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Standardization

TODAY

and

TOMORROW

Herausgeber: Wilfried Hesser

Important note

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Preface

The contributions presented in this book were drawn up as part of an EU project that took place in Poland in 1997 under the heading of

Strengthening the Management Capacities of PKN*

It was financed by and the responsibility of the PHARE/CEN-TCU/DIN consortium.

The objectives in conducting the project were as follows:

- to create promotional material presenting the benefits of standardization,
- to present the benefits of participating in standardization activities and applying standards in business management to industry.

A further task was to present part of the contributions at one-day conferences in three Polish cities.

The conferences were held in October and November of 1997 in Katowice, Mikolajki and Warsaw.

The conference agenda and the conference documentation were of impressively high quality. Particular mention should be made of the conference documents. These were provided to participants as a book written in Polish. This indicates the extraordinary level of commitment on the part of the PKN staff in preparing the conference programme. Sincere thanks are extended to them on behalf of the speakers.

The conferences clearly showed that, in a society undergoing rapid economic development, standardization can only be repositioned by involving industry and business associations. Participants from these groups posed questions that primarily concentrated on the following areas:

- the economic importance of standardization for industry and commerce
- the organization development of standardization in the European Community
- the importance of standardization in the European legal structure.

Our special thanks go DIN, Deutsches Institut für Normung e.V., and the coordinator for their outstanding organization and cooperation during this project.

Hamburg, May 1998

Prof. Dr.-Ing. W. Hesser

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Standardization in Everyday Life

Roland Hildebrandt

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1 Prolog

Well, here I am, sitting in my study and deliberating on how I will ever find a lead-in to such an extensive subject. So I take a sheet of paper, try to outline a structure and before I know it, I am right in the midst of the subject. This sheet of paper is of German DIN A4 standard size, the ballpoint pen I am using has a refill cartridge designed according to DIN 16554. On the left side of this sheet of paper, there are punch holes that match DIN 821. I am sitting on an office chair made according to DIN 4551 at a table made according to DIN 4549 and these pieces of furniture are standing on a fitted carpet made according to DIN 54345 and TFI EDV 2. In front of me is a computer (IBM standard) with a keyboard designed according to DIN 2137. Attached to the computer is a printer designed for using DIN A4 paper that is able to convert the print data from my IBM-compatible PC into graphic characters.

It is only when you look at the world around you with your eyes open that you realize how many spheres of everyday life voluntary standardization has found its way into. We sleep in sheets and blankets of standardized sizes, wear clothes from standardized size ranges and use electrical appliances that meet certain safety requirements.

2 The Development of Standardization

You could well think that standardization has developed because consumers want to be surrounded by a world they can easily grasp.

But standardization in the sense of a general definition is as old as human culture. The origin of the word gives an impression of the long history of standardization. In Greek, the word "gnomon" (a standard is also called a "norm") means someone who has knowledge of or can judge something and it also designates the hand of a sun dial. This double meaning is also an indication of what is probably the oldest form of a definition or standard that can be found in history. Long before man used defined characters to transmit information, and long before the first standards in today's sense were defined, in Mesopotamia, for the size of sun-baked bricks, the knowledge of certain courses in nature and the knowledge of time were decisive for the beginnings of agriculture. Seedtime for the first cultivated field crops was determined by the position of the sun in the course of the year. The definition of this exact time, the establishment and re-

turn of which were often connected with religious rituals, therefore constitutes the first definition and so in the furthest sense "standardization" in the history of mankind.

But if you look at the origins of standardization work as it is today, you can soon see that it was the producers who were the first to try and lay down recurring product specifications. This can easily be accounted for on the one hand by the advantages of mass production that were achieved by making and using parts that were always the same and on the other hand by a certain regulation of the market due to the fact that competitors could reach agreement on specific characteristics for their products. At the same time, the wide variety of parts on the market altogether and in the companies was narrowed down, a development that led to a simplification in the selection of purchase parts required. The fact that standardization was strongly influenced and speeded up from the outside in times of war can be explained by the general shortage of resources and the demands by the military for exchangeable components. This compatibility of products from various manufacturers plays a role that has recently become more and more important in standardization, especially in the field of information and communication technology. It is not the existence of different systems side by side that ensures suppliers the possibility of being accepted by the consumers, but the ability to combine these different systems. By getting together in due time to determine standards or define interfaces between different systems, the suppliers of technical products ensure themselves market shares from the beginning. This not only saves them development costs, but also avoids expensive and costly fights over positions in the market that frequently end in the loss of all market shares, as the example of the dispute over the video recorder system (VHS, Betamax, Video 2000) shows. In the end, Sony's Betamax system, which was superior in quality but more expensive, just could not hold its own on the market against the market pressure of JVC's lower-priced VHS system for which large numbers of feature films were offered at favorable prices. The producers of more complicated and expensive technologies learned from this and with regard to the development of the CD player and digital versatile disc (DVD) agreed in due time on certain technical specifications.

Although there are still suppliers in various fields who try to get their products accepted as *de facto standards*, but they either have a dominating position in the market or fill a specific market niche in which their products can hold their own. Experience shows that it is even more exciting to watch which digital television supplier will be able to succeed with his decoder system and whether agreement will be reached in the future on a joint interface between the different systems on offer.

Consumers also derive a benefit from industry's standardization activities that should not be underestimated - even though most of them are probably not aware of this. It is only because of the fact that the dimensions of many items of everyday use are standardized that it is possible for consumers to handle them so easily. What good is a light bulb that does not fit any lamp? Standardizing sockets is the only way of enabling the consumer to decide if he would prefer a colored, a frosted or a clear light bulb. An excellent example of the confusion caused by different standards can be seen again and again in clothes stores. The different trouser sizes given by European and American clothes manufacturers time and again give rise to amusing incidents. Who knows if his trousers must be size "94" or maybe "32 x 34"? At least you can be sure that once you have memorized the sizes, they will be right the next time, unless you have "grown out" of them. What benefit do textile manufacturers have from such a size system? They can sell their goods to all customers in a larger marketing area, and the customers can be sure that the clothes with the appropriate size label fit. Minor deviations are accepted. Some items of clothing "just differ".

Specifying certain sizes and adhering to the specifications is the only way, for instance, of using Polish paper in American printers that are adapted to the requirements of the European market. It is a well-known fact that the Americans still hold on to their deviating paper standard ("Letter").

3 Standardization as a Market Instrument

Sometimes, however, work with standards does produce some strange results. A German gauze manufacturer produces his gauze bandages without chemical additives. This leads to patients being less allergic to them than when he used gauze treated with the approved bleaching agents. But unfortunately he does not treat his products as specified in DIN 61630. According to this standard, gauze is "a cleaned and bleached absorbent fabric [...] made of cotton". The standard also contains the specification that "gauze must be white". As German hospitals may only buy material that conforms to the specifications of certain standards - and this includes DIN 61630 - this company cannot sell its unbleached and untreated products to German hospitals because it does not manufacture its products in accordance with the specifications of the standard. Due to the procurement directives of German hospitals, DIN 61630 assumes a de facto liability by which this manufacturer is excluded from the market.

A further example of the attempt made to render a market inaccessible for foreign products by the use of standards was the attempt by Japanese industry to prevent European and American ski manufacturers from importing their products onto the Japanese market by claiming that these manufacturers' products were not suited for Japan. The reason given was that Japanese snow had a different consistency to European or American snow. Only when the French threatened to investigate if maybe the roadway paving in France might have different characteristics to that in Japan - which could have had an immediate influence on the sales of Japanese cars on the French market - were the Japanese authorities ready to make concessions.

This is how voluntary standardization was for a long time used by countries to prevent foreign competitors from selling goods in their own countries (a situation that conflicts with the idea of a common European market and the planned elimination of technical trade barriers due to different technical specifications in the member states) or even to exclude competitors from the market. This can and may of course not be the aim of voluntary standardization work by industry. On the contrary, the real concern is that agreement is reached on the joint determination of minimum requirements for technical products. Such regulation is of particular importance in the field of product reliability. For a consumer, it is important that his toaster only toasts the bread and not the kitchen. A person working in the facade or building trade must also be able to rely entirely on the fact that in the event of an accident his safety rope will really save him from a nasty fall.

The far-reaching consequences of standardization can clearly be seen from the example set by the "bolt war" the Americans unleashed in the early 70's. Under the lead of General Motors, the so-called "Optimum Metric Fastener System (OMFS)" was developed, the threads of which were around 30 % less deep. This meant that washers could be slimmer as the core diameter of the washers was smaller, but at the same time they had to become longer to achieve the same strength due to the reduction of the effective diameter. American industry supported this project. The consequence would have been that 90 % of the metric bolts used on the international market would have had to be replaced by new ones. The West Europeans together with the East European nations asserted themselves against the Americans at the time of the "Cold War" (which required complicated behind-the-scenes diplomacy) and thus prevented the threat of billions of dollars having to be spent to convert all the West and East European production facilities.

But it would be too one-sided to regard standardization in this context just as a means of demarcation. Leading economists are of the opinion that voluntary standardization is an absolute must for extensive and free international trade. No country can have a healthy economy if it does not face free competition in the world market. On the other hand, free standardization in the interest of industry is imperative if companies are to stand a chance of surviving on the international market. International economic experts have noted that ill-designed standards or standards that are not adopted in time can in the long term pose an obstacle to trade. In this context, early standardization, that often already takes place while a technical product is still under development, assumes ever higher status. Free standardization work based on consensus does not impede creativity or even hold up progress. It gives everyone concerned with technology the possibility to influence and promote it.

4 Standards in Technical Law

In addition to considering standardization from the purely market economy angle, its importance in the jurisdiction of the European nations must not go unmentioned. Standards assume special importance when they constitute the interface between public law and technical specifications. The rule in Germany is that standards established by private standards organizations cannot be legally valid as the German constitution stipulates that the monopoly for law-making rests solely with the government. These standards do not become legally valid either if references are made to standards in laws. Nevertheless, there are various ways of making standards established by private standards organizations binding in application.

Standards become legally binding, for example, whenever they are part of contracts between different parties who according to the contract are liable to observe these standards. These can, for example, be delivery contracts in which the manufacturer is liable to manufacture products according to the requirements of a certain standard. These kinds of regulations are often found in the building trade. Building constructors are liable under a contract to carry out work on the basis of specific construction standards and to use standardized construction material. They can also be membership agreements of certain organizations under which members are obliged to meet certain product requirements (in Germany, these are DEMETER in the field of food manufacturing or RAL for paints and varnishes).

Nevertheless, standards not referred to in contracts can contain requirements that have a normative character in the legal sense. This derives from the demands made by standards that as many addressees of the standards as possible, ideally all of them, use it and implement the requirements they contain. Every general industrial standard is based on the expectation that it will be used in practice. Standards must therefore not be seen merely as recommendations for solution to problems, but as a call concerning how to implement the requirements they contain.

Pursuant to the German legal system, this call applies in particular for safety standards. It derives from the protective functions they contain. Safety standards serve to protect life, health and material goods and so, for the field of technology, express the requirements laid down in the Basic Law with regard to physical integrity in concrete terms (see the German Basic Law, Article 2, first sentence: "(2) Everybody has the right to life and physical integrity. ..."). In terms of substance, they are a reference to the idea of law, although they must be understood as technical standards and not as legal standards. Legal claims are affected when potentially dangerous appliances / facilities are used.

This form of organization can also be found at international level. The specification of uniform EU standards has been applied to the European standardization institutions of CEN, CENELEC and ETSI. They elaborate technical details of the basic safety requirements established in the EU guidelines. Just like German DIN standards, the technical specifications are of no obligatory or legally binding character. The protective goals specified in them can and may also be achieved technologically in ways other than those described in the standard.

Standardization associations organized under private law thus make decisions that concern important areas of social and business life. They therefore perform an important public function.

The effects of safety standards in particular are clearly visible in the great importance for jurisdiction in the field of technical safety. The law on technical safety in Germany, for example, comprises all the laws, ordinances and administrative provisions that deal with protection against dangers emanating from technical products or hazardous materials. The jurisdiction is characterized by the close coordination practiced between governmental jurisdiction and private technical rules. Governmental jurisdiction is limited to the legal determination of protection goals whereas standards contain detailed rules on safety needed to implement it.

As the legal foundations for technical safety deliberately do not contain exact statements on the implementation of certain safety requirements, which instead are described generally by protection goals, it is up to the producers of such technical products to decide on these goals are to be achieved.

The precise purpose of technical standards is to provide the technician, who does not have the possibility to make adequate examinations, general guidance on conduct so that he is able to exclude individual faults, in particular in the field of technical safety. Nevertheless, every user of standards must check whether the standards that he or she is using really do adequately cover a certain danger. Someone only violates the necessary duty to take due care if they fail to notice obvious deficiencies in a technical standard that they should have recognized without special examination. They may not use standards that are obviously not right. Above and beyond that, they are not required to carry out any further examinations.

In jurisdiction, standards are of high probative value. As they are established by a variety of qualified experts working together, they are often used by courts of law as a basis for the evaluation of technical matters.

But authorities and courts of law are not obliged to use standards as a basis for decisions without examination. They can also decide in specific cases to seek an expert's opinion.

5 Summary

Standardization is as old as human culture. In Germany alone, there are more than 20,000 standards, affecting all spheres of everyday life. They are not only an important foundation for the manufacture of all kinds of products, but also play an important role in jurisdiction. The standards elaborated by voluntary amalgamations of industry and all interested groups represent the status of a country's technology and are an important basis for drawing up contracts and for settling legal disputes. On the road to achieving a common European market, for which free trading in goods is an absolute prerequisite, standards are an important instrument for putting the guidelines issued by the European Commission into concrete terms

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(*"Trimmed Paper Sizes" and "Trimmed Paper Sizes to DIN 476"*)

DIN 16554

"Kugelschreiber-Minen"
(*"Ball point pen refills"*)

DIN 821 T 2

"Schriftgutbehälter; Abheftlöcher für Schriftgut, Maße und Anordnung"
(*"Files and folders; Filing holes for records, dimensions and layout"*)

DIN 4551

"Büromöbel; Bürodrehstühle ..."

("Office furniture; Swivel office chairs ...")

DIN 4549

"Büromöbel; Schreibtische ..."

("Officer furniture; Desks ...")

DIN 54345 T 3

"Prüfung von Textilien; elektrostatisches Verhalten ..."

("Examination of textiles; electrostatic behavior ...")

TFI Information Sheets

TFI EDV 2 Guidelines

"Textile Fußbodenbeläge in Räumen mit elektronischer Datenverarbeitung"

("Textile carpets in rooms used for electronic data processing")

DIN 2137 T 2

"Alphanumerische Tastaturen; Deutsche Tastatur für Text- und Datenverarbeitung ...".

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Standard Battles

Jens Kleinemeyer

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1 Coincidences and Luck

The long-term success of an enterprise depends on its capability to motivate its personnel, to produce at a low cost and to offer consistently good quality, but sometimes also on coincidences and a good measure of luck. The knowledge that coincidences have a decisive influence on the development of markets and enterprises is attributed to the theory of dynamic systems developed in the 1970s. One of the core statements of this theory is that small changes at the beginning of a development can lead to considerable changes at the end. This view is also known as the chaos theory and has been applied to a host of systems such as the weather, the contraction behavior of the heart, stock quotations, and also the behavior of certain product markets.

While these dynamic aspects seem to be of less importance to some of these markets, such as construction materials, food and clothing, they do play a considerable role in other fields. The best-known examples are telecommunication, computers or entertainment electronics. In these markets there is a tendency for the product of one single company to become the leading product and to oust other products from the market. In the field of computers, the DOS / Windows / WIN95 operating system and the internet program Netscape immediately come to mind, in the field of entertainment electronics, the VHS standard for video cassette recorders (VCRs), the Philips and Sony CD format, and in the field of telecommunications, the "de facto standards" for fax machines, mobile radio or the telephone per se.

The success of a company in global and regional standardization is thus becoming a prerequisite for survival in an increasing number of lines of business. The first conflicts concerning standardized technologies took place at the end of the 19th century, going largely unnoticed by the public. The determination of the track width for trains, the question of whether alternating or direct current should be used as a basis for national electricity networks or of what voltage should be used to operate these networks, or the question of what means of propulsion should be used for automobiles all occurred at this time.

In the meantime, public interest in standardization processes also clearly gained in significance. Due to the fact that coincidences can let these processes turn in favor of any one technology there is always the possibility that a technology will establish itself as a *de facto standard* even though there are technically superior alternatives. This explains why, today, we must agree that gasoline-driven engines, for example, have major ecological disadvantages such as noise and pollutant emission and also political disadvantages, such as dependence on oil imports.

A change from this technology, that can also be regarded as a *de facto standard*, to a different means of propulsion such as electricity, gas, alcohol, sun power etc., has failed because these means were either too expensive or there was no or is an adequate network of (gasoline) stations available to supply the fuel required. What we would like to do here is to tell the stories of some of these *de facto* standards and norms.

2 VHS Video Recorder versus Beta 2000

For a long time, it seemed that a device for recording, storing and reproducing TV pictures was only a product that television stations used to archive their shows. At the end of the 1950s, however, a few companies recognized that there could also be a demand in private households, but the devices available at that time were too big, too heavy and clearly too expensive.

The beginnings of this technology were characterized by a small number of cooperation projects and a large number of companies going it alone. This resulted at times in six companies were working on different technologies. The "famous" thing about these technologies was their absolute lack of compatibility, i.e. one producer's video cassettes did not fit into the devices of another.

In the late 1960s and early 1970s, Sony in particular tried to open the market for the home use of these technologies, albeit in vain. It was some time before companies learned to understand consumer needs. These were, on the one hand, the possibility to record a TV show and watch it later and, on the other, to buy feature films and watch them any time they wanted to. Finally, the consumer also wanted the device to be transportable. These consumer demands led to a direct requirement with regard to the running time of the cassette: it was to be at least 90 minutes (which at that time was approx. the standard length of a feature film). The problem of the technologies that entered the market up to the mid-1970s was that they provided less than 60 minutes of running time and were still too heavy and too expensive. So technological development concentrated on the increase of running time, the reduction in weight and/or the lowering of costs and thus of the price. In this competition between several companies, the technological lead changed all of the time.

In 1974, Sony was able to introduce the first prototype of the Betamax® Systems with a running time of 60 minutes. It was at least possible to reduce size of the format and obtain an acceptable price. In the meantime, Betamax® is generally considered to be the first technology for video cassette recorders. Betamax® was also the first system that was accepted by the consumers.

Therefore in 1976 - the year it was introduced into the market - 70 000 Betamax® VCRs and in the following year 213 000 were sold in the USA - the USA being the most important market. Before the introduction of Betamax® into the market, Sony approached Matsushita and proposed a cooperation agreement aimed at helping the Betamax® technology to conquer the market. But Matsushita declined and decided in favor of the VCR technology of a an affiliated company - JVC. This system, the so-called Video Home System, better known as VHS, ousted Sony's Betamax® from the market within an extremely short time and from 1988 onwards, Sony was compelled to produce recorders to the VHS standard.

About a year after Betamax®, JVC introduced VHS into the American market. Sony was able to cancel out the technological lead of a 120-minute running time compared with Betamax® within a few months, but in a short time Matsushita was also able to extend this time to 240 minutes. The two systems were not compatible, the Betamax® cassette being smaller than the VHS one. This explains the advantage that is turning out to be more and more true with regard to the running time: a larger cassette simply has more room for magnetic tape than a smaller one.

As we know today, it took VHS only eight years to completely oust its competitor, who started out at the same time, from the market. In 1988 no Betamax® recorders were produced, except for a very small number that were produced by Sony itself. VHS and Betamax® were not competitors in the usual sense **in** a market, but **about** a market. So the competitors chose different - practically diametrical - strategies. Sony tried to make profits by applying a rigid licensing policy, whereas JVC to a large extent renounced exercising its privileges and granted licenses at very moderate conditions so as to intensify the propagation of its own technology. Profits were to be obtained, on the one hand, from the expected amount of royalties and, on the other, from playing the role of technological trailblazer.

It is meanwhile generally known that the "strategy of open licensing" pursued by JVC was decisive for the success over Sony's "strategy of closed licensing". On the other hand, it cannot be denied that by choosing its format more for technical than for strategic reasons, VHS had a persistent advantage with regard to the running time of the cassettes; a criterion of great importance when it comes to buying. If Sony had chosen a large format like VHS and had achieved a similar running time, it is absolutely conceivable that households would now have Betamax® recorders and VHS would be a thing of the past. A small change in this factor can have a large or even decisive influence on the development of product markets. Sony's defeat hit a company

with a financial backing large enough to compensate for the losses due to the VCR business. A defeat of this kind could have meant the end of the line for a smaller company.

3 The Introduction of a New Credit Card

Another example, one that does not have a directly technical character, took place in Germany in the late 1980s. In the early 1970s, credit cards started to propagate in Germany, though they could not really compete against the established means of payment. This changed when *American Express* and *Diners Club*, the companies that had hitherto been active in Germany, were joined by further companies offering the *Eurocard* and *Visa-Card*. The analogy to the other *de facto standards* lies in the fact that even in the case of credit cards, the system tends to establish the dominance of some few cards, the *de facto standard* for credit cards. In this case technical interfaces are substituted by the willingness of retailers to accept the cards.

The advertising drive the credit card companies made in the 1980s led to a further increase in the number of credit card holders and deep concern on the part of the retail trade. An increasing number of stores were forced to accept credit cards in order to avoid losing customers to their competitors or to facilitate impulsive buying.

This increase in the credit card business led to louder and louder concern being expressed because of the low sales revenue of retailing. It is true that credit card companies finance themselves on the one hand by charging the credit card holders fees, but on the other hand - and this is of considerably greater importance - the store accepting them does not receive the total sales amount, some of the credit card companies even retaining up to 7 % of the sales amount as a charge.

This situation led to the parent organization of the German retail trade presenting a credit card of its own in 1987: the *Deutsche Kreditkarte* (German credit card). It was to be offered on definitely more favorable terms than the known credit cards. The places willing to accept the credit cards were, for instance, supposed to pay 2,75 % in fees.

The competitors' reaction to the *Deutsche Kreditkarte* was more positive than negative. With the introduction of this new credit card, they admittedly had a new competitor to contend with, but this additional company would help to promote the acceptance of credit cards as a means of payment. This effect would in the end be of advantage to all suppliers of credit cards. Only GZS (an amalgamation of German banks and credit institutions), the supplier of *Eurocard*, reacted

negatively to the new competitor. After the breakdown of top-level discussions between the amalgamation of the German retail trade and the GZS, the GZS developed a strategy designed to prevent the introduction of the *Deutsche Kreditkarte*.

It decided to introduce a credit card of its own, as competition for the *Deutsche Kreditkarte*. This card was to be superior to the *Deutsche Kreditkarte* in almost all points of interest. It was to be designed for international use (*Deutsche Kreditkarte*: only national use), have banking functions (*Deutsche Kreditkarte*: does not have any) and be of less charge. The name was also supposed to clearly show its intention of providing competition for the *Deutsche Kreditkarte*: *German Banking Card* or *Europlus*. This competition product was to be introduced in the following year.

The aim of this German Banking Card was and is clear: to be such a strong competitor that the introduction of the *Deutsche Kreditkarte* into the market would be impossible due to the fact that not enough places that would accept the *Deutsche Kreditkarte* and that it would not be possible to prompt enough customers to acquire the card. In order for a credit card to be a success, it must be widely spread among the credit card holders and a large number of places must also be willing to accept it. So while the one side was trying to establish these two networks in order to be able to introduce the *Deutsche Kreditkarte*, the other side was trying to do all it could to prevent it from being introduced. When signs began to emerge that it was difficult to establish both networks simultaneously, the retail trade amalgamation intensified its efforts to find places willing to accept the card.

Just at that time an association, the members of which have stayed anonymous to this day, filed a suit against the *Deutsche Kreditkarte*, complaining about the use of the term "Deutsche" and the colors "black, red, gold". The suit was based on the fact that the network of the *Deutsche Kreditkarte* did not cover all regions, so its name was misleading. This suit not only delayed the introduction of the card into the market, but also increased the sense of insecurity among the potential credit card holders and places of acceptance. The establishment of the networks of card holders and places of acceptance was successfully prevented. The *Deutsche Kreditkarte* project was officially ended on April 13th, 1989 - almost exactly two years after its announcement. This also marked the end of the efforts of the GZS to introduce the German Banking Card.

4 The Development of the Personal Computer (PC)

The first PCs were introduced in 1977, but the dynamic development of this market only started four years later with the entry of IBM into the market. When IBM introduced its own PC, it was

enormously pressed for time. It therefore had to fall back on a number of additional purchase parts in order to be able to offer its own product on the PC market: e.g. the INTEL processor, the Zenith monitor or the Microsoft operating system. So due to the standardization power of IBM the PC had an open architecture: i.e. competitors are able to make IBM-compatible PCs without acting in violation of IBM patents. The only technology still in IBM's possession - BIOS (Basic-Input / Output System) - became available to all other suppliers through a similar product of another company just a short time later. So IBM used its standardization power in the PC market, but did not have the means to turn it into profits.

To remedy this evil, IBM decided to utilize the increasing advances in technology and use its own standardization power for the next PC generation, though with a number of protected technologies in order to improve its own profits again. IBM's idea was to introduce a 32-bit computer and so to set a new *de facto standard*. IBM considered it a matter of importance to keep this project secret as long as possible in order to avoid undermining the sales of its own products and to leave its competitors no time for the development, preparation and implementation of counterstrategies.

It came as a complete surprise to IBM when in September 1986 one of its long-standing competitors, emerging from IBM's shadow, and no longer waited for powerful IBM to take the next step and beat IBM to it. Compaq presented its own 32-bit PC: the *Compaq 386*. This was a triple blow to IBM: firstly, its already damaged image as technological leader was further undermined; secondly, Compaq was trying to establish itself as a technological leader; and thirdly, this step marked the start for the build-up of a Compaq network of Compaq PCs and possibly set a *de facto standard* that would render all of IBM's efforts, research and development work on a 32-bit technology of its own useless.

IBM was in an extremely awkward situation. Its own product was far from ready for series production; so ways had to be found to prevent or at least delay the growth of the *Compaq 386*. IBM decided to take a number of measures to undermine the potential *Compaq 386* users' sense of security with regard to the success and compatibility of this new PC and the related software. This strategy proved to be exceptionally effective. In the important application domain of business, the *Compaq 386* was only able to make very small profits. In addition, remarks were made at press conferences indicating that a breakthrough at IBM and in the PC market was imminent; this was generally understood to mean that IBM wanted to market a 32-bit PC of its own.

At the beginning of 1987 IBM placed its new PC on the market: the PS/2. The fact that had formerly been criticized with regard to the Compaq 386 had definitely and deliberately not been realized with the new IBM PC; its compatibility with the existing *de facto standard*. The heart of the IBM strategy was the idea of offering a complete system that in large companies would be able to interconnect high-capacity computers, mainframe computers and PCs. This was a task that could not be achieved with the old technology. Of the four new IBM PC models, only one in the end still came up to the existing *de facto standard*. The other three were based on another technology for data transmission in the processor and on other computer components (bus). The older architecture can only carry out the parallel transmission of 8 or 16 bits, whereas the new IBM allowed the parallel transmission of 32 bits. Of course, IBM owned the rights for this MCA technology (microchannel architecture). This computer was to be supported or its performance optimized by the IBM operating system OS/2.

The introduction of the two products "computer" and "operating system" was accompanied by intensive advertising worth a total of several million dollars. The first positive sales results were presented to the media effectively to make sure that there were no doubts about the success of the introduction of the PS/2. Even more important than the actual introduction of the computer was and still is the availability of software (remember the importance of the acceptance of credit cards or of video cassettes and the availability of feature films). IBM was able to attract a number of software companies (such as Lotus and Microsoft) to OS/2; they all announced that they were going to develop software in the OS/2 format.

In spite of these activities, insecurity in the market with regard to the future development of the PC market was so strong that no more than a few units were sold. Nevertheless, IBM stuck to their patents and their restrictive licensing policy. They did so, expecting that the sales figures would rise by themselves as soon as all the components of the technically superior PS/2 and OS/2 systems became available. Even though IBM even stopped the delivery of the previous PC generation, that was selling very well, and so indicated very clearly that IBM was definitely and irrevocably committing itself to the PS/2, the insecurity in the market could not first of all be overcome.

IBM then finally decided to grant licenses, but only to "good" competitors and on no account to low-price suppliers from the Far East. This move improved the penetration of the market with PS/2 PCs, but the PS/2 was not able to establish itself as a dominant *de facto standard*. Compaq was still very successful in the market with its 286 PC. The performance of this computer

was able to be constantly improved. Only 15 months later, IBM introduced a 286-compatible PC into the market and thus signaled the end of the PS/2 technology. What was left was just the compatibility of this PC with IBM's own OS/2 operating system. In order to deal the IBM technology the final death-blow, a consortium in collaboration with Compaq improved and enlarged the present bus structure (ISA). From today's point of view, it can be said that the introduction of the PS/2 PC technology and also the attempt to attack the position that Microsoft held with DOS/Windows by introducing the OS/2 operating system has failed. IBM's massive development and marketing effort was in vain. But much worse for IBM is the loss of its reputation as a technology leader and standard setter; a position that in the meantime has been taken over by other companies such as Compaq.

5 High-Definition Television

If the impression up to now has been that only companies participate in the dispute over compatibility standards, then this impression is deceiving. Whole nations or amalgamations of countries were and are involved time and again. The next story deals with the settling of such a confrontation at political level. An organization affiliated with the United Nations is in this case the stage. It is the CCIR (now ITU-R), the committee responsible for the awarding of frequencies and standards for radio and television.

At the general assembly of the CCIR in Dubrovnik in 1986, the Japanese delegation proposed the acceptance of the standard for high-definition television (HDTV) developed by a Japanese consortium with the support of the Japanese Department of Industry. While the American delegation took a quite positive view of this proposal, it met with considerable resistance from the European participants. Japanese industry had after all built up a dominant position in the hi-fi market and a successful standardization initiative would have clearly worsened the European TV set producers' still well-established position. The US position resulted from the fact that at this time there was indeed only one independent American TV producer.

So after the Japanese proposal had been turned down due to the efforts of the European delegation, Europe started an extensive initiative to develop its own standard for HDTV. The framework used for this was *EUREKA 95*, a European Union research and development program. Within the scope of this program, the HD-MAC standard costing approximately 750 million dollars was developed between 1986 and 1992.

While the US at first had a favorable opinion of the Japanese proposal, this attitude changed in 1989. In its specifications for an American standard for high-definition television, the Federal Communications Commission (FCC), the competent authority, laid down requirements that the Japanese technology did not meet. The requirement for reverse compatibility in the new standard played a decisive role in this. Reverse compatibility is a standard when older TV sets are able to read and recognized the new TV signal and therefore there is no necessity to buy a new TV set.

Moreover, American policy-makers had in the meantime noticed that a new standard for high-definition television could well be seen as a possibility to bring American enterprises back into the market for TV sets. The FCC reacted by putting the new standard up for competition. Enterprises were called upon to submit their new technologies so that they could be tested and the best technology established as standard. Shortly before the deadline for tenders was reached, the first completely digital system was submitted, whereas all the other competitors had submitted analog or analog/digital systems. In order to still give them a chance, the deadline was extended and in the end four digital technologies competed for the new HDTV standard. After extensive tests, the FCC found that no one technology was superior to all of the others, but that each had its strengths and weaknesses. The FCC then approached the enterprises with the proposal to either eliminate these weaknesses, submit and test the technologies again or to cooperate and combine the best components of each technology. The enterprises decided in favor of the latter and founded the "Digital HDTV Grand Alliance". Since the beginning of 1997, the FCC has accepted the technology developed by this alliance as a standard.

As the American market is the most important market for program production as well as worldwide sales, the US decision has far-reaching consequences. In 1993, the European Broadcasting Union officially declared that the efforts made to implement a European standard of its own were being called off and that it would now follow the decision of the FCC. Thus the European rejection of the Japanese proposal in Dubrovnik in 1986 and the subsequent initiative to develop the European HD-MAC standard were solely a (successful) attempt to ward off a Japanese standard. More important than the successful introduction of the European standard was evidently the warding off of the Japanese standard.

6 Results

Obviously the success and failure of enterprises or nations lie at times very close together: two enterprises offer comparable products to the market at the same time, one product having an edge in quality and the other in quantity, and after a short time one enterprise conquers the whole market while the other withdraws from the market. In another instance the introduction of a new product is prevented entirely by a product that has only just been announced. And then again it can happen that an enterprise successfully introduces a product and within no time at all loses control over the associated *de facto standard* and the suppliers of complementary products make an enormous profit, while the innovator does not even attain an average share of the profit.

The fact that the systems described here are dynamic systems leads to only one product design or only one enterprise staying in the market. So the enterprises display fierce determination in the question of capturing or defending these markets. Friends and allies must be won to increase the power of standardization; misinformation is used as a means to impede competitors or competitors are cut off or excluded from important resources such as television and feature films, computer programs or music productions.

Of course, these are usually disputes between enterprises; consumer involvement is secondary at most. But ultimately it is the consumer who uses the products (video cassette records, credit cards, HDTV televisions or PCs). In the case of the European standard for high-definition television, it was in fact even the European taxpayers who had to pay for the development of a competitive standard to the Japanese proposal (without being asked to do so). So consumers should pay attention to how such trade rivalries are carried out. Because in the end the aim will always be to defend a market against competing enterprises or nations and in particular with regard to disputes between nations, the interests of just a few enterprises often determine policy. The knowledge of how such markets function and the behavior of those involved is therefore an essential prerequisite for the democratic control of this kind of dispute.

Introductory literature could be found in H. Landis Gabel, 1991, "Competitive strategies for product standards: the strategic use of compatibility standard for competitive advantage", Gerhard Hess, 1993, "Kampf um den Standard", and Peter Grindley, 1995, "Standards, Strategy, and Policy".

**Chances and Risks in Implementing
Management Systems
ISO 9000 ff. and ISO 14000 ff. and/or EMAS**

by

Wilfried Hesser

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1 Introduction

In view of the growing globalization in industry and trade, the more the products resemble each other in terms of price, design, quality etc., the more important the image of a manufacturing country and thus the image of its products become as a factor determining the customers decision to make a purchase.

In the world league, for example, German products, with 35.1 % of the votes, are at present second as regards the assessment of their quality behind league leader Japan, whose products are rated excellent or very good by 41.2 % of the people questioned. They are followed by the USA with 34.9 %, the UK with 21.2 % and France with 20.8 %. Brazil is bottom of the league with 4.4 %, behind Mexico with 4.6 % and Russia with 5.3 %¹

Among the European consumers, the reputation of German products is unbeatable; 44.6 % consider goods from Germany excellent or very good.

“Made in Germany”, a label German products were forced to bear for the first time 110 years ago by English industry, is still an indication for product quality, regardless of the increased internationalization of trade (**figure 1/1a**).

The industry of a country therefore not only has to produce high-quality goods; it also has to develop and safeguard an image that inspires the consumer to decide to make a purchase.²

Even though the Eastern European countries do not appear in the Bozell and Gallup survey, some of them are catching up. Burdened with an economy that was unable to meet competition, most Eastern European nations have meanwhile embarked on an offensive economic course. Poland, Hungary, Slovakia and the Czech Republic are at the top. As far as economic growth is concerned, Slovakia and Poland are in the lead with a rate of 6 %. Poland's economy has benefited from a powerful boost in gross investments, which rose by 16 % in 1996 (**figure 2**). Success could also be achieved in the development of prices. While in 1991 and 1993 there still were four-digit inflation rates, the figures in 1996 had dropped to 5.3 % in Slovakia, 8.6 % in the Czech Republic, 18.6 % in Poland and 19.8 % in Hungary. If this trend

¹ Bozell/Gallup Press Release 1996

² "Die Welt", 3 June 1995 - Wirtschaft (business section)

continues, the development will lead to an increase in productivity of the businesses and so to an improvement in the countries' competitiveness.³

2 Management Systems

Asked about the objectives of their businesses, managers will simply answer:

The objective is to constantly make a profit.

In order to attain this objective, a product has to constantly hold its own on the market. A prerequisite for this is qualified management, which essentially means management methods, i. e. techniques designed to ensure the efficient performance of management tasks.⁴

The most important **qualitative management methods** are:

- **Management by objectives:** Business management based on clearly defined operational objectives, e. g. increase in turnover, improvement of quality, etc.
- **Management by exception:** Delegation of full responsibility for individual decisions to subordinates, consultation of superiors being confined to well-founded cases.
- **Management by system:** Systematization of management and control functions using regulations to ensure the consistent performance of recurrent activities.

The **quantitative management methods** above all include the network technique, operations research, system analysis and various optimization techniques for consistent performance of recurrent activities⁵.

If the first definition is used, the quality management system according to ISO 9000 ff. is a qualitative management method designed to ensure the optimization and consistent performance of recurrent activities.

³ "Osteuropas Reformstaaten holen auf", Gerhard Krause, Deutsche Bank Research, "Anlage-Management", No. 4/1997, p. 6/7

⁴ "Was ist Qualitätsmanagement?"

The significance of research and development within businesses is generally recognized in Western Europe. As competition becomes keener, however, cuts are made even in this area. At the same time, doubts are being expressed that these cuts in the research and development budgets might in the long run jeopardize innovative power and thus competitiveness on the international market. The growth of the businesses, however, can only be achieved by means of accelerated product, process and structure innovations.⁶

The competitiveness of a country is only in part determined by the big businesses; innovative small and medium-sized businesses engaged in new economic fields are of equal importance. They make up the infrastructure environment in which the economic development of a country can take place. According to a statistical investigation conducted by the Federal Ministry of Economics in 1991, approximately 90 % of all German businesses have staffs of less than 20.

3 Management Systems, e. g. ISO 9000 ff. and ISO 14000 ff.

Certification according to ISO 9000 ff. experienced a boom all over the world in 1995. By December 1995, more than 127,000 businesses in 99 countries of the world had received a certificate according to ISO 9000 and 257 businesses in 19 countries an environmental certificate. The leading countries as regards the implementation of ISO 9000 in Europe are the UK with 52,591 certificates issued, Germany with 10,236 and France with 5,535. In table 1, the Central and Eastern European countries are listed, e. g. Hungary with 309 with certificates according to ISO 9000, the Czech Republic with 180, Poland with 130 and Slovakia with 59, ahead of Russia with 22 and Bulgaria with 3 such certificates.⁷ In the sector of environmental certification shown in table 2, Great Britain is in the lead, with 61 companies having implemented the standards, ahead of Germany with 35 and Denmark with 21.⁸

⁵ Meyers Taschenlexikon, Vol. 6, 1985

⁶ "Deutschland ist von einer akuten Innovationsschwäche befallen", Roland Berger, HB No. 61, 27.3.1997, p. 16

⁷ The Mobil Survey, ISO 9000.....

⁸ The Mobil Survey, ISO 9000 NEWS, Vol. 5. No. 6. Nov./Dec. 1996

Quality and the environment are being declared a "strategic goal" in many businesses. The cost increase resulting from this decision is offset by the fact that less products are faulty (no rework and rejects) and in particular disposal costs are reduced.

3.1 Management System ISO 9000 ff.

The ISO 9000 ff. standard series implemented in 1987 describes the requirements for a quality management system as well as possible methods for the verification of and by quality management systems according to ISO 10011. ISO 9000 is a quality management and quality assurance standard. It is also a guideline for the selection of the three models ISO 9001, ISO 9002 and ISO 9003. With regard to quality assurance, these models describe the following:

- ISO 9001 Design/development, production, installation and servicing
- ISO 9002 Production, installation and servicing
- ISO 9003 Final inspection and test.

A business is free to choose the model on which its quality management system is built and certified.

ISO 9004, which provides the elements of the quality management system, is composed of two parts

- Part 1 Guidelines
- Part 2 Guidelines for service providers.

