

Economic Benefits of Standardization -Result of a German Scientific Study-

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Key words: benefits, DIN, research on standardization benefits

SUMMARY

In recent years, technical standardization has been the subject of numerous academic research projects. Although these projects did not ignore economic aspects, they lacked the theoretical background necessary for a detailed analysis. Industry has become increasingly interested in assessing its economic efficiency, and thus is more interested in the role of standardization.

Systematic and reliable results can only be attained on a common basis. Because there is greater pressure on industry to rationalize, the costs and benefits of standardization must be examined from both a microeconomic and a macroeconomic viewpoint. The Presidial Board of DIN therefore asked research institutes to initiate research into the economic efficiency of standardization, with the aim of making the costs and benefits of standardization transparent from both economic perspectives.

DIN, the German Institute for Standardization, contracted the Fraunhofer Institute for Systems and Innovation Research Karlsruhe (ISI Karlsruhe) and the Departments of Market-Oriented Business Management and of Political Economics and Economic Research at the Technical University of Dresden to jointly carry out this research project in Germany, Austria and Switzerland.

The conclusions are: As expected, company standards have the greatest positive effect on businesses, for they help improve processes. When it comes to the relationship with suppliers and customers, however, industry-wide standards are the main instruments used to lower transaction costs and assert market power over suppliers and customers. In fact, industry-wide standards play a vital role in our increasingly globalized world. 84% of the companies surveyed use European and International Standards as part of their export strategy, in order to conform to foreign standards. From a macroeconomic perspective, it is significant that standards make a greater contribution to economic growth than patents or licences, that export-oriented sectors of industry make use of standards as a strategy in opening up new markets, and that standards help technological change. This research project shows that industry-wide standards not only have a positive effect on the economy as a whole, but also provide benefits for individual businesses, who use them as strategic market instruments.

This research including its results of economic benefits show the basic needs for standardization for all disciplines standardization is requested like in the wide spread spectrum of tasks of FIG.

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1. INTRODUCTION

In recent years, technical standardization has been the subject of numerous academic research projects. Although these projects did not ignore economic aspects, they lacked the theoretical background necessary for a detailed analysis. Industry has become increasingly interested in assessing its economic efficiency, and thus is more interested in the role of standardization.

The development of standards and technical rules by institutions given authority to do so by both the private and public sectors is an essential element of the technological and economic infrastructure of a nation, and greatly influences its competitive ability and the strategies of companies. Increasing globalization has dramatically changed the international business environment. This fact, together with the changing role of standardization within the European and international contexts, make it necessary to examine both the form and content of standardization procedures in order to identify the economic implications of standards and technical rules.

Systematic and reliable results can only be attained on a common basis. Because there is greater pressure on industry to rationalize, the costs and benefits of standardization must be examined from both a microeconomic