they tried to balance risks and benefits.

For the lack of quantitative parameters and appropriate knowledge, such balances are rather qualitative than quantitative. This is true even for the most professionals of our theoretical sample. A typical answer refers to interview No. 55, Mrs. S., a 39 years old female doctor of biology, director of a molecular biological company: *»... Genetic engineering contains incredible many chances and many great things, but there are also risks included, which one should reflect upon. And where you have to ask yourself over and over: 'Is this o.k., what I am doing?' ... If these are great risks or not, this is left to each individual. It is hard to assess, if these are great risks or not. I think, the opportunities genetic engineering contains, are much more important. But the risks should not be neglected.«*

The next question is, how risk-related judgements are justified: Amongst the laypersons, judgements are based mainly on value-rational, ethical, or emotional reasoning. This is true also for semi- and professionals, but in these two groups, instrumental-rational judgements play a comparably relevant role. Thus, semi-professionals and professionals exhibit a more complex orientation towards risks.

After all, the most interesting question is: ›what subjects do people associate with risks?‹ Each interview partner had the opportunity to relate risks to different fields of application and to develop - if desired - multiple aspects and arguments.

Fig. 3: Genetic Engineering: Selected Attributes of Risk Assessment by Groups of Interview Partners

	G.E.-PROFESSIONAL?			
	Laypersons	Semi-Prof.	Profess.	Total
Total cases	**30**	**12**	**6**	**48**
Risks reported? Yes	15	8	6	29
(Proportion)	50%	75%	100%	60%
Number of risks reported	24	16	18	48
Mean	1.6	2.0	3.0	2.0
Valid cases	**15**	**8**	**6**	**29**
Type of reported risk Social hazards:	10	2	3	15
Risks and benefits balanced:	4	2	4	10
Quantifiable risks	0	2	1	3
Quality of judgement (mult. responses)				
instrumental-rational	3	5	6	14
value-rational/ ethical/religous	12	4	6	23
aesthetical/emotional	4	4	3	11
categorical	0	0	2	2
ideological/cultural-/ system-critical	0	2	2	4
sceptical/ambivalent	4	2	3	9
historical	2	1	0	3
N of judgements (N)	25	18	23	66
Valid cases	**15**	**8**	**6**	**29**

Let us first consider the group of the lay public: 12 out of 15 laypersons who mentioned risks, related risks to prenatal human genetics, and 11 to agricultural and food-applications. These three fields of application attracted nearly 80% of all risk arguments. One single argument was dominant: 12 of 15 laypersons fear an *abuse* of genetic engineering by criminals, by politicians, irresponsible entrepreneurs, or in general, by humankind. This fear is related to genfood, but on an even higher scale to prenatal human genetics. The German public rejects cloning or manipulating human beings. People are concerned about social selection and its consequences, due to imperatives of the political or economic system, for example loss of tolerance for disabled people. Particularly some of the older interview partners explicitely mentioned the »Third Reich« as horrifying example for the abuse of human genetics. A considerable number

of persons expressed a general mistrust against humankind. Let me cite a well pointed but not untypical answer, given in interview No. 7 with Mr. A. He is 71 years old and retired. In earlier days he was a public official. *»Surely, genetic engineering is a progress in medicine, but, as I noticed already: 'Humans tend to abuse everything, everything, everything. Every invention, every progress. And the abuses of genetic engineering, surely, cannot be assessed until now. Basically, one will be able to ascertain now, that benefits and detriments are to be interpreted more to detriment... You can breed a certain kind of human beings and there, I see a great danger. We already had a regime, which tried to breed human beings ... I can even imagine, that one day, people are produced only by lack of spare parts. These criminal elements rob people - not money but people -, they will exploit them and sell their parts for money. And thus, I like to say, due to such considerations, my horror is big.«* All laypersons who reflected hazards in combination with human genetics came to an extremely negative judgement. The second most frequently used argument refers to uncertain and unknown potentials of benefits and detriments. But only half of those discussing abuse mentioned benefits and detriments. When they did, the judgements of risks were ambivalent if not sceptical.