ISO 9004 is intended to enhance the appreciation and support the implementation of the requirements of ISO 9001 to 9002⁹

⁹ "Qualitätsmanagement", Jörg O.R.Schwinning, 1996

Section 4 of ISO 9001, the standard which is most frequently used, describes the demands on a quality management system, grouping them in 20 elements. These elements include management responsibility, quality management, contract review etc., down to servicing and statistical techniques. ISO 9001, however, does not define the level of quality, i. e. the quality of a product or service of a business.

The time it takes to implement it is stated in specialist literature and varies from 5 to 15 months. The assumed cost of the certification lies between 10,000 DM and 250,000 DM, depending on the line of business and size of the business concerned. The internal costs the business has to bear are between 100,000 DM and 1 million DM¹⁰.

Jütting refers to studies conducted in several medium-sized businesses. He discovered that approximately 75 % of the spending on the implementation of ISO 9001 goes on internal costs and about 25 %, i. e. about 3,000 DM, can be ascribed to the certification¹¹. According to Sprenger, small businesses in Germany have to pay at least 10,000 DM, medium-sized ones up to 45,000 DM and large ones indeed some 100,000 DM.¹²

Certification of a quality management system is fundamentally optional. The certification procedures are essentially the same with all certification companies and include the following phases:

- the submission of the request,
- the optional pre-audit,
- the review of the documents,
- the audit at the business premises and
- surveillance and re-auditing.

¹⁰ (vgl. Unternehmensqualität als Standortvorteil; Axel Postinett, HB Nr. 31, 13.02.96, S. 19

¹¹ Jütting, K.; Korn, G.; Möbius, M.: "Qualitätsmanagementsysteme in kleinen und mittleren Unternehmen", VDI-Z. 135 (1993), No. 7-July, p. 34 - 37

¹² "Der ISO-Wahnsinn ..."

With most certification companies, the certificate is valid for 3 years, with a review audit being conducted every year.

In the course of the implementation of quality management systems, more and more companies decide to build up a quality management system and prepare for the certification without calling for external advice. The immediate realization by the staff is considered a particular advantage. The quality handbook is written in teamwork between the personnel in each area and the quality management department.

According to a study by Leimbach¹³, the "claim to optimum work processes" is the main reason why most businesses opt for the certification (**figure 3**).

A certificate does not protect a company from going bankrupt; in the long run, only businesses that do not confine themselves to the certificate, but that subject both its product and its management system to a continuous improvement process will have a competitive edge.

The industrial change is drastically affecting most small and medium-sized businesses, including the trade companies in Eastern Europe. In order to safeguard their existence and remain competitive, these businesses will have to adapt quickly and effectively to new technologies (new materials and manufacturing processes) as well as to adjust their quality management systems and environmental management system to today's demands.

If in the course of the structural change in industry, small and medium-sized businesses want to receive orders from large businesses, i. e. become a part of their manufacturing process, quality and environmental protection will play an important role in the selection of the ancillary suppliers. A study on the adoption of ISO 9000 in small companies, however, revealed deficiencies in the documentation of job contents and working processes. This tendency was confirmed at the 1996 Hanover Fair. Many small and medium-sized enterprises are unable to establish a quality management system according to ISO 9000 ff. and have it certified due to the high cost involved, particularly since it is not possible to apportion the expenses to the

product prices. On the other hand, the implementation of a quality management system according to ISO 9000 is supported with EU and national funds. Up to 80 % of the costs accrued for consulting and certification are taken over.

The trades organizations are responsible for supporting the companies in the implementation of quality management systems that match the size of each company concerned and the services it provides as well as for suggesting a certification that corresponds to its financial capacities. As an economic group of a country, the trade companies (small and medium-sized businesses) play an important role. This group provides the subcontractors for the large businesses of our country. In the future they will only receive orders if they are able to fulfill the requirements of these businesses. In order to meet the increasing demand for quality management systems of the subcontracting companies faced with the requirements of the large-scale businesses and searching for technically suitable solutions, the author considers it necessary to build up certification companies within the trades organizations. By employing choice consultants who have many years of experience and can therefore take account of the peculiarities of the small and medium-sized trade companies, it will be possible for auditors and certifiers to conduct tailor-made certification audits at reasonable prices.¹⁴ The buildup of such structures will also be required in the Eastern European countries in order to stop untrustworthy consultants.

In contrast to the distinctly positive development in the industrial sector, only about 340 trade companies in Germany, from the motorcar workshop to the butcher, had certificates according to ISO 9000 ff. in 1995.

3.2 Management Systems ISO 14000 ff. and/or EMAS

Ecology must be worthwhile, the VDI-Nachrichten, one of Germany's best-known and recognized journals for engineers, wrote on 19 April 1996. The question is: Worthwhile for whom? For the businesses, for the shareholders, for the state or the government, for the people or even

¹³ Study: "ISO 9000 im Praxistest"

for the certifiers? With the waste mountains rising exorbitantly, rivers stinking and treasury funds spent, some governments are recalling the old polluter pays principle, i. e. those who cause the damage have to bear the costs resulting from it.

But how can entrepreneurs/managers be moved to go easy on the environment? For years, governments and parliaments in Western Europe have counted on regulatory measures, the result being innumerable acts and a situation in which the government authorities have in practice long since been unable to monitor the observance of the regulations due to the lack of funds and personnel in the Länder administrations. In this respect, the EU government is pinning its hopes on deregulation, direct responsibility and voluntary action on the part of the businesses, without government control.

With the adoption of the EU EMAS regulation (environmental audit regulation) in 1993, Brussels gave a first signal. Every company carrying on a trade or business which proclaims war on the waste of energy, the emission CO₂, the unlawful disposal of waste oil etc. may - if it has passed a test conducted by an independent environmental verifier - attach an *eco* label to its letterhead,.

Whether many companies will in practice subject their business to the environmental certification remains uncertain. But as in the case of the ISO 9000 ff., major enterprises are expected to urge their subcontractors to have their businesses certified because they (the major enterprises) are held liable by banks and insurance companies for environmental damage caused by their products via corresponding liability and risks classes and the respective premiums. The environmental audit is thus also intended to reduce risks in terms of civil and criminal law.

Finally, certified businesses may expect exemption from administrative regulations, for anyone taking part in the environmental audit is intended to be exempted from certain reporting duties.

The Environmental Audit Act, including its implementing regulation, has been in force in Germany since April 1995. It is based on the 1993EC environmental audit regulation (EMAS

¹⁴ "Erste Erfahrungen mit Zertifizierung", Max -Dieter Behr, HB No. 75, 17.4.1996, p. B15

regulation). It requires particular importance to be attached to the proper performance of the environmental audit act prior to the build-up of an environmental management system. The actual state must be established in accordance with Appendix I C of the regulation. Appendices I C and II contain information in support of the environmental review of the company. The environmental policy of a business should not only be focused on the observance of laws; continuous improvement of the environmental management is part of the obligation as well. Environmental targets must be defined and quantified and deadlines for reaching these targets must be fixed. As far as possible and reasonable, the business must determine, for example, the percentage by which and the period in which it intends to reduce its current waste volume¹⁵. According to the environmental audit regulation, an independent environmental verifier declares the environmental statement of the business valid. The companies inspected according to the environmental audit regulation are registered at the chambers of industry and commerce or at the chambers of crafts. The location of the business is entered in the EU register of sites and published in the official journal of the EU (**figure 4**).

The manufacture of a product has an impact on the environment. For this reason, it is necessary to define limits for the impact businesses have on the environment: this is particularly true for air, water and soils.

Environmental management systems are nowadays also certified according to ISO 14000 ff. Electrical engineering, food and mechanical engineering companies are trailblazers in environmental management.

The ISO 14000 ff. standard series may be regarded as another international management standard. It comprises general standards for the implementation of an effective environmental management system including the related necessary audits. This standard series specifies requirements for an effective environmental management system whose elements can be connected with other management requirements. There is no intention to create unfair trade barriers or to change obligations of the organizations based on laws.

¹⁵ "Öko-Audit-Verordnung oder ISO 14001", Interview Josef Stoll, DQS, March 1996

All the requirements ISO 14001 contains can be audited objectively. This work can be done by means of certification or self-declaration.

This standard is applicable to all companies and organizations aiming at:

- a) implementing, maintaining and improving an environmental management system,
- b) ensuring conformity with their company environmental policy,
- c) proving this conformity towards others,
- d) having the company management certified by an external organization or by
- e) determining and declaring conformity with this international standard themselves.¹⁶

Particular attention should be attached to section 4 of ISO 14001. It describes the requirements for an environmental management system which is to be introduced by an organization. The ISO 14004 standard, "Environmental Management Systems - General Guidelines for Principles, Systems and Tools", is intended to support organizations in the introduction or revision of an environmental management system.

ISO 14010 contains general principles for the performance of environmental audits which have to be observed by organizations, auditors and their customers in the auditing.

ISO 14011 contains "Guidelines for Environmental Auditing - Auditing of Environmental Management Systems".

"Guidelines for Environmental Auditing - Qualification Criteria for Environmental Auditors" are comprised in ISO 14012.

At present ISO 14040 exists in draft form. It specifies principles and general requirements for life cycle assessment within the scope of environmental management.

Further standards of the ISO 14000 series are currently being prepared: ISO 14041 (Environmental Management - Life Cycle Assessment - Goal and Scope Definition and Inventory Analysis), ISO 14042 (Environmental Management - Life Cycle Assessment - Impact As-

¹⁶ ISO 14001, p. 6

essment), ISO 14043 (Environmental Management - Life Cycle Assessment - Evaluation)¹⁷ and ISO 14050 (Environmental Management - Vocabulary)¹⁸.

The data required for an environmental management system should already be available in the businesses, since they are obliged to submit documentation and report under existing legislation, e. g. the Federal Immission Control Act.¹⁹

The first step in the introduction of an environmental management system is the analysis phase which starts with an assessment of the present situation. One result of the basic analysis is the relevance table which provides a qualitative survey on the environmental impacts of the individual activities of the business, including the respective degree of importance. These data may be used to draw up a detailed list of all environmentally relevant activities²⁰.

Both documents, ISO 14000 and the environmental audit regulation EMAS, require a responsible environmental policy involving adequate measures by the management. One difference between the two documents is their origin. ISO 14000 is a standard applicable at international level and is therefore above all important for businesses engaged in worldwide activities. It thus applies to all sites, whereas the environmental audit regulation is only applicable within EU territory.

Most authors drawing a comparison between the EMAS regulation and ISO 14001 point out the correspondence between the two as regards content.

Both treat elements such as environmental policy, environmental programs and environmental management systems and both are based on a regular performance of environmental reviews or environmental audits. Both systems are applied on a voluntary basis.

The fundamental differences between the EMAS regulation and ISO 14001 are as follows:

- EMAS obliges the companies to publish an environmental statement, a document not required by ISO 14001, which calls for a certificate to be issued subsequent to auditing

¹⁷ ISO 14040, p. 5

¹⁸ ISO 14010, p. 7

¹⁹ Myska, "Nach dem QM", p.161-162

and leaves the question of informing the public about the receipt of the certificate at the discretion of the management.

- EMAS provides for an authorized environmental verifier to deliver an opinion, while, according to ISO 14000, a certification is performed by an auditor on the basis of a private law contract.
- EMAS requires that the internal audit is conducted in compliance with environmentally relevant laws; such a clear requirement is not contained in ISO 14000 ff.

The two systems also differ in their performance requirements. Both systems use the term continuous improvement.

- In the case of EMAS, this means the continuous improvement of the environmental performance of the business, whereas the ISO standard uses this term in the sense of the continuous improvement of the environmental management system.

The EMAS system uses a further two criteria:

- The requirement for the *economically viable application of best available technology*, and - described in more detail in the appendix - the term *good management practices*. ISO 14000, in contrast, includes the declaration to avoid environmental impact²¹

The EMAS regulation is criticized, however, for the fact that the observance of statutory provisions alone is not considered a sufficient reference criterion. Another danger is seen in the fact that an expert opinion according to EMAS does not provide any information about the environmental compatibility of a product, this subject being covered by a separate EU regulation. Another cause for criticism is the fact that the validation process only has to be repeated after three years, so that the companies can use the *eco* label during that period without having to furnish evidence of the improvement of their environmental performance²².

²⁰ Häflinger, "Kombiniert oder getrennt", p. 44 - 45

²¹ Dyllick, Hummel, p. 24-28.

²² Kuhlmann, "Es Grünt..", p. 42 - 45

Literature provides only little information about the costs. Between 1993 and 1995, 14 businesses were supported by the Hessian state government in the introduction and conduct of an *eco* audit. An audit cost between 15,000 DM and 114,000 DM. In his article, Schwarz quotes auditing costs for pilot projects ranging from 15,000 DM to 1 million DM.²³

An existing quality management system may be regarded as a favorable basis for the establishment of an environmental management system. There are evident structural similarities between ISO 14001 and ISO 9001. Both systems show the same basic structure and differ only in terms of emphasis. Whereas a quality management system is primarily adjusted to the requirements of the customers, an environmental management system is aligned to the entire environment of a business.

A business which has already adopted a quality management system can choose from several possible methods of introducing an environmental management system:

- The environmental management system are completely integrated into the existing quality management system.
- All quality-related terms in the quality management system are neutralized.
- The quality and environmental management systems are integrated into a process-oriented management system.
- The environmental management system is introduced, regardless of the existing quality management system.

The decisive aspect for a business is the environmental relevance of its activities. For businesses which are in the public eye or under severe observation as regards the environmental issue, an integration into the quality management system should not be favorable. It is expected, however, that there is a trend towards integrating the requirements of the environmental management system into the quality management system.²⁴

²³ Schwarz, "Zuckerbrot", p. 201

²⁴ Häfliger, "Kombiniert oder getrennt", p. 46

4 Chances and Risks of Implementation

The analysis of recognized technical journals in consideration of this article revealed that since 1994, more and more articles have appeared that make criticism of the way in which ISO 9000 ff. is being commercialized a topic of public debate.

The introduction of a quality management system and its certification according to ISO 9000 ff. have almost become a must and may therefore be called de facto standard practice.

More and more certification companies are striving to get a share of the developing certification market. One result of this is that the certification audits are becoming increasingly simpler and cheaper. Also, the businesses have discovered that many certificates can in practice only be regarded as an admission ticket to the market and so represent not more than the completion of formalities. In particular with businesses which strive for a quality management certification merely due to market compulsions, there is the danger that an artificial quality management system is established that has no effect on the qualities of products or services. There is all too sharp criticism of this approach, and the certifiers themselves are to blame for the doubtful value of their certificates. Businesses are responding to this practice of the certifiers by trying to get a certificate at minimum expense.

This inevitably leads to the question: "Who certified your business?" "The Big Three", Ford, GM and Chrysler, set the standard back in 1995. A joint quality guideline known as QS 9000 replaced their differing regulations. Anyone who wants to become a subcontractor of Ford, Opel or Chrysler in the future will in future have to fulfill the requirements of these companies²⁵.

Consultants are particularly criticized whenever they present their run-of-the-mill concepts and introduce formal structures without taking account of existing processes in businesses. Prof. C. Niedereichholz states that the economic damage that gamblers and adventurers have caused in Eastern Germany after reunification and in Poland, the Czech Republic, Hungary

²⁵ "Nach der Euphorie droht Konfusion", Klaus Kayser, HB No. 187 of 27.9.95, p. 33

and above all Russia after the opening of Eastern Europe, runs into billions. The holder of the chair of management consulting deplors the fact that there are "many incompetent and dubious elements" on the consulting market²⁶.

Consultants often take recourse to formal and outdated concepts when implementing the ISO 9000. This suits many managers very well, as they tend to feel well on safe ground only, but it is often an impediment as far as the qualification of staff members is concerned²⁷.

It must be emphasized that the set phrase "quality management according to ISO 9000 ff." implies that the use of this standard guarantees quality. This is by no means the case, since certification according to ISO 9000 alone does not say anything about the quality of a product or service.

Not least, consultants are said to be only interested in the money, a claim towards which major businesses in particular adopt an anti stance. The attitude of the consultants to want to earn as much money as possible is nothing really out of the ordinary, considering that the entire consulting and certification market in Germany is estimated to be worth approximately 5 billion DM²⁸.

In order to counter the above-mentioned development in the certification sector, Petrick considers it necessary to take the following measures²⁹:

- to improve the competence of the accreditors;
- to ensure the effective examination and monitoring of the certifiers for minimum competence by the accreditors;
- to improve the competence of the certifiers beyond the minimum requirements;

²⁶ HB No. 169, 1.09.95, p. K1

²⁷ Essay, "Der ISO-Wahnsinn"; Reinhard Sprenger, *Industriemagazin*, 10/95

²⁸ "Nach der Euphorie droht Konfusion"; Klaus Kayser, HB No. 187, 27.09.95, p. 33

²⁹ Dr. Klaus Petrik, "Extrepositionen zum Thema...", DQS 03/97

- to encourage organizations (businesses, administrations etc.) to select from among the accredited certifiers the ones who show having particular competence as well as to establish and propagate selection criteria.

The chances of implementing ISO 9000 lie in the reorganization and improvement of company processes. Irrespective of all the criticism voiced, this has also been recognized by the managers.

Strategic company objectives beyond the formal framework of ISO 9000 are derived by means of well-aimed project management. Such objectives are:

- using certification as a launching platform for an overall business concept for realizing understandable, documented and improved internal processes;
- getting certification accomplished within 12 to 15 months by a certifier recognized among experts.

During an analysis and planning phase, the quite general requirements of the standard series are interpreted and transferred to a company's parameters. It is necessary to adapt the host of individual requirements to the actual conditions of the company.

The most important tasks during the buildup and introduction phase are on the one hand to inform the staff and on the other to determine the scope and precision of the documentation, with account being taken of the specific conditions of the company. This gives the businesses the chance to identify the processes and procedures that are essential for a stable and constant improvement of product quality. Documented in a quality management handbook, this forms the typical basis of a quality management system.

The documentation of the quality management system can be divided into system-related and product-related documents.

Another important element of the quality management system are the internal quality audits, which must be regarded as instruments designed to improve products and processes. The crucial questions are:

- Have the quality management measures been adopted?
- Are the written instructions at the workplaces?
- Are the instructions being followed?
- Are the measures adopted effective?³⁰

In order to constantly improve both the management system and product quality, it is necessary to constantly take corrective measures. These must be regarded as part of the management system.

The quality management system, built up as a formal structure, will contribute little to the success of the company. Only a continuous improvement of its processes and products will make it competitive.

³⁰ "Qualitätsmanagement-Systeme in kleinen ...", K. Jütting, VDI-Z 135, 1993, No. 7 - July

5 Summary

Technical Committee (TC) 176 (about 300 representatives from 40 countries), the so-called "Quality Management and Quality Assurance" committee of the ISO, continues to adhere to the 'VISION 2000' strategy paper in its revised form.

Strategic objectives for the standards of the ISO 9000 and ISO 10000 series are:

- general acceptance, compatibility now and in the future;
- consideration of an organization and its quality management system as a 'network of processes';
- integration of customers, owner(s), staff member(s), suppliers and society;
- attachment of more importance to process assessment, QM system audits and QM system assessments;
- distinct positioning of the QM system within a super-ordinate management system,
- harmonization of QM standards with related standard management sectors such as the ISO 14000 series on environmental management systems³¹.

The ISO 14000 series may be regarded as another set of international management standards. It will be far more difficult to implement them successfully than it was the ISO 9000 series.

Environmental management is intended to be part of the strategic objectives of a business. Agreement must be reached on what the company's target environmental strategy is to be. When environmental management systems are established in practice, they are often found to have an end-in-itself character³².

³¹ Re-Vision 2000: "ISO/TC 176 geht in die langwierige Phase II Revision", Klaus Petrick, 1995/1996)

³² "EMAS und/oder ISO14001?" Dyllick, Umwelt Wirtschafts Forum, volume 3. No. 3. Sept.1995

Articles giving an outlook for the future say that there are plans to combine the quality and environmental management systems with other management components, e. g. employment protection management, to form a comprehensive management system³³ (**figure 5**).

Management systems are only aids and instruments for attaining objectives in an efficient manner. This applies both to the quality management and the environmental management of a business.

The objective of every business/manager, to constantly make a profit, cannot be reached by the introduction of modern structures alone, i. e. standard management systems, but only by the provision of innovative, high-quality and environmentally sound goods and services. Standard management systems are therefore always only part of a successful business strategy.

³³ Presse-Info 05-97: <http://www.din.de/aktuelles>, vom 20.03.1997

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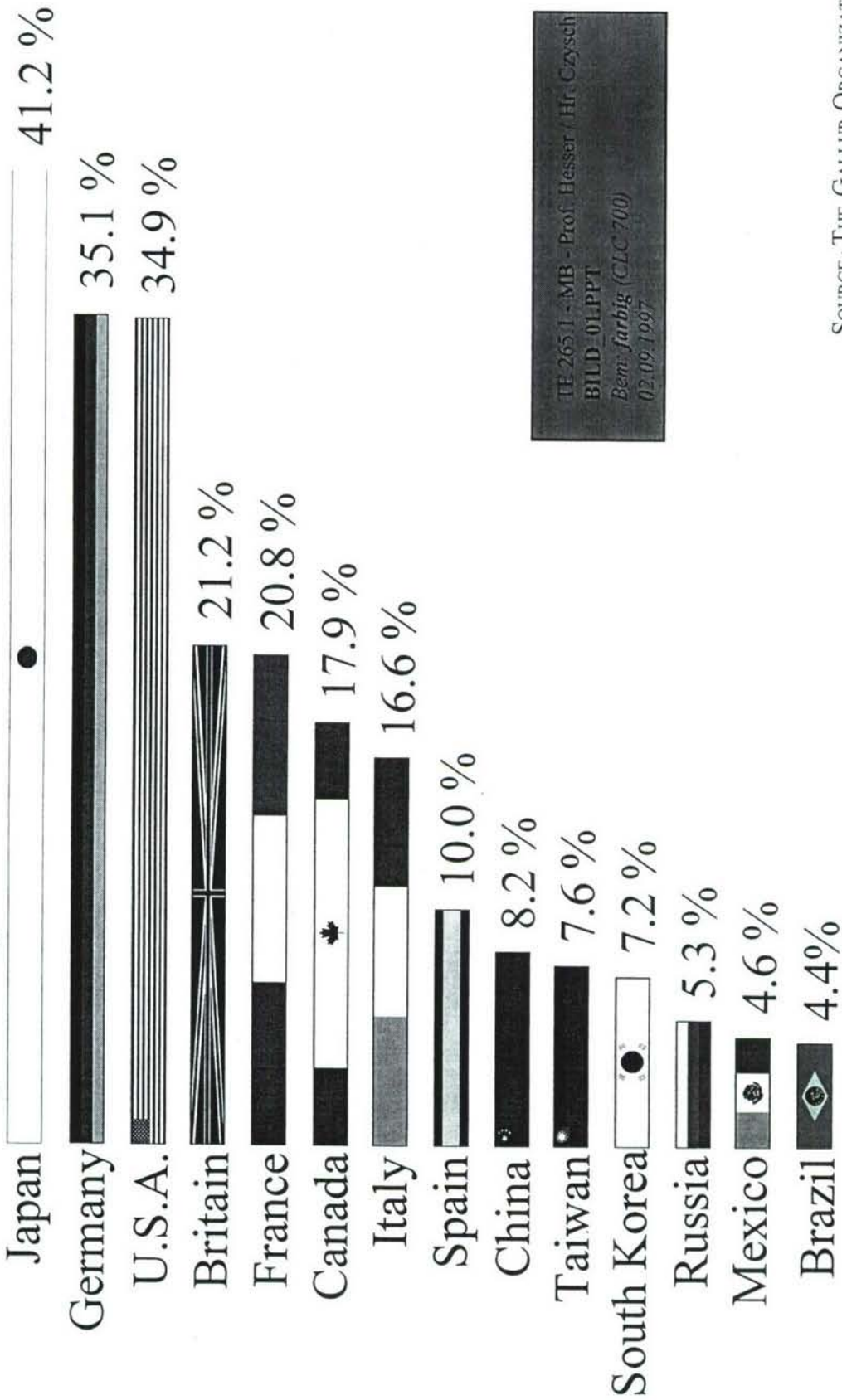
	<i>Jan 93</i>	<i>Sep 93</i>	<i>June 94</i>	<i>Mar 95</i>	<i>Dec 95</i>
Austria	101	200	434	667	1133
Belgium	180	464	870	1226	1716
Bulgaria				1	3
Croatia			2	8	22
Cyprus		1	5	5	7
Czech Republic		18	47	101	180
Denmark	326	608	916	1183	1314
Estonia			1	1	1
Finland	185	324	496	646	772
France	1049	1586	3359	4277	5535
Germany	790	1534	3470	5875	10236
Gibraltar			2	3	4
Greece	18	46	90	162	248
Hungary	3	23	58	125	309
Iceland	2	3	4	4	12
Ireland	100	893	1132	1410	1617
Italy	188	864	2008	3146	4814
Liechtenstein			14	14	19
Lithuania					2
Luxembourg	4	10	21	40	48
Macedonia					1
Malta		1	3	7	12
Monaco	1	1	2	5	5
Netherlands	716	1502	2718	4198	5284
Norway	91	172	400	679	890
Poland	1	1	16	41	130
Portugal	48	85	181	257	389
Romania			6	15	42
Russia		5	8	15	22
Slovakia		5	11	27	59
Slovenia	3	16	43	62	99
Spain	43	320	586	942	1492
Sweden	229	365	618	871	1095
Switzerland	410	569	945	1520	2065
Turkey	26	65	106	270	434
Ukraine		1	4	7	8
Yugoslavia	1	1	1		
Europe excl. UK	4515	9683	18577	27810	40019
% Share	16.23	20.79	26.40	29.20	31.41
Countries	23	29	34	34	36

Table 1 : ISO 9000 Certification in Europe

<i>Environmental certificates worldwide on 1995-12-31</i>	
Argentina	1
Australia	1
Austria	11
Brazil	2
Denmark	21
Finland	10
France	3
Germany	35
India	1
Ireland	3
Japan	4
Netherlands	74
Norway	3
Korea	19
Sweden	2
Taiwan	2
Turkey	3
United Kingdom	61
USA	1
Total	257

Table 2 : Worldwide Environmental Certification

Overall Quality Leaders: Trend 1996

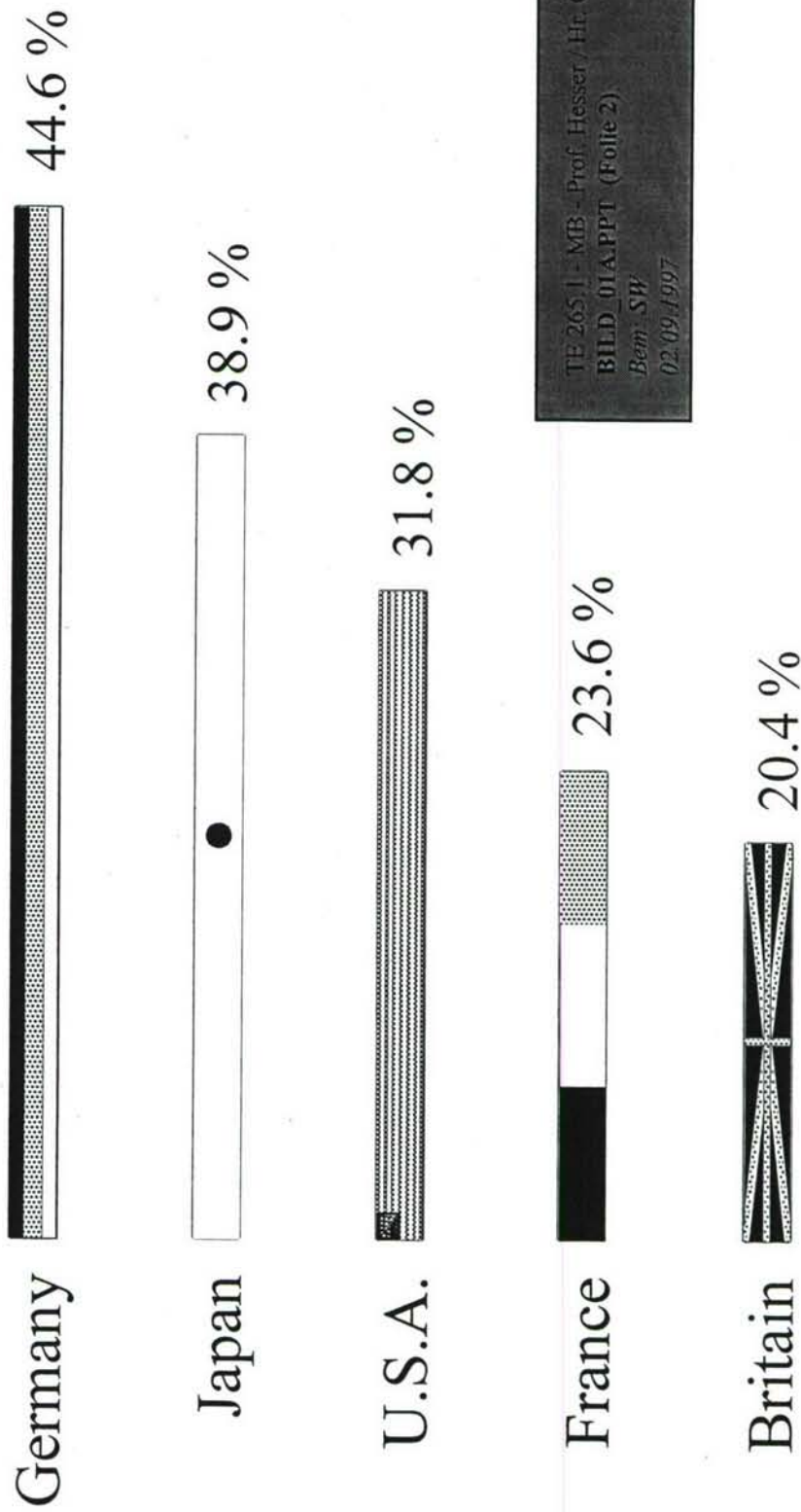


TE 26511 - MB - Prof. Hesser / Hr. Czysch
 BILD 01.PPT
 Ben: Jarbig (CLC 700)
 02.09.1997

SOURCE: THE GALLUP ORGANIZATION

Figure 1 : *Manufactured Products*

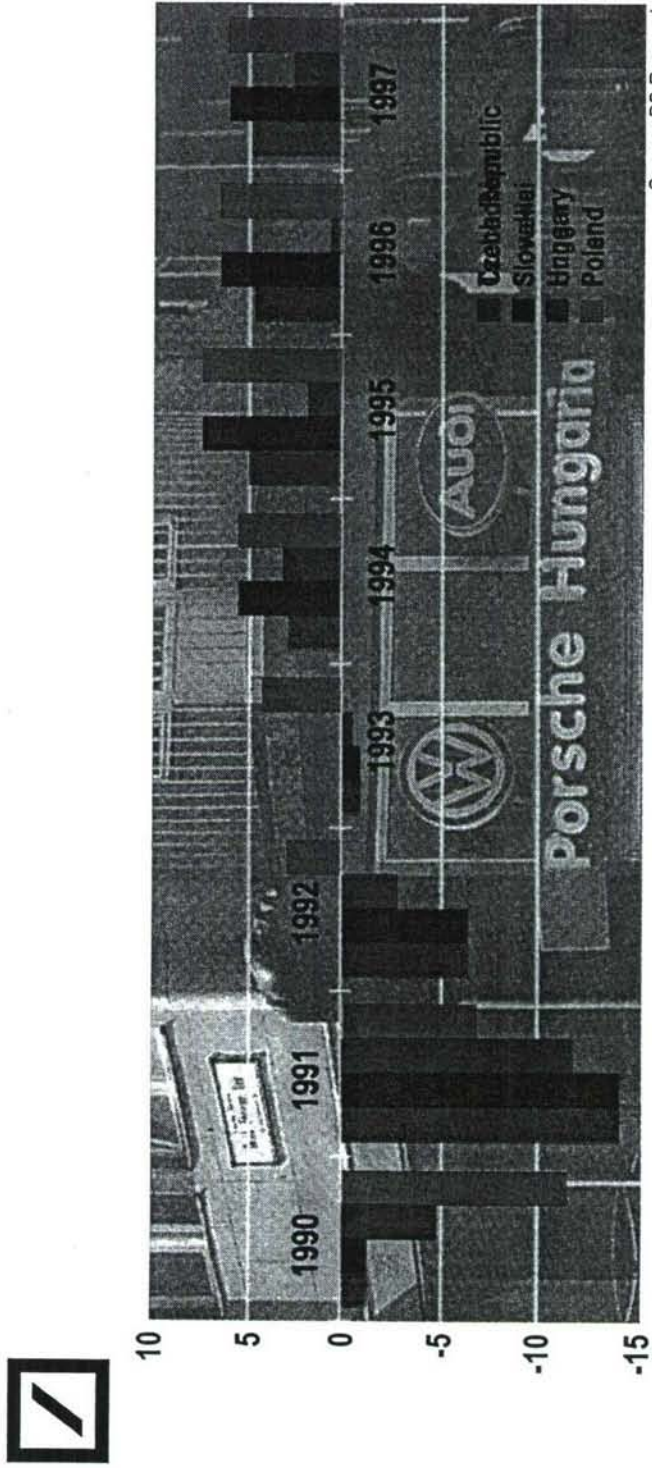
Top 5 in Europe: Trend 1996



TE 2651 - MB - Prof. Hesser / Hr. Czysch
BILD_01A.PPT (Folie 2)
Bem. SW
02.09.1997

SOURCE: THE GALLUP ORGANIZATION

Figure 1a : *Manufactured Exports*

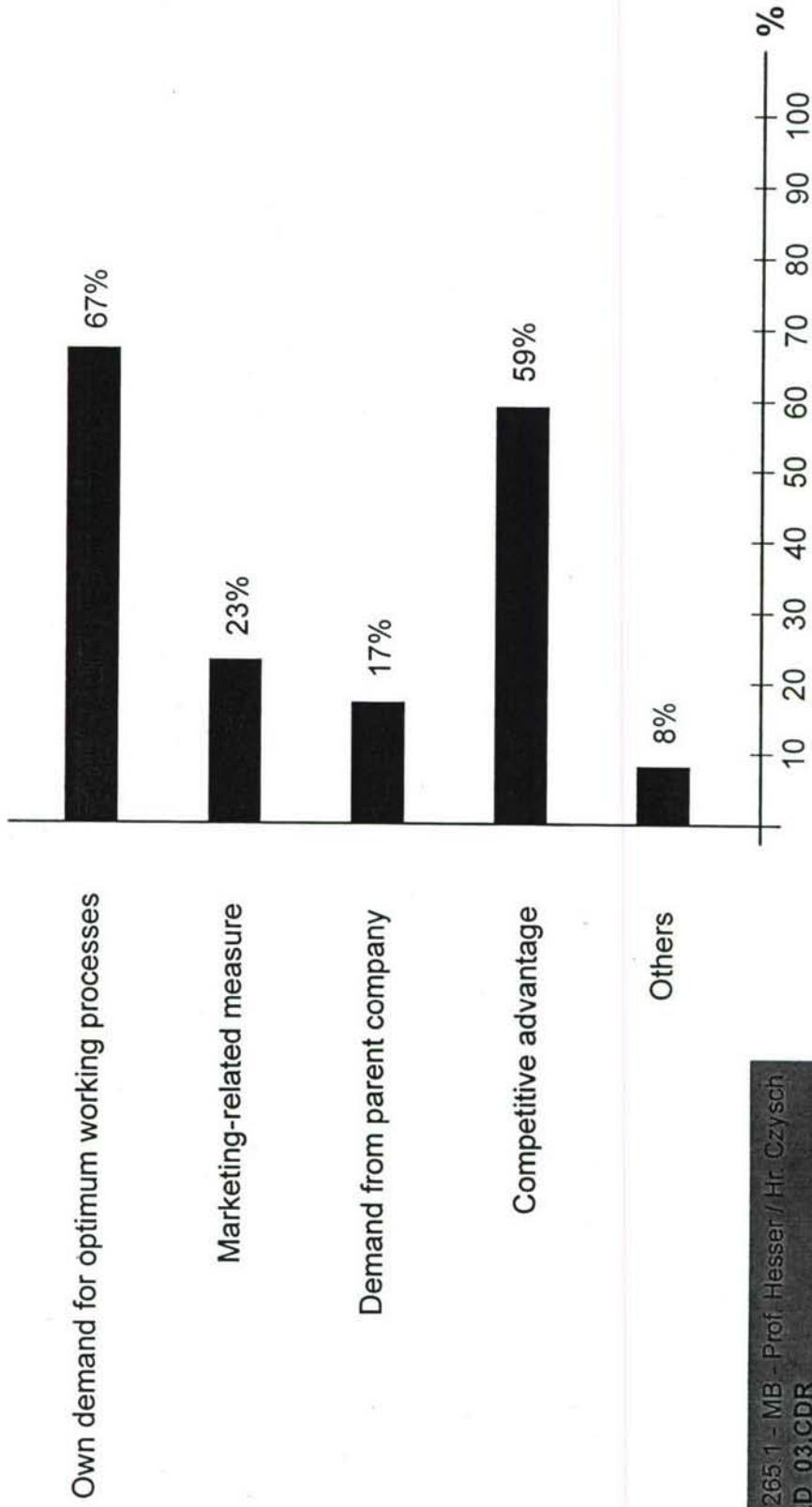


Source: DB Research

TE 265.1 - MB - Prof. Hesser / Hr. Czysz
 BILD_02.CDR (Seite 2)
 Bem: SW (55%-Druck-Raster)
 02.09.97

Figure 2 : Trend in the gross domestic product for the reference states in eastern Europe (compared with previous year in %)

Reasons for introducing ISO 9000



TE 265.1 - MB - Prof. Hesser / Hr. Czysch
BILD_03.CDR
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02.09.97