Amongst the group of semi-professionals and professionals, considerations of risks are much more widely spread. Most of them think about »applied genetic engineering«. This includes particular aspects such as genetic engineering as a tool, but also applied tests and deliberations of manipulated organisms. The usual attributes of risk like reversibility, probability, and the assumed extent of detriment are important for them. In the same way, regulation and control play an important role for judging the balance between risks and benefits. In general, the judgements are sceptical or ambivalent. The second and third position refer to prenatal human genetics and the shift of interpretation of our world by genetic engineering. In both respects, the value judgements are clearly negative, based on various arguments. The risks of agricultural applications takes fourth position. It also triggers clear negative evaluations. *The most important argument is the objection against natural sciences for providing only missing, bad or paradoxical expertise and information strategies to influence public policy.*

Our findings show that there is a considerable difference in discussing risks between laypersons and professionals. Laypersons particularly associate social hazards with genetic engineering, professionals prefer technical emphasis and procedural aspects of risks. Because suspicion of abuse is wide-spread among the lay public, there seems to be no institution trustworthy enough to regulate and control its problematic applications: In contrast, entrepreneurs, politicians or administrative institutions are guarding against abuse. Their perception is closely related to technical risks, they exhibit a much smaller fear of abuse, they have more confidence in the German economic and political system. Overall they are less radical in their judgements.

In addition, our data show that laypersons in particular link the hazard of genetic engineering with social abuse, particularly in the fields of human-genetics and genfood. There is a considerable social mistrust against almost everyone: politicians, entrepreneurs, humankind. The risk-based objections against genetic engineering are less related to the impacts of the technology but refer to the assessment of the social and political situation in Germany. Obviously, this reflects not only German history but also the present situation, which is characterized by pessimism, mistrust, alienation, and retreat into privacy. With regard to genfood, politicians are largely made responsible for this condition by some respondents: A Government trying to camouflage the application of new technologies will lose trust.

5. Orientations towards Genetic Engineering and its Risks - Personal Factors

So far, the discussion focused on the symbolic meaning of genetic engineering. But our data also points to a considerable variation in the orientations of the interview partners: Variations which affect the prevalent views of nature, the perception of risks, optimism and pessimism, conformity or distance to the political and economical system, its protagonists and institutions. Thus our data indicate that orientations towards genetic engineering depend not only on symbolic or value-related aspects of the *technology*, but equally important on the *value orientations* of the interview partners.

Within the past two years, a standardized indicator to measure specific patterns of value orientation was developed by the author using qualitative data.[6]

The next table (fig. 4) shows six patterns of specific value orientations. They affect orientations towards genetic engineering, concepts and acceptance of different kinds of risks, specific orientations towards nature and others. Especially the two left columns, describing patterns of value orientations, and the fifth and sixth columns, which contain orientations towards genetic engineering and risk, are of special interest.

Most positively inclined towards accepting genetic engineering, are the representatives of the *TECH*[7]: the *technocratic orientated, liberalist social climbers*. Their objections center around success, prestige, and power. They utilize technologies as a means to reach economic and social goals. Being progressive and future-optimistic, they have a clearly positive orientation towards technologies. More than this: Among this group one could find market individualists for whom risk serves as a base for business. Thus they will be risk-seeking. Finally one can expect them to conform with a political and economical system, which permits them to obtain everything they gain for.

Fig. 4: Archetypical Pattern of Value Orientation, Pictures of Nature, and Orientations towards Genetic Engineering and Risks[8]

Value orientation	Goal	Code	Nature	Genetic engineering	Risk
KALT: 7% Social-critical, culture-pessimistic alternatives	Postmaterialistic kind of selfactualization, egalitarism, emanzipation, participation.	Critics of modernity. Moralist scepticism, political protest for security, protection, conservation, social matters, health, and ethics of renunciation. Intense critics of technologies and technocracy.	Vulnerable and endangered foundation of life (health, beauty, holiness, completelyness).	Mostly value-rational motivated, intense rejection of GE. Social politics, sufficiency, and decline of social unequality are more important than technological innovation.	»Zero risk«. Often fundamental opposition against external risks and »risk-technologies«.
INGE: 2% Modernized enjoyment-orientated individualists	Absolute pleasure - antiascetic and anti-conventional self-actualization. Individualism.	Pleasure, action, risk. Pleasure as philosophy of life. Anti-conventionalism, and -institutionalism.	Robust and valuable resource for leasure time and individual pleasure. Looking for purity. Thus rejection of external destruction of nature.	Mostly large distance to phenomena which could burden the individual feeling for life.	Partly high acceptance of risks in leasure time (challenge). Refusal of external risks.
KOBU: 16% People with conventional civic orientations	Comfort, unburdened life on a middle-range level of standards, high-class level, security, order.	Realistic goal-adaption, legitimate way of attainment means, protagonist of civic virtues like order, industriousness, honesty etc.	»Romantical« views of nature. Idyll, based partly nostalgical, partly aesthetical.	Large-scale technologies don't fit with the overseeable view of life. Little interest and information. No or elementary judgements: for instance rejection because of unnaturalness.	No fundamental rejection. Acceptance if high standards of security, economic compensations, control and regulations are guaranteed.
REAL: 35% Liberal-minded pragmatic realists	Balanced model of life. Versatile concept of quality of life. »Get the most out of life!«	Versatility, undogmatic adaptability, pragmatism, willingness to compromise.	Resource for production and reproduction. Perspective of balanced interests.	Partly acceptance only if benefits outrun risks, and a high level of regulation and control is guaranteed.	As much as necessary, as less as possible. Needs for regulation and control.
ASKO: 10% Orientation towards ascetical-conservative establishment	Elitist model of life, privileges, demonstrative style of consuming, emphasized distinction, »genuineness«.	Conservatism, strategical - use of cultural, economical, and social resources. But also underline of ascetic principles.	Resource for production and reproduction. Underlines value-conservative based limitations, all in nature, which is worth being protected and conserved.	Rational balance of ethical and economical aspects. No excessive speed of modernization and innovation. Value judgements are well differentiated. Preference of a slow speed of development.	Refusal to »leasure-time«-risks. Acceptance of risks if serious reasons exist, control and regulation is guaranteed.
TECH: 3% Technocratic-liberal social climbers	Success, prestige, power, socio-economic upward-orientated	Efficiency, money, power, push-through, risk, optimism of progress, meritocratism, technocracy, optimism of modernization.	System-concept on nature, robust resource for production and reproduction rsp., which should be used systematically.	Tolerance as far as economical conveniently. Rejection of prenatal human genetics because of a liberal philosophy.	Risk as a basis for business. Attempt to externalize risks. »No progress without risk«. Economical or technological concept of risk.

The second social highly integrated type is *ASKO*, the conservative bourgeois. They have already won what the technocrats are still longing for. Plenty of economic, social and cultural resources are at their disposal. They cultivate an elitist lifestyle. On average they are older and more conservative than the technocrats. Their logic is not one of gaining and winning goods, on the contrary, they rather defend what they have already accomplished. Thus they reject an all too rapid social, economic, political or technological change. One can expect them to favour the premises of a growth-orientated economy as well as the development of innovative technologies, but not so intensely as technocrats do.

Realists - *REAL* - are pragmatically oriented. They try to accomplish an adequate standard of living and look for a decent quality of life; they are flexible, adaptable and averse to any fundamentalism. Realists tend to balance the potentials of risk and benefit with respect to genetic engineering. They will tolerate only these applications, that are accompanied by trust in the institutions regulating and controlling this technology. They care for fair compensation if required. Realists can be expected to be ambivalent, sometimes positive, sometimes negative depending on the application in question.

The conventionalist bourgeoise middle-class - *KOBU* - likes comfort, an unburdened life on a middle-ranged level, and feels attached to »law and order«. The daily range of activities and aspirations is smaller compared to the other types. They try to design their life as an easily comprehensible idyll. Genetic engineering perceived as a key technology with probable global consequences won't fit well into the lifeworld of this type. So we can expect a moderate disapproval founded on basic arguments or feelings of doubts and vague fears.

The individualized pleasure-orientated type - *INGE* - belongs to the camp of comparatively modernized individuals: They reject conventional values and institutions. Their goals are absolute pleasure and self-actualization. They are younger than the conventionalists. They feel attached to action, fun, and pleasure. Their attitude towards risks is paradox: On one hand, they seek leasure-time risks for mastering dangerous adventures, on the other hand, they fear large-scale technological risks. Small technologies and nature are very essential resources for their lifestyle. Thus one can expect that they will highly agree to »small« technical products of everyday life but will clearly reject key technologies as an imposition to their lifestyle and a threat to pure nature.

The type most averse to genetic engineering can be described as the critical, culture-pessimistic, and alternative group *(KALT)*. People belonging to this prototype long for a postmaterialistic kind of self-actualization, strive for egalitarianism, emancipation, and political participation. They are deeply discontent with the present shape of society,

they reject its political and economical imperatives, representatives and institutions. For these people genetic engineering is a symbol for a society they despise.

The next table (fig. 5) shows the empirical evidence that orientations towards genetic engineering are affected by value orientations, as our hypotheses would have predicted.