Figure 3 : Why companies decide for certification, after A. Leimbach

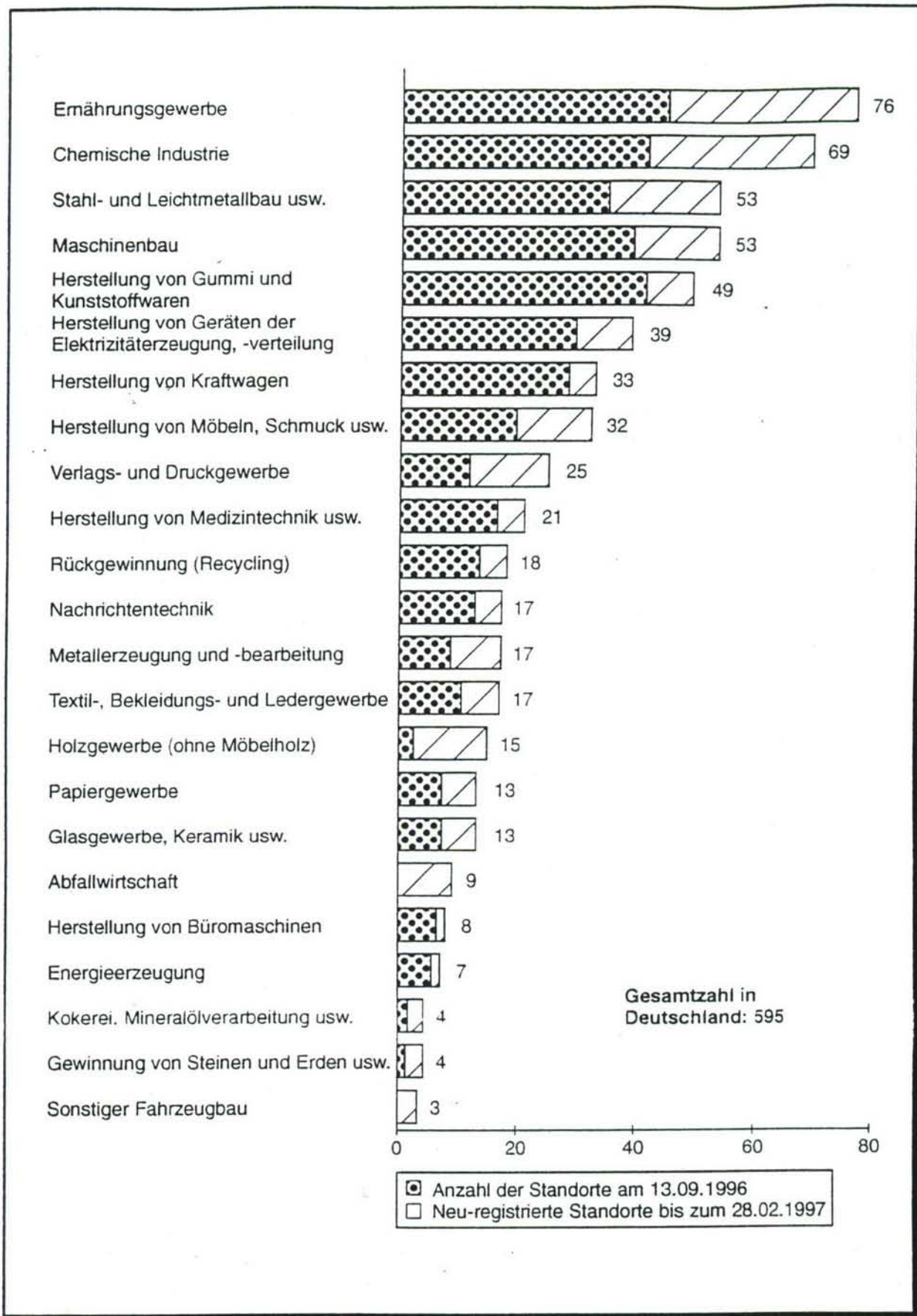
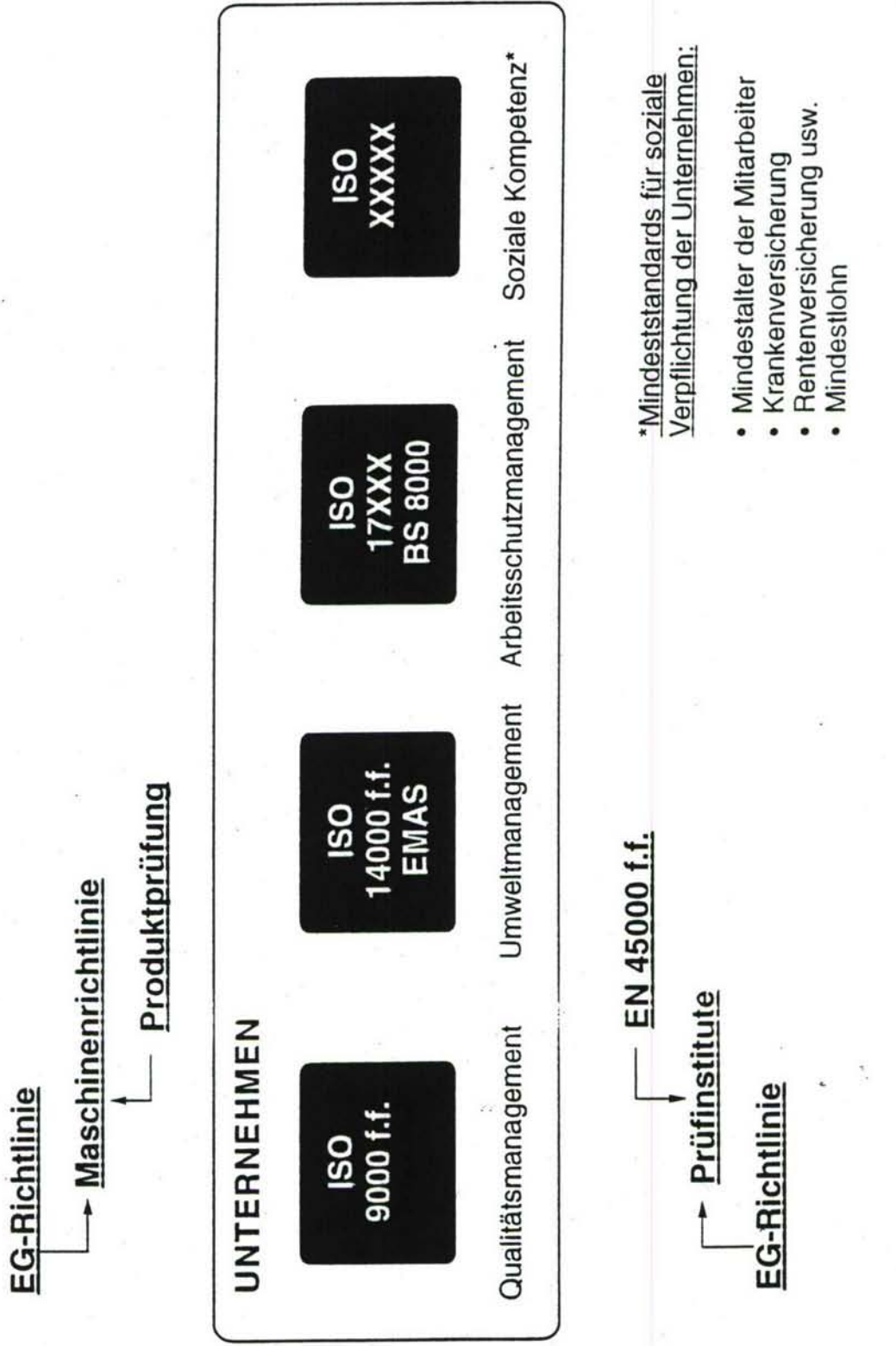


Bild 4 : EU-Öko-Audit: Beteiligung nach Branchen



*Mindeststandards für soziale Verpflichtung der Unternehmen:

- Mindestalter der Mitarbeiter
- Krankenversicherung
- Rentenversicherung usw.
- Mindestlohn

Bild 5 : Stellung der ISO-Normen in Bezug auf EG-Richtlinien

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Standardization strategies for a company

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Introduction

The increasing globalization of economic relations and the continuing integration of the worldwide data and information flow is to a large extent based on standards. In modern industrial societies decisions with regard to standards are of great importance. They determine the characteristics of the interdependencies of technological systems as well as their development capacities and they open up new market opportunities. In this context companies play an important role: They develop and market standards or participate (e. g. in committees) in their selection.

In the beginning of the industrial revolution engineers recognized early the economic, technical and practical advantages of in-house standardization, i. e. harmonization of parts, products and processes. Company standardization is an integral feature of the transition from manual production to modern mass production based on the division of labor. In-house standardization leads to a reduction of variety, which in turn primarily leads to a reduction in costs by reducing the expense for storage, materials management and construction as well as by extending machine running times. In the following decades engineers in companies, committees and standardization institutions coordinated the industry- and nationwide harmonization of standards. With the increasing regional and international economic and technological interdependence of modern economies there has also developed an increasing requirement for a regional and international harmonization of standards, which is taken into account in the corresponding standardization institutions. Today the decision of which technologies will gain acceptance (especially in the promising fields of the computer and information industries) is primarily made in the marketplace. In this respect standards and "de facto standards" have significant a strategic influence.

Although today many managers are well acquainted with the consequences of in-house standardization, they do not recognize the strategic dimension of standards and de facto standards. The intent of this contribution is to make clear what strategies can be employed by companies concerning standards and de facto standards vis-à-vis their environment. The description of company strategies is illustrated using examples primarily from the field of computer and information technology.

Discussion of some terms

Company environment

First of all, the environment a company faces in a modern industrial society is of particular interest. The characteristics of the company environment effect considerably the scope of action of a company.

Elements of the company environment include the *markets*, where the company offers its products, competes - together with its competitors - for the favors of customers, procures intermediates (e. g. raw materials), hires workers and raises capital.

National, regional and international standardization committees - in the following simply called committees - , in which the company meets with other companies of its industry as well as with other experts, decide on the introduction and the forms of standards.

National, regional and international standardization institutions deal quasi 'full-time' with standards and exert great influence on the introduction and the forms of national, regional and international standards.

The scope for formative action of the companies is influenced by *the state*, e. g. in its role as lawmaker or important customer.

The legal system defines the companies' scope for formative action.

Furthermore, the company is integrated into the "super system" *society*, representing social order, prevailing ethics and moral principles, manners, customs and the like. This super system induces 'rules of conduct' to which the company must submit if it wants to ensure its existence; elementary or permanent violations of these rules threaten the continued existence of the company.

In principle the company environment is complex. A company strategy will always be oriented towards one or several of its elements.

What is a company strategy?

In the following a company strategy is defined as a plan for the conduct of a company serving its long-term business objectives and taking into account the company environment and its future (expected) development.

Company strategies are determined by the company's business objectives. Business objectives are manifold, consisting of diverse, sometimes contradicting sub-objectives and may change in the course of time. Typical business objectives are for example maximizing profits, achieving a high market share or opening up new markets. Business objectives are not exclusively egoistic but extend also to the well-being of the company environment. In principle the prevailing objective is to secure permanently the existence of the company.

What does standardization mean?

The reader surely has an idea of the term 'standards' that can be used without any problem in everyday life. In decades of work the institutions dealing with standards have indeed developed a number of definitions clearly defining the objects and providing a good starting point for the following remarks. According to DIN EN 45020, at the European level the valid definition is:

'Standardization: Activity of establishing, with regard to actual or potential problems, provisions for common and repeated use, aimed at the achievement of the optimum degree of order in a given context.'

Compatibility and network effects

The subsequently described strategies primarily refer to standards whose purpose is to permit compatibility. These standards determine the ways in which technical products work together. Compatibility frequently permits establishing networks, which in turn are characterized by so-called network effects. The larger the number of users of a network, the greater the benefits for each individual user. This is the case, for example, in a telephone system. The benefit for the individual user is determined by the number of people he can reach. Since the number of users in the telephone system is very large, there is no incentive to fall back on other, less widespread means of communication. In addition to the benefits from the large number of users, a new network user can expect mature products and good service.

Markets with network effects are frequently prone to monopolistic tendencies, i. e. in the end only one company or one technical solution dominates the market.

Gaining acceptance for a *de facto standard* in the marketplace

A company may try to establish its product in the market as a so-called *de facto standard*. The term *de facto standard* was coined in economic theory and refers to a product dominating the market due to network effects. 'WIN95', for example, dominates the market for personal computer operating systems.

Gaining acceptance in a market means for a company, in particular, convincing customers that it has the better product. In general the target is to give the company a favorable market position, i. e. a big profit or a large market share. This should be particularly successful if the product is superior to competing products with regard to quality, performance characteristics or extended product features when it enters the market. If the product cannot be distinguished from competing products on the basis of its product features, a company may offer a better service, start a comprehensive advertising campaign or create a distinct image for itself by way of an unusual design. These strategies, however, are universally valid and may be applied by companies in every conceivable competitive situation. With regard to standards and *de facto standards* the following strategies are of particular interest.

Cutting production costs by reducing the number of different parts

A company that produces more economically than others can set a lower cost-covering price than its competitors and thus gain their customers. Reducing the number of different parts through company standards means reduced unit costs in materials management, storage, administration and engineering. Consistent orientation of manufacturing towards less varying

parts and products or towards extended machine running times can also lead to a reduction in unit costs.

In development and production, for example, the introduction of a family or modular design may lead to a faster, more economical and safer design. In the case of modular design a number of follow-on designs are derived from one basic design in accordance with certain laws. The follow-on designs may, for example, differ from the basic design in size but have the same proportions. In modular design, on the other hand, standardized modules with different functions are combined into different overall solutions.

Fixing of prices that do not cover the production costs

If a company wants to increase the market share of its product, it may offer it at a price, which is lower than the production costs. This is generally called 'dumping'. If other companies pursue the same strategy, the result may be 'price wars', which may have negative effects on some of the participating companies or on the whole industry.

Dumping is frequently observed in the case of products that form the technological basis for the use of other products (the latter are called complementary products). If a customer chooses a certain product, he may be committed to the choice of complementary products. If the company offers these complementary products as well, it has the chance to at least compensate for the revenues lost through price dumping by a corresponding price increase for application software.

In the extreme case prices are reduced to zero. Software companies sometimes give away their products to tie customers to their product range. A similar policy is to give away or to provide without cost complete versions which are only operational for a limited period of time, or operational demonstrator versions.

The scope for formative action of a company whose product has gained acceptance as a *de facto standard*

A company whose product has successfully gained acceptance as a *de facto standard* enjoys a monopoly and has far-reaching pricing and product styling opportunities.

Setting excessive prices

Such a company may set excessive prices because there are no competitors who may exert pressure by way of their pricing. The lack of competition may also lead to inefficient production and insufficient product quality.

Staggering of product introduction over time

A company may dynamically stagger the introduction of products based on the *de facto* standard to maximize profit or revenue in the market in the course of time.

Dynamic structuring of innovation cycles

A company that has succeeded in setting a *de facto standard* may also dynamically structure the innovation cycles of its technology. Since there are no competitors, it is possible to stretch innovation cycles. Here the target is also to maximize profits or revenues. Especially in innovative industries competition exerts strong innovation pressure on all companies involved. A company in the computer industry, for example, that cannot cope with the enormous innovation pressure quickly falls behind. In this industry innovation cycles are sometimes only 5 months. For a company with a *de facto standard* the innovation pressure may not be very pronounced.

Exerting pressure on the manufacturers of complementary products

Because of their market power, companies with a *de facto standard* can exert pressure on the product and innovation styling of the manufacturers of complementary products. For example, in the press there is a discussion of the influence of Microsoft on INTEL with regard to INTEL's MMX technology, which was introduced in the beginning of 1997. The capability of INTEL's MMX processors with regard to multimedia applications is greater than that of the generation of their predecessors. It is suspected, however, that MMX technology was not at the limit of what was technologically possible for INTEL. It was supposed that Microsoft, on the other hand, would have had problems in supporting a more capable technology than MMX technology with its software, and that Microsoft had therefore exerted pressure on INTEL to introduce the technologically inferior MMX technology in order to 'technologically keep in step' INTEL and Microsoft. This example shows that the shortcomings of a *de facto standard* can obviously also influence the technological progress in the complementary markets.

The problems of replacing an inadequate de facto standard

A *de facto standard* establishes a so-called 'installed basis': All actors involved are committed to one product, have more or less come to terms with this situation and can change to another product only at a considerable cost. Even if the shortcomings of the installed basis are common knowledge and there is also a better technology, the shift to a new product may be accompanied by social costs, which - if it is not imposed by the state - will prevent it. A company with an installed basis therefore enjoys a particularly secure market position due to the high costs involved in the replacement of the product by the users.

Strategic implications of downward compatibility

In the computer industry the question of downward compatibility is of particular interest. This means the compatibility between one product generation of a company and the previous one. The advantage for a company is that the supply of complementary products is not reduced. On the other hand, when the company wants to guarantee downward compatibility over several product generations, this may become a self-inflicted problem. The reason for this is that downward compatibility affects the technical capability of the newest product generation (possibly exceeding the desired extent). A common example is the Microsoft operating system MS-DOS. Over many years and product versions Microsoft guaranteed the downward compatibility of MS-DOS to make a large amount of software accessible to the user. The result was, however, that all later versions of MS-DOS and Windows transported the deficiencies of the early MS-DOS versions.

The technical shortcomings of the *de facto standard* in turn give other companies the opportunity to attack it because of its apparent deficiencies. Whether such a strategy is successful depends on the market position of the *de facto standard* and the starting position of the challengers.

On the other hand, a well-established company may give up or restrict the downward compatibility of its product quasi overnight. Then the customers are often forced to adapt to this strategy or to choose the more expensive product of another company.

Strategies of companies without their own *de facto standard*

Even if a company with a *de facto standard* obviously has a large scope of formative action, its competitors can also apply a number of strategies to improve the market positions of their products.

Adaptation to the de facto standard

The company may adapt its own products and technologies to the *de facto standard* as far as this can be done technically and with acceptable costs. An example is a software firm that previously wrote programs for APPLE computers and now, due to the small market share of APPLE products, writes programs for PCs. The competitors can try to gain market shares from the dominating company on the basis of its *de facto standard*. In the 80s this happened to IBM with its PCs.

Replacing or circumventing the de facto standard

If a company does not want to adapt to the established *de facto standard*, it can try to develop its own technology that is suitable for replacing or 'circumventing' it, i. e. rendering it

superfluous. One example is a software-based solution with the potential to replace a hardware standard.

Development of an adapter

It is furthermore possible to develop an adapter that makes one's own technology compatible with the de facto standard of the competitor. One example is a PC emulator for APPLE computers used for running PC programs on the APPLE computer.

The influence of coincidence

Another important factor is coincidence. During the phase in which several products penetrate the market which are all capable of becoming a de facto standard, i. e. in the 'infiltration' phase, frequently factors that cannot be influenced by the company decide on success or failure. This includes, for example, the (possibly insufficient) level of information of the customers, their expectations with regard to the future development, unpredictable variations in the preferences of the customers, historical circumstances and the more or less accidental sequence of the first buying decisions, which due to network effects already favor a certain product. The victorious product, however, does not in any way have to represent the best technology.

IBM's decision to select Microsoft's 'MS-DOS' as the operating system for its personal computers can be interpreted as a 'lucky coincidence': Without this decision Microsoft would hardly enjoy the dominant market position it has today.

The possibilities of influencing committees and the state

In addition to the application of market-directed strategies, companies can also influence other social institutions (e. g. the state or a committee).

The influence of companies in committees

The influence of companies in committees largely depends on the decision and voting mechanisms that apply there. In general each company participating in a committee will be eager to promote its own technology as the best solution and to implement at least some of its elements into the standard on which the committee is to decide. Companies with a de facto standard are sometimes interested in preventing decisions that are directed against their standard. Particularly when decisions must be taken unanimously, this is easy. Under these circumstances a veto may block an undesired decision. Voting mechanisms have their special

characteristics, which may favor a certain result. The participant who is aware of this may use it to gain a strategic advantage in committees.

Influencing the state

"Lobbying" is an instrument with which companies or whole industries exert direct influence on the state. Here influence is exerted on the representatives of political power by certain representatives of company interests such as associations. The latter spend their time in the sphere of political power, articulating the claims and demands of the companies.

In most states the entanglement of companies and the power of the state has progressed very far. Businessmen are active in politics, promoting their own interests, and politicians are working quasi 'part-time' for companies, but always in elevated positions, for example as members of the supervisory board.

Due to its prominent position, the state is a particularly important customer. Because of their significance, the procurement decisions of the state often directly define a *de facto standard*. For companies able to provide the relevant technology it is very tempting to exert influence on national decision makers in this context.

Legal means of a company

Patents, copyrights and licensing

The legal system allows a company a number of possibilities to protect its own technology, e. g. through patents, protected designs and copyrights.

Patents may exclude other parties for a certain period of time from the use of the patented technology. It is possible, however, to grant other companies the right to use this technology through licensing. In many situations licensing has proven its value as a strategic instrument for the market penetration of a company's technology. For this purpose a company may basically use two strategies: On the one hand it may generously grant licenses to spread its own technology widely; on the other hand it may try to collect all profits from the use of its own technology with a restrictive licensing policy. A well-known example for the superiority of generous licensing in contrast to a more restrictive policy is the victory of the JVC VHS format over SONY's Betamax format in the VCR market.

The role of litigation

Another alternative for pushing through one's interests, e. g. against competitors, is litigation. The stormy development of the computer industry since the beginning of the 80s has been accompanied by a large number of legal disputes. Here regularly company X charges company Y of illegally copying the patented technology of X. At issue are therefore the rights to the sole use of one's own technology, which very often has the potential to become a *de facto standard*.

But the litigation wave is also an expression of the fact that the existing legislation is inadequate for dealing with the radically different circumstances in the computer industry that is undergoing a stormy development. Companies aware of the legal system's deficiencies of the (e. g. a lawsuit takes very long, while the product life cycles in industry are very short) can gain a strategic advantage at this level.

At the same time the attempt to apply these laws to new technologies can not only hinder, but even become an existential threat to technological development. The Internet, for example, poses totally new challenges to the traditional copyright because it can be used to download all kinds of data (which may be copyrighted) to one's own computer and to use them at will. At the end of 1996 an international meeting in Geneva discussed measures to tighten the copyright in the Internet. According to computer experts, this could be the end of the Internet as a data highway.

Dynamics of contemporary growth markets

The presentation of company strategies and of the corresponding examples shows that especially in the future markets, for example in information technology, standardization questions play a prominent role. The specific market conditions open up enormous growth potentials and the chance to obtain a monopoly and make large profits. These markets are characterized by a stormy, sometimes incalculable development, but also by a number of bizarre phenomena: For example, quasi overnight coalitions are formed between companies, which even experienced market observers had never expected to cooperate, and these coalitions are dissolved as quickly as they were established. Companies that cooperate do so, for example, to be able to confront a powerful competitor who might have a de facto standard or to jointly launch a new technology offering new growth potentials. Frequently companies working together in one market are fierce competitors in other markets. Because of the complex interrelations it is sometimes difficult even for experts to find out the real motives of company strategies.

Conclusions

Today standardization is an important factor not only in high technology markets, but also in practically all industries and spheres of life. When standards are introduced by national, regional and international standardization organizations, companies have the opportunity to make essential contributions to the formation of these standards. In connection with standards companies have special opportunities (e. g. with regard to possible profits), but also a special

responsibility, because standards have a special influence on social well-being due to their general scope of validity.

Even industries in which at first glance standardization questions do not play a large role can be directly affected very quickly by standardization decisions in other areas (e. g. at the international level). Frequently companies without their own standardization department have difficulties in recognizing the importance of national, regional and international standards for the company and in reacting to relevant situations. The reason for this is that the responsibilities, the know-how and the relevant data are spread over different divisions and that there is no division with direct responsibility for standardization in the company. The inability to implement appropriate strategies in standardization matters can have lasting negative effects for a company. It is therefore advisable to be informed about the national, regional and international development of standards to be able to react to future standards and their development.

References

For further information the interested reader may refer to:

1. Besen, Stanley M. and Joseph Farrell (1994):

"Choosing How to Compete: Strategies and Tactics in Standardization; in: *Journal of Economic Perspectives* Vol. 8, pp. 117-131.

This article from the field of management science deals with standardization; it is readily comprehensible even for non-economists and introduces the reader to the ways of thinking of economists.

2. The *DIN-Mitteilungen* published by 'Deutsches Institut für Normung e. V.' deal with a wide variety of facets of standardization mostly from the point of view of engineering.

Company standardization

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1 Introduction

National, European and international standards influence companies in many ways: conformity with them may be a prerequisite for market entry or may be demanded by customers. Moreover, standards form an important basis for international trade and enable markets to merge while at the same time reducing trade barriers. There are various reasons for this:

1. Standards define the minimum requirements for the exchange of goods and services between different markets.
2. Standards influence customers' satisfaction with goods and services.
3. Standards guarantee compatibility between different components of a system.
4. Standards permit problem-free transfer of know-how and technology between commercial partners.

One example of the great significance of standards for companies is the EN 81 standard which standardizes, amongst other things, the technical safety requirements for passenger lifts. When this standard was passed in 1978, it radically changed the passenger lift market in Europe. Closed national markets with individual safety requirements were turned into one common market. As a consequence, large enterprises operating throughout Europe were able to reduce their production costs because different versions no longer had to be built for individual countries. At the same time, competition increased because the common market was then also of interest to companies which had up to then operated only at national level.

The considerable importance of standards for companies also becomes apparent when looking at the purchase volume. An examination of American enterprises showed that between 50 and 90 per cent of all procured parts and material are defined by standards.

Due to the considerable significance of standards for their economic success, companies must concern themselves seriously with standardization and its various aspects. Within the context of this paper, one of these aspects, company standardization, will be dealt with in depth. For the purpose of this paper, the concept of "*company standardization*" designates the standardization of material and immaterial objects used recurrently for the benefit of the company.

Firstly, aims and areas of employment of company standards are described while the subsequent section deals with the integration of company standardization into the firms and, finally, the evaluation of company standardization is briefly discussed.

2 Company Standardization

2.1 Aims

Company standardization can be used to pursue various aims. One can differentiate between three primary aims (see fig. 1).

The first primary aim refers to the market requirements. The market, i. e. the customers of a company, demand that certain standards with regard to company products or the organization of the company must be observed. These demands must be integrated.

The second primary aim - influencing surrounding factors - requires a number of activities, for example passing information about relevant standards on to customers or participating in standardization committees.

The implementation of the third primary aim leads to positive savings within the company. These result from, for example, a reduction in the variety of individual items or products, from safeguarding company know-how by means of company standards and from implementing government directives, for example EC-directives.

This short description of primary aims underlines the comprehensive character of company standardization and gives initial hints as to the benefits of an active company standardization policy.

2.2 Areas of Employment

The areas in which company standardization can be employed are not only on the technical side of a company but also, for example, in the commercial and administrative departments. The following is a description of how company standardization using an integral approach is reflected in six different areas:

1. Sales and Marketing

Examples of company standardization in sales and marketing are optimum packaging design as the prerequisite for smooth-running logistics or a consistent concept for the processing of orders. An additional task area results from the need to inform the customers in what way the products of a company are compatible with national, European or international standards.

2. Research and Development

The classic area of company standardization is reduction in variety, for example, with regard to recurrent parts, semifinished products or products, which is achieved by employing appropriate classification and identification methods which guarantee a retrieval of solutions already available. In addition, calculation and design procedures can be standardized, too.

3. Quality Assurance

Company standardization is a vital prerequisite for high quality products because it documents the main processes of quality assurance as well as the specifications to be observed.

4. Management

In the management field, company standardization is used in cost accounting and, above all, in data processing. The definition of cost accounting procedures by means of company standards guarantees the compatibility of data from different branches of one company. The standardization of interfaces for the exchange of data between different user programs, on the other hand, constitutes the basis for problem-free flow of computer-supported information within the company.

5. Personnel Management

Company standards can constitute a basis for personnel policy when they define, for example, vacancy descriptions, salary structures or training plans.

6. Production

As far as production is concerned, company standards can on the one hand define the machinery and plants to be procured so that stocks of spare parts can be reduced whilst on the other setting out optimum work procedures and processes .

2.3 The Standards Pyramid

Company standardization is an integral part of national, European and international standardization: Company standards form the basis for standards above company level (see fig. 2). However, some standards above company level are derived from company standards. At the same time there are considerable differences between the standard levels described: International standards are a compromise between the interests of the different countries while company standards can be developed in accordance with the individual requirements of every company. Moreover, company standards, as a rule, are more up-to-date and are technologically more advanced than standards above company level because they can be elaborated without having to undergo time-consuming agreement processes.

These interrelations underline the significance of active participation of companies in standardization above company level: This applies not only to national but also to European and international standardization. The number of national standards is decreasing in proportion to an increasing number of European and international standards. In Germany 80 per cent of all DIN (German Industrial Standard) standardization projects referred to national standards in 1984. By 1995 this proportion had dropped to only 25 per cent. Many large companies have reacted to this development and have consciously made their standardization strategies consistent with a participation in European and international standardization. A company which does not participate in European and international standardization foregoes its opportunity to influence standards to its own advantage.

3 Integration of Company Standardization into Firms

3.1 Task Areas

The explanations in the previous section gave an initial overview of the various facets of company standardization as well as of the areas in which it is employed within a company. Four task areas of company standardization can thus be identified:

1. Identification of standardization needs

The starting point for company standardization is the identification of potential standardization needs within the individual company departments.

2. Development of company standards

If no adequate standards above company level are available to cover standardization needs, appropriate standards have to be developed or standards above company level must be adapted so that they will satisfy the needs of companies.

3. Availability of company standards and standards above company level

The prerequisite for the implementation of standards is their availability, i. e. the employees of a company should have direct access to the respective documents. First, standards above company level must be obtained. Additionally, it is necessary to make copies of company standards and standards above company level and to distribute them within the company. A further task is the establishment of a standards information system with the aid of which employees can obtain information on whether company standards and standards above company level exist.

4. Influencing standards above company level

Within the context of this fourth task area, participation in standardization committees is decided upon and the aims of such participation defined.

3.2 Organizational Aspects

Successful work in these various task areas calls for an appropriate organizational framework. Within this framework, for instance, the various tasks are allocated to individual employees and activities taking place simultaneously are coordinated.

The structure of the respective organizational framework depends on a number of factors, among others

- the size of the company
- internal company organization
- the product program and
- the personnel structure.

Therefore, it is not possible to define an optimum organizational structure for all companies. Rather, each company must develop a company-specific structure of its own, taking the factors just mentioned into consideration. Independent of such deliberations, various organizational aspects of company standardization are described below which give an overview of the alternatives basically possible in structuring such an organization.

The first aspect deals with performing tasks in these four areas, whereby three forms of organization are conceivable (see fig. 3). The characteristic of the first one is complete delegation of the various task area to the respective specialist departments. These specialist departments decide as part of their daily routine who is to perform tasks in these areas, there is no centralized coordination of activities in the specialist departments. In contrast, in the second form of organization all task areas are dealt with by one department in the company, for example the Standardization Department. This department is autonomous in its decisions and acts independently of the other specialist departments. Finally, the third structure is a combination of the previous two, some tasks being carried out centrally for the whole company and others being taken care of in a decentralized process by the specialist departments.

Each of these types of organization have their advantages and their disadvantages which result from tensions between centralization and decentralization. If a high degree of autonomy of the specialized departments is part of the company aims, for example, within the framework of a profit-center organization, the first type of organization should be implemented. The centralization of tasks within a standardization department will, on the other hand, result in synergy and permit specialization with regard to questions involved in company standardization. The third organization is characterized by the possibility of using the know-how of the specialist departments whilst at the same time specializing in the field of company standardization. Thus it seems to be appropriate for many companies.

With regard to the last type of organization mentioned, the emphasis of tasks of a centralized standardization department is on coordination of activities taken over by the specialist departments, initiation of standardization projects and making company standards and standards above company level available. The specialist departments, on the other hand, elaborate company standards and are responsible for exerting influence on standards above company level.

The question of which sector of the company the standardization department - whether yet to be established or already in existence – is to be allocated is a second point to be considered. In Germany, more than 50 per cent of all standardization departments are assigned to R&D and 10 per cent are directly subordinate to the management. Despite these statistics, it would be more beneficial to assign the standardization department directly to the management as its tasks concern all sectors of the company. The direct support of company management is necessary so that the standardization department can coordinate the activities in the different specialist departments to an optimum extent. Moreover, if the standardization department ranks high within the company hierarchy this corresponds to the significance of company standardization for firms.

Finally, the third aspect relating to organizational structure, the choice of personnel for the standardization department, will now be considered. The emphasis here is not so much on the number of staff but on their qualifications. As already described in section 2.3, standardization above company level increasingly takes place at European and international level. Therefore, successful participation in the respective committees requires specialists who are not only experts in their fields besides being proficient in languages but who also have some knowledge in steering group processes: within the framework of committee work, coalitions have to be formed, the interests of the other committee members have to be understood whilst simultaneously pursuing own aims .

Apart from that, these experts must be given the necessary financial resources and sufficient time to be able to prepare themselves to an optimum extent for their committee work and - if required - take over the chair of a committee. Beside expert knowledge relating to standardization, members of the standardization department should have excellent interdisciplinary know-how so that they will be accepted as a partners in discussion by all specialist departments and are able to familiarize themselves with questions pertaining to that specialist field.

3.3 Examples

Building upon this theoretical description of the three organizational aspects relating to company standardization, some organizational models of selected companies will now be outlined. These examples underline what was previously stated and give an overview of the wide spectrum of possible solutions.

The standardization department of a company with 700 employees is directly subordinate to the management. The two employees responsible have the following tasks: the development of company standards, the procurement and administration of standards as well as the assignment of item numbers.

In the second company with about 13,000 employees the standardization department is allocated to one of four sections. The task emphases are: development of company standards, the administration and updating of company standards and standards above company level as well as the assignment of item numbers. 24 employees are responsible for these activities. The employees of the standard department as well as those of specialist departments are actively involved in standardization committees.

In a third company with 55,000 employees, the standardization department is an external, autonomous company, a profit center with 8 employees. Their tasks are participation in standardization committees dealing with more than one subject, the administration of standards as well as information and advice in the area of standards above company level. All services of the standardization department are charged to the departments which have placed the order.

4 Assessment of Company Standardization

4.1 Costs and Benefits

Company standardization has many positive effects, however, it also requires equivalent effort. The costs and, above all, the benefits of company standardization are the subject of the

following remarks. However, it is only possible to mention a few aspects as a comprehensive description would be beyond the scope of this paper.

With regard to the costs of company standardization, one has to distinguish between variable and fixed overheads. Fixed overheads which accrue independently of the number and quality of standardization activities are for example the expenses for the standardization department, for membership in the PCS (Polish Committee for Standardization) or for the administration of company standards and standards above company level. Variable overheads, on the other hand, such as the expenses for membership in standardization committees, for the development of company standards or the implementation of standards depend directly on company standardization activities.

Apart from these quantifiable costs, non quantifiable costs which may result from company standardization must also be taken into account. These occur, for example, when possibilities of choice are restricted by standards or when the market position of the own company is weakened by standardizing product characteristics which would previously have permitted differentiation by the competitors.

Company sector	Benefits
Procurement	- fewer procurement procedures - simpler procurement
R&D	- faster design
Storing	- fewer stock items
Production	- greater availability of plants - higher productivity
Quality Assurance	- fewer inspection orders

Sales/Service

- fewer spare parts

Table 1: Benefits of company standardization resulting in reduced variety

The positive effects of company standardization, too, can be divided into quantifiable and non-quantifiable benefits. The quantifiable benefit results mainly from the savings resulting from many company standardization activities (see fig. 1). Examples of such benefits due to variety-reducing company standards are depicted in Table 1. The selection underlines the scope of the positive effects that a company may gain from just one single company standard.

Examples of non-quantifiable benefits are an enhanced image due to the implementation of standards, improved communication with suppliers or an fewer problems with internal data exchange. Moreover, participation in standardization committees leads to non-quantifiable benefits such as

- early knowledge of current standardization activities above company level.
- obtaining of information about potential competitors and
- being able to influence standards in the company's own interests.

4.2 Cost Effectiveness

Company standardization is not an end in itself, which is to say that the necessary costs must be justified by commensurate benefits. The cost effectiveness is derive from the cost/ benefit quotient. The prerequisite for the calculation of cost effectiveness is the existence of quantitative statements because comparisons on the basis of verbal evidence are difficult and subjective.

Several problems have to be solved with regard to the determination of costs and benefits:

- As already described in the previous section, costs and savings are mostly not quantifiable. Thus, there no objective basis for the corresponding standardization activities.
- As a rule, savings resulting from company standardization occur in different company sectors so that considering only one sector leads to incorrect results.
- The effects of company standardization activities generally extend over a prolonged period of time (sometimes several years). For a correct analysis of the effects the entire period must be taken into account.
- As a rule, company standardization activities concern more than one cost area and cost category. It is therefore only possible to a very limited extent to identify them by means of traditional cost accounting .

These points show the difficulties which have to be resolved when attempting an exact evaluation of the cost effectiveness of standardization. At the same time they also give an idea of the effort necessary to prove the cost effectiveness. For this reason, it makes sense in many cases to use simple checklists permitting initial assessment of a standardization activity's expediency before the activity commences. A corresponding list for the assessment of company standards is shown in Table 2.

Table 2: Checklist for the assessment of company standards

Kriterien	criteria
Aufwand	effort
Bedeutung	significance
Groß	high
Klein	low
Bedarf für die betriebliche Norm	need for company standard
Erwartete Umsetzung im Unternehmen	implementation expected within the company
Erwartete Lebensdauer der betrieblichen Norm	anticipated applicability of company standard

Wirkung der betrieblichen Norm auf die Qualität	effect of company standard on quality
Wirkung der betrieblichen Norm auf die Sicherheit	effect of company standard on security
Wirkung der betrieblichen Norm auf die Vielfalt	effect of company standard on variety
Konformität zu nationalen Normen	conformity to national standards
Konformität zu internationalen Normen	conformity to international standards

5 Conclusion

With competition becoming increasingly intense, the consistent implementation of company standards can be a decisive competitive advantage to a company. These advantages result from savings and other manifold positive effects which result from company standards. The prerequisite for this is a consistent company standardization strategy which must take into account company parameters as well as the competitive situation of the company.

A standardization strategy should not only be restricted to company aspects such as the development of company standards, the establishment of a standardization department and a company standards information system. The aspects above company level must be considered, too. Especially active participation in standardization committees above company level can lead to important impulses for the company and be a positive influence on its competitive position.

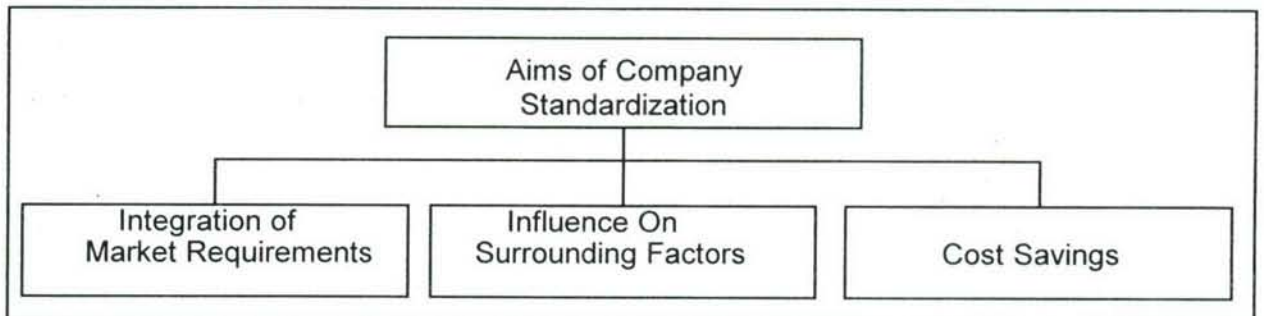


Figure 1: Primary Aims of Company Standardization

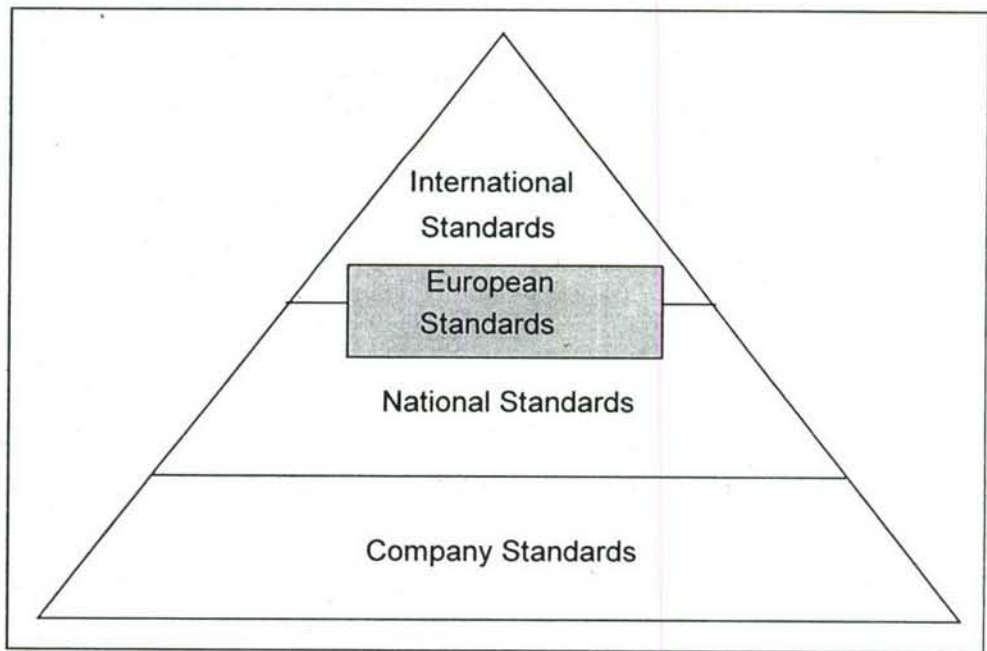


Figure 2: Standards Pyramid

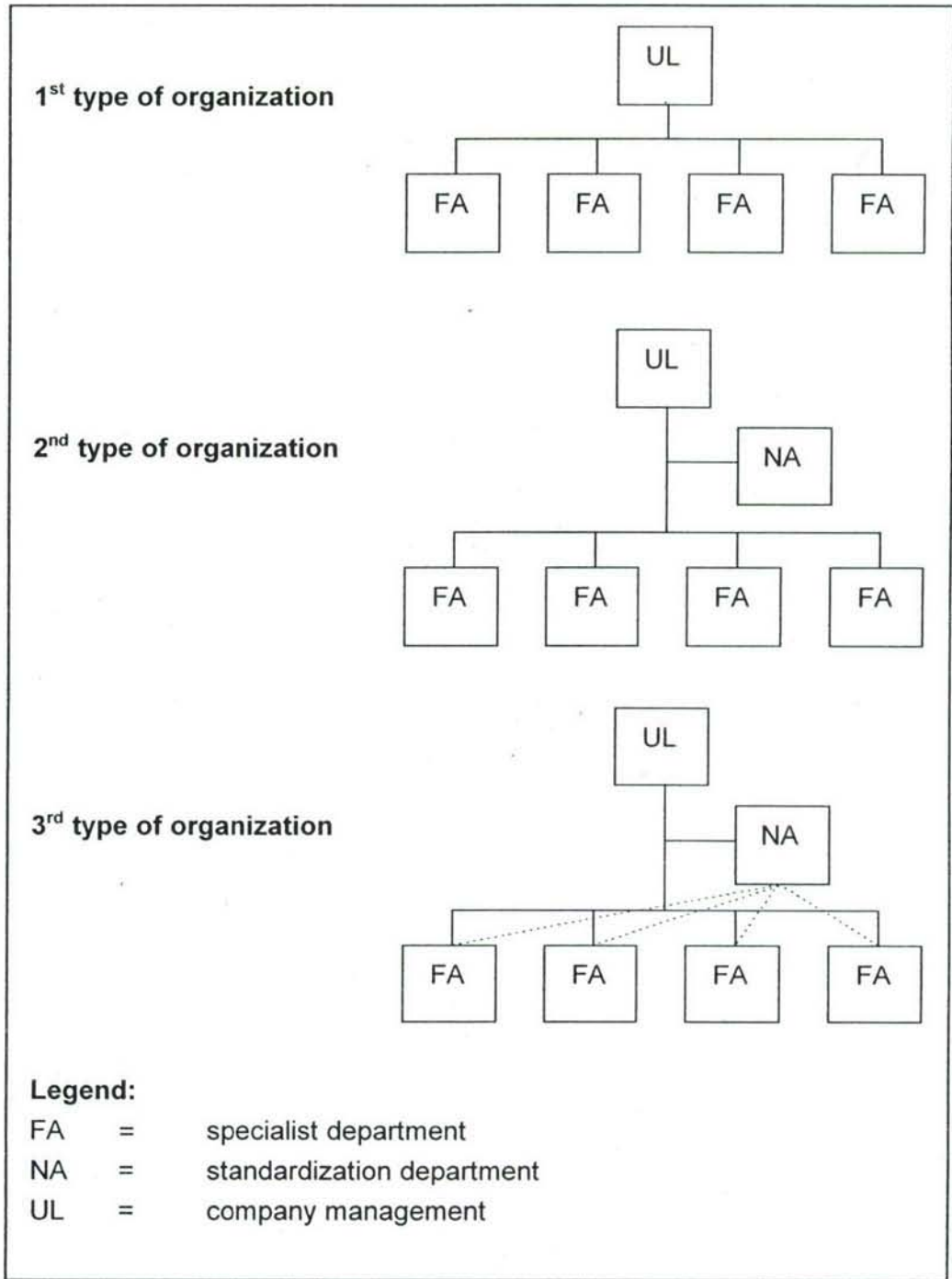


Figure 3: Types of Organization

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Company Standardization and Strategic Management

Hendrik Adolphi and Jens Kleinemeyer

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1 Introduction

The traditional viewpoint with regard to company standardization¹ restricts its function to the reduction of the variety of parts. Thus, material and storage costs can be lowered and larger production batches can be completed. However, company standardization is in fact more than just that:

1. Binding requirements, for example in the areas of environmental protection and safety are processed for application within companies and made available to them.
2. The communication flow within a company is defined. Many problems in companies are caused by the very fact that information channels are not standardized, which is to say they are not formally defined and dry up when the respective persons leave their positions. Unless information is passed on quickly and efficiently, wrong decisions on account of incomplete and/or wrong information are inevitable.
3. Company standardization is the basis for consistent and reliable quality of production and products.
4. It is a necessary prerequisite for participation in standardization projects above company level at national, regional and international level and for at least influencing these projects for the company's own benefit, if not even for steering them.

In short: Company standards have effects on every company section. They influence relationships between the company and others (customers, suppliers, authorities and competitors) as well as within the company (between departments, production plants etc.).

Figure 1 illustrates the comprehensive effect of standards on the sections of a company. Here, a connection is established between the items that can possibly be standardized and the respective company departments.

It becomes obvious that every company section can also be considered a potential standardization section.

¹ In order to avoid misunderstandings, we would like to define the term "standard" as used in the following:
Standard: Harmonization of material and immaterial items for recurrent use to the benefit of the company.

Section to be Standardized	personnel	administration	design	purchase	production	quality assurance	sales	material administration	storage and shipping	packaging	repair	customer service
purchased parts			X	X	X	X						X
own parts			X		X	X		X				X
raw materials			X	X	X	X		X		X		
machinery			X		X	X	X		X	X		X
production processes			X		X	X		X				
design procedures			X		X	X						X
procedures/formalities	X	X	X	X					X			
colors			X	X	X	X	X	X				X
packaging			X	X			X	X		X		X
tools						X					X	
spare parts			X	X	X	X			X	X		X
terminology	X	X	X	X	X	X	X	X	X	X	X	X
test procedures			X	X	X	X	X					
safety	X	X	X	X	X	X	X	X	X	X	X	X

Figure 1: Possible standardization sections (source: Brown, p. 141)

Such an important tool of company management must be checked for its efficiency at all times. In the following, the activities which are necessary for this are designated the *standardization program of a company*. This program consists of a considerable number of steps as illustrated in the overview in figure 2.

As a first step, it is important to recognize a problem and to analyze whether it is internal or external. Subsequently, it must be examined whether the problem recognized can be eliminated or resolved with the help of company standards. As the effects of company standards, as illustrated above, are generally not restricted to one section, it must be ascertained which company sections will be concerned by the new company standard. If this information is available, the question arises as to whether the company should develop its own standard or adopt one from outside. When developing a new standard, the question about the participants and their competencies will, of course, have to be put and answered. The standard which was

developed or adopted must now be implemented in the company sections concerned. The company standardization program is rounded off by an internal control.

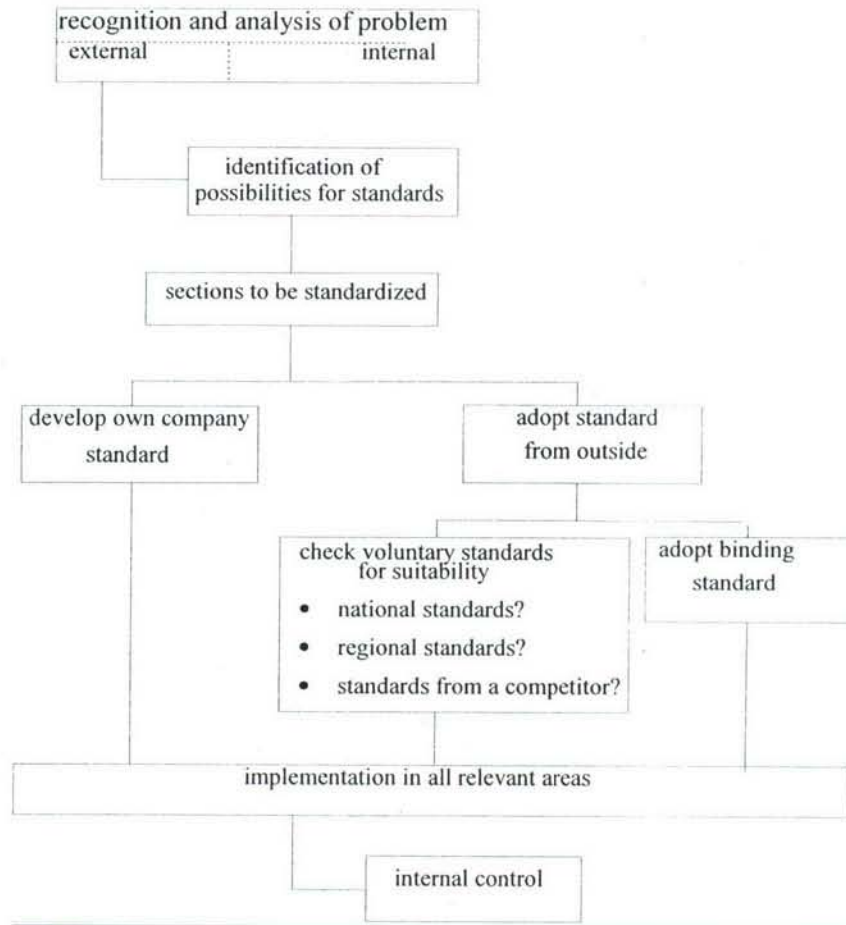


Figure 2: The most important steps of a company standard program

This will form the basis for the remainder of this paper. In the following section, various possible external or internal problems are described for which a company standardization program should be considered. Some effects of company standards in various company sections are described in the third section.

2 External and Internal Problems

2.1 External Problems

External problems may arise due to national authorities requiring binding standards or due to one or more of the five so-called competitive forces in accordance with PORTER 1980:

1. The competitors lower their sales prices

The competitors are competing directly with the company to gain customers and by lowering sales prices they may force the company to introduce innovative products or to reduce prices.

2. Customers want variety and low prices

The significance of the "customer" as a factor of competition depends primarily on their power with regard to the company. The more power customers have, the more easily they can force a company, for example, to decrease its prices or to use a certain technology or a specific standard. Customers are especially powerful when there is only a few of them or the company cannot switch to other markets.

3. Suppliers demand high purchase prices

Suppliers must be considered within the framework of a company strategy particularly in cases where they have a monopoly for an indispensable technology, or a substantial raw material or its own products can only be used in connection with suppliers' products. The latter case is called complementary production, which is to say that the products are of greater benefit if used together rather than individually. Examples of this are films and cameras, vacuum cleaners and vacuum cleaner bags, CDs and CD-players, discs and computers etc.

4. Potential competitors have a negative influence on the sales price

Potential competitors are companies which may want to offer competing products in future. The prerequisite for this is a lack of barriers to the entry to the market. The mere existence of

potential competitors who will enter the market as soon as the profit margin becomes lucrative enough for them is enough to keep own prices and profit margins low.

5. Potential substitutes force sales prices to be kept low

As a fifth competitive force, potential substitutes must be integrated into the competition strategy. In particular, price limits must be defined above which one can expect customers to resort to substitutes. This depends, of course, on whether own products can be substituted.

Excursus: Company Strategy

Building upon the five competitive forces mentioned, we can distinguish between four strategies that a company can pursue in competition².

With the goal of **low-cost leadership** a company pursues a strategy of always offering its products at a lower price than the competitor. This can be achieved through, for example, efficient production, strict control of expenses or the optimum use of production plants.

A second strategy is called **differentiation**. It necessitates conferring a special image on the product. This is based, for example, on special quality of the product, innovative product design or customer-friendly service.

Focussing is a restriction to a chosen market sector, which is to say, the company concentrates on market niches. These could be a special clientele, a clearly defined market sector or a limited range of products (core competencies).

The strategy of **dominance** pursues the aim of obtaining as large a market section as possible or establishing own technology as a de-facto standard.

2.2 Internal problems

The most important internal problems and symptoms of a company are, among others:

- high scrap rates
- exceeding delivery deadlines
- low productivity

² The strategies of cost leadership, differentiation and focussing are based on PORTER 1980; the strategy of dominance is based on LEE et al. 1995

- poor motivation of employees
- lack of identification of employees with the company
- willful destruction of products and machinery by employees
- insufficient maintenance of appliances and machinery, etc.

In some cases, these problems are characterized by considerable interaction. This can be put down to just a few causes. The most important mistakes are those made by the management as well as a lack of communication or senseless communication. Often, the passing on of communication by the management to the employees and vice versa is unsatisfactory³.

It must be pointed out that the competitive forces - with the exception of the customers - have an influence on costs which is also one of the most important problem areas in the case of internal problems.

In contrast to this, there are areas which influence the profit side of the company such as customer satisfaction or the compatibility of own products with the technology dominating on the market.

An efficient standardization program must always consider these two areas; concentration on only one area may lead to fatal effects. Based on these two fundamental problems, two kinds of standards can be distinguished. On the one hand, standards may serve to solve problems which lie exclusively within the company. Here we speak of *internal standards*. However, these standards may also serve to solve problems which exist between the company and its surroundings. Standards concerning this field are called *external standards*.

³ The fact that, for example, IBM was driven out of the lucrative PC-market had its causes in long information and decision-making processes within the company that were not adequate for such a dynamic market. Compare CARRQL 1995.

3 The Effects of Standards in Companies

3.1 Internal Effects

With regard to research and development, company standards make product systemization possible as well as (linked to this) recurrent use of available individual parts and assemblies. Thus, the necessary design effort can be reduced.

Modular and series designs, for example, constitute the basis for product systemization. In the case of series design, follow-on designs are derived from a basic design; they differ in size from their basic design but have the same function whilst employing the same solution. In the case of modular design, however, standardized modules with different solutions are combined to form the respective overall solutions.

The recurrent use of individual parts and assemblies can be achieved by means of their documentation in company standards. The engineers can see from these standards which individual parts and assemblies are available in the company and integrate them straight away into their development projects. Product systematization as well as recurrent use reduce the necessary design effort as it is possible to fall back on available solutions.

In **production**, company standards particularly result in so-called *increasing economies of scale*. This describes the fact that it is possible to double the output with less than twice the production means. "Learning effects" are one example of economies of scale. Employees and workers can carry out actions faster and with an ever-decreasing error ratio the more often they repeat them. This means that repetition of work is an instrument for achieving economies of scale, and company standards are a basis for these repetitions. The respective standards define, for example, specific work steps which have to be repeated during every operation⁴.

⁴ It cannot be denied that continuous repetition of an activity can lead to dissatisfaction of the employee thus reducing his productivity. In other words, a balance must be struck between the two effects.

3.2 External Effects

When making decisions about the procurement of capital goods such as machinery and materials, company standards can simplify and substantially expedite the selection process. They can define the basic parameters of the capital goods to be procured so that compatibility with the machinery and plants already present in the company is guaranteed.

From the point of view of the standardization program, the management will have to decide whether to develop its own standard or to adopt a national one. A general guideline is that this decision depends upon the specificity of the investment⁵. The more specific an investment is, the less suitable will general national standards be and the greater is the need for the definition of own standards.

Also The procurement of **materials** is simplified by company standards, as well: The requirements to be met by the materials no longer need to be defined for each procurement. Reference to the respective company standard is sufficient. At the same time on-receipt inspection may be dispensed with if suppliers have undertaken to fulfill the requirements defined in these standards. It is an additional advantage if standards are based on, for example, EN-standards. In this case a change of suppliers can be realized without difficulties. Thus, it becomes clear in which cases it is more beneficial to develop own standards: If demands made on the material - this includes very high as well as low demands - are company- specific, it is advisable to develop own standards. In the case of commonly used materials, however, in customary qualities, on the other hand, it is obviously better to base company standards on national or regional ones.

If the **products** to be manufactured are mainly homogenous - which means that the price is the main criterion for consumers and customers - this is an argument for the adoption of a national standard. This way, a product can be manufactured that does not differ from those of the competitors. If the objective is to manufacture a product that differs totally or substantially - in design, quality or function - from the products of the competitors, though, it is more beneficial to develop own standards.

⁵ The *specificity of the investment* serves as a measurement of its salability. The more specific an investment is, the less well it can be sold because it has been tailored to the specific needs of the company.

Due to these effects, areas to which standards should apply can be defined. Having completed this step, the contents of the standardization program must be decided upon. This addresses the question of how standards should be developed within a company or which standards should be adopted.

4 The Origin of Company Standards

Now we come to the question of *how* standards should be developed within a company or *which* standards should be adopted.

External as well as internal standards can have different sources. As described in more detail in the paper "Kreis der Normung" (Circle of Standardization), company standards can be products of an autonomous development. In addition, a company standard can be based on a national standard such as those developed, for example by PKN in Poland, DIN in Germany or CEN at a European level. In the meantime, National standards in Poland are now of a voluntary character which is to say that their contents consist of non-binding proposals and possible solutions for problems. Beside these, there are still a number of (state) regulations which must be observed by the companies. A company standard may therefore also contain the implementation of binding regulations by State authorities, for example safety or environmental regulations. The last possibility is that company standards can also adopt complete technologies available on the market.

When deciding upon the standardization program to be applied, the respective advantages and disadvantages must be seen clearly. A standard on the basis of an internal development has the advantage of relating to special individual problems of the respective company while the adoption of a national standard represents a general solution which may not necessarily be tailored to the needs of the company. On the other hand, the national standard offers the advantage of enabling a company to build upon the experience of other companies so that an at least acceptable solution to an internal problem may be available within a relatively short time.

Conformity to binding standards - often also called *regulations* - is compulsory. Non-conformity would lead to sanctions imposed by authorities if they take action. Sanctions can extend from reminders to adhere to the binding standard in future to withdrawal of operating licenses.

The decision to adopt a technology established in the market can have many reasons that are linked closely to one other. Many small and medium-sized companies are in no position to maintain a research and development department of their own. The automatic consequence is that they mainly use the innovative know-how of other companies and make this know-how available for their own companies. However, the adoption of an existing technology may practically be enforced by the market. This is increasingly true for the areas of telecommunication and information technology with regard to which a single company cannot afford to offer an independent product which is not compatible to the dominating technology in the market. One only has to recall standards such as exist in the computer field in which the so-called IBM-standard has asserted itself to such an extent that producers of individual components such as CD-ROM devices, hard disks or disks are forced to design their own products in such a way that they can be connected to existing devices. The attempt to search for a niche outside this "IBM-standard" is probably condemned to failure⁶.

For many companies in Poland, however, the question is not whether to create new *de-facto standards* on the world market of computer products. Similar structures can be found with regard to other products where the importance of compatibility is not quite so obvious. The spectrum extends from toys which interlock to model railways to vacuum cleaner bags.

Consequently, the company management has to decide upon which standardization programs can or must be chosen. Every decision in favor of one of the standardization programs to choose from in many cases has a substantial impact on the company itself (*internal standards*) and its surrounding (*external standards*). These decisions are of a strategic nature: on the one hand they determine the internal structures of a company in the long term, on the other hand they have an influence on the behavior of competitors and customers.

⁶ A similar structure exists with regard to office software. In Poland, too, Microsoft has asserted itself to a large extent. Of the local companies only Malkom with QR-Text and QR-office can compete (to a limited extent) with Microsoft.

5 Implementation of the Standardization Program

5.1 Integration of company standards into the organizational structure

The prerequisite for successful implementation of company standards is an appropriate organizational framework within which, amongst other things, tasks are delegated to individual employees. For this, there are basically two alternatives available:

If tasks are delegated to the specialist departments, the efforts that would be necessary for a separate company standardization office can be dropped so that company standardization efforts altogether can possibly be reduced. At the same time, this approach has its advantages if there is a close connection between the contents of the previous task spectrum of the specialist department and the respective activities in company standardization.

On the other hand, the establishment of a company standardization office permits specialization on standardization issues as employees in this department are exclusively concerned with these issues. Moreover, with this approach there is a point of reference within the company for all questions related to company standardization. This approach, however, is more cost intensive compared to the assignment of tasks to specialized departments.

Both approaches have their advantages and their disadvantages so that none of them can be considered ideal. The right way seems to be a combination of these two approaches: some tasks are concentrated in a standardization office, the rest are assigned to the specialist departments.

Consequently, those tasks that concern the whole company should be carried out by the standardization office. Those tasks related to the departments themselves and requiring expert knowledge, however, should be assigned to the specialist departments.

Thus, the following three task areas can be identified for the organizational integration of standards into the company:

1. Information

The first task area comprises all informative activities related to company standards. Among these are procuring standards and making them available but also information and advice about standards.

2. Company standardization

This task area comprises all tasks that serve directly or indirectly for the elaboration of company standards, from planning to the complete standard.

3. Standardization above company level

The observation of standards above company level with regard to outside standardization activities that are of relevance to the company as well as participation in standardization committees constitute the third task area.

It follows from this that the standardization office is responsible primarily for the first of the three areas while the others should be delegated to the specialist departments. Additionally, however, the standardization office is responsible for coordination and planning. This concerns elaboration of company standards as well as participation in standardization committees above company level.

Up to now only a standardization office has been mentioned. However, this term can designate various organizational solutions, such as:

- a standardization representative
- a standardization group or
- a standardization department.

The basic difference between these variants is the number of employees involved. This number results primarily from the task spectrum of the standardization office and has no connection to the size of the company: companies with 3000 employees, for example, have standardization offices between one and eleven employees. As a result, no general recommendations about the "right size" can be given, it is the company-specific parameters that need to be considered.

A further question within the framework of the organization of company standardization is the assignment of the standardization office to a certain company section. According to our own research, more than 50% of all standardization offices interviewed are part of the "research" and "development" departments while 10% are directly responsible to the management (Adolphi 1996, p. 4). Despite the fact that a high percentage of standardization offices are in practice of assigned to the research and development section, this is not an optimal solution as the tasks - as indicated above - concern the whole company and do not only concern the technical section. In the course of the general description of company standardization, the cross-departmental significance was already pointed out.

For these reasons it makes sense, as a rule, to assign the standardization office directly to the company management. This way it can take action throughout the entire company and is not restricted to one section only.

5.2 Internal Information and Promotion of the Standardization Program

The best company standard is of no use if it is not implemented and used within the company. Thus, the promotion of implementation becomes one of the most important tasks of the management within the framework of the standardization program. The most important issue is to foster the conviction of the employees so that they will apply the standard. There are a number of ways of ensuring that employees are prepared to support the standardization program to the necessary extent, some of which are listed below (Henise 1990, p. 64):

- short seminars about the internal standardization program
- short seminars about standardization activities in certain (important) company sections
- internal directives
- regular situation reports to the management
- temporary participation of employees in standardization organizations and work groups
- contributions in company news letters (if these exist) or in magazines from associations (chambers of commerce etc.)
- information about new standardization activities to the responsible specialists
- integration of standardization into company-internal training programs such as
 - quality assurance
 - management and
 - technical areas.

6 Standing up to competition by means of standardization

Which strategies can as a general rule be pursued by a firm with regard to company standardization? Basically, there are a total of six different procedures, which will now be discussed briefly:

The aim of the first strategy is the **establishment** of a **de-facto-standard**. Examples of de-facto standards are, for example, the DP-operating system "Windows" and VHS-technology for video recorders. A *de-facto-standard* is targeted against competitors and potential co-applicants as well as against sub-agents. Three different approaches to the establishment of *de-facto-standards*, can be presented, as in the follows.

1. In the first approach, several companies try to make their product a *de-facto-standard*. This means that several incompatible products are in direct competition with one another which can be characterized as follows:

- Each company will attempt to obtain as large a market share as possible.
- Each company will strive to improve the choice of required complementary products.
- Each company will announce product innovations as early as possible in order to stop the customers from buying a competitor's product .

2. In the second approach, companies agree that a joint *de-facto-standard* would be of benefit to each of them. Within this context, the following measures can be taken:

- The companies bind themselves to the chosen *de-facto-standard* by making considerable investments in the respective technology.
- Licenses for the technology on which the *de-facto-standard* is based are issued at moderate conditions.

3. In the third approach the companies have diverging interests with regard to a *de-facto-standard*: company A wants it, company B does not. Consequently, the two companies will pursue different interests: Company A will attempt to achieve compatibility with the *de-facto-standard* via imitations while company B will strive to prevent compatibility by means of a swift product innovations or patents.

The second strategy, **compatibility and entry to the market**, is closely connected to the third approach just mentioned. Especially for small companies, the compatibility of their products with the products of the market leader can be of utmost importance for their economic success. Therefore, their aim must be to guarantee this compatibility, for example via licenses. If the market leader refuses to issue such licenses, smaller companies must produce an interface to the products of the market leader by means of *reverse engineering*.

The primary aim of company standardization is a reduction of the costs. Thus, the third strategy pursues the aim of achieving **relative cost advantages**. These can be realized in different ways.

- The Participation in the standardization process leads to *direct* cost advantages as the standard can be influenced to the benefit of the company. Thus, the implementation of this standard will result in only low costs.
- Additionally, *indirect cost advantages* can be obtained by means of participation in the standardization process as this process makes it possible to obtain a considerable amount of information about the technologies and developments of competing companies without great effort.
- A further advantage is the considerable experience that a company gains through regular participation in standardization processes. Thus, own technology can be asserted as a standard. Moreover, an experienced company can force competitors to participate in the standardization process which means that they, too, have to bear the costs of participation.
- Additionally, a company standard can lead to cost advantages with regard to product liability. If regulations governing product liability require proof that the products are safe, this can be proved by observing the relevant standards.

4. As a fourth strategy, the **exploitation of complementarities** will now be described: If a company has a dominant position within the market, it can try to transfer it to the market for complementary products. A possible implementation of this aim, for example, is the documentation of the interface between product and complementary product within the framework of company standards and thus to protect it from competitors. This way, buyers of a product can be forced to buy complementary products from the same company, as well.

5. **Reduction in variety** is the fifth strategy. This can be implemented in various areas:

Products: A restriction to certain market segments or a product systematization (for example modular systems) will result in a reduction in product variety.

Additional purchase parts: If variety can be reduced in this area, this will lead to more favorable conditions and may reduce dependence on suppliers.

Individual parts: Here, larger production batches with lower setup costs can be achieved.

Production methods and processes: The company specializes in certain production methods.

6. Finally, the last strategy refers to the **implementation of management standards** such as the ISO-9000 or the ISO-14000 series. Often, the implementation of management standards is a vital prerequisite for entry to the market. Beside this external necessity, the introduction of these standards can also produce internal advantages as the grown information structures with their manifold inadequacies are replaced by a systematic, continuous flow of information.

7 Standardization and management strategy - an example

Why should a company have its own strategy in the field of company standardization or why should company standardization be taken into account when establishing a management strategy? These questions will now be examined by taking EN 81 part 1 as an example :

EN 81 harmonizes the safety technical requirements for electric passenger, service and small-freight elevators. This standard was passed as a European standard and as the German DIN EN 81 standard in 1978. Before that, there were different technical requirements relating to safety for elevators in each country. At the same time, there was a discrepancy between North and South : The number of accidents in the northern countries was well below that in the southern countries. Despite this, producers were compelled to fulfill just the respective requirements of the purchasing countries even though they were higher in their own country. Due to the new standard, the necessity to adapt products to the different standards can be dispensed with so that the market is now open (PLINKE 1990, p. 662).

A simplified illustration of the structure of the elevator industry can be seen in figure 3. Basically, the customers are prime contractors who choose an elevator supplier for the owner of the building. On the supply side, several producers compete with one another, some of them obtaining their elevator components from subcontractors.

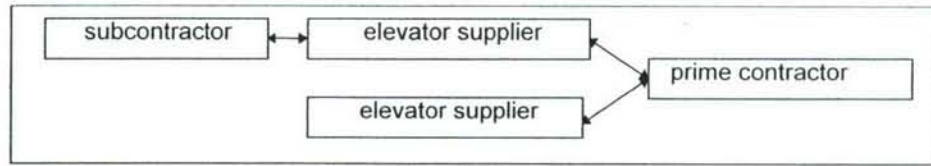


Figure 3: Structure of the elevator industry (on the basis of PLINKE 1990, p.)

The elevator suppliers can be divided into three groups. The first group are the large companies that have branches throughout Europe and manufacture all components themselves. The second group consists of medium-sized companies that are restricted to the national market and obtain some of their components from suppliers; they are more specialized than the companies from the first group. The third group, finally, is made up of small companies that operate only regionally, have limited product variety and mainly deliver individual installations.

The consequences which result from the introduction of the EN 81 standard for those three groups can be seen in table 1. Large companies can now reduce their production costs due to the harmonization of safety standards as they can now manufacture one product for all countries - the production of individual variants for different countries is no longer necessary. At the same time, competition will increase as the enlarged market becomes interesting for non-European (for example Japanese) and medium-sized companies.

	changes to the relevant market	rivalry among existent manufacturers	new manufacturers emerge	changes in the negotiation strength of suppliers	changes in the negotiation strength of customers
prospects of a large manufacturer	regionally none factually yes (1x12 instead of 12x1)	increases	non-European competition	basically none	increases due to new competitors
prospects of a medium-sized manufacturer	increases to the whole of Europe	increases	European and non-European competition	decreases	increases
prospects of a small manufacturer	no changes	unchanged	rare	decreases	unchanged

Table 1: Effects of harmonization on the elevator industry (source: PLINKE 1990)

Due to the changed parameters, medium-sized manufacturers have to adapt their market (Europe instead of national markets) and their product range and, if necessary, restrict themselves to certain market segments. Smaller manufacturers do not need to react much, which is to say that harmonization has little effect on their market and their competitors.

What conclusions can be drawn from this European harmonization process with regard to the standardization program?

Firstly, companies are called upon to **participate** actively in the European **standardization process** so that their specific national requirements are taken into consideration in the standards being developed will be considered. If not, far-reaching disadvantages in competition may be the consequence for national companies.

For large and medium-sized companies, the changes to the relevant market present an opportunity to **reduce variety** by means of company standardization activities - especially through the development of series and modular systems - and to reduce costs and thus remain competitive. The strategy of smaller companies to concentrate on special customer wishes is largely unaffected by European harmonization.

This, of course, entails the requirement for a smooth internal **flow of information**. In the case of small companies this is important with regard to the correct transmission and implementation of special customer wishes while for medium-sized and large companies is more important to the keep delivery deadlines.

For all companies, the **documentation** of information and data accruing during the life-cycle of the product (in accordance with the ISO 9004 standard) is becoming increasingly important. There must be written instructions - which is to say company standards - regulating for employees the information route, responsibilities and the file system. On the one hand, these steps become necessary due to certification in accordance with the ISO-9000 standards family, the significance of which is still increasing in importance. On the other hand, many products require a CE-marking before being put on the market within the EC national market which documents the conformity to the requirements of EC guidelines⁷. This is implemented by integrating relevant European standards into company standards. Together with appropriate documentation this can prove conformity to EC guidelines in doubtful cases.

For smaller companies, the documentation of design solutions is of vital significance as documentation thereof with the possibility of **reuse** can cut the design effort substantially as well as the number of subsequent mistakes in the production and installation process. The designers must have clear instructions in terms of standards as to how they have to document their results and, at the same time, how they can check if a solution for a certain problem has already been developed within the company.

⁷ more information on this can be found in the presentation by R. Hildebrandt.

8 Final Remarks

The effects of standards are not only restricted to reduction in variety, as has become clear in the course of this paper. Company standards can also make a substantial contribution to the structuring of information channels and thus form a better basis for decision-making for all persons responsible. The question which arises for companies is not so much whether to develop a standardization program at all; the more important issue is the decision about which standards are to be applied in this program. The question whether to develop own standards or to integrate standards above company level can be answered in accordance with the specificity of the problem to be solved: The more company-specific a problem is, for example the procurement of material or machines, the more appropriate it is to develop a company standard.

However, one fact that must not be neglected is the possibility of structural similarities existing also in other companies so that it would be beneficial for all to learn from one another. The participation in respective standardization committees of national standardization organizations is a good opportunity to establish contacts and to obtain a platform for exchange of information.

One of the most important tasks of the management within the framework of a standardization program is the implementation of company standards. On the one hand, organizational decisions must be made about the establishment of a standardization department etc. and the allocation of tasks. On the other hand, employees should not only be informed about the existing standards, they should also be convinced about the advantages for all employees.

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Executive summary

Standardization has been seen as a technical tool for the reduction in variety of parts and products for a long time. But standardization can do a lot more for the company. Although its effects sometimes are not obvious, they can be found in every department of a company:

- Standardization can improve the flow of information by reducing the number of decisions based on false or incomplete information.
- Standardization can make external know-how available to the employers, leading to a reduction in mistakes, e.g. in production, design, or management processes.
- Standardization is an important tool to guarantee the compatibility of the company's assets, i.e. machines, materials, and human capital.
- Standardization of products

As standards play an important role the way a company standard is developed becomes an important aspect; there are four different ways of developing a standard:

- The development of a company standard by employees of the company themselves.
- The adoption of a national or international standard, i.e. taking the national standard and using it as a company standard.
- The adaptation of a national or international standard, i.e. using this standard and changing it slightly, in accordance with the requirements of the firm.
- The adoption of a de-facto-standard, i.e. a technological design that dominates the market.

Which of these strategies the company should adopt depends on the specificity of the underlying problem. The more company-specific the problem is and therefore the solution should be, the better it is for the company to develop its own standard.

Finally both the standard and the strategy of standardization that have been chosen have to be implemented. The acceptance of the standard by the employees can be fostered by different means such as seminars, information, integration of employees etc. The processes necessary to carry out a standardization program can be focused in a standardization department that can be structured in various ways with respect to responsibility, number of members etc. (there is no trend as to whether large companies have large departments and vice versa) or the processes can be allocated to different departments. Both organizational set-ups have their weaknesses and strong points.

As a last remark, the way standards and standardization can be used against the competitive forces, that lower the profits, is described and illustrated by an example.

CE Marking and Trade in the European Union

Roland Hildebrandt

1998

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1 Introduction

Along the path to establishing a common European market it was inevitable that a large number of different regulations were issued which are valid throughout Europe. Many companies found this flood of regulations annoying. Companies that prepared themselves for the changes at an early stage and implemented the harmonized European regulations have a competitive advantage. These regulations not only apply to all companies in the countries of the European Union but also to companies in states which will be future EU members as well as to companies in non-EU member states which intend to supply the European market, especially if their country strives for membership of the European Union. Hence this means that the sooner these regulations are adopted, for instance by Polish companies, in their everyday routine, the sooner they can find their feet in the entire European market and the fewer conversions will be necessary when Poland joins the EU.

2 Legal prerequisites

An important prerequisite for a closer economic integration of the European market was the removal of technical barriers to trade which had evolved in the past due to different technical regulations in the member states of the European Union. The original approach of including detailed technical specifications in directives failed because it was impossible to implement. During the ten years which in some cases were needed to develop directives, the specifications elaborated were outpaced by technical progress. In addition, decisions were delayed or prevented owing to the unanimity rule.

2.1 The new approach¹

Within the framework of the so-called new approach, a new procedure was developed in 1985 which permits the passing of directives within a reasonably short period of time. By changing Articles 100 and 118 of the Treaty establishing the European Economic Community, which provided for the unanimity rule to be applied in passing directives for the safety of technical products and for occupational safety and health protection, into a majority rule, the elaboration and adoption of directives was additionally speeded up.

The EC directives prepared in accordance with the new approach in future only include the basic safety requirements to be met by technical products. Technical shaping of these general regulations is carried out in European standards which are mainly elaborated by CEN

¹ For more details of this topic see EG 1985, EG 1992, Schwappach 1996

and CENELEC as instructed by the European Commission. These are implemented without modifications by the national standardization bodies which are members of CEN.

The removal of technical barriers to trade is founded basically on three principles:

1. Mutual recognition,
2. notification,
3. legal harmonization.

2.1.1 Mutual recognition

Mutual recognition aims at facilitating free movement of goods by recognizing national technical specifications as long as regulations have not yet been harmonized.

2.1.2 Notification

The individual member states will be put under obligation to inform the European Commission about all drafts of national technical standards and specifications before they come into force (notification) in order to prevent the creation of new technical barriers to trade.

2.1.3 Legal harmonization

The aim of legal harmonization is to prepare technical EC directives which are to be implemented by the European Union member states. With this a uniform legal basis is to be created throughout Europe.

2.2 EC directives in accordance with the new approach

Below are some of the areas for which directives have been prepared according to the specifications of the new approach:

- General principles,
- electrical engineering, information systems engineering, telecommunications,
(e.g. electromagnetic compatibility 89/336/EEC)
- (e.g. telecommunications terminal equipment 91/263/EEC)
- medical technology,
- toys, consumer goods,
(e.g. safety of toys 88/378/EEC)

- mechanical engineering,
(e.g. safety of machinery 89/392/EEC)
- metrology,
- pressure vessels,
(e.g. simple pressure vessels 87/404/EEC)
- energy- using appliances, gas appliances,
(e.g. appliances burning gaseous fuels 90/396/EEC)
- construction products,
- personal safety equipment,
- industrial safety,
- noise emission,
- bioengineering,
- hazardous materials,
- drugs,
- transportation, shipbuilding,
- environmental law, general regulations,
- waste disposal, waste recycling, waste avoidance.

Brief descriptions of some selected directives are to be found below.

2.2.1 Directive on simple pressure vessels

The directive on simple pressure vessels stipulates that the equipment used to absorb air or nitrogen under this regulation must be installed and operated in accordance with the requirements referred to in the annexes and otherwise according to the generally recognized technical rules (e.g. standards, regulations laid down by the working group on pressure vessels, safety regulations). For the purposes of this directive, 'simple pressure vessel' means any group of pressure vessels or any array of tubes subjected to an internal gauge pressure greater than 0.5 bar. The objectives regarding safety (criteria) to be achieved for the elaboration of technical regulations are specified in the annexes. These include:

- Materials,
- vessel design,
- manufacturing processes and
- vessel operation.

Pressure vessels which meet the requirements under this directive are labeled with the CE mark.

2.2.2 Directive on the safety of toys

Toys are defined in this directive as all products designed or intended for use in play by children of less than 14 years of age.

The directive includes basic specifications of

- design, manufacture, composition,
- use,
- risks from using the toy,
- minimum age of child for whom it is intended and
- labels and warnings.

In addition, other stipulations are made regarding the warnings and instructions for use, such as:

- Physical and mechanical characteristics,
- flammability,
- chemical characteristics,
- electrical properties,
- hygiene and
- radioactivity.

Toys that meet the provisions of this directive are labeled with the CE mark.

2.2.3 Directive on electromagnetic compatibility

The directive on electromagnetic compatibility applies to all equipment liable to cause electromagnetic disturbance or the performance of which is liable to be affected by such disturbance.

This includes the following equipment:

- Private radio and television receivers,
- commercial wireless equipment and radio telephones,
- medical and scientific apparatus and instruments,
- household appliances,
- electronic equipment for educational purposes.

Equipment that fulfils the requirements of the directive is labeled with the EC mark.

2.2.4 Machinery directive

The machinery directive prescribes basic requirements of safety and health which have to be met by all machines that are sold or offered for sale in the European internal market. For the purposes of this Directive, 'machinery' means "an assembly of linked parts or components, at least one of which moves, ..., joined together for a specific application, in particular for the processing, treatment, moving or packaging of a material" (see machinery directive).