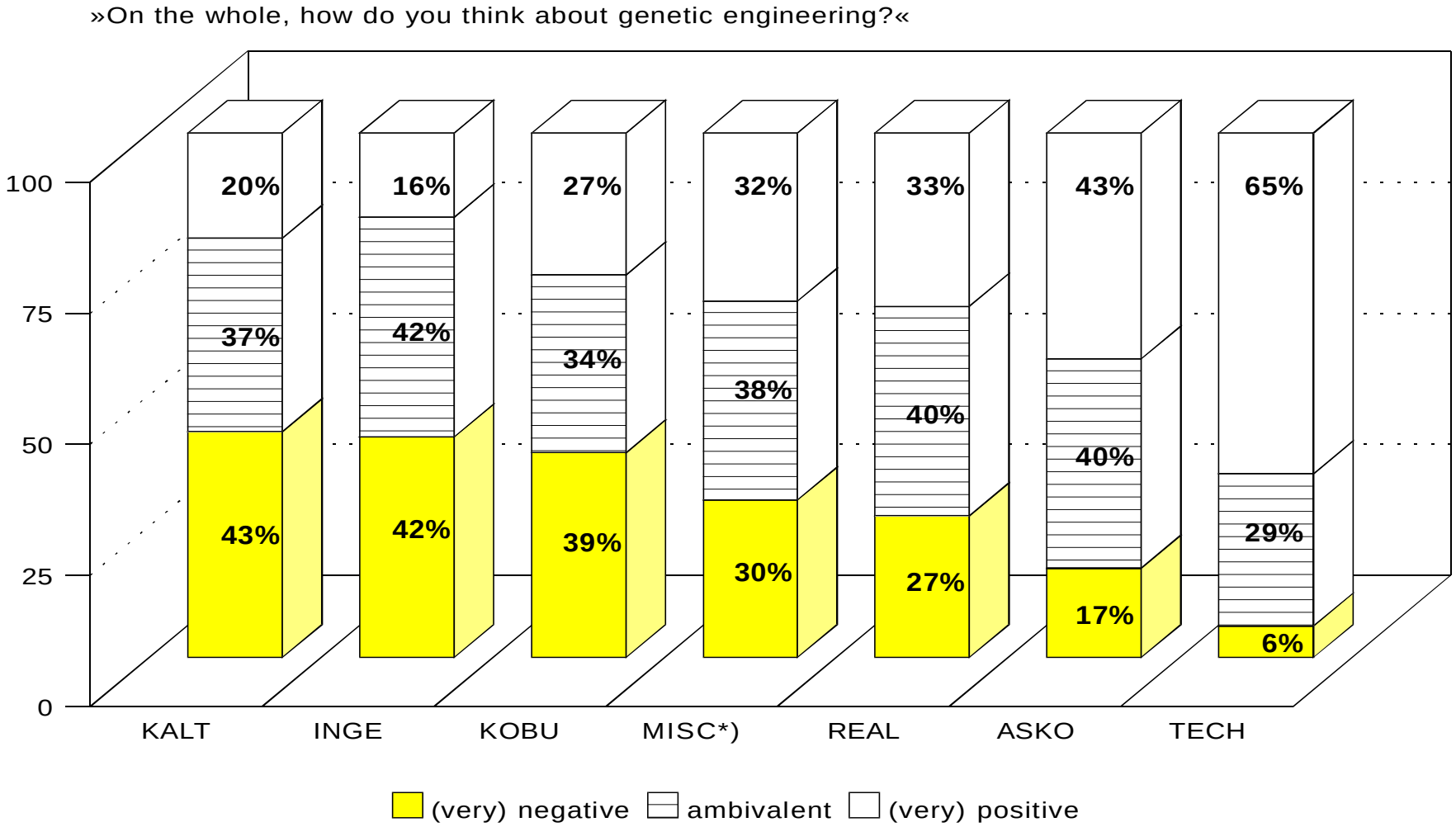
First, figure 5 shows that there is no categorical rejection of genetic engineering within the German public. On the contrary, about one third of the public seems to have positive or even very positive connotations. About another third of the respondents expressed sceptical or ambivalent orientations towards this technology. Only the remaining third of the Germans came to negative or clearly negative judgements. They vary considerably along our typology: Only 16% of the enjoyment-orientated individualists and 20% of the cultural-pessimistic postmaterialists think positively, but the wide majority of about two thirds of the technocrats.

This result is not only related to the sweeping statements towards genetic engineering, but reflects also their stances towards the risks of genetic engineering, as well as the semantic meaning of risk in general. The next two tables (fig. 6 and 7) show that there is much evidence for this hypothesis.

Balancing risks and hazards of genetic engineering, nearly the same order of value-types can be found (fig. 6). Again, on the one side technocrats *(TECH)* and conservative orientated respondents *(ASKO)* seem to be least risk-averse, while - as shown above - people with high scores on postmaterialistic criticism against modernization *(KALT)* have much stronger »ressentiments« against external risks: A clear majority of 57% emphasizes the need to balance risks with benefits.