Individual components which perform a safety function are treated separately in this directive.

Machines that fulfil the requirements of the directive are labeled with the EC mark.

2.2.5 Directive on appliances burning gaseous fuels

This directive applies, amongst other things, to appliances burning gaseous fuels used for cooking, heating, hot water production, refrigeration, lighting or washing.

The directive makes stipulations regarding:

- General operational provisions,
- materials and
- design and manufacture of the appliances.

In addition, procedures for certifying conformity, for CE marking and for preparing the design documentation are specified.

2.2.6 Directive on telecommunications terminal equipment

'Terminal equipment' for the purposes of this directive means equipment intended to be connected to the public telecommunications network or which directly interacts with a public telecommunications network.

The respective annexes of the directive specify precise instructions for:

- Production quality assurance,
- full quality assurance and
- marking.

Here, too, the CE mark is the externally visible sign to the consumer stating that a technical product meets the safety requirements of the technical EC directives elaborated on the basis of the new approach.

2.3 CE marking

By means of CE marking, the manufacturer of a product makes it clear that the product manufactured by him meets the basic safety requirements of the applicable EC directives. Even if the product has been tested by a notified agency, the manufacturer is under obligation to affix the CE mark. However, the manufacturer may not apply the CE mark until he has carried out the conformity assessment procedures and drawn up an EC declaration of conformity.

If the manufacturer is not established within the European Union, his local authorized representative must issue the EC declaration of conformity and affix the CE mark. Its shape and size is prescribed and must comply with the sample shown below:

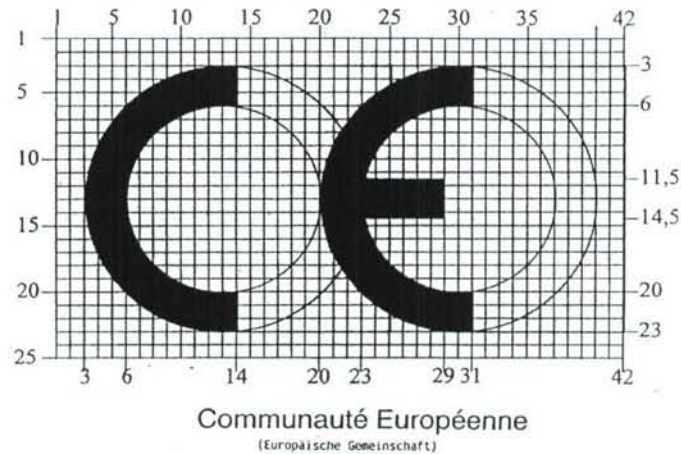


Figure 1: Sample of the CE mark²

The CE mark is to be applied, for instance, on the type plate of the machine. The following information must be added:

- Name and address of the manufacturer,
- designation of series, type and serial number
- year of construction of the machine.

The operating instructions must contain the same information as the information with which the machinery is marked. For this reason many manufacturers include a copy of the machinery marking information in the operating instructions.

2.4 Use of standards

Using European standards implies that the basic safety requirements of the EC directives are fulfilled.³ Hence it is useful to translate the specifications laid down in European standards into the internal set of company standards. Acquisition of the right to use these standards is an important prerequisite for this. The purchaser of a standard obtains this right. It is not permissible to copy a standard for the company without prior permission from the German Standards Institution (DIN) because DIN standards are copyright-protected. Members pay an annual lump sum for making copies and thus acquire the right to copy standards in electronic form or on paper for internal purposes. These copies must be made from their own original. The copies must be marked as such. Non-members or members who do not make a lump-sum payment for making copies need special permission to make copies from the legal

² EC 1993, Annex I B. d) 1.

branch of the DIN institution. Permission to make copies is granted six months after publication of the DIN standard at the earliest. It applies only to the number of copies stated in the permission. Companies which are not established in Germany must submit the application for making copies to the standards institution responsible. All copies are liable to a charge, irrespective of the form or format of the copies; this also includes storage by electronic means. The charge to be paid is 30 per cent of the net price of the standard copied plus VAT.

Further details can be found in the copyright law and DIN leaflet 3.⁴

DIN retains the right to translate the standards into foreign languages. If it is not planned to translate a standard into foreign languages or if a translation has already been made, DIN grants the translation rights on application; this is to be filed in writing to the DIN legal branch. Applications for translations filed by companies which are not established in Germany are to be submitted via the standards institution responsible. If the translation is approved, its format must be such that it cannot be confused with the original. The translation may be used for own purposes. DIN is to be provided with an author's copy of the translation. Copies may only be made on the aforementioned terms.

Further details can be found in DIN leaflet 5.⁵

There is no reason why the contents of standards cannot be adopted into company standards if they are independent documents which are the product of elaboration and reshaping of the standards for company purposes. The content of the standard must then be expressed in the company's own words. In this case the adoption of short quotations is not considered to be a copy, provided that such quotations are used to make the independently prepared text more specific and is therefore not subject to prior permission. Merely replacing the header with company data and classification or omitting the outer frame does not constitute reshaping in this sense.⁶

3 Adoption of EC directives

EC directives are directly aimed at individuals or companies. They are to be converted into national law by the governments of the member states of the European Union within a given

³ Art. 5 (2) EC Machinery Directive

⁴ DIN 1995, p. 423-424

⁵ DIN 1995, p. 427-428

⁶ For more details see DIN 820 Part 1, para. 7

time limit. These national laws contain the stipulations which are to be observed by the manufacturers of technical products.

3.1 Methods

As adoption of European directives into national law is not obligatory for non-EU states, they have the opportunity to work in a fundamentally different way with these directives, as compared with EU member states. If products are to be sold to the European Union, they must meet the basic requirements of the EC directives. There are basically two possible procedures for fulfilling these basic safety requirements. Both of these approaches are explained briefly below.

3.1.1 Preparing company standards on the basis of EC directives

Preparation of company standards on the basis of the text in the directives presupposes experience in dealing with the translation of generally formulated demands into detailed requirements. The work of incorporating the specifications of these general demands amplified by means of basic safety standards (Type A standards) and group standards (Type B standards) into detailed company standards - as for instance the basic safety requirements laid down in the EC machinery directive - has to be performed by appropriate specialist staff (legal experts, standardizers, environmental experts, etc.).

3.1.2 Preparing company standards on the basis of European standards

The use of European standards also remains voluntary for manufacturers from member states of the European Union. Since the harmonized standards have been prepared on the general basis of the safety requirements set forth in the directives, it may be presumed that if European standards are adopted and used, then the basic safety requirements of the directives will also be met.⁷ This presumptive effect is laid down in the directives. This process of deduction can naturally also apply to manufacturers from non-EU states who label their products with the required EC declaration of conformity and the CE mark. The products can then be offered and sold in the entire European economic area.

It is left to the manufacturers of technical products to decide whether they will use the European standards. If a product attains the same level of safety without using European standards, it may also be sold in the European market without limitations, but only on condition

⁷ See, for instance, EC Machinery Directive, Art. 5 (2)

that the manufacturer proves within the scope of EC type testing that the same level of protection has been attained, that an EC declaration of conformity has been issued and that the CE mark has been affixed. A body certified (notified) on the basis of series EN 45000 is to be tasked with carrying out the conformity assessment procedure.

3.2 Means

Various organizational means are already available within companies which can be used to implement and apply the directive specifications. Taking the most important organizational means as an example, a brief description is given below as to how they can be used to adopt EC directives and European standards.

3.2.1 Company standards

The main contents of the EC directives, the European standards as well as of the national standards can be summarized in company standards for internal use. This is useful because these standards often contain specifications which are not needed in the companies in their entirety. They are supplemented by internal specifications prepared for the company, such as manufacturing tolerances, material selection or procedures, terms and definitions specifically laid down. Thus they develop into independent documents of the companies to which the conditions listed in paragraph 0 apply.

The rules laid down in paragraph 0 regarding DIN standards also apply to the adoption of European standards.

The EC machinery directive is taken as an example of such a company standard:

Company's Name	CE Marking of Machinery (i.a.w. EC Machinery Directive)	Date of Issue
Contents		
0	Introduction	
1	Purpose	
	1.1 Requirements	
	1.2 Prerequisites	
2	Definitions and comments	
	2.1 EC declaration of conformity	
	2.2 CE marking	
	2.3 Manufacturer's declaration	
3	Definition of the term 'machinery'	
	3.1 Individual machine	
	3.2 Complex machinery/installation	
	3.3 Interchangeable equipment	
	3.4 Safety components	
	3.5 Machinery which cannot function independently	
	3.6 Used machinery	
4	Manufacture for own use	
<p>0 Introduction</p> <p>Member States shall apply the EC Machinery Directive (89/392/EEC) including the amendments and supplements (91/368/EEC, 93/44/EEC and 93/68/EEC) with effect from 01 January 1995 for placing on the market and putting into service of machinery within the European Internal Market.</p> <p>The following shall apply to machinery which has already been put into service or placed on the market before 01 January 1995:</p> <ul style="list-style-type: none"> It is not required to retrofit machinery in order to meet the requirements of the EC machinery directive. 	<ul style="list-style-type: none"> All maintenance measures or adaptations to the state-of-the-art technology without modifying machinery functions or performance are not covered by the provisions laid down in the EC machinery directive. Spare parts or machinery parts needed to carry out maintenance measures must meet the requirements laid down in the directive. The EC machinery directive shall apply to existing machinery only if modifications are carried out which affect the function, technology or performance of the machinery. 	

1 Purpose

This standard describes the approach to applying the CE mark and manufacturing the machinery/installations and defines important terms.

1.1 Requirements

- Compliance with the basic safety and health requirements laid down in the EC machinery directive.
- Issuance of an EC declaration of conformity for any independently operating machine, installation and interchangeable equipment and for any safety component by the manufacturer.
- Application of the CE mark.

1.2 Prerequisites

- Technical documentation prepared by the manufacturer.
- Operating instructions to be supplied in the language of the country in which the machinery is to be used.

2 Definitions and comments

An EC declaration of conformity shall be issued only if the technical product/machinery can function independently and no other attachments are required. Otherwise a manufacturer's declaration without a CE mark shall be issued.

2.1 EC declaration of conformity

In the EC declaration of conformity, the signatory certifies on his own and sole responsibility that the machinery conforms to the applicable EC directives.

The obligation to draw up and issue the EC declaration of conformity applies to any machinery - also to machines manufactured only once -, to custom-built products

and interchangeable equipment as well as to each machine belonging to a series.

The obligation to issue the EC declaration of conformity applies to any machinery - irrespective of the fact whether it is used in the commercial, industrial or private sector.

The obligation to issue the EC declaration of conformity applies to the commercial sector even if the machinery is constructed by the manufacturer himself.

The same obligation to issue an EC declaration of conformity also applies to any person assembling machinery or parts thereof of various origins.

The EC declaration of conformity shall be issued in particular if a machine which cannot function independently and for which no EC declaration of conformity has been drawn up, is incorporated into other machinery or assembled with other machinery to form a complex installation. The machinery must not be put into service until an EC declaration of conformity has been issued.

The EC declaration of conformity is an official document and specifies the relevant provisions met by the machinery.

The underlying standards, directives, regulations and technical specifications shall be stated. The EC declaration of conformity shall be signed in a legally binding form.

The EC declaration of conformity must accompany the documentation of each machine supplied.

2.2 CE Marking

Signing of the EC declaration of conformity entitles the manufacturer to affix the CE mark to the machine.

Each machine may bear only one CE mark.

Interchangeable equipment is an exception to this principle and shall be individually marked.

If machines are incorporated into other machinery or assembled with other machinery to form a complex machine or installation whose individual machines can function independently, each individual machine shall be marked. But if these machines are linked with each other to form a complex machine as a result of having been assembled such that they can no longer function independently, only one CE mark may be applied.

The CE mark shall be affixed to machinery distinctly and visibly and indelibly.

Marks or inscriptions liable to be confused with the CE mark shall not be put on machinery.

The CE mark is affixed by the manufacturer of the machinery.

2.3 Manufacturer's declaration

By issuing the manufacturer's declaration, the manufacturer certifies that the product in question is intended to be incorporated into machinery or assembled with other machinery to constitute a complex machinery or installation and does not function independently.

The manufacturer's declaration shall be issued for any machinery which can function independently.

This machinery must of course satisfy the basic safety requirements laid down in the EC machinery directive and all other relevant directives.

The manufacturer's declaration basically contains the same information as the EC declaration of conformity. In addition, it must contain a statement that the machinery must not be put into service until the

complex machinery into which it is to be incorporated has been declared to conform with the provisions of the directive.

3 Definition of the term 'machinery'

3.1 Individual machine

For the purposes of the EC machinery directive, 'machinery' means an assembly of linked parts or components, at least one of which moves, with the appropriate actuators, control and power circuits, etc., joined together for a specific application, in particular for the processing, treatment, moving or packaging of a material.

3.2 Complex machinery / installation

For the purposes of the EC machinery directive, the term 'machinery' covers an assembly of machines which are arranged and controlled so that they function as an integral whole.

3.3 Interchangeable equipment

For the purposes of the EC machinery directive, 'interchangeable equipment' means equipment used to change the function of the machinery and which can be exchanged by the operating personnel.

3.4 Safety components

Safety components are components which the manufacturer places on the market to fulfil a safety function when in use and the failure or malfunctioning of which endangers the safety or health of exposed persons in the danger zone of the machinery equipped with the safety component.

3.5 Machinery which cannot function independently

Machinery that is exclusively intended to be incorporated into machinery or assembled with other machinery and cannot function independently is also covered by the provisions laid down in the EC machinery directive.

3.6 Used machinery

The EC machinery directive does not apply to the sale of or trade with used machinery.

If used machinery is integrated into complex machinery/installations for the first time or if modifications are made to used machinery which change the original safety precautions, this is equivalent to putting it into service or, in the case of sales, placing it on the market for the first time within the meaning of the EC machinery directive. The EC machinery directive shall then be fully applied. Any person who effected the modifications thus shall be regarded as the manufacturer for the

purposes of the EC machinery directive and shall fulfil the same requirements which apply to new machinery.

4 Manufacture for own use

The manufacturer is obliged to carry out a hazards analysis. Machinery construction must ensure that operation, setup and maintenance of the machinery does not endanger persons when the machinery is used for its intended purpose.

The basic safety and health requirements referred to in the EC machinery directive shall apply.

An EC declaration of conformity shall be issued (usually by the responsible design engineer in charge of carrying out the hazards analysis) which shall be signed by the responsible superiors empowered to sign.

3.2.2 Flow charts

Process or flow charts open up the possibility of structuring procedures and processes within the companies and making them comprehensible. At the same time they make it possible to implement those measures that are listed in the ISO 9000 catalogue (e.g. definition of procedures and processes).

The example listed below summarizes the steps required to ensure that machinery meets the safety requirements formulated in the EC machinery directive. First, it is necessary to define the limits of the machinery, to define intended conditions of use and to determine and evaluate the hazards involved. Finally, it must be specified how construction can be adapted to avoid the hazards or how the risk caused by them can be reduced. If the hazards are then not completely eliminated, it must be considered whether they can be reduced by technical protection measures. If this is still not sufficient, the user's guide must include notes on this. If these measures are still not sufficient to ensure an adequate level of safety, the limits of the machinery must be redefined.

As these flow charts are independent products of the companies, the contents of standards or directives can be used to elaborate them.

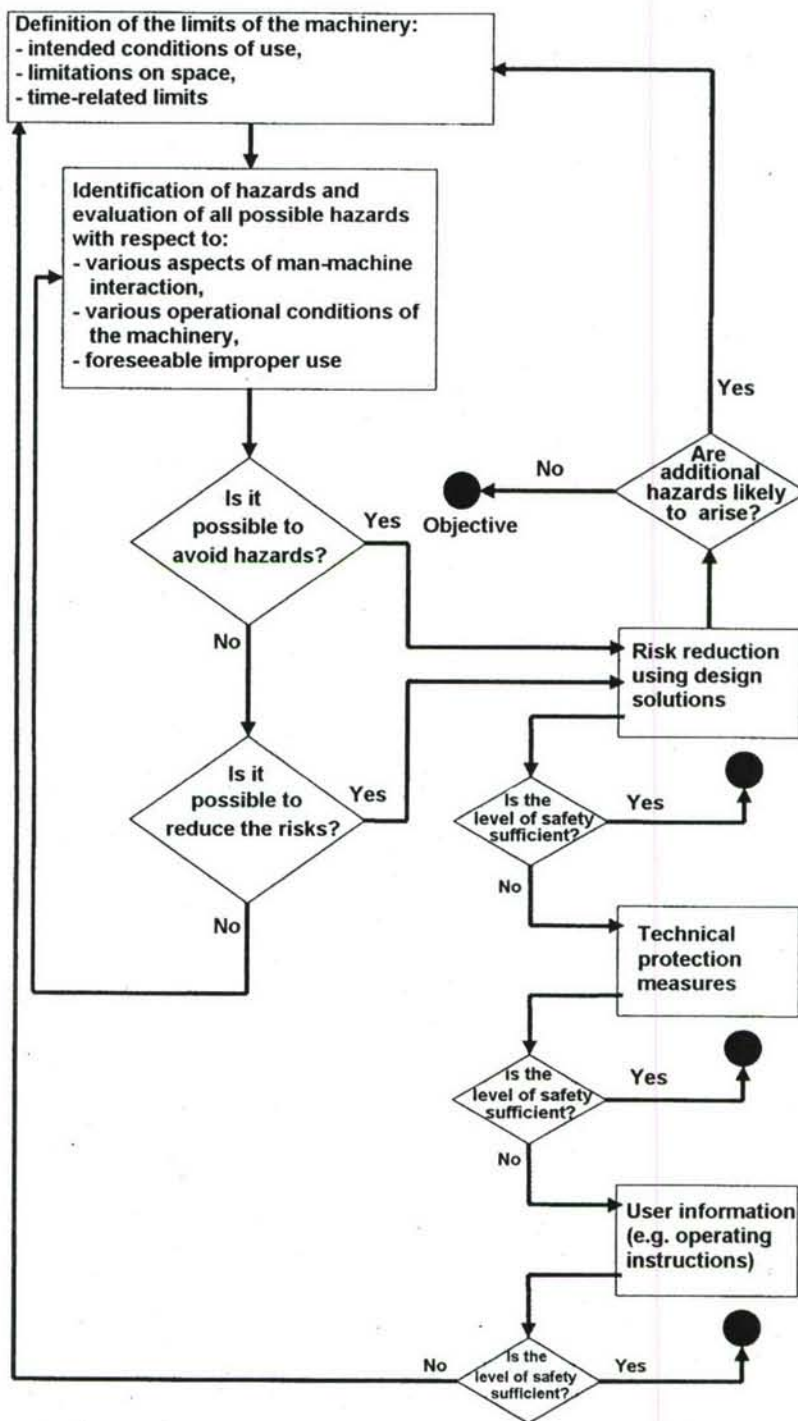


Figure 2: Example of a flow chart used to define product safety⁸

⁸ i.a.w. Johannknecht / Warlich 1994

3.2.3 Checklists

Checklists are useful in preparing flow charts when recurring sets of tasks have to be structured. The contents of the European standards can be used in these checklists, too. The following is an example of a checklist to be completed prior to the delivery of a technical product:

Checklist of machinery acceptance		
	yes	no
1. For the purposes of the EC machinery directive, "product" means		
a machine	<input type="radio"/>	<input type="radio"/>
interchangeable equipment	<input type="radio"/>	<input type="radio"/>
a safety component	<input type="radio"/>	<input type="radio"/>
2. An EC declaration of conformity is available	<input type="radio"/>	<input type="radio"/>
including the harmonized standards used	<input type="radio"/>	<input type="radio"/>
including the national standards used	<input type="radio"/>	<input type="radio"/>
3. Technical documentation (i.a.w. the EC machinery directive) is available	<input type="radio"/>	<input type="radio"/>
4. Operating instructions in the language of the recipient country are available	<input type="radio"/>	<input type="radio"/>
5. Operating instructions in the language of the manufacturing country are available	<input type="radio"/>	<input type="radio"/>
6. Type plate has been applied	<input type="radio"/>	<input type="radio"/>
7. CE marking has been applied	<input type="radio"/>	<input type="radio"/>
Name:		
Date:		
Signature:		

4 Summary

The objective of this presentation was to give a brief description as to how access to the common European market can be facilitated for companies in non-EU countries. A brief outline of the current legal basis for harmonizing legal provisions was given and various means and procedures required to implement the European set of rules were briefly described. The possibilities and legal foundations for adopting and implementing technical rules into the companies were illustrated by means of examples.

5 References

DIN 1995

Deutsches Institut für Normung (Hrsg.): Grundlagen der Normungsarbeit des DIN; DIN-Normenheft 10; Berlin, Wien, Zürich: Beuth, 1995

EG 1985

Amt für amtliche Veröffentlichungen der Europäischen Gemeinschaften (Hrsg.): Vollendung des Binnenmarktes - Weißbuch der Kommission an den Europäischen Rat; Luxemburg 1985

EG 1992

Amt für amtliche Veröffentlichungen der Europäischen Gemeinschaften (Hrsg.): Eine neue gemeinsame Normungspolitik - Das neue Konzept für die Harmonisierung; Luxemburg 1992

EG 1993

Beschluß 93/465/EWG des Rates vom 22. Juli 1993 über die in den technischen Harmonisierungsrichtlinien zu verwendenden Module für die verschiedenen Phasen der Konformitätsbewertungsverfahren und die Regeln für die Anbringung und Verwendung der CE-Konformitätskennzeichnung; ABI. EG Nr. L 220 vom 30.08.1993; S.23

Johannknecht / Warlich 1994

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Schwappach 1996

Schwappach, J. (Hrsg.): EU-Rechtshandbuch für die Wirtschaft; München: Beck, 1996

6 Summary

It was intended to give an introduction into European policy in the field of technical directives. Therefore it was explained on which legal basis directives are prepared and what has to be done to implement them into companies. Some of the most important technical directives were introduced and it was shown how to fulfil the basic requirements in the field of technical safety and health in using European standards and how to use the CE marking.

Because there are certain difficulties in using copyrighted material it was explained how to adopt technical directives and European standards into company standards without violating intellectual property rights by quoting and transforming the original papers into own standards.

Translation from German

THE STANDARDIZATION CYCLE

By

Jens Kleinemeyer

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1 Introduction

In many countries which are in the process of evolving from a centrally planned economy to a market economy there are binding standards developed by a government authority or on its behalf. Therefore, deviations from these government standards are not permitted. Participation – in particular of public enterprises – in the standardization process may be decreed. However, mandatory participation usually leads to this obligation being met without any great involvement. Thus, many producing enterprises or collective combines became mere recipients of standards and engineering directives. They virtually did not contribute anything to the preparation of these technical specifications. Because the government financed national standardization, the national standards could be passed on at very low cost. When the market economy was introduced, which involved the privatization of a great number of former state functions, national standardization was also restructured. It was adapted to Western systems by changing over to voluntary standardization, often organized under private law.

The changes in the area of standardization must be seen in the context of political and economic developments in Central and Eastern Europe. The economic reforms – in particular with regard to price decontrol and general privatization – inevitably lead to enterprises which can no longer be forced to participate in national standardization. In principle, the government may provide funds for national standardization even in a market economy but this will be difficult to get accepted politically, since national standardization would primarily benefit the enterprises. Government funding of national standardization would thus be nothing but a subsidization of the enterprises. This policy would neither go with the attempt to meet the criteria of the European Monetary Union nor facilitate accession to the European Union. Of course, this does not affect the fact that the development of individual standardization projects serving the general welfare may also be sped up by granting government aid.

The formerly centrally controlled economic systems are now faced with the problem that they have to turn former recipients into producers of technical specifications, who should also be prepared to fund this process. This becomes necessary because the new standardization organizations have neither the know-how nor the financial resources to perform the actual work and produce the required standards. Structures like those that have evolved in the Western economic systems since World War I and resulted in approximately 20,000 standards in Germany, France and Great Britain today cannot be „conjured up out of thin air“. Nevertheless, the countries in transition have great resources of technical know-how that may be used for technical

standardization. However, mechanisms have to be found which permit these resources to be tapped, i.e. it must be possible to fund the standardization work.

2 The Standardization Cycle

Within a national economy, standardization occurs at various levels. For instance, it may occur at the lowest level – the individual company – or at a higher level, e.g. within a branch of business or industry, or at a comprehensive national level. Standardization as practised in the Western industrial nations can best be illustrated by Figure 1. Inter-branch or national standards are normally developed on the basis of intracompany standardization. In turn, these standards are then used by the enterprises and incorporated into their own standards. This may be done by complete adoption, with or without amendments, or partial adoption. But national standards may also serve as a basis for regional or global standardization.

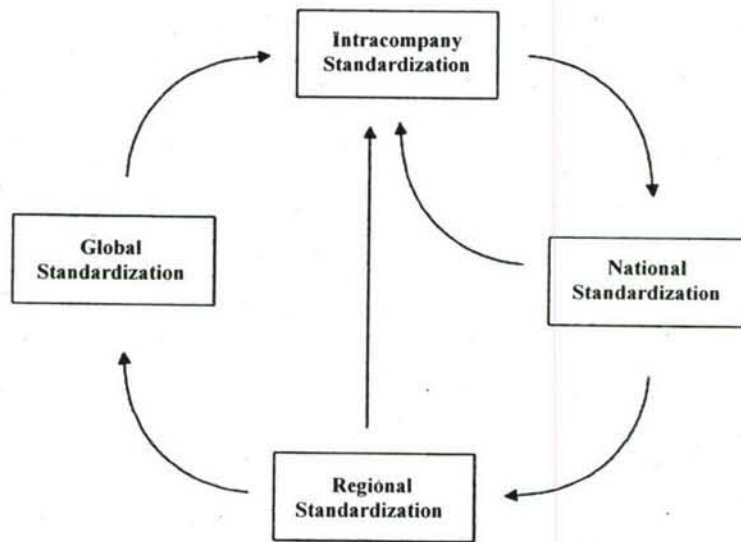


Fig. 1 The Standardization Cycle¹

¹ Naturally, links may be established between all elements of the standardization cycle, but the emphasis was placed here on the links between the company and the national level.

The standardization cycle can, of course, also begin at levels other than intracompany standardization, i.e. through a national, regional or global standardization initiative. But it becomes clear that, regardless of the origin of the standard, it must be adhered to within the enterprise and integrated into intracompany standardization to be successful. From a historical point of view it is difficult to tell what came first: intracompany standardization at the national, regional or global level. An intracompany standard was first established in the German Reich by Siemens & Halske, who in 1976 gave a written definition for the characteristics of a thread (Wölcker, p. 28).

Figure 1 looks so simple and uncomplicated at first glance, but when we take a closer look it turns out to be a network of a great number of interconnected relationships and problems.

1. Intracompany standards are incorporated into national standards. As is generally known, absolutely conflicting interests may clash during this process. As a rule, competing enterprises are not very inclined to agree to a competitor's proposal to establish a standard because this might provide him with a competitive advantage. If the companies have finally reached an agreement, then their position will probably be in contrast to the consumers' and/or the trade union's position.
2. The fact that the consumers' position is only rarely considered by standardization bodies is a problem frequently voiced in the Federal Republic of Germany. The reason for this is the lack of opportunities for consumers to organize and to raise funds for the representation of their interests. Thus, the organizations setting the standards are increasingly becoming the focal point of interest for the supervisory authorities enforcing fair competition, because it cannot be ruled out that the standardization bodies reach not only technical agreements but also agreements on prices and quantities.
3. What applies to the consumers is also true for national standardization as a whole. It costs money and thus requires money. The attitude of many companies not to participate in voluntary standardization but to make use of the product of this process is called „*taking a free ride*“ – not only in the company. These companies avoid sharing the costs for the development of standards in order to cheaply use the know-how contained in the standards afterwards. If a sufficient number of companies demonstrate this attitude, national standardization will collapse or not even come into being. This problem will be dealt with in more detail in section 4.3, „Free Riders of Standardization“.

3 Intracompany Standardization

Within the framework of intracompany standardization, standards may originate in various ways. As outlined in detail in the contribution on the strategic importance of intracompany standardization, this can be done by company development or by adopting an intercompany standard. Intracompany standardization is intended, firstly, to lower the costs, and secondly, to increase the proceeds of the company.

Standards for Increasing Output

Standards are developed and implemented to either increase the production output at the same production cost or to lower the production cost while the output remains constant. It is a well-known phenomenon that the repetition of operations will lead to these operations being performed at a higher speed. Intracompany standards will ensure a sufficiently great similarity –between the individual operations. Standards are thus the prerequisite for mass production.

However, efficient standardization also provides for a reduction in the variety of parts, assemblies and even end products, if necessary. A reduction in the number of parts becomes noticeable through lower production cost, e.g. on account of larger production batches or lower procurement costs, since the purchased parts can be produced at a better price and increased competition will lead to lower prices.

When speaking of or writing about technical standardization, this generally concerns standards which lead to the effects described above.

Standards for Improving Intracompany Communication

Directives concerning communication and information flow within the company are very rarely regarded as standards. The reason for this is that the standards for improving communication are not directly technical and also cannot be represented as technical drawings. Nevertheless, standards for improving communication are of at least equal importance; this all the more since the factor „information“ has become the fourth production factor, placed on a level with the factors „work“, „capital“ (machines, etc.) and „real estate“. The internal processes and channels of communication can be clearly defined with the aid of standards.

Standards are a common basis for the company's employees and more or less define its terminology. Thus, standards cause less misunderstandings and help to reduce errors in the production process.

Quality Assurance Standards

Standards play different roles in quality assurance. Firstly, standards are necessary for assessing deviations from a technical reference value, i.e. whether they fall within the tolerance range and the product may therefore be sold, or whether the limits have been exceeded and the product must therefore be entered in the books as a reject. The standards therefore include the measuring method and the measuring conditions as well as ideal values and tolerances in order to ensure the constant quality of a product. Secondly, standards are necessary to ensure that these standards are observed. An example for this is the well-known ISO 9000 family.

Many intracompany standards are based on national standards which are adapted to the special requirement of the company, if necessary. For many companies, national standardization thus is a frequently used source of technical knowledge.

4 The Structure and Problems of National Standardization

4.1 The Structure of National Standardization

When considering the various legal and organizational forms of national standardization, recurring patterns may be perceived, but also a number of contradictions.

Thus, contradictions (which will be dealt within more detail in the following contribution on the organization of national standardization) exist between

- the *binding force* and the *voluntariness* of standards,
- the *centralized* and *decentralized* development of standards,
- *privately*, and *government-funded* national standardization,
and
- the *private* and *government* development of standards.

Similarities exist especially in the organizational structure where the actual standardization is carried out. At national as well as international level we can see a specialization of standardization in the field of electrical engineering from the standardization in other fields. This has produced the combinations ISO – CEN – DIN and TEC – CENELEC – DKE. But the structure of these organizations also shows symmetries. A connecting criterion is the subdivision into technical committees, subcommittees, working groups and subworking groups.

The more complex a problem is which is to be solved with the aid of one or several standards, the more complex the organizational structures become, since a single working group will usually not be able to develop the necessary number of standards. Thus, the task of coordinating the work will gain in importance, as well. This standardization project will not only become more expensive because more standards have to be developed, but also because of the greater coordination effort. There is also the danger that several differing solutions will be prepared for certain problems which ultimately leads to no standard being developed after all. The costs incurred for the actual standardization work as well as for the coordination of this work must be funded; otherwise national standardization will remain incomplete.

4.2 The Origin of National Standards

The origin of a future standard is a point to be considered both for the purpose of national standardization and for standardization within an individual company.

1. Should the national standard be newly developed?
2. Should a regional or international standard be adopted as the national standard?
3. Should a regional or international standard be adopted in a modified form?

Various determining factors will influence the decision on what approach to choose for developing a national standard.

First, the economic importance of a country plays a role. A small country which wants to get closer to the European Union will be well advised to put the emphasis on adopting mostly European standards and develop its own standards only in exceptional cases. Lithuania is pursuing such a strategy, for example. Small countries often do not have the variety of industries that exist in larger countries. Therefore, the network of relationships, i.e. products and services produced, bought and sold exclusively within the respective country, will be smaller than that in a larger country.

A second factor is the political attitude towards international and regional trade. As is well known, standards may be technical trade barriers. Again and again they are misused as a tool for protecting domestic industry or trade against foreign (and generally cheaper) competition. If a country therefore pursues a policy aimed more at protectionism, then national standards would have to be developed, of course.

Orientation towards free trade and the world market will automatically lead to more international or regional standards being adopted as national standards.

However, the political attitude towards integration into the European Union, for example, also plays a role in the selection of the national standardization strategy. If a country aspires to association with or later admission into the European Union, incorporating both European directives into national laws and European standards into national standards suggests itself in order to thus create the technical basis for a smooth admission – e.g. into the European Union. That this is of considerable relevance for Poland, for example, is revealed by a look at the structure of the Polish foreign trade (see Table 1). As can be seen, the Federal Republic of Germany has by far the greatest importance for Poland's foreign trade. For the Polish national standardization, this means that following the German national standards, in addition to complying with regional European standards, is an important prerequisite for the success of Poland's foreign trade in the long term.

Country 1996	Turnover (in million US dollars)	Export (in million US dollars)	Import (in million US dollars)	Share in %	
				Export	Import
Germany	16 514.1	8 777.5	7 736.6	38.34	26.63
Italy	3 604.1	1 121.9	2 482.2	4.90	8.54
Russia	3 234.0	1 274.2	1 959.8	5.57	6.75
Netherlands	2 606.6	1 288.6	1 318.0	5.63	4.54
Great Britain	2 419.6	916.9	1 502.7	4.00	5.17
France	2 239.9	818.2	1 420.7	3.58	4.89
USA	1 758.0	621.1	1 136.9	2.71	3.91
Czech Republic	1 589.9	698.2	891.7	3.05	3.07
Sweden	1 490.5	581.0	909.5	2.54	3.13

Table 1: Poland's most important trading partners

(Source: Ministry for Economic Cooperation with Foreign Countries)

4.3 Free Riders of Standardization

Now we come to the probably greatest problem facing national standardization. The product STANDARD has some special features. In some cases, the production of a standard involves considerable expenditure. WEISS and SPRING (1995, p. 7), for example, estimate that the production of the 10BaseT Ethernet standard (IEEE 802.3i) cost between 8.7 and

13 million US dollars. Thus, every participating organization has to pay between 120,000 and 185,000 US dollars. However, not only the participants in the standardization process may make use of this standard but also enterprises which have not been involved. Those enterprises which have not shared the costs yet want to reap the benefits are called „free riders“. This free-riding by companies involves the risk that a standardization process will not materialize at all because nobody is willing to meet all the expenses alone. For this reason, national standardization must be organized in such a way that, firstly, the companies participating in the standardization process can realize benefits which others cannot realize, and secondly, the production costs of a standard are also shared to a larger extent by those companies not participating but using the standard.

Table 1 illustrates this situation and the dilemma connected with it. Company A must now decide whether it wants to participate in the standardization process or not. If it participates, then it will have to pay the costs for participating in the process: „participation costs“. Even if only one company participates in the process, a standard is produced. The benefit resulting from it in the form of technical information will become accessible to all: „benefit“.

If all the companies decide against participation, then they will neither incur costs nor will a standard be produced from which they may benefit: „0“.

		All other companies	
		participate in the production of the standard	do not participate in the production of the standard
Company A	participates in the production of the standard	Benefit minus participation costs	Benefit
	does not participate in the production of the standard	Benefit minus participation costs	Benefit minus participation costs
		Benefit Minus participation costs	0
		Benefit	0

Table 2: Strategic situation from the perspective of many companies

The two most significant parameters for companies participating in the standardization process have thus been identified:

- the amount to be paid for participating in the standardization process, and
- the level of benefit to be derived from a standard by the individual company.

The decision of the company or its managers is clear if all the other companies participate in the production of the standard. The participation would only involve expenses for Company A, so it will decide against participation. However, if all the other companies do not participate in the production of the standard, Company A will have neither expenses nor any benefit if it does not participate in the standardization body either. If it participates in the standardization process, however, it will not only benefit from the standard but it will also incur participation costs. If one excludes the extreme cases where the benefit from a standard is greater than the costs for national participation (even for only one company), a situation arises where Company A will not participate in standardization irrespective of what all the other companies do. Because of the symmetry, this also applies to all the other companies so that in the end none of the companies will participate in the standardization, and national standardization will not come about.

5 Participation of Companies in National Standardization

5.1 Effects of a Standard and Effects of Participation in Standardization

Thus, it seems clear that participation in a national standardization body cannot be justified from an economic point of view. However, the description contained in Table 2 neglects a number of facts which many decision makers in companies also fail to see. Their view is shown in Table 2.

Let us now proceed to Table 3. The benefit of participation in a national standardization process is not only that it will in the end result in a standard that may be used both by the companies that contributed to the development of the standard but also those which use the standard without making any contribution of their own. The benefit is also that the participating companies already gain an advantage through their participation. This can happen in various ways:

Information Collection

Participation in national standardization may serve as a source of information about the developmental status and intentions of competitors. It may also provide insights into the competitor's assessment of the market development or technological innovations.

		All other companies	
		participate in the production of the standard	do not participate in the production of the standard
Company A	participates in the production of the standard	Benefit from the standard plus benefit from participation minus participation costs	Benefit from the standard
	does not participate in the production of the standard	Benefit from the standard plus benefit from participation minus participation costs	Benefit from the standard plus benefit from participation minus participation costs
		Benefit from the standard plus benefit from participation minus participation costs	0
		Benefit from the standard	0

Table 3: Strategic situation when taking a differentiated view of the effects of participation in standardization on the benefit

Exchange of Experience

Within the standardization body, there may be an exchange of experience that may benefit all the participating companies. This applies, for example, to the problems and solutions connected with the implementation of the ISO 9000 family, to products conforming to European directives, to general documentation problems, etc.

Cooperation and Joint Ventures

A standardization body can already be regarded as the basis for potential technological cooperation between one or several of the participating enterprises. The fact that this body unites companies which operate on similar or identical markets results in the body being almost made for sounding out and, if possible, preparing opportunities for technological cooperation or for joint ventures on a more technical level. Of course, this not only applies to national standardization but to a similar degree also to international standardization.

5.2 Effects of a Standard and Effects of Participation in Standardization on the Costs

Participation in the production of a standard does not only affect the benefit side but also the cost side. This particularly applies to the proportion of costs incurred by the participating companies and those incurred by companies which only want to use the standard.

A standard or the know-how accumulated in this standard does not provide any benefit if it is not put to use. Companies not participating in the standardization process are, on the one hand, faced with the problem that they must or want to use a standard that does not incorporate the wishes and ideas of the company; on the other hand, there may also arise terminological problems, since only those companies which participated in the development of the standard know what certain phrases refer to. This cannot really be expected from free riders. For this reason, putting a standard to use may be more cost-effective in companies which participated in its development than in those which only want to use the finished standard. Participation in a standardization body may therefore be used as a tool for raising the costs for competitors and thus to obtain a cost benefit, and thereby a competitive advantage.

	All other companies	
	participate in the production of the standard	do not participate in the production of the standard
Company A	participates in the production of the standard Benefit from the standard plus benefit from participation minus participation costs minus the costs of putting the standard to use	Benefit from the standard minus the costs of putting the standard to use Benefit from the standard plus benefit from participation minus participation costs minus the costs of putting the standard to use
	does not participate in the production of the standard Benefit from the standard plus benefit from participation minus participation costs minus the costs of putting the standard to use Benefit from the standard minus the costs of putting the standard to use	0 0

Table 4: Strategic situation when taking a differentiated view of the effects of participation in standardization on the benefit and costs

Thus the participating company gains a number of advantages over the company taking a free ride:

- participation in the standardization process will result in an additional benefit through the opportunities for establishing contacts, exchanging and collecting information;
- the costs of putting the standard to use will be lower because the standard is more likely to be tailored to the needs of the participating company and there will be no misunderstandings when interpreting the standard.

This will change the strategic situation of the companies. If the companies view the matter as shown in Table 2, their decision not to participate in national standardization will be justified. However, this no longer applies when the implicit effects of participation in national standardization on both the benefit and the cost side are also considered.

6 Possible Methods of Financing Standardization

In addition to the companies' strategy of fully mediating the effects of participation in the national standardization process, ways of lowering participation costs while at the same time increasing the benefits of participation may also be looked for.

National standardization may be financed in various ways. In one extreme case it may be financed solely from tax money, while in another extreme case financing may be based exclusively on one's own proceeds which, in turn, may derive from various sources such as the sale of standards, certification and also consultation and training. Each of these financing methods has its advantages and disadvantages.

In many countries it was decided to establish standardization as a largely self-supporting institution with little government support. This concept of not letting the general public pay for something that will benefit only a few (business enterprises) may be expanded so that standardization is financed exclusively by those who benefit from it directly.

When considering the phases of disaggregated standardization, we notice that this condition is most likely to be met in the implementation phase. Here, all companies benefiting from the standard have to integrate it into their production process and, as a rule, certify that their products comply with the national standard. If these conformance structures are created in such a way that they also record how often the conformance of a product to a standard is certified, i.e. how big the production is, then the costs for financing the standardization can be fairly allocated

to the users. This means that a quantity-related conformance fee has to be paid, to be used to support both the preparation and propagation of the standard and to ensure the provision of auxiliary functions.

The currently customary practice of distributing the costs among the companies by selling the standard has the disadvantage that companies benefiting greatly (e.g. in the form of great production quantities) from the standard contribute just as much to its financing as those companies which benefit only a little (e.g. in the form of small production quantities).

The proceeds derived from a quantity-related conformance fee must then be used for both preparing and propagating the standards and ensuring the provision of auxiliary functions.

However, what should be the mechanism to ensure the financing of the preparation of standards?²

1. The costs of preparing standards will be fully refunded by the national standards organization, which use the proceeds from the conformance fee for this purpose. This financing model involves several problems, however: The participating companies are induced to state higher costs than they actually incurred. This further involves the risk that enterprises will only participate in the standardization process because of this pecuniary compensation so that they can improve their turnover ratios. In this case there will be no incentive for the participating companies to save costs, since they can pass them on completely to the national standards organization.

² In addition to efficiency aspects, other factors also seem to play a role here. If, for example all interested groups are to participate in the standardization process, then it should be made possible to participate free of charge, with compensation for all costs. If all participate, this will probably lower the quality of the standard because the smallest common denominator they can agree on will be smaller than if there are only a few participants. In this respect, the matter of costs or financing can also be interpreted as a matter of what would be the optimum number of participating companies. If only a few participate in the standardization process, then extended participation will provide a better standard. However, if many already participate in the process, additional participants will impair the quality. Two contrary factors are the reason for this. Firstly, more participants will increase the technical know-how and input. Secondly, however, more participants will also increase the coordination costs.

2. Each company could receive a lump-sum subsidy which would encourage the companies to handle costs more carefully. This also counteracts the problem of claiming excessively high costs. However, a new problem arises, since there is now an incentive for the companies to participate in as many standardization projects as possible and with as little expenditure as possible in order to receive the cost subsidy and realize this as nonoperating revenue. So there will be a wide range of participants, but this will not necessarily make the standardization process more effective.
3. The companies participating in the standardization process do not pay any or only a reduced conformance fee. This will obviously have the result that the participating companies will neither inflate their costs nor push their effective costs. However, this tool alone cannot prevent that many companies will try to obtain the benefit of using the standard (practically) free of charge. This may be countered, however, by sufficiently high membership dues to be paid prior to participation in the standardization process. In this way it is possible to ensure that only those who actually benefit from the standard and who are therefore willing to invest the appropriate capital will participate in the standardization process.

7 National Standardization as Representation of Interests

A frequently overlooked aspect of national standardization is the concentration of national interests and their transformation into regional and international standardization bodies. This especially applies to the two European standardization organizations CEN and CENELEC, in whose technical committees only representatives of the respective member organizations may participate. In the third European standardization organization – ETSI – the companies may participate directly in the technical committee.

In order to be able to represent the national interests – which undoubtedly are also the interests of the industry or, more generally, the producing sector – in CEN or CENELEC, these interests must be formulated and presented in the appropriate forum. This is normally a so-called „mirror committee“ in which the interested and affected companies meet at the national level to determine the strategy that the chairman of this body should implement in the technical committee at the European level. Without national standardization there can be no effective concentration and formulation of one's own interests, and thus there can be no successful influence on the regional or, in this specific case, the European standardization process.

In addition, a national representative body also has the task of concentrating the interests so that the different groups will not work against each other at the international level. Something like that happened in a big internationally operating German group of affiliated companies, whose departments represented opposite positions in different working groups (and also in different countries) and where the lack of internal coordination contrasted with the speed of the standardization process. The same situation may occur if there is no coordination at the national level.

A national standardization organization or participation in the standardization process is not only important for companies which move on the international stage and are thus interested in a strong and internationally operating standardization organization, but smaller and medium-sized companies can also concentrate their interests in standardization bodies and get them accepted, if necessary.

An important motive for companies to participate in the national standardization process is the opportunity to influence both the process itself and the standard. This can, firstly, prevent that the national standard runs counter to company interests and, secondly, preclude the possibility of a competitive advantage for participating competitors. Irrespective of their binding force, standards set a signal not only for a great number of companies, but also for consumers. (Especially in Central and Eastern Europe, referring to standards – e.g. the ISO 9000 family for quality management systems – is gaining importance even in government procurement.) If a company keeps out of the standardization process, then its competitors can be expected to try to gain a competitive advantage through the resulting standard.

Differing interests, e.g. between small and medium companies on the one hand and big companies on the other, are to be expected with regard to standardization. Thus, small and medium companies prefer to operate on markets with more generalized standards because with precise standards the price of the product will be the decisive argument, and big companies with larger production facilities will therefore have a competitive advantage (KLEINALTENKAMP and MARRA).

The wish not to have any standard or only a general standard does, however, not release the small and medium companies from participating in the standardization process, because otherwise the big companies will see to it that a (very precise) standard will be developed. Thus, the small and medium companies must use the standardization process to either totally prevent a standard or influence the standard in such a way that the advantages of smaller and medium companies – proximity to the customer and flexibility – are not eliminated by the standard.

8 Summary

Even if company and intercompany national standardization are not necessary mutual prerequisites, they nevertheless show great complementarities, i.e. the positive effects of company standardization are enhanced by intercompany standardization and vice versa. The standardization cycle is therefore a self-reinforcing structure. An increased intercompany standardization activity will lead to better results at the company level and thus also increase intracompany standardization activities, which will simultaneously enhance intercompany national standardization. For both company and national standardization it is vital to get this process going.

While at the company level the decision and implementation are the exclusive responsibility of management, at the national level it is possible for the government to influence this development in a formative way. However, more important than direct government support is to convince the companies that their participation in the standardization process will be worth the effort in the medium and long term. Government financial support can be limited to two exceptions: first, standardization to serve the general welfare, and second, to get the standardization cycle in motion.

The former structure of national standardization in Central and Eastern Europe was characterized, first, by forced participation in standardization and, second, by government funding. In this form it is not compatible with the market-oriented economy because it leads to distorted prices and inefficiencies. It is understandable that from today's point of view, a part of the former structures, in particular the assumption of costs, is considered positive, but it should not be overlooked that this was accompanied by the „state“ owning the companies, while today the objective is privatization of the companies, which has already been accomplished to a large extent.

Market economics and private property ownership always require the transactors' initiative. The positive development of the Polish economy during the past few years shows that the Polish people have so much initiative and, ultimately, so much enterprise that they were able to overcome the depression following the shift from the centrally planned economy to the market economy. In the final analysis, standards are products or commodities, like any others; so there is no reason not to use the successful initiatives of private enterprise for standardization, as is done in other areas. In the short term one cannot expect the same results in Poland as in other Western economies, but in the medium and long term a standardization cycle based on the initiatives of private companies will gain momentum and benefit all the participants.

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Translation from German

**FUNCTIONS AND STRUCTURES OF NATIONAL STANDARDS
INSTITUTES AS A BASIS FOR SECURING THEIR
ECONOMIC EXISTENCE**

By

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1 Introduction

Standard-setting organizations exist in every country. They may have the status of institutions under either private law or public law. These organizations emerged at the beginning of this century, with World War I accelerating the development.

In the course of the progressing industrialization, the prime objective of these organizations was to support the rationalization of the production process in private companies. The emphasis was placed on the traditional rationalization, such as the reduction and standardization of products and manufacturing methods. In this way the companies realized effective production processes and economic success.

In the past, national standards institutes concentrated their efforts on national companies, since the standards were used in the sense of traditional rationalization, and the companies thus had a largely homogeneous interest.

This common interest in rationalization explains why the national industries joined standard-setting associations and organizations and why there developed consensus-oriented decision-making rules for the preparation of standards.

The situation in which standard-setting organizations find themselves today differs decisively from the situation in which they emerged during the industrialization process at the beginning of the 20th century. In Europe, national standards institutes - and this must be especially remembered - essentially are organizations which resulted from the merger of national companies.

Today, however, these companies not only compete with each other at the national level but also, and mainly, on a European and increasingly also on a global level (e.g. Germany exports 60 percent of its mechanical engineering output).

National and European markets are increasingly replaced by regional markets such as ASEAN, North American Free Trading Area, or MERKOSUR in Latin America. These regions establish or have established their own standard-setting organizations with the objective of developing uniform standards, but also to protect their markets.

This is only one aspect that will result in changes for the national standards institutes in Europe.

2 Basis for the Change in Standardization Systems

A *The decisive change will result from the changing quality of the standards.*

If in the past the focus of standardization work was placed, on the rationalization of production, then today standards are prepared to ensure the compatibility of products, procedures, and services.

This change is most obvious in the case of technologies based on or requiring a functional compatibility. Examples are the computer and also the telecommunications industries and their products.

Because of this development, it can no longer be assumed that there is a homogeneous interest of national companies in traditional standardization, with the aim of rationalizing the production. On the contrary, the companies have realized that standards which center on the aspect of compatibility beyond the individual enterprise may simultaneously be used as a strategy or tool for placing their products on the market.

In the companies this obviously raises questions such as whether participation in standardization processes that take up to 5 years to complete can actually be justified from an economic point of view. At the same time there is the question of more efficient forms of standard setting, e.g. by the merger of companies and by preparing publicly available specifications (PAS).

The importance attached to compatibility standards can be most clearly seen in the K-CIM and the Q-CIM projects realized in Germany. From 1988 to 1996 the Federal Ministry of Education, Science, Research and Technology funded these projects with approximately 36 million DM. The objective of these projects was to standardize interfaces for computer-integrated manufacturing (CIM).

The results of this work must be subsumed under the general term "compatibility standards".

B *Purely national standardization projects will continue to decrease in favor of European standardization projects, which will continue to increase in importance.*

Only the development of European standards will contribute to a common European market. National standards cannot be mutually recognized by the national standards institutes. They thus do not contribute to the integration of the European market.

The national standards institutes can play a meaningful role only if the leading companies participate in European standardization.

Trade and industry, by their own behavior, will decide whether they will become participants or onlookers in European standardization and whether they will actively determine the technological level, i.e. the contents of European standards, or passively accept the technical requirements defined in standards.

Currently, hundreds of European standards (**Fig. 1 and 2**) are being prepared; they will supplement the technical legislation (e.g. machinery regulations) of the European Union. After the European standards have been adopted and the laws have been implemented, they will have to be translated into national law, with the consequence that the companies will have to comply with them, or considerably more expensive alternatives will have to be developed.

Only if the national companies represented by the national standards institutes participate in the European standardization process can the interests of the national trade and industry be ensured.

C *There will be a continued change from printed standards to standards and standard-like information in digital form.*

It does not require great foresight to propose the hypothesis that there will be a continued development of computer networking, i.e. of the information and communication technology in Europe.

The currently existing database PERINORM contains bibliographical data on standards and draft standards of ISO/IEC, CEN, CENELEC and ETSI as well as AFNOR, BSI and DIN.

A European standards database which provides digital standards and standard information is considered essential.

The state of the art of the electronic publishing of scientific-technical documents already allows the SGML-based preparation and provision of standard documents. SGML structured standards can be provided as electronic products on marketable media (CD-ROM, diskettes) and also via public networks.¹

¹ DIN Geschäftsbericht (Business Report) 1995/1996.

Only this form of provision gives the user up-to-date access via computer networks. This objective of providing the standard in digital form gives the user quick access to the desired standard documents as well as individual data by means of fulltext searching. For future users of a European standards database it should not only be a matter of course to be able to obtain the bibliographical data on national and European standards, but also to have access to the actual documents.

In addition, the overall standardization process can be made more effective by including advanced communications technologies. The advanced network technologies should not only be used in the sense of electronic mail, but also as a communication channel for discussing the prepared draft standards. Reports on current standardization activities at both the national and the European level can also be provided via this medium.

D *The political demand to improve both the efficiency within the standardization organizations and their mutual cooperation is most clearly defined in the "Green Paper of the European Commission on the Development of European Standardization"².*

It is imperative to improve the efficiency, since the established bulwarks, i.e. the national standards, are a considerable barrier for the free trade of products within a single European market. Only by harmonizing the standards, i.e. establishing a European standards system based on European standards, can the economic rationalization and competitive effect be achieved in the single European market, as has been stated as an objective in the EEC treaty (see "Green Paper", p. 5).

European standardization has a strategic significance for the realization of the single European market.

1. The European standards define the technological requirements for the manufacture of products in the European market.
2. They form the basis for a common European technical legislation (European standards are imperative for enforcing a uniform product legislation within the European Union).
3. The Commission has allocated a prominent role to the European standards in the opening up of public procurement markets. The EC directives on deliveries and performances for the public sector require that the purchasing agencies refer to European standards.

² "Green Paper".

Thus the prepared European standards will have a decisive influence on the technological structure of the entire European market; they will not only change the terms of trade on the export markets, but also on the individual national markets (see "Green Paper", p. 23).

The standard-setting organizations must respond to these changes by questioning their structures and functions, and they must face up to the new requirements.

E *Entire industrial structures are breaking out of national thinking.*

The changing environment in which standardization takes place results in an increasingly stronger friction between those for whom the standards are produced and those who are to prepare these standards. The opening of markets, both in Europe and worldwide, provides the companies with opportunities to exploit new markets for their products. For this purpose the products must comply with the technical standards of the respective market. If national, European or international standards do not yet exist for the products in the markets, as is partially the case in information and communication technology, the companies will endeavor to set their own standards as de facto standards or prepare de facto standards, i.e. technical specifications, through consortia³ within a very short time.

The competitive situation of the companies in and for the market is at the center of this approach. The definition of the technical specification can ensure that systems of different manufactures can cooperate, or it will guarantee that an application program can run on different computers or operating systems. Such an approach is inconsistent with the principles of preparing standards⁴ at national standards institutes.

Irrespective of this, CEN, CENELEC and ETSI provide a platform at the European level by abolishing their own principles.

If required, consortia will be established under the roof of the European standards institutes.

- In this case, the national delegation principle will not apply.
- There will be no public opposition proceedings.
- The work results will be called specifications and published as European PAS.

³ Normung in Europa und das DIN - Ziele für das Jahr 2005 , p. 18.

⁴ DIN Geschäftsbericht (Business Report) 1995/1996, p. 19.

- A fee will be charged to participating companies.
- The secretariat will be managed by a national standards institute.⁵

These examples show that in a democratically managed market economy, companies have the power to abolish the traditional principles of national and European standards institutes.

Entire industry sectors - in particular the information and communication technology sectors - have left the level of national thinking. The success of the companies is decided on the European and international markets. To integrate these companies into the standardization system even at the European level will require significant structural and organizational changes. Holding on to traditional principles will exclude the companies from participation in European standardization.

3 Functions and Structures of Standard-Setting Organizations

For an economic assessment it is necessary to understand the existing structure of intercompany standardization. Four national standards institutes are therefore important for our discussion; they will be briefly presented here, and the important differences will be pointed out. These standards institutes are:

AFNOR	- Association Française de Normalisation
ANSI	- American National Standards Institute
BSI	- British Standards Institution
DIN	- Deutsches Institut für Normung e.V.

3.1 AFNOR - Association Française de Normalisation

Today's AFNOR organization is based on the Act of 24 May 1941. It is an association under private law but is recognized by the government in its public function and is managed by a supervisory board whose composition was stipulated by the Minister of Industry and Science in a directive of 1970. In 1941, the Ministry of Agriculture and Industry was charged with drawing up a charter to regulate standardization, which contributes to the preparation of standards and their introduction into the public area.

⁵ DIN Geschäftsbericht (Business Report) 1995/1996, p. 19.

Four groups were considered essential as cooperation partners and collaborators in the standardization process:

- government agencies,
- technically specialized national institutions, e.g. government testing institutes,
- trade associations, and
- consumer organizations.

Up to the present, the Act of 1941 has not undergone any significant changes. The structure of 1941 was confirmed in a new act of 1984. There were only a few minor corrections of designations. Thus the "Commissioner for Standardization" is today called "Interministerial Delegate for Standardization".

AFNOR is bound by regulations to the Ministry of Industry, which thus exerts a strong influence (Fig. 3 and 4).

AFNOR's functions are described in Article 8 of the decree for French standardization. The most important functions are as follows:

- Transmittal of the directives of superior ministries or the Delegate for Standardization, and monitoring their compliance.
- Supporting the standards offices in the preparation of technical standards.
- Testing and coordinating projects that have been completed.
- Representing the French standards in international standards organizations.
- Disseminating and publishing information on standardization to all who are affected by the standardization.

In sum it can be said that AFNOR has approximately 560 staff, manages, approx. 15,230 standards, and has approx. 1,100 publications per year⁶. In 1991, AFNOR's overall budget

⁶ Florence Nicolas: "Gemeinsame Normen für Europa" (Common Standards for Europe), 1995, p. 26.

amounted to approx. 360 million francs (**Fig. 5**), of which 28 % were government subsidies, 71 % were own receipts, and 1 % was income of the previous year.

In the receipt portion of 71 %, 24 % resulted from the sale of standards and other publications, 15 % from business contracts and trade agreements, 10 % from certification, and 9 % from training services (**Fig. 6**).

3.2 BSI - British Standards Institution

The British Standards Institution (BSI) was established in 1901 as the world's first national standards institute. Its aim is coordinating and developing national standards. It received its statutes, the Royal Charter, in 1929. According to the Royal Charter, the BSI is the only organization in Great Britain with the task of preparing standards and providing for their implementation as well as performing the EC conformity certification. The BSI is subdivided into the following functional areas (**Fig. 7**)⁷:

1. BSI Standards
2. BSI Quality Assurance
3. BSI Product Certification
4. BSI Testing
5. BSI Training Services

The BSI is an association under British law; it operates autonomously and independent of trade organizations, the government, and industry.

The BSI is the largest European standards institute and has approx. 1,800 staff (as of 1996). In the functional area of BSI Standards (**Fig. 8**), approx. 490 staff are employed (**Fig. 9**). They are distributed among various sections, as can be seen from the table below. The predominant portion of the staff is employed in the sections Sales and Marketing (23.5 %) and Development of Standards (49 %).

⁷ BSI Annual Report of 30 March 1996.

Distribution of Manpower in BSI Standards
According to Functions

Staff	Distribution
Planning, Business Analysis, Strategic Membership	10
Quality Function	2
Sales and Marketing	115
Production (production of standard media, printing, EDP)	113
Development of Standards	240
Internationality	10
Total Staff	490

In 1996, the BSI had a turnover of 88 million £, distributed regionally as follows (**Fig. 10**):

Region	Turnover in million £ in 1996	Turnover in million £ in 1995
Great Britain	67	68
Remainder of the EU	5	6
North America	8	5
Far East and Australia	4	5
Rest of the world	4	1
Total	88	85

The BSI attained 75 % of its turnover at home but it attempts to increasingly internationalize its activities. It expanded its activities in the various regions (increase from 1995 to 1996, from **17 million £ to 21 million £**), mainly in the areas Quality Assurance and Product Certification (increase from **6 million £ in 1995 to 9 million £ in 1996**).

The turnover is distributed over the various functional areas as is shown in the following table (Fig. 11):

Functional Area	Turnover in million £ in 1996	Turnover in million £ in 1995
Standards (sale of standards)	23	23
Quality Assurance	47	44
Testing	7	8
Training Services	2	3
Product Certification	9	6
Others		1
Total	88	85

The distribution of the turnover and of the staff figures shows that the present BSI turnover is attained in the areas Quality Assurance and Standards (sale of standards).

During the fiscal year from April 1995 to March 1996, the BSI made an operational profit of 6,937 million £.

The work of the BSI was supported by the Department of Trade and Industry (DTI) with a total of 6.67 million £, with the support decreasing from year to year (Fig. 12).

	1993/94	1994/95	1995/96	1996/97
Total support for the standardization work in million £	7.90	7.30	6.91	6.67

In 1996, approx. 26,000 companies were members of the BSI. Currently there are approx. 15,000 effective British standards, and approx. 17,627 standardization projects are being processed.

In 1996, the BSI sold a total of 435,000 standards. In that year it staffed 53 secretariats in the European standards organization CEN and 18 in CENELEC.

3.3 ANSI - American National Standards Institute

The United States Pharmacopoeial Convention was founded in 1829. It was the first standard-setting organization in the United States and dealt with the standardization of drugs. In 1852 there followed the American Society of Civil Engineers, the first scientific-technical organization, and in 1855 the American Iron and Steel Institute. These were the first trade organizations to be concerned with standardization (GARCIA 1992, p. 533).

Later, a great number of organizations which concentrated on developing standards in their particular branches of trade was established. These organization were thus based on financing by the private sector and received no public support. In the United States, the government virtually kept out of standardization until World War I.⁸ As was the case in the European industrial nations, World War I made it clear to the USA as well what the consequences of insufficient coordination of standardization would be. As a result, a "Commercial Economy Board" was established which had the task of facilitating the employment of work, capital, and machinery. In the immediate postwar era, the dwindling American economy was to be strengthened by government-supported standardization (GARCIA 1992, p. 532). However, the government was confined to supporting the private standardization organization, without actively interfering.

On the grounds that there was no intention to create any predominant standardization organization, the coexistence of a great number of organization was promoted. According to a survey of standard-setting organizations in the United States in 1991, the number amounts to over 750.

The dilemma of American intercompany standardization is clearly shown by the fact that the many standards-setting organizations are not only competing against each other but have also developed contradictory standards. This has led to the realization that a national coordination of standardization is imperative [...].

In addition to the lack of coordination, the United States has also discovered that it had no tool for concentrating its own interests at the international level and for exercising influence on the international standardization work according to its own wishes. This has led to the desire for a concerted national standardization policy and the related concentration of the coordination in a single organization (GARCIA 1992, p. 534). Upon objections by government agencies and

⁸ Exceptions were the "Office of Weights and Measures" and the "Bureau of Standards" (GARCIA 1992, p. 532).

⁹ TOTH 1991, p. V.

fair-competition authorities it was agreed to name the organization the "American National Standards Institute" (ANSI). It would not produce any standards of its own [...].

Only organizations which are concerned with the development of standards may become members of ANSI. ANSI serves as a kind of accreditation authority for American standardization and is the only organization entitled to issue "American National Standards". The function of coordinating American standardization may be performed by ANSI in three ways (CARLTON and KLAMER 1983, p. 449, and CARGILL 1989, p. 103 ff):

- canvass method or accredited sponsor method [...],
- accredited organization method [...], and
- accredited committee method [...] ¹⁰.

¹⁰ A detailed description is contained in the doctoral thesis of J. Kleinemeyer.

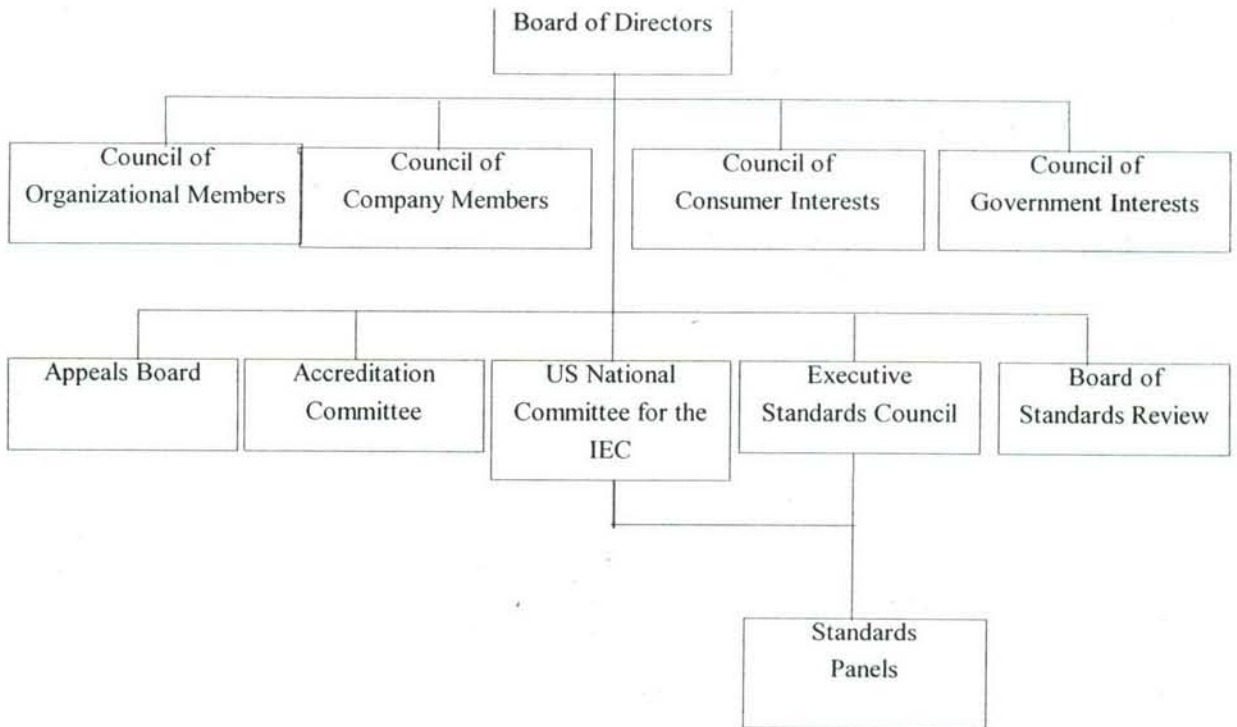


Fig. 13

Organizational Structure of the American National Standards Institute

(Source: Cargill, Carl, "Information technology standardization: theory, process, and organization", 1989, p. 165)

The ANSI members elect the Board of Directors which is responsible for the organization and strategic orientation. Here, the predominance of one pressure group is to be avoided or prevented. The specific interests of the various interest groups are concentrated in the subordinate bodies - the councils for the individual member organizations.

The actual coordination of the standardization is carried out by the Executive Standards Council. This Council also coordinates the participation of the various American standard-setting organizations in the international standardization process. In this it is supported by eight Standards Panels which support the Executive Standards Council in their respective areas of responsibility with regard to management and coordination of the standardization process [...].

The large number of these organizations and government agencies makes it impossible to provide a comprehensive survey of the American organizations [...].

During the past few years, dissatisfaction with the inter-company standardization in the United States¹¹ has led to the development of standardization outside of the traditional structures (WEISS and CARGILL 1992, p.559). So-called "consortia" are created in which enterprises combine to jointly develop the standards they need in a quick and unbureaucratic manner. If these consortia are to actually work as efficiently as they want to they must depart from the requirement for general access, on the one hand, and from the rule of consensus on the other. In particular the limited access to these consortia has led the fair-competition authorities to take a critical view of them¹² and ...¹³.

3.4 DIN- Deutsches Institut für Normung e.V.

The DIN (German Institute for Standardization) was established in 1917 under the name "Deutscher Normenausschuß - DNA" (German Standardization Committee); it has the well-known designation "DIN e.V." since 1973.

Economic considerations were the reason why standardization was organized in an association in 1917. Its products, the DIN standards and the national standardization system, were to be exported to other countries in order to open up markets and, in addition, to make it more difficult for competitors in neighboring countries to enter the German market.

DIN is an organization under private law, i.e. it is a registered and incorporated association (e.V.) working exclusively on a non-profit basis.

According to the DIN charter, the DIN bodies are: the General Assembly (approx. 5,900¹⁴ members in 1996) and the Executive Committee (represented by approx. 35 to 40 members), which may appoint panels to accomplish its tasks (e.g. Standards Review Activity, Consumer Council).

¹¹ The same also applies to the situation in other countries, as the comments made by representatives of Siemens AG and IBM Germany to the DIN clearly show. See KUNERTH, p. 19, and RICHTER, p. 88 f., in "Normung in Europa und das DIN - Ziele für das Jahr 2005".

¹² See ANTON and YAO, 1995.

¹³ Kleinmeyer, J. 1997. The author replaced the term "standards" with the term "Norm".

¹⁴ DIN Geschäftsbericht (Business Report) 1995/1996.

The General Assembly¹⁵ is responsible for accepting the Annual Report, for relieving the Executive Committee, and for electing the members of the Executive Committee. The Executive Committee establishes the principles of standardization policy and decides on the business and financial policy of the DIN and its subsidiaries (represented by broken-line boxes in the organizational chart, **Fig. 14**). The DIN Director is its business manager, who may set up an executive body to handle his functions. The business management is concerned with the following functions:

(a) Standard Conformance and Certification

In this functional area, primarily conformance verifications and certifications are carried out, mostly by the subsidiaries subordinate to this functional area.

(b) Standardization

This functional area is responsible for the practical preparation of the standards and for the cultivation of international relations in the field of standardization.

(c) Administration and Publishing

Activities within this functional area deal with administrative functions (personnel, social, financial, etc.) as well as sales and distribution (publishing and selling standards) (**Fig. 14**).

DIN 820 regulates the development of a DIN standard. **Fig. 14a** shows the development from a request for standardization to a German standard. A general and partnership agreement between the Federal Republic of Germany and DIN of 1975 states that DIN is the competent national standards organization and that it will protect the interests of the Federal Republic of Germany in international standardization bodies. The DIN also undertakes to consider the public interest in its standardization work and to inform and advise the Federal Government in standardization matters. In return, the government agreed to provide direct financial assistance amounting to approx. 15 % to 20 % of the DIN budget. In addition, the agreement states that standardization is not a government task but a private task to be performed by trade and industry.

¹⁵ Only legal entities may be DIN members, not private persons.

The DIN is established as a non-profit association and has developed into an enterprise which had approx. 825¹⁶ employees in 1996. The DIN subsidiaries have another 235 staff; however, DIN staff also hold positions in the subsidiaries. During the years 1993 to 1996, the overall budget almost consistently amounted to approx. 159 million DM (**Fig. 15 and 16**).

In 1996 there existed approx. 24,000 DIN standards and approx. 8,500 DIN draft standards¹⁷. **Fig. 14** provides an overview of the current DIN organizational structure.

In the following, the DIN subsidiaries will be briefly considered; they are of great importance for accomplishing the tasks of the German Institute for Standardization.

In the functional area Standard Conformance and Certification:

Deutsche Gesellschaft für Produkt Information GmbH (DGPI) is responsible for preparing type sheets (in accordance with EC regulations) on products which are subject to the compulsory provision of information in order to provide the consumer with the means required to compare articles of daily use.

Deutsche Gesellschaft zur Zertifizierung von Qualitätsmanagementsystemen mbH (DQS) is responsible for certifying quality management systems in accordance with DIN ISO 9000.

Gesellschaft zur Vereinfachung von Handelsverfahren und Förderung der EDI-Anwendung (DE-PRO) is responsible for distributing data structured in accordance with the Electronic Data Interchange (EDI) program, up to and including the interchange of product defining data within the scope of computer aided logistic support (CALs).

Deutsche Akkreditierungsstelle Chemie GmbH (DACH) is responsible for accrediting chemical laboratories.

Gesellschaft für Konformitätsbewertung mbH DIN-CERTCO (formerly DGWK) is responsible for certifying products and services.

¹⁶ DIN Geschäftsbericht (Business Report) 1995/1996.

¹⁷ DIN Geschäftsbericht (Business Report) 1995/1996.

In the functional area Standardization:

Technorga GmbH is responsible for developing and preparing standards in cooperation with DIN and the Federal Office of Defense Technology and Procurement (BWB).

In the functional area Administration and Publishing:

Beuth-Verlag GmbH (BV) is responsible for printing, publishing and distributing DIN standards and technical rules; its DIN Software section is responsible for procuring, preparing and distributing DIN-standard files, programs and standards on machine-readable media.

Verlag für technische Regelwerke GmbH (VTR) is responsible for printing, publishing and selling other DIN products (e.g. special information brochures).

As can be seen from this list, DIN (including its subsidiaries) is not only concerned with questions of technical standardization but also with matters of conformance, certification, and accreditation. It should be realized that the subsidiaries have to be regarded as a permanent part of DIN, which considerably increases its responsibilities.

DIN is the largest German national standardization organization, and it attempts to organize all the functions of a national standards organization under one roof. The emphasis is on the primary function of **standard preparation** and the provision of standard contents; this is done via Beuth-Verlag. It is important to realize that the testing and certification of conformance is increasingly gaining in significance. This finds expression in the growing number of subsidiaries which perform these functions in various sectors of industry.

4 Functions of Standard-Setting Organization

This part of the paper is not intended to provide a theoretical discussion of the functions of standard-setting organization but rather to state the functions that have to be performed if successful standardization is to be guaranteed. Those functions are discussed which are the same for all standard-setting organizations and which ensure the efficiency of the institutional processes.

Adolphi¹⁸ and Kleinemeyer¹⁹ take a closer theoretical look. According to Kleinemeyer, four functions of national standardization which complement each other can generally be identified (Fig. 17):

First,	the function	-	<u>preparation of standards</u>
Second,	the function	-	<u>dissemination of standards</u>
Third,	the function	-	<u>implementation of standards</u>
Fourth,	the auxiliary functions	-	<u>standardization, organization, coordination, testing and general research</u>

The function „preparation of standards“ results from the secondary functions

- provision of potential standard contents,
- technology-peculiar research, and
- establishing the results of the standardization work.

This function is essentially defined by the provision of standard contents derived from a standardization committee as well as governmental or private research and development work.

The function „dissemination of standards“ comprises the secondary functions

- providing standard contents,
- making information on standards available,
- performing public relations work,
- training and
- counseling.

¹⁸ H. Adolphi: „Funktionen nationaler Normungsinstitute“.

¹⁹ J. Kleinemeyer: „Standardisierung zwischen Kooperation und Wettbewerb“.

This function essentially results from two focal points: first from the reproduction, distribution and archiving of standards; secondly from the provision of information about standards, the standardization process, and the possibilities of participating in it and influencing it, and about the structure of national standardization.

The function „implementation of standards“ is based on

- testing standard conformance and
- certifying standard conformance.

The background to the function „implementation of standards“ ist that products and services are tested with regard to their conformance to the standards controlling them. This includes the development of standardized testing procedures and the announcement of the test results, i.e. a conformance test and the issuance of a mark of conformity.

The defined auxiliary functions can be described as follows:

The so-called auxiliary functions support the functions such that a national standardization organization can function. These tasks include the organization and coordination of the standardization work and the reviewing of standards for their conformance with other standards and the law.

The general requirements for standardization must also be considered, which concerns the impact of standardization on society, trade and industry, up to the impact on changing markets.

Characteristics of National Standards Institutes

Characteristics	AFNOR	ANSI	BSI	DIN
Private-law	x	x	x	x
Governmental				
Mainly private financing	x	x	x	x
Mainly government financing				
Centralized organizational structure	x		x	x
Decentralized organizational structure		x		
Membership of standard-preparing organizations only		x		
Standards organization based on law	x			
Agreement with the government	x		x	x
No agreement		x		

5 Future Development of National Standard-Setting Organizations

When we consider the national standardization organizations such as AFNOR, ANSI, BSI, and DIN described in the previous chapters, it is obvious that their organization, functions and legal status, including their funding, can only be understood and evaluated within the framework of the historical context.

As to legal status, in Western Europe different forms of legal status of national standardization organizations can be found, from contractual arrangements in the form of cooperation agreements to standardization acts. This will not be evaluated in this paper.

In Western Europe the national standard-setting organizations are essentially centralized, at least when we consider the dominant organizations such as AFNOR, BSI, and DIN.

ANSI is a clearly decentralized organization with regard to the development of standards. Only organizations concerned with the development and preparation of standards may become members of ANSI: These organizations represent the most diverse sectors of business and industry. ANSI itself is not supposed to prepare any standards.

The following is a summary of the functions and tasks of the standard-setting organizations in Western Europe.

The functions

- preparation of standards,
- dissemination of standards,
- implementation of standards,
- organization, coordination of standardization including standard testing and general research as auxiliary functions

are performed by AFNOR, BSI, and DIN in various ways.

From these functions, tasks are derived which are to be performed by the national standard-setting organizations.

These include:

- standardization or development of standards,
- publication and dissemination of standard information, including the software of electronic products,
- testing for and certifying conformance to standards,
- training the staff of business and industry,
- consulting and providing expert opinions with regard to standardization, certification, and quality assurance, etc.

There are definite trends concerning the future development.

AFNOR, BSI and DIN are pursuing a strategy of integrating all functions under one roof. As a result, the marketing of electronic products and the testing and certification (i.e. the indication) of conformance to standards will become more and more important. At DIN this finds its expression in a growing number of subsidiaries.

This general development will be intensified by the special developments discussed in Chapter 2, to which the national standard-setting organizations are no exception.

These are:

- the change from the quality of standards to the compatibility of standards,
- the decline in purely national standardization projects and the increase in European standardization projects (Fig. 18),
- the change from the printed standard to standards and standard information provided in digital form in a European and global computer network (e.g. the Internet),
- the political demand for efficient European organizational structures in the field of standardization, and
- the shift of entire segments of industry from national thinking or traditional ties toward a common European market, especially in Eastern Europe.

These constraints are forcing the West European standard-setting organizations to change their organizational structures and to moving to new fields of activity in order to ensure their survival in the long term, especially their economic survival. These fields of activity are being defined especially in the services sectors „testing, certification, quality assurance“ and in the provision of information, although it is precisely here that a strong competition between the national standardization organizations has already begun.

5.1 Developments in Eastern Europe

A prerequisite for the successful entry of the East European countries into the West European and world markets is the implementation of a functional standardization structure in trade and industry and the establishment of a national standard-setting organization. Standards are an important part of the environment required for the build-up of markets.

Establishing a national standard-setting organization should therefore have priority in the process of transformation toward a market-oriented society.

Traditionally the East European countries had self-contained and uniformly structured MSTQ²⁰ infrastructures which were (and partly still are) organizationally assigned to a ministry. In some

²⁰ MSTQ = metrology, standardization, testing, quality.

countries the standardization element has been separated and more or less successfully transformed into an independent national standard-setting organization.

The basis for the successful establishment of such an organization is the formation of an economically independent unit, i.e. an organizational structure that is economically mostly self-supporting.

It is understandable that some pressure groups want a decentralized organization of the national standard-setting organization, comparable to ANSI. In a democratically oriented market economy, it is always a matter of asserting group or branch interests to achieve economic advantage. However, the structure of ANSI clearly shows that such an organizational structure impedes the establishment of an effective national standard-setting organization. The dilemma of the American intercompany standardization is clearly shown by the fact that the numerous standard-setting organizations (all in all nearly 750) not only compete with each other but also develop contradictory standards.