More generally, in our random sample, the respondents were asked about a special understanding of risk. Since we live in a capitalistic society gaining economical success often depends on taking risks, people were asked to assess the phrase: If new technologies are to be developed, the guidline ought to be »nothing ventured, nothing gained!« The diagram shows striking differences between the six patterns: Again, technocrats demonstrate how much they are willing to take risks. Three quarters of *TECH* and at least 61% of the conservatives *(ASKO)* answer affirmatively, while only 27% of the postmaterialistic cultural pessimists do so. Furthermore, only 41% of technocrats but nearly twice as much cultural pessimists demand to forgo a new technology if their risks are uncertain or not calculable.

Fig. 5: Sweeping Statements towards Genetic Engineering by Patterns of Value Orientations.



Source: Biotech-Survey of Center of Technology Assessment; representative sample 1997: N = 1.501
*) The response pattern of 'mixed typus' corresponds to the mean of all respondents.

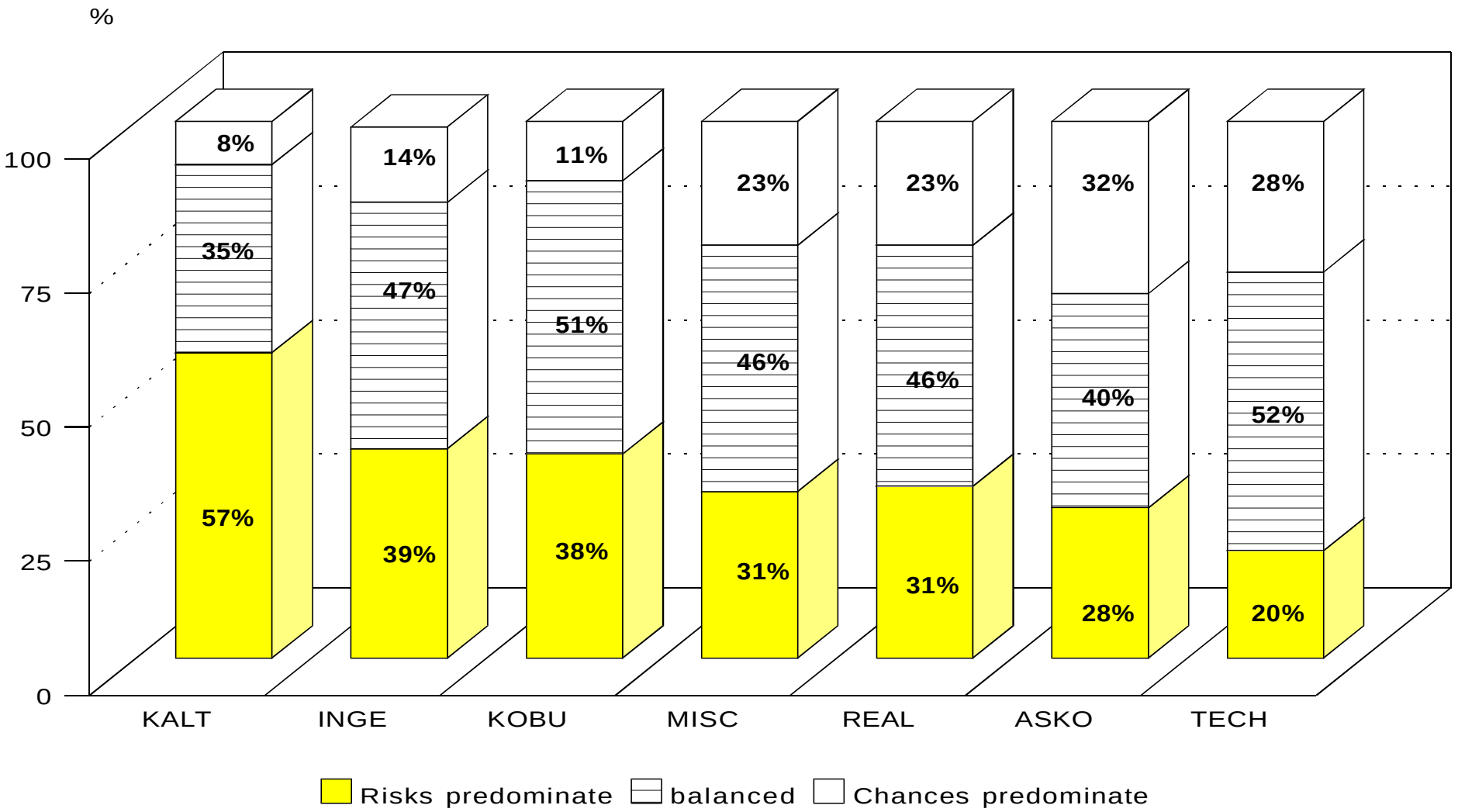
Our examples of fig. 6 and 7 show that there are considerable differences between our cultural types: They reveal different orientations towards genetic engineering as well as the general perception and semantic assessment of risks, all of which preform the risk assessment in a considerable way.

Surely, the main effects differentiating the assessment of genetic engineering and risks emanate from small groups: *KALT* on the one side includes 7% of all respondents, and *TECH*, on the other side, 3%. However, under the focus of the »resource mobilization theory«[9], these two eccentric groups play an essential role in the social and political arena: the protagonists of both groups are high educated and well established in Germany's social structure. Both of them display strong political convictions and are willing to shape the world according to their antithetical objectives.

In accordance with resource mobilization theory, both groups try to neutralize their opponents, to gain support from the pool of neutral people, to mobilize sympathisers in order to become supporters and to make activists out of the supporters. Thus the position of each of the types in the diagrams is of some importance: The closer a type is located to one of the two most eccentric positions, the more reasons are available for politization and mobilization. However, this hypothesis should benefit particularly types bent towards the *KALT*-type, since social mobilization will play an even more important role for them than for technocrats. Technocrats partly represent the German establishment and represent stakeholders of industry and politics. Thus they probably will prefer institutional paths for pushing their goals.

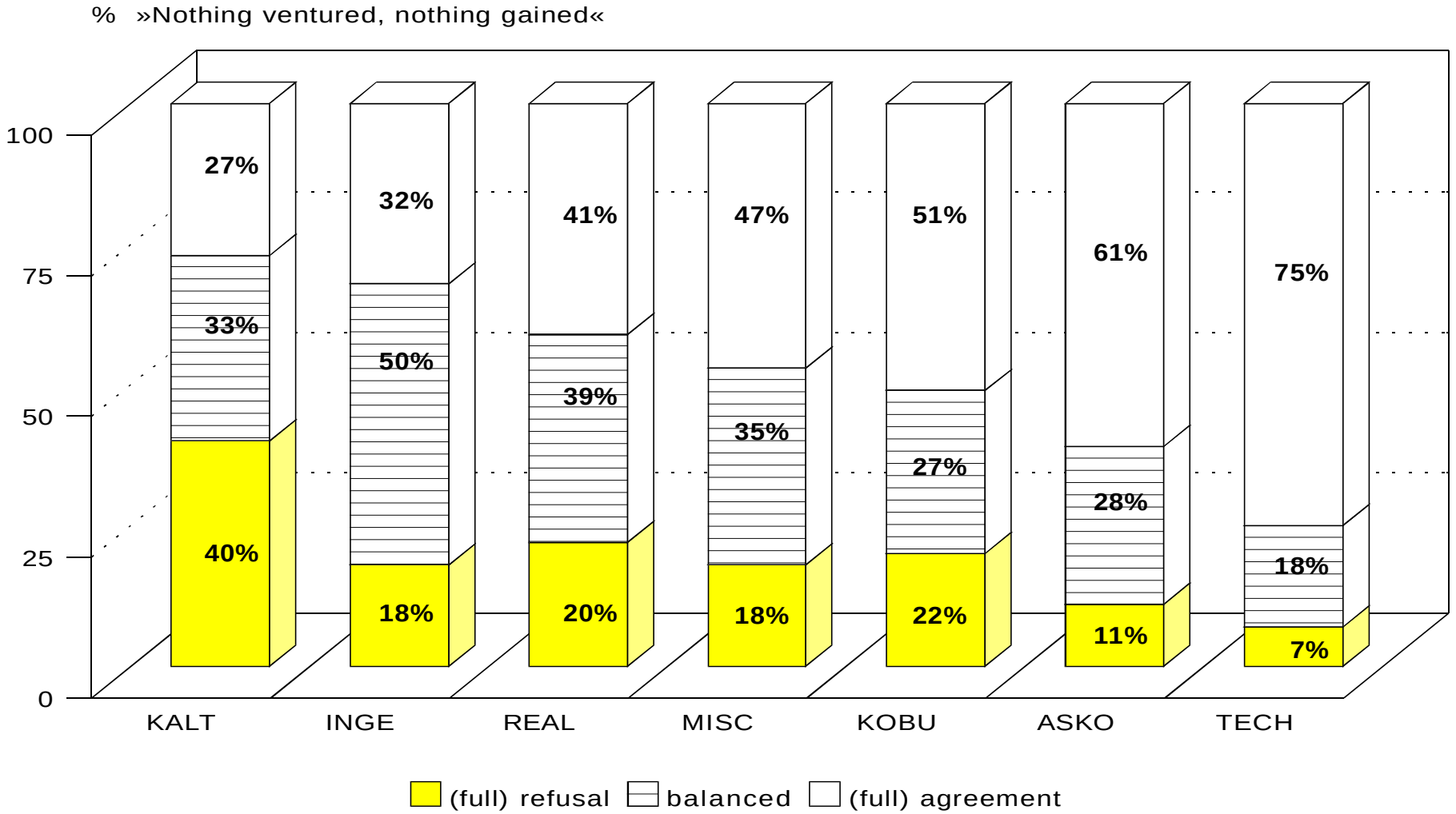
On the contrary, the protagonists of *KALT* are often embedded in human services like for instance teachers, educators, psychologists, lecturers, health care professionals and so on. Typically they don't have the economic and institutional resources available as the technocrats have. Thus their mobilization strategy can best be characterized as social: They politicise and mobilize people by teaching and lecturing, but also by planning political demonstrations, carrying out autograph collections, organizing citizens' action groups and demonstrating a wide variety of other forms of conventional and unconventional protest behavior. In this regard the *KALT*'s protagonists have learned a wide spectrum of social knowledge and cultural techniques for politicizing and mobilizing the public.