They also discovered that apart from their lack of coordination they also had no tool for concentrating their national interests at the international level and for influencing the international standardization work as they wished. It was this bitter experience that led to the establishment of ANSI.

The structure of a national standard-setting organization must include all the interest groups of a society. In addition to integrating the consumers and trade unions, it is important to make the various interest groups of trade and industry part of a national standardization organization. Of course, the individual groups will justify their demand for a decentralized organizational structure with reference to the European standard-setting organizational structure, as represented by CEN, CENELEC, and ETSI.

Comparable deficits have become apparent, and could only be cleared up after many years, not only in the European, but also in the German (i.e. national) standard-setting organization, represented by DIN, VDE, and VDI.

The establishment of a national standard-setting organization in the various East European countries thus provides an opportunity to avoid just copying the partly ineffective and historically evolved, national and European structures, and not to waste the scarce human and capital resources in disputes for the benefit of individual pressure groups.

It is to be recommended that one national standard-setting organization should include all functions and should have the required legal competence and contractual obligations; and, in addition, it should represent or defend the national interests in a united Europe.

When revising the national standards it should be taken into account that the long-term aim is a complete convergence of the technical standards in Europe. Today, the national standardization organizations in Western Europe are already subject to a „standstill rule“, which implies that national standards must not be prepared if European standards either already exist or are being developed or prepared.

Apart from the introduction of European standards, the priority task in the years to come should therefore be to improve the specific national standards so that the quality and the technical product requirements of the European market will be achieved.

The Commission's „Green Paper“ clearly states that national standardization is to be replaced by European standardization (p. 37).

5.2 Funding of National Standards Institutes

Successful national standardization depends on the involvement and motivation of those who want to use the national and European standards. The European Commission is of the opinion that the industrial and business enterprises which want to benefit from a single European market, and other interested groups such as users and consumers of industrial products, ought to ask themselves whether they have an adequate strategic concept for participation in national and European standardization.

Thus it is obvious that standardization is not a government task but a private task of trade and industry, consumer organizations and trade unions, i.e. of all interested segments of society. This alternative is preferable to government regulations for organizing the market.

Standardization organizations – both national and European – require personnel and resources to effectively accomplish their tasks. It is therefore recommended (with qualifications) that there should be direct financial subsidies by the European Commission or the respective governments to meet the costs of the standardization organizations, whether at the European or the national level.

The real costs of standardization, however, result from the participation of trade and industry in the standardization process and negotiations, due to the temporary assignment of technical

specialists from businesses to the technical committees for the development of standards. In Germany the number of volunteers is estimated to be approx. 34,000²¹.

Companies wanting to exert influence on their future technological environment have no choice but to participate in standardization. Companies which do not participate in national or European standardization will be at a disadvantage as compared to their competitors.

Trade and industry naturally have the option of participating in national and European standardization, or to combine into consortia – particularly at the European level – in order to develop publicly available specifications (PAS) together with the most powerful forces in the market. Companies wanting to influence the definition of new technologies have to get involved. What form this will take is not so crucial for the time being.

The funding of national standards institutes will now be discussed with reference to institutes such as AFNOR, BSI, and DIN. Like the European organizations CEN and CENELEC, the national organizations essentially receive their income directly from the private sector of the economy, i.e. from membership dues and the sale of standards.

The funding of DIN illustrates this most clearly. In 1996, the overall DIN budget amounted to 159.2 million DM. 66.5 % came from publishing proceeds and services (sale of standards and publications related to standards), 17.5 % from contributions by trade and industry, and 16 % from support by the public sector.²²

AFNOR and the BSI have similar turnover structures, but it must be pointed out that the portion of turnover resulting from the sale of standards and standard-like information amounts to only approx. 24 % for AFNOR and to 27 % for the BSI, as compared to approx. 66.5 % for DIN.

In the long run it will not be possible for the national standards institutes to maintain these funding structures.

1. *This is due to the European Commission's demand for an efficient organization of the European standardization system, including its funding.*

Thus it is expected that in the future, part of the proceeds from the sale of European standards will go directly to the European standards institutes that are responsible for the

²¹ DIN Geschäftsbericht (Business Report) 1995/1996.

²² DIN Geschäftsbericht (Business Report) 1995/1996.

preparation of these standards. This means that the proceeds will be divided among the European and national standards institutes in a way that recognizes the significant contribution of the latter. Thus the proceeds will be divided between the European standards institute responsible for the standards, the organization selling them, and all the national standards institutes.

The discussion about the copyright of standards and thus the right to market them, is not affected by this. Thus, in the German legal debate, standards are defined as „public property“, thereby calling the copyright into question.

What effects this may have on the future budgets of the national and European standards institutes is most clearly demonstrated by the DIN budget. The natural consequence of this would be additional financing through membership fees.

2. *A considerably more effective cooperation of the groups participating in standardization can be achieved by introducing up-to-date information and communication systems into the European standardization process.*

In a few years it will be taken for granted that advanced information technologies are not only used as an electronic mail system but also as a means of communication for discussions in the preparation of draft standards²³.

In the future, this technology will permit everyone to participate in the work of a technical committee, as organized in a computer network internet. This will enhance the direct participation of individual members rather than representation by national delegations. This is already done in the European Telecommunications Standards Institute (ETSI) and the European Workshop for Open Systems (EWOS).

If the European standardization system changes in this way, i.e. if the national delegation principle is abandoned, then this will mean a trend towards the companies leaving the national standardization system. This will be accompanied by a reduction in the number of members (i.e. companies) in the national standards institutes, and thus in the income from membership dues.

²³ Prof. W. Kunerth, a member of the Executive Board of Siemens AG, has stated: „For the year 2005 I expect that 80 % of the actual harmonization work will be supported by electronic document communication; ... the participants should agree on a virtual network of experts“ (p. 19).

To summarize this development: In the future, the funding for all the national standards institutes in both Eastern and Western Europe will only be assured to a limited degree on the basis of the sale of standards and standard-like information as well as membership dues, i.e. financing by companies.

National standards institutes in Western Europe have already recognized this development, as is clearly demonstrated by the BSI. They are countering this development with a future financing strategy by improving their services. The data make it easy to understand why a quality sector has been established at the BSI and the sectors Electronic Products, Software, Certification, Testing, Training and Consulting have been created at DIN subsidiaries (**Fig. 19**).

When removing national standardization functions from governmental structures, that is, when privatizing the national standardization system, services must therefore be considered as functions of the private national standardization organization.

A separate privatization of services will deprive the private national standards institute of its financial basis and thus jeopardize its future development.

6 Summary

The change in the national and European standardization systems must keep up with the speed of European integration.

This not only means a reorganization of the European standardization structures; rather, the national standards institutes in particular are called upon to abandon obsolete structures and principles.

The dynamics of the change will be determined by the social changes in Europe, but in particular by the dynamic developments in information and communication technology.

The essential aspects of the change will be the following:

- A *The decisive change will be a result of the changing quality of standards.*
- B *There will be a continued decline in purely national standardization projects and an increase in the importance of European standardization projects.*
- C *The change from the printed standard to standards and standard-like information provided in digital form will continue.*
- D *There is a political demand for the improvement of both the efficiency within standardization organizations and their mutual cooperation.*
- E *Entire industrial sectors are being removed from national thinking.*

The European Commission is of the opinion that the industrial and business enterprises which want to benefit from a single European market, and other interested groups such as users and consumers of industrial products, ought to ask themselves whether they have an adequate strategic concept for participation in national and European standardization.

Thus it is obvious that standardization is not a government task, but a private task of trade and industry, consumer organizations and trade unions, that is, of all the interested segments of society, and that this alternative is preferable to government regulations for organizing the market.

Companies wanting to exert influence on their future technological environment have no choice but to participate in standardization. Companies which do not participate in national and European standardization will be at a disadvantage as compared to their competitors.

Using AFNOR, ANSI, BSI and DIN as examples, the existing national structures and the beginnings of their reorganization have been described. An important finding based on the data is that the standards institutes aim to develop a strategy for integrating all the functions such as the development of standards, publication and dissemination of standard information, provision of software for standards management, testing for and certifying conformance to standards, training, consulting, and providing expert opinions concerning standardization, certification, and quality assurance.

A financing concept based on the sale of standards and membership dues will not ensure the establishment and the future of standards institutes, especially in Eastern Europe.

National standards institutes in Western Europe have recognized this development, as is most clearly demonstrated by the BSI. They counter this with a future financing strategy by improving their services. An example of this is the increasing establishment of sections for the quality sector at the BSI and of the sectors Electronic Products, Software, Certification, Testing, Training, and Consulting at DIN subsidiaries.

The financing strategy is determined by the fact that services are the future and will be the financial basis for the standards institutes. This is most clearly demonstrated by the BSI, which achieved a turnover of 53.5 % in the quality assurance sector in 1996. When removing national standardization functions from governmental structures, that is, when privatizing the national standardization system, it must therefore be considered that the above-mentioned services are being removed as functions of the private national standardization system.

A separate privatization of the services will deprive the private national standardization system of its financial basis, and thus jeopardize its future development.

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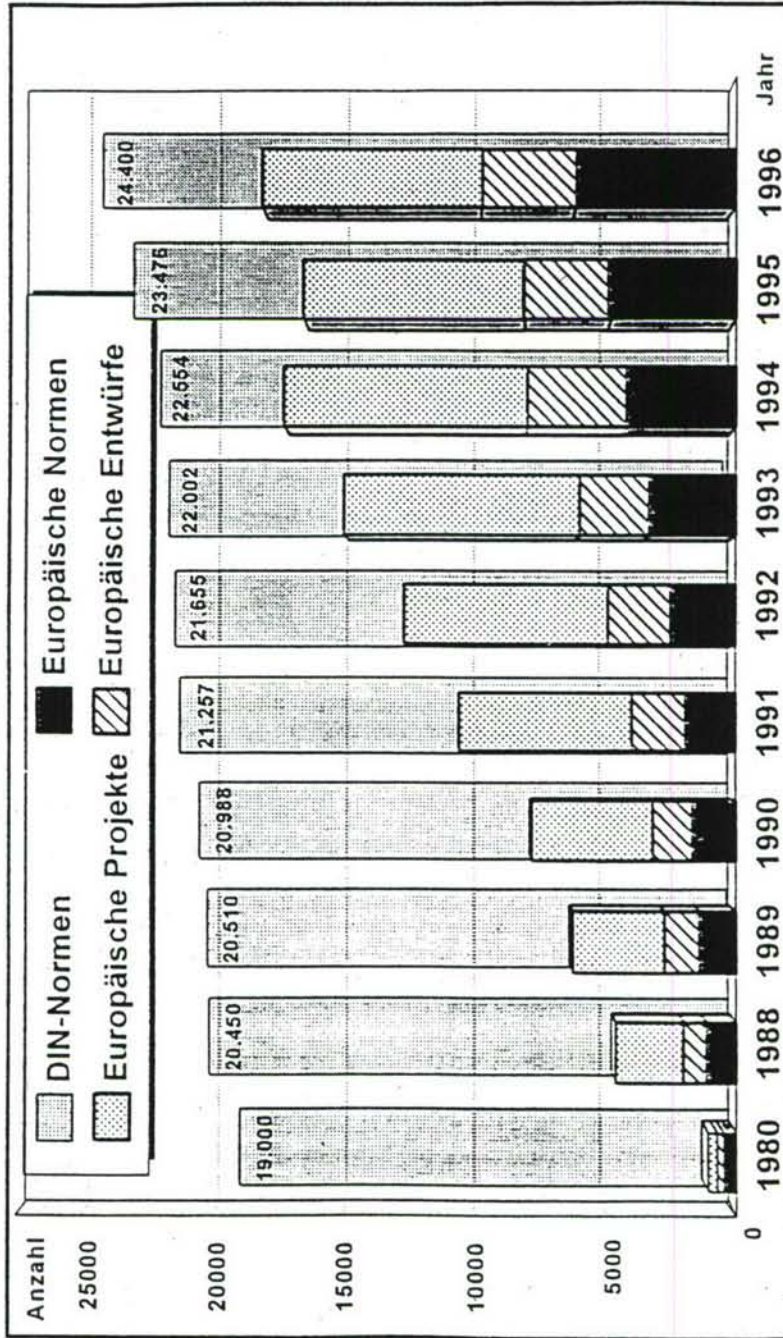
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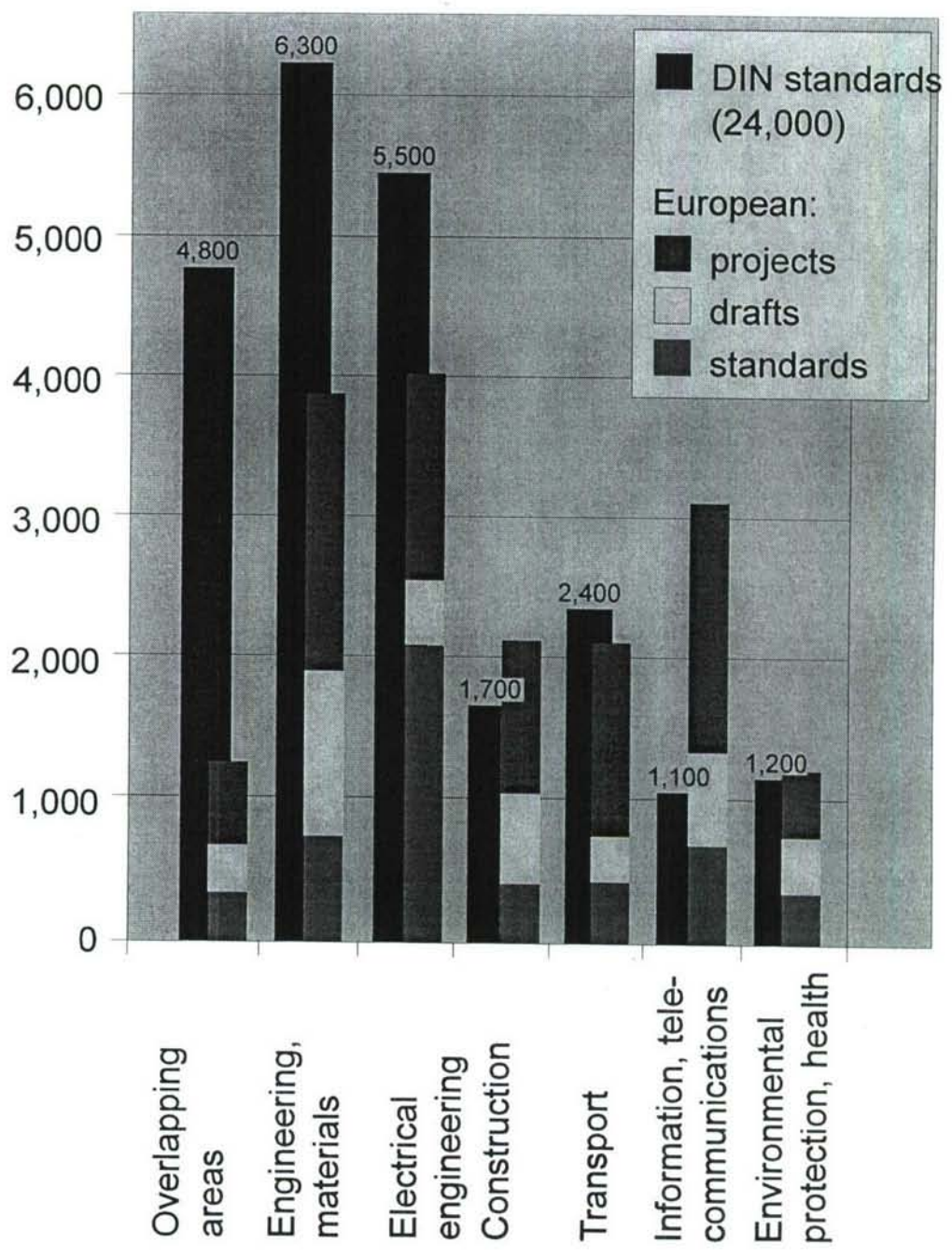


DIN

ENTWICKLUNG DER EUROPÄISCHEN NORMUNG IN
CEN/CENELEC/ETSI UND ANZAHL DER DIN-NORMEN

Abbildung
1

Entw. 2 wpg



Specialist areas of European Standardization in CEN / CENELEC / ETSI

Figure 2

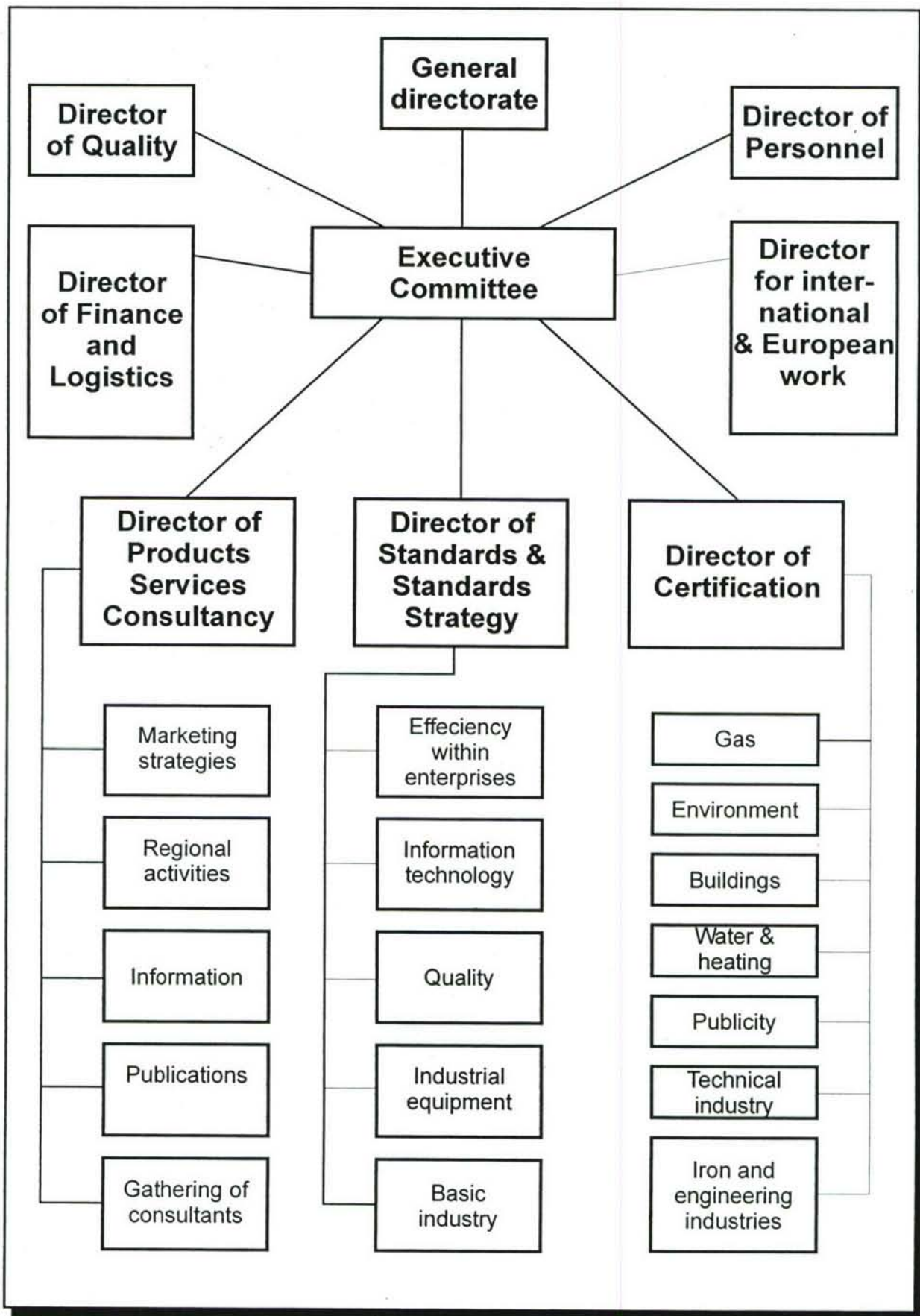


Figure 3 : Organization of AFNOR

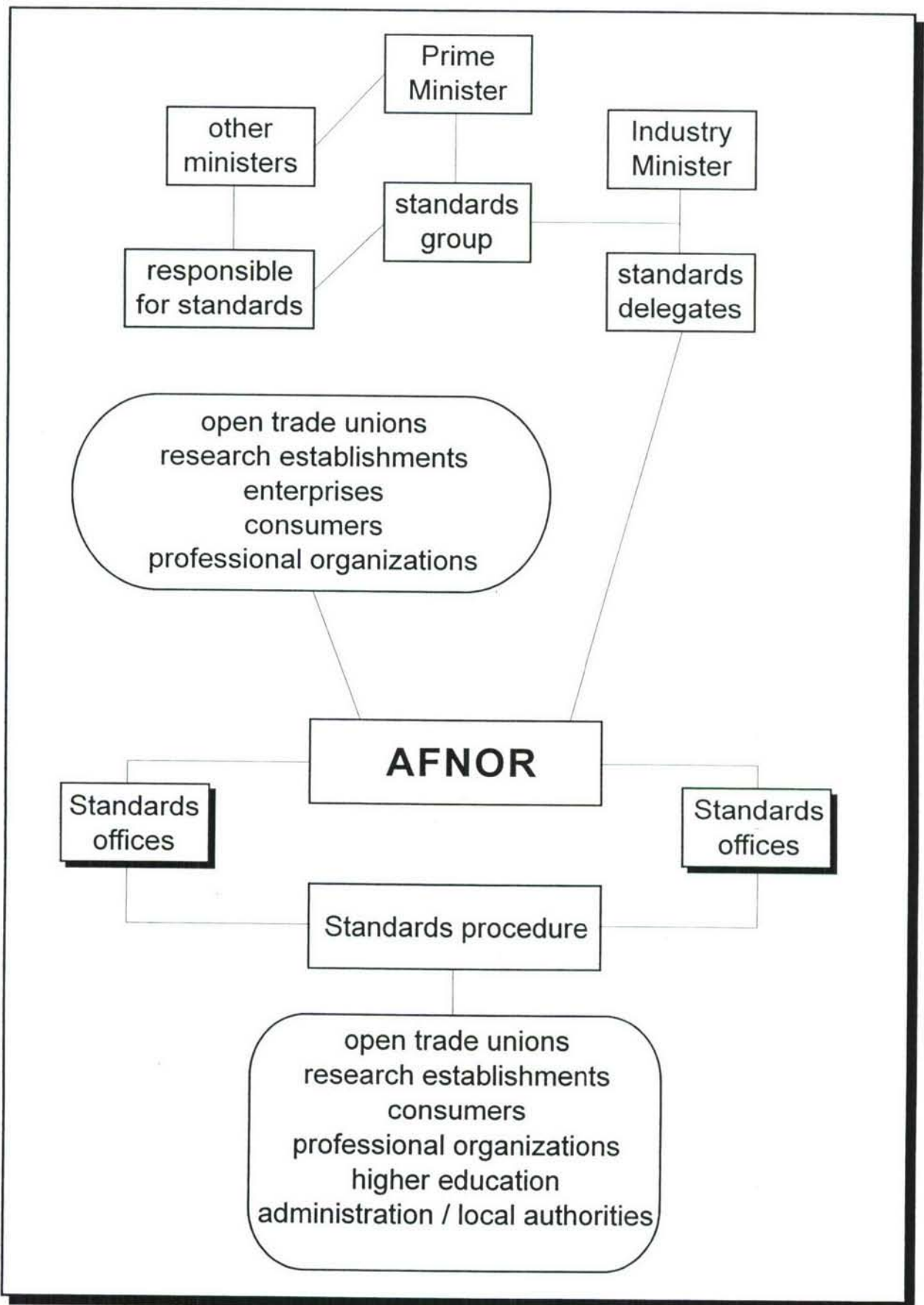


Figure 4 : AFNOR in the circle of French standardization

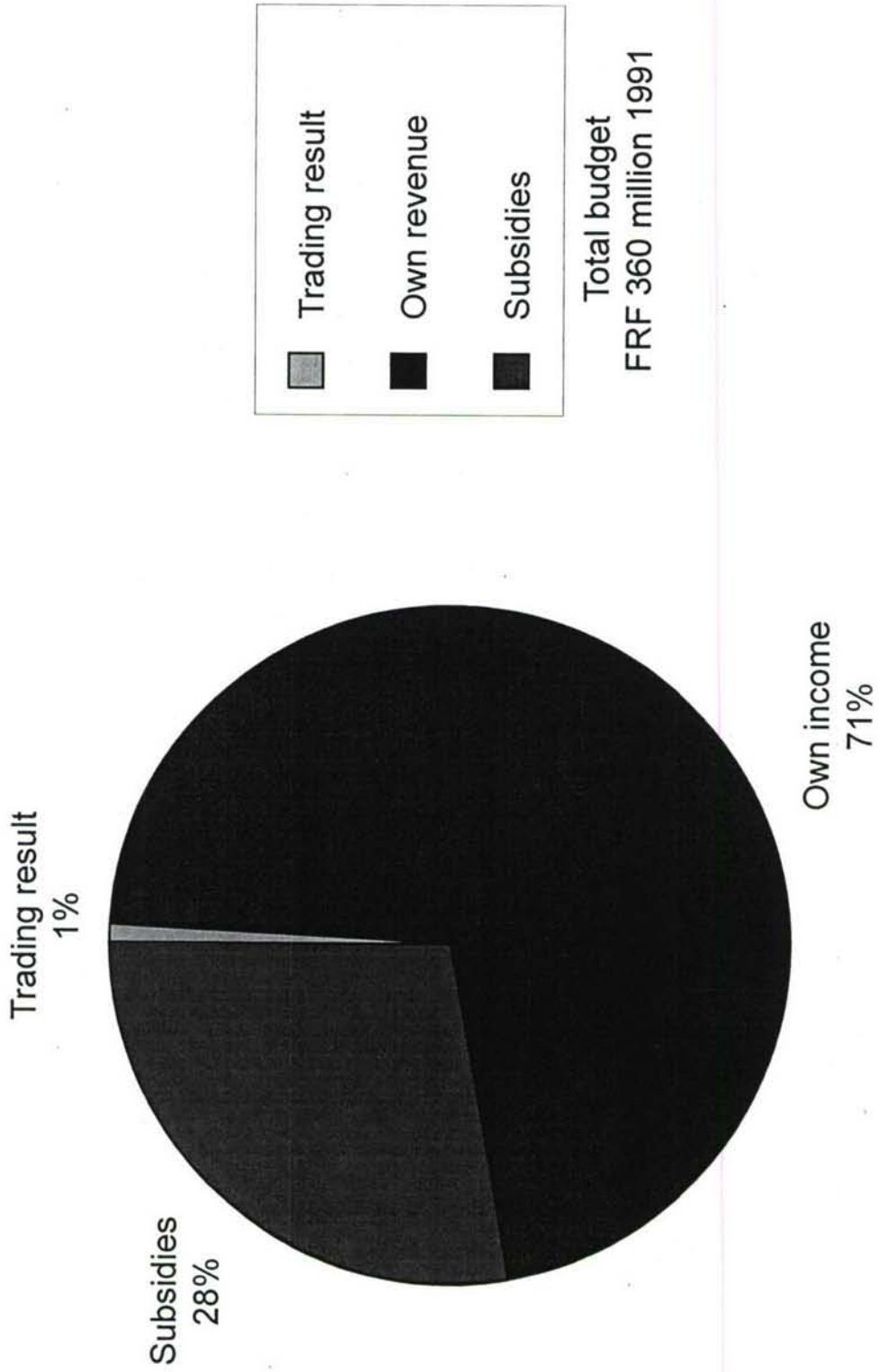


Figure 5 : Sources of Revenue from AFNOR

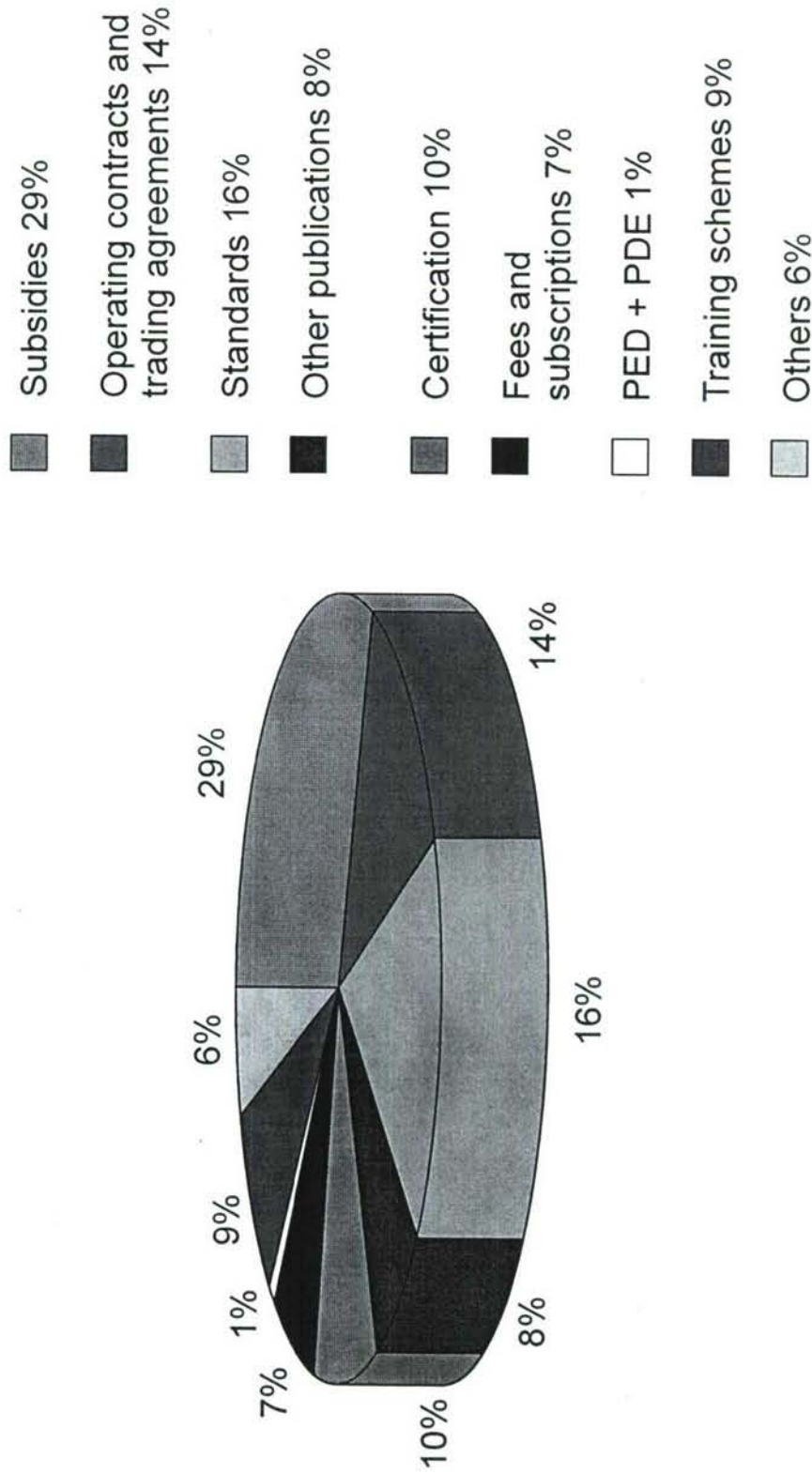


Figure 6 : Distribution of the Financial Resources

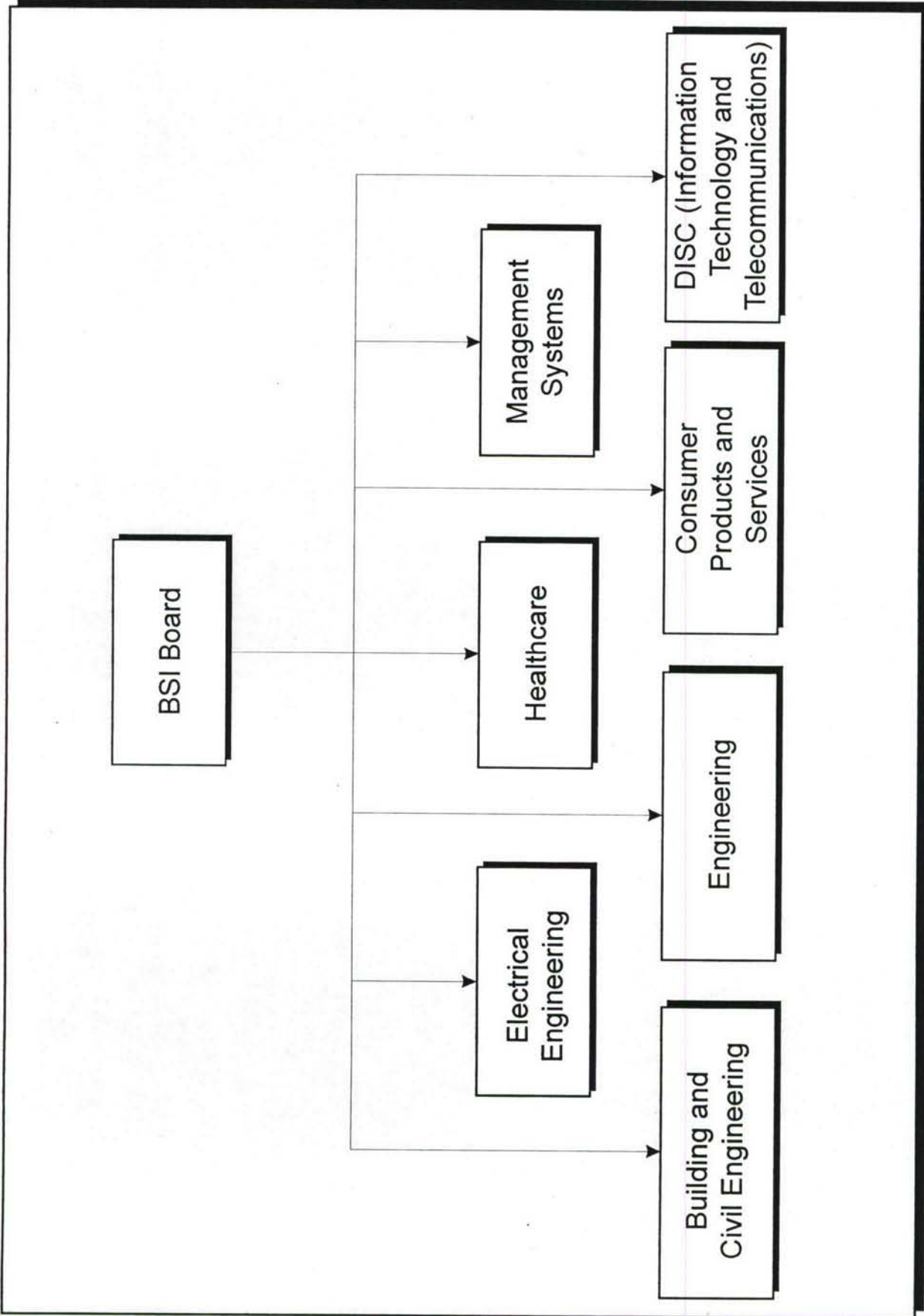


Figure 7 : Internal organization of BSI Standard

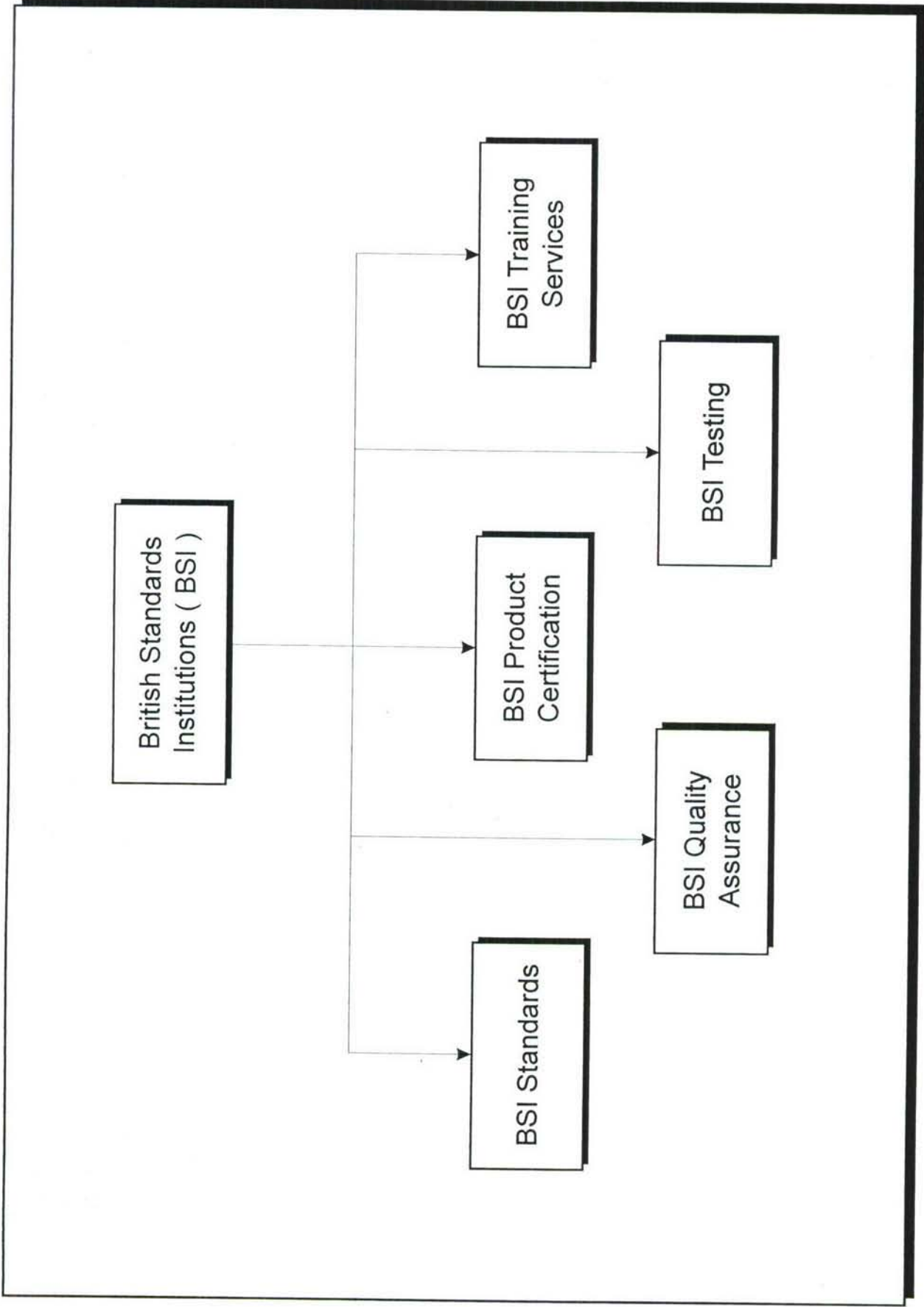


Figure 8 : Organizational Chart of the BSI Structure

Distribution of Staff within BSI Standard

490 employees = 100%, 1996

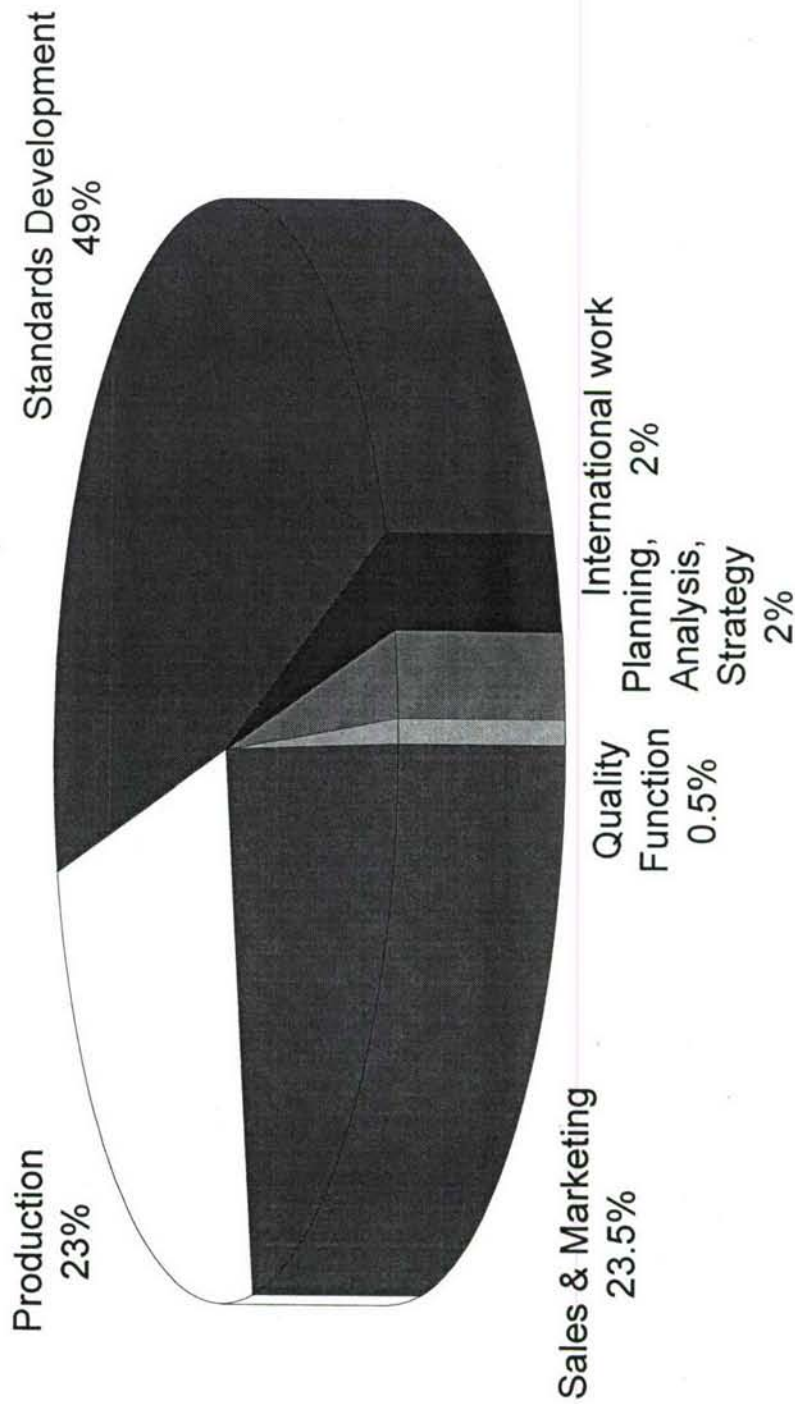


Figure 9 : Distribution of Staff within BSI Standard, 1996

Regional Breakdown of the BSI Turnover

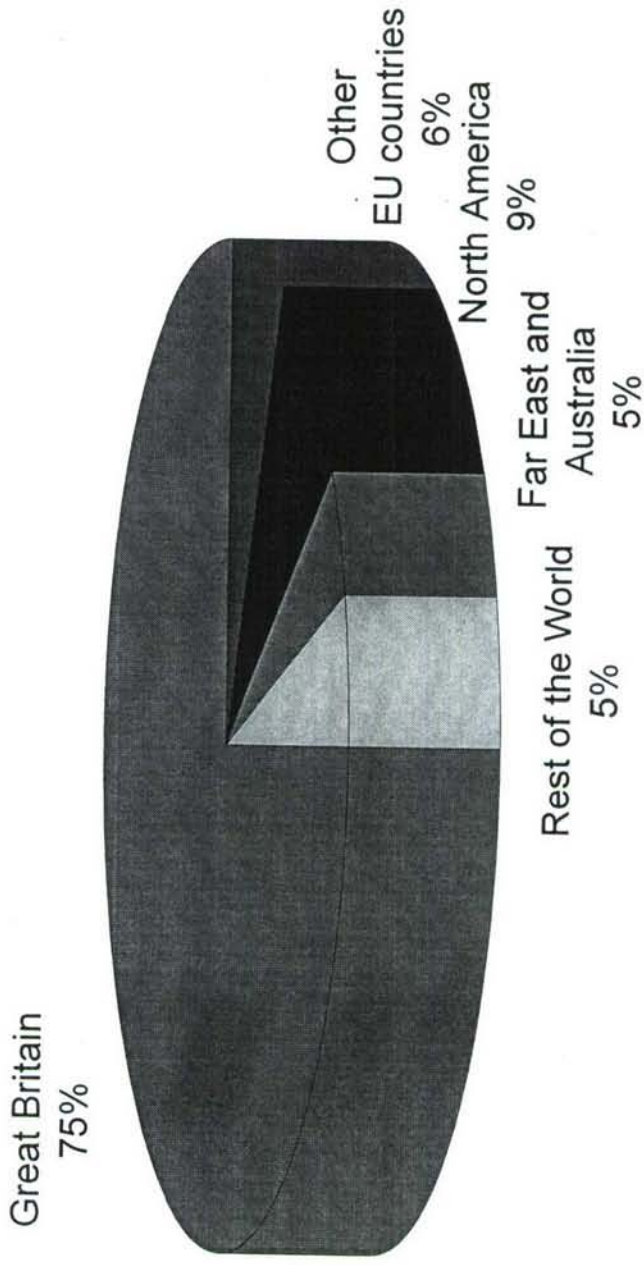
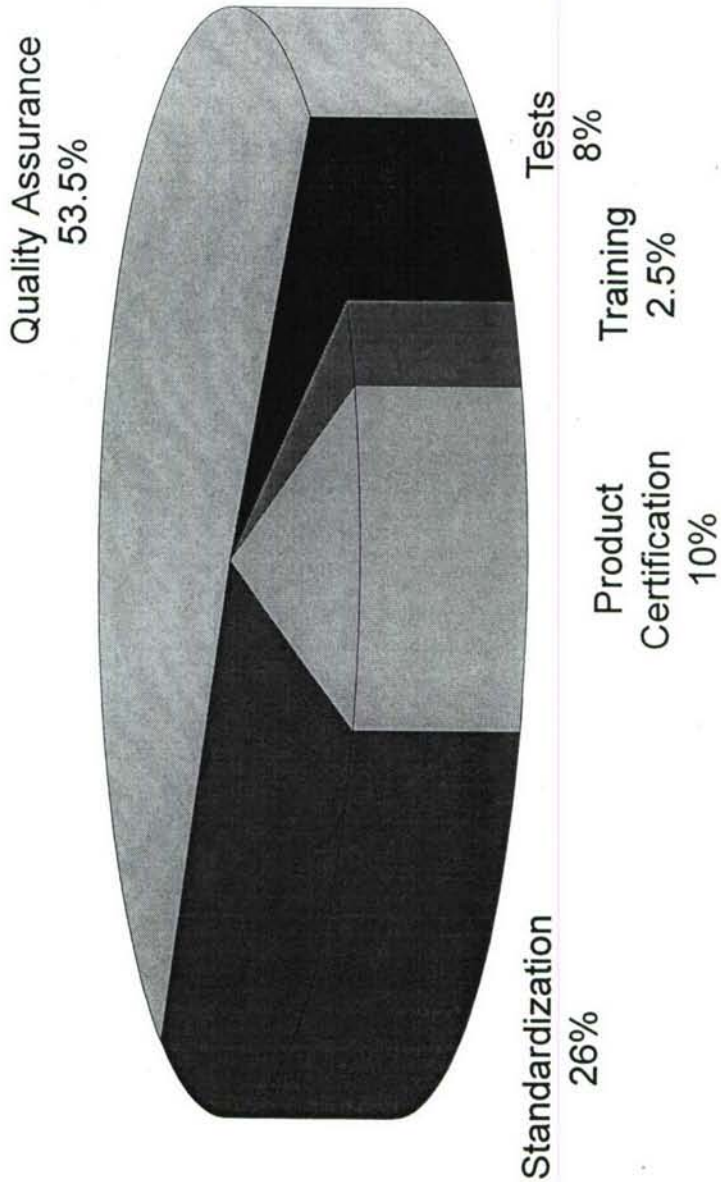


Figure 10 : Regional Breakdown of the BSI Turnover

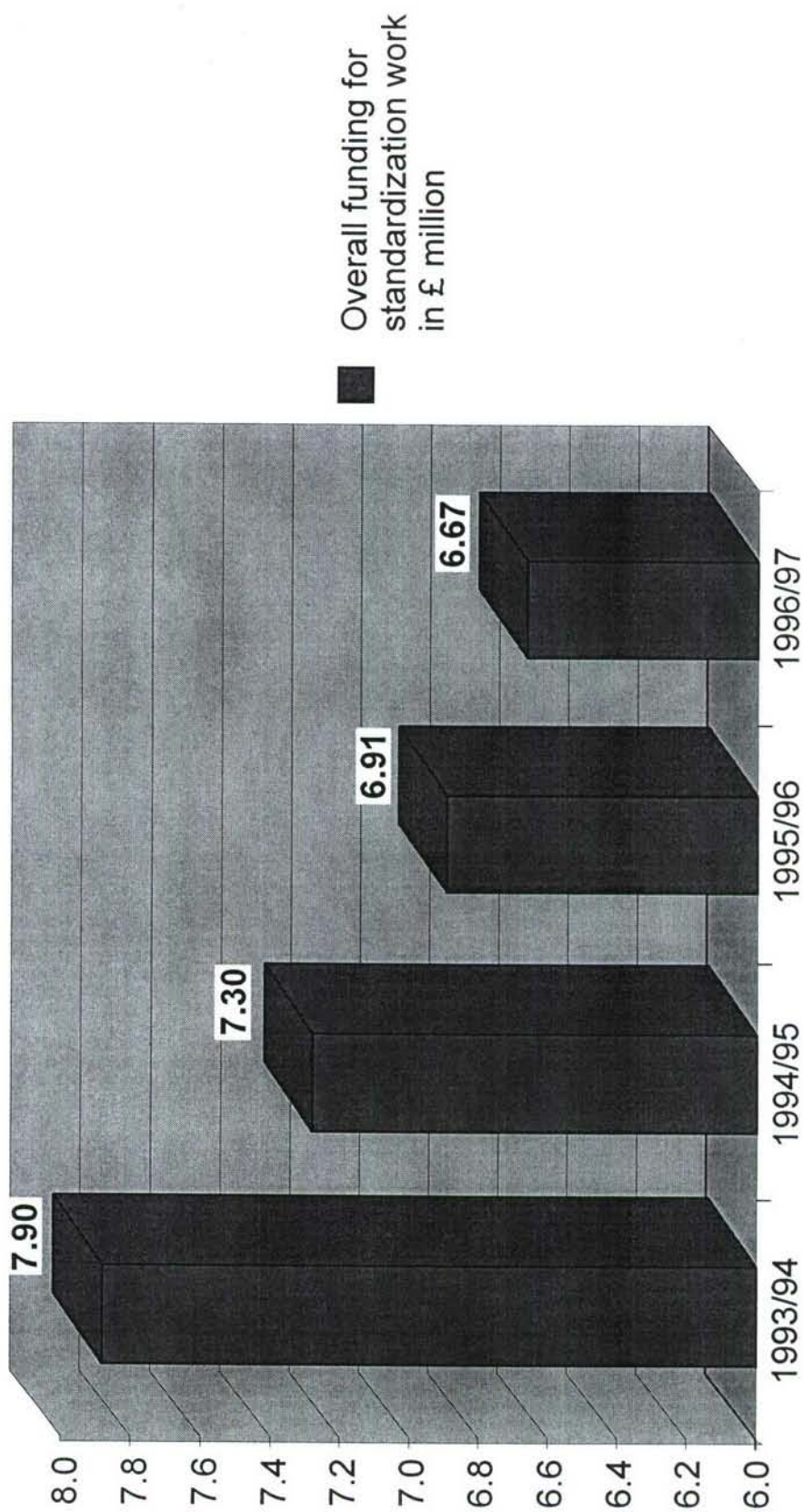
Breakdown of Turnover by Operating Division in BSI

£88 million = 100%, 1996



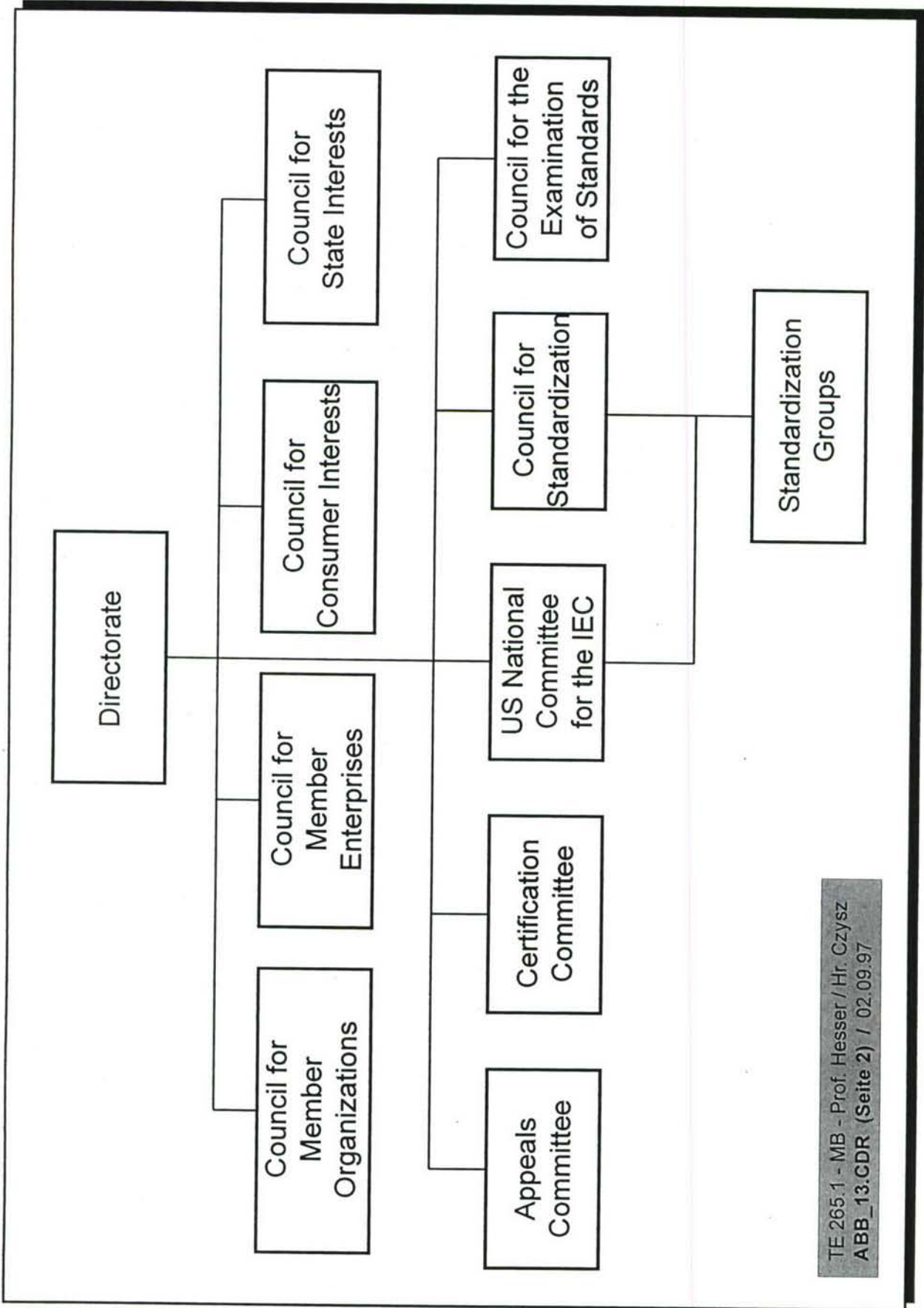
TE2651-MB - Prof. Hassen, Hr. Coyse
ABB 11.00R (Seite 2) / 02.09.97

Figure 11 : Breakdown of Turnover by Operating Division in BSI, 1996



TE 265.1 - MB - Prof. Hesser / Hr. Czysz
 ABB_12.CDR (Seite 2) / 02.09.97

Figure 12 : Overall Funding for Standardization Work from the Ministry of Trade and Industry in £ million



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Figure 13 : Organizational Structure of the American National Standards Institute " Source: Cargill 1989, P. 165

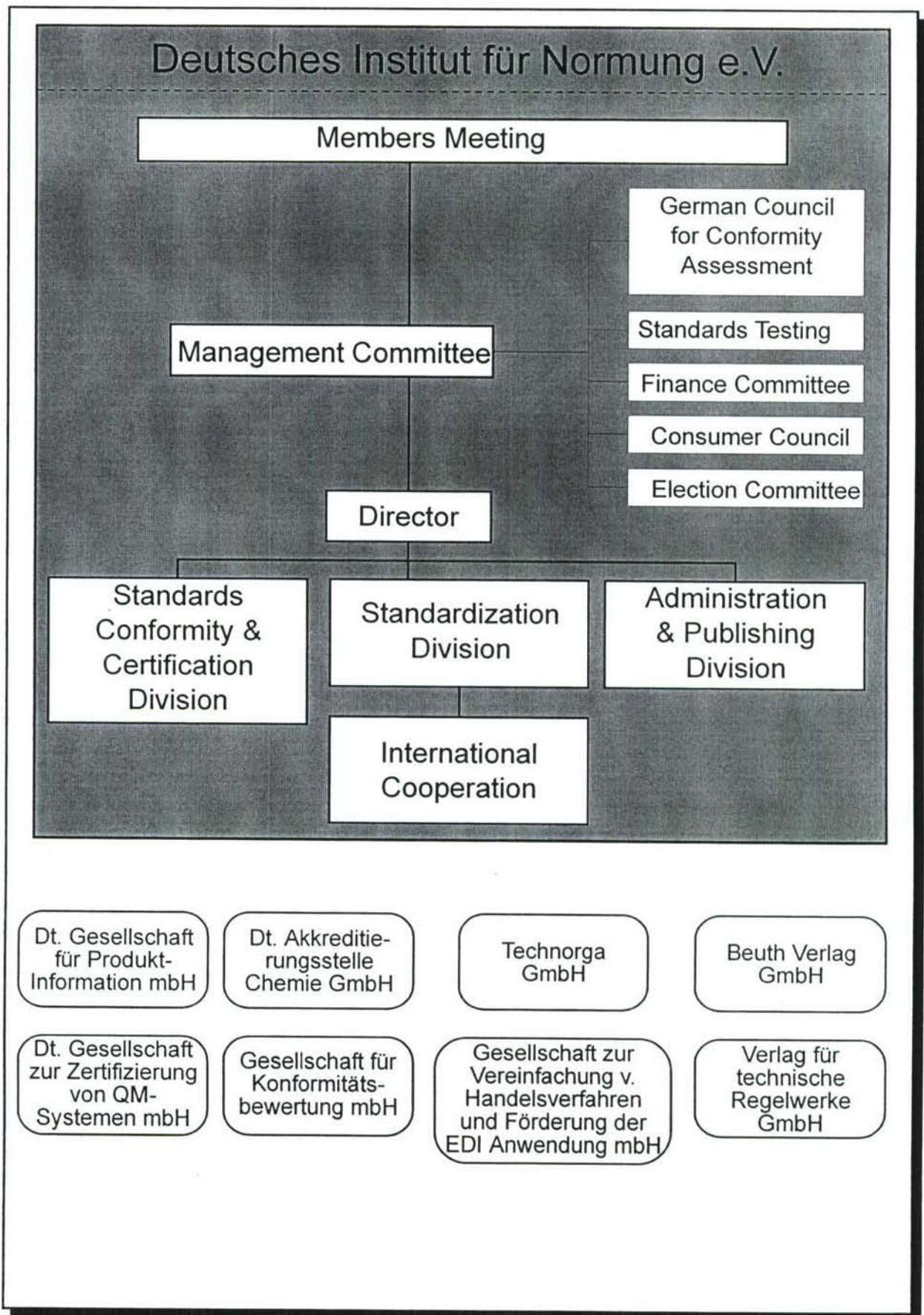


Figure 14 : The organizational structure of the DIN including subsidiaries

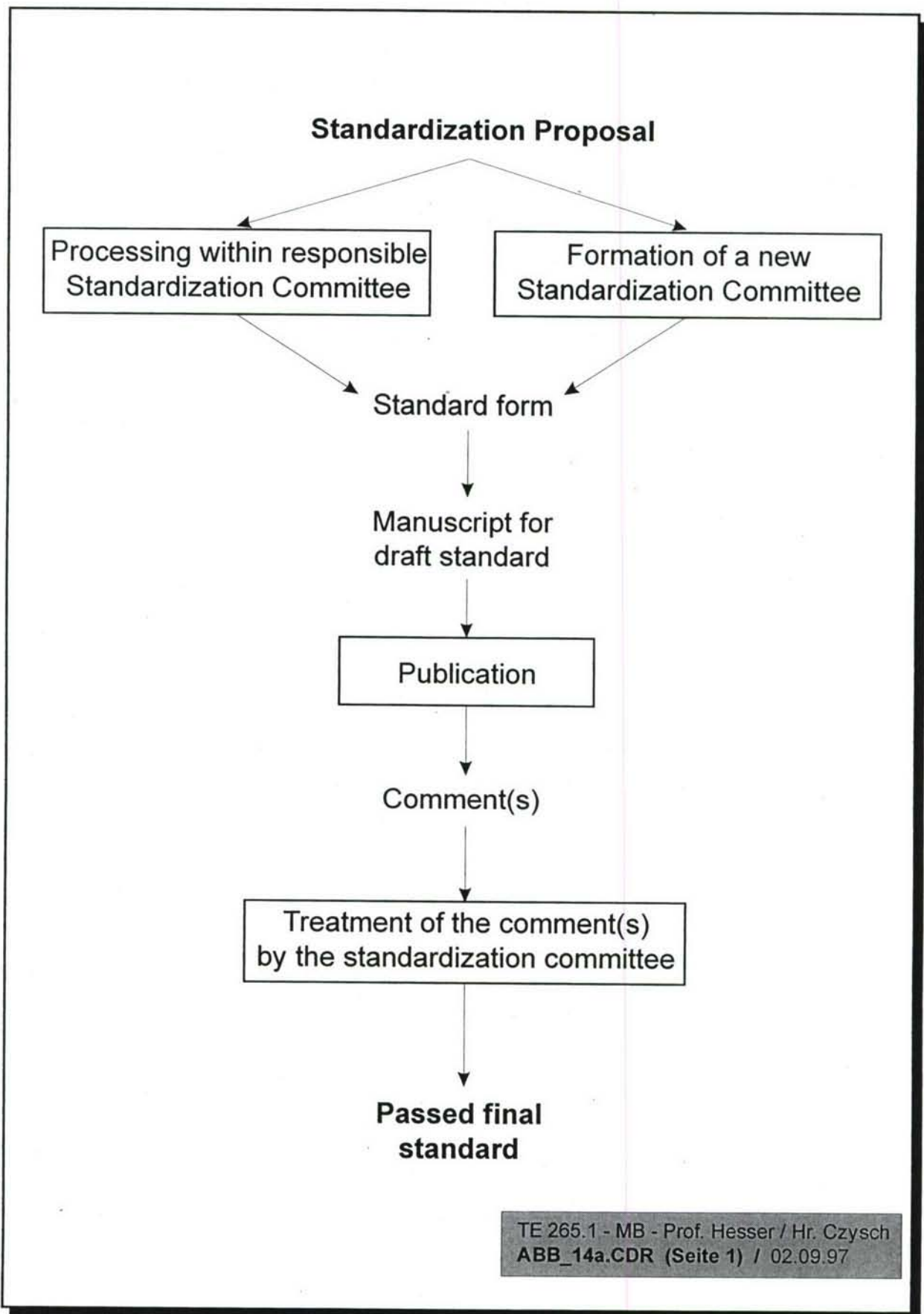
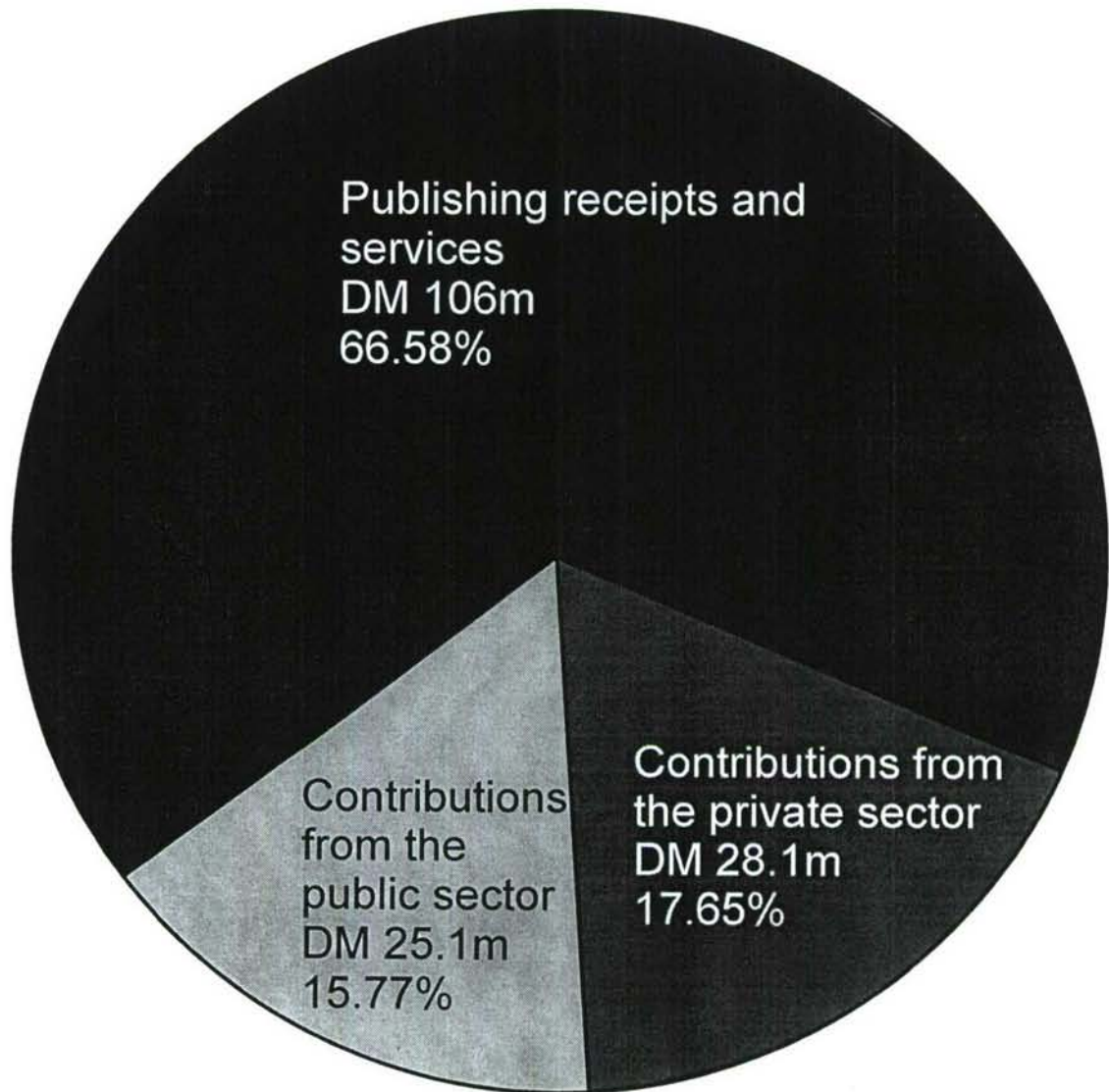


Figure 14a : Survey of the steps from a standardization proposal to a German DIN standard. (after DIN 820 Teil 4: Normungsarbeit, 1986, P. 1)

DIN - Budget DM 159.2m



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ABB_15.CDR (Seite 2) / 02.09.97

Figure 15

(Source: DIN Annual Report 1995/1996)

	1993 mDM	1994 mDM	1995 mDM	1996* mDM
Receipts from publishing & others	105.895	105.775	105.358	106.000
Private sector income	28.456	27.898	28.541	28.100
Public sector contributions	25.351	25.574	24.682	25.100
	159.702	159.247	158.581	159.200
Personnel costs	71.204	72.399	77.062	77.400
Manuf. costs	18.716	16.479	16.547	17.500
Business costs	57.293	60.393	50.040	54.260
Other expenditure alterations reserves / association capital	12.489	9.976	14.932	10.040
	159.702	159.247	158.581	159.200

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Figure 16 :
(Source: DIN Annual Report 1995/1996)

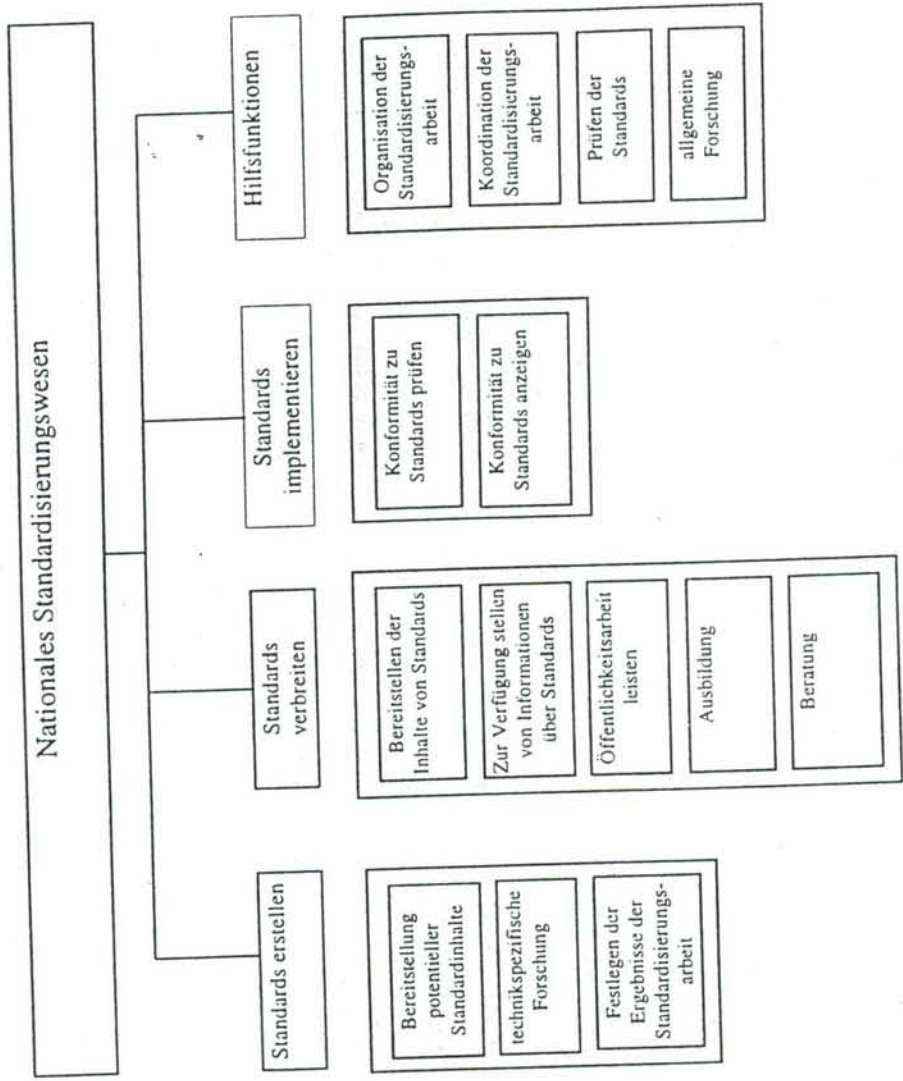


Abbildung 17: Primäre und sekundäre Funktionen eines nationalen Standardisierungswesens

Trends in standardization projects show that the importance of purely national standards is decreasing

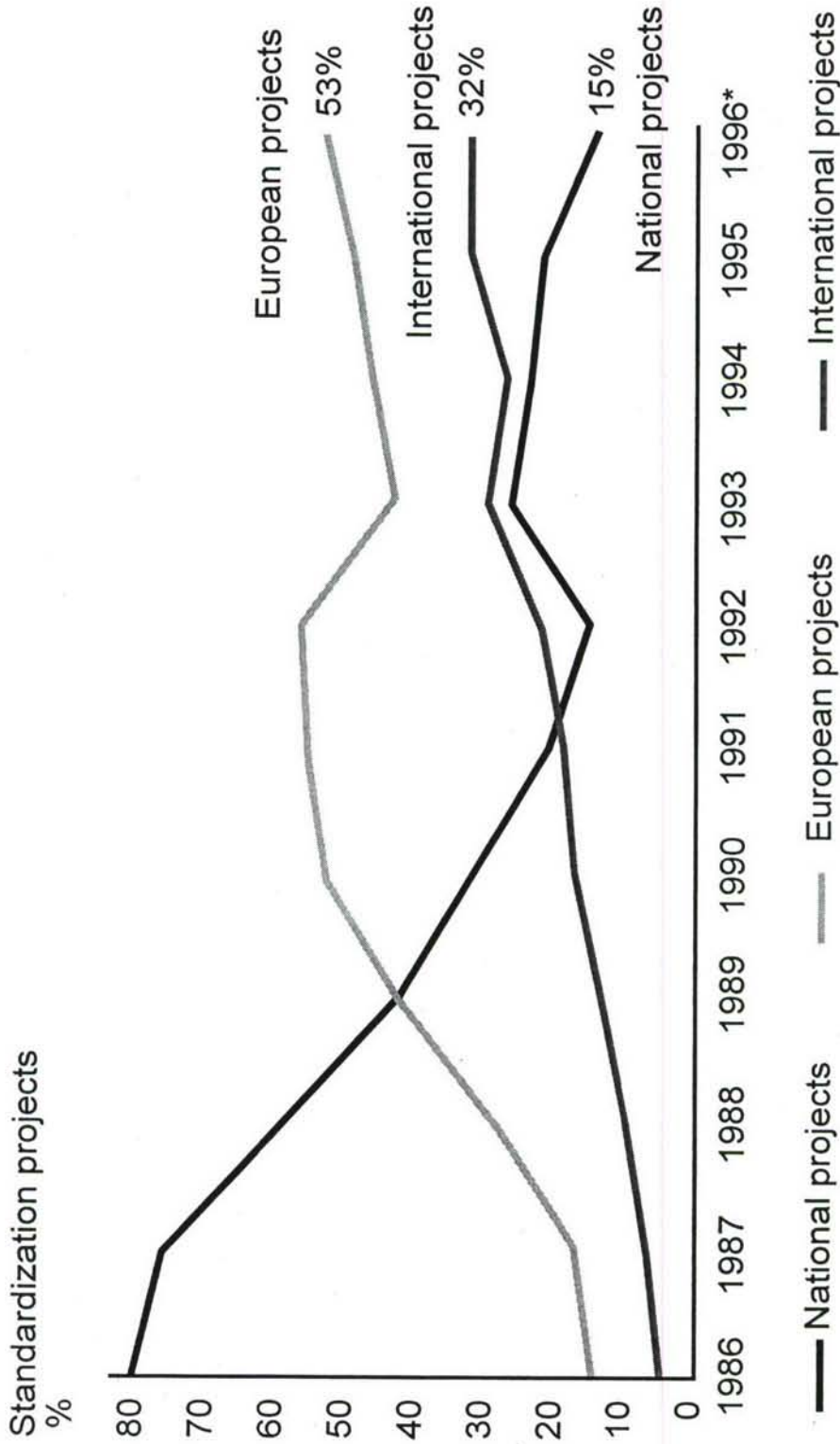


Figure 18: DIN - Annual Report 1995 / 1996

Seminar participants
1983 to 1995

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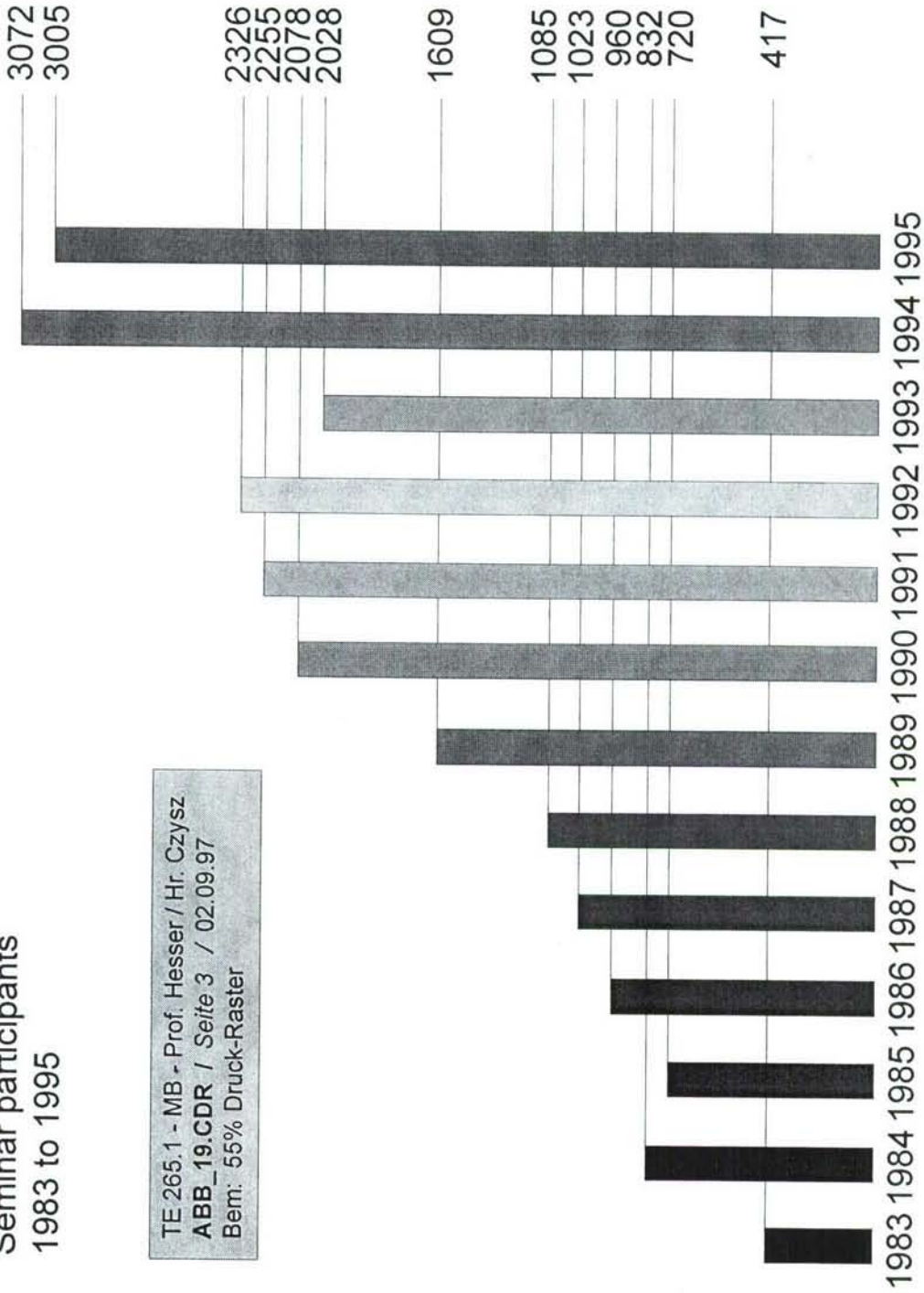


Figure 19
 (Source: DIN Annual Report 1995/1996)