Fig. 6: Balancing Chances and Risks of Genetic Engineering



Source. Biotech-Survey of Center of Technology Assessment. Representative sample 1997; N = 1.501.

Fig. 7: The Risks of Technological Development by Patterns of Value Orientations



Source: Biotech-Survey of Center of Technology Assessment; representative sample 1997: N = 1.501

If topics are affected, in which - like in fig. 7 - the *KOBU*-type responds similarly to the *TECH*-protagonists, a new and somehow unconventional cleavage can appear: For instance, the fear of hazards could lead to a coalition of young, left-wing, cultural-pessimist postmaterialists and rather old, strongly value conservative bourgeoise middle-class like right-wing catholic farmers, pensioners or so on. In this way a new »unifier« like for example hazards of large-scale technologies or the demand for »natualness« could unit people who would otherwise not fit in one social or political category.

6. Summary and Conclusions

First, qualitative data provided evidence for the double character of genetic engineering: People base their estimate of benefits and risks on the associations that they attribute to the different fields of application. Lifeworld-based arguments are prevalent within the German public. Orientations and value judgements are particularly relevant in the perception of prenatal human genetics and genfood. In both cases, doubts and fears dominate over a rational balance of risks and benefits and the great majority of laypersons come to clear negative judgement.

Secondly, in the case of prenatal human genetics and genfood, people tend to justify their judgements on values based on ethics, emotions or even system-criticism. They consider social abuse and social consequences of genetic engineering as major risks. They expect abuse of human genetics by criminals, irresponsible politicians, entrepreneurs, or »humankind« in general. The scenarios reach from declining tolerance against handicapped persons, increase of abortion, eugenics, to cloning and designing human beings according to political and economic needs. Thus laypersons serve as lobbyists for social values: Values concerning nature, naturalness, the value of life, the right of free development for one's personality, and the right of autonomy for each consumer to choose between food - genetically manipulated or not. Most of these values are deeply internalized. They reflect a life-long anchoring in one's biographical experience and can hardly be manipulated by PR-campaigns. Anyone who would neglect them will offend not only deeply rooted social values but also the identity and lifeworld of the citizens. Furthermore, the politicians' plea for a renaissance of basic values would be futile if they ignore the threat to such salient values induced by modern technology.

Third, the data show that risk-specific orientations among the lay public are less associated with genetic engineering and its consequences, but are particularly related to perceived shape of the present German society. A remarkable proportion of

interview partners relate genetic engineering and its hazards symptomatically to the shape of society. They have obviously lost trust in the political and economic system, in humankind, and in some of the society's basic institutions. Is this lack of socio-cultural »ligatures« symptomatic for postmodern, highly individualized societies?

Fourth, the concepts of risk preferred by politicians, scientists, and entrepreneurs do not match public understanding. The professionals and semi-professionals use conventional risk concepts that allow quantification of expected losses over time. The lifeworld-based concepts of hazards, however, pursue qualitative deliberation about risk: None of the interview partners mentioned parameters of risk - neither its probability nor its potential benefits or detriments. Instead, risks are assessed as being extremely high or extremely low. Most respondents had problems when they tried to balance potential benefits with moral hazards. The balancing of risks and benefits seems impossible for them because they lie on different dimensions. Thus the equation remains unresolvable. One should be sceptical, if one tries to expand classical risk concepts of balancing risks and benefits to this domain.

Fifth, the public discussion of genetic engineering affects the perception of natural sciences. Scientists dealing with genetic risks run the danger of losing prestige and trustworthiness among the public. Some of the interview partners reported that they perceive two kinds of scientists: One kind argues that biotechnological risks are extremely small. The other kind of experts alleges risks as unpredictably high. People complain that nobody is willing or capable to show valid and unambiguous results. The so-called »expert-dilemma« undermines the prestige of natural sciences and its experts. It reinforces the impression that these scientists are not independent advisers but stakeholders either of supporting or of opposing groups. Independence, however, seems to be a key-variable on which experts have been estimated as being trustworthy or not.

Sixth, in a social discourse on risks a series of codes gain persuasive power. Regularly such arguments develop the highest strategic effect in western modernized industrial societies based on rational calculation. This is supported by empirical data. There is little chance to dispute conclusions based on moral or aesthetical reasoning or value-rational thinking since they are excluded from a conventional »trade-off« analysis. Under these circumstances discourse on risk reflects two special strategies: First, terms of risk are frequently instrumentalized only to label an already existing, deeply rooted agreement or rejection of genetic engineering »in the politically correct way«. The act as the »Trojan Horse« for transporting deeper convictions. Second, one can assume that people with substantial interests in continuing research and industrial transfer of genetical processes will do what they can to turn the public discourse of genetic

engineering from lifeworld concerns to economic necessities, and from moral hazards to »rational risk management«. Then laypersons will have only little opportunity to make an argument against elaborate, highly rational claims, even if the protagonists' concept of risk does not touch upon the dimensions that matter to most people. One might assume that the powerful risk concepts will prevail in the end and lifeworld based concerns will be dismissed as irrational or old-fashioned.

Finally, there seems to be a cultural conflict between the political and economic system on the one side, and the great majority of a lifeworld-based public on the other side. In fact, our data suggest the situation to be even more complicated: The division of the German public in six patterns of value orientation shows that there are major differences in estimating and evaluating genetic engineering and its risks and benefits. This key technology, its applications, risks and benefits, but even more its symbolic meaning is perceived, interpreted and assessed in different ways depending on the value-cluster to which respondents feel attracted. Work on this social and cultural stratification of value patterns is still in progress. It will provide us with additional evidence about the socio-demographic composition of the value patterns, and it will allow us to generate some more hypotheses about the future development of technocratic and/or protest potential, about the increase or decline of group-specific value patterns and about the fate of the controversy about genetic engineering in Germany.

Notes

1 Glaser, B. and Strauss, A. 1979: Die Entdeckung gegenstandsbezogener Theorie. Eine Grundstrategie qualitativer Sozialforschung. In: Hopf, C. und Weingarten, E. (eds.): Qualitative Sozialforschung, pp 91 - 111, Stuttgart.
Cf Strauss, A. and Corbin, J. 1990: Basics of Qualitative Research. Grounded Theory Procedures and Techniques, Newbury Park.

2 Classical: Schütz, A. and Luckmann, T. 1973: The Structures of Life-World, New York.

3 The so called Thomas-Theorem - modified by R.Bendix - reads: »As long as men live by what they believe to be so, their beliefs are real in their consequences.« (Cf Helle, H.J. 1977: Verstehende Soziologie und Theorie der Symbolischen Interaktion, Stuttgart: 61, and Thomas, W.I. 1931: The Unadjusted Girl, Boston: 331f.).

4 Cf Strauss, A.L. 1987: Qualitative Analysis for Social Scientists, Cambridge.

5 Cf Bourdieu, P. 1983: Ökonomisches Kapital, kulturelles Kapital, soziales Kapital. In: Kreckel, R. (ed.): Soziale Ungleichheiten, pp 183-198, Göttingen.
Bourdieu, P. 1979: La distinction. Critique sociale du jugement, Paris.

6 In constructing this standardized indicator, I was supported by the »Zentrum für Umfragen, Methoden und Analysen« (ZUMA), Mannheim, Germany, and I like to thank Dagmar Krebs for constructive criticism and valuable hints.

7 A more detailed charcterization can be found in: Zwick, M.M. 1998: Wahrnehmung und Bewertung von Technik in der deutschen Öffentlichkeit am Beispiel der Gentechnik. Ed. by Pinkau, K. and Stahlberg, C. (eds.): Deutsche Naturphilosophie und Technikverständnis, Stuttgart.

8 The percentages are taken out of the biotech-suvey of the Center of Technology Assessment Baden-Württemberg; representative sample 1997, N = 1.501. The complete item-battery can be found in Hampel, J. et al. 1998: Einstellungen zur Gentechnik. Tabellenband zum Biotech-Survey des Forschungsverbunds »Chancen und Risiken der Gentechnik aus der Sicht der Öffentlichkeit«. Discussion paper No. 87, ed. by the Center of Technology Assessment Baden-Württemberg, Stuttgart.

9 Cf McCarthy, J.D. and Zald, M.N. 1977: Resource Mobilization and Social Movements: A Partial Theory. American Journal of Sociology, Vol. 82 1976/77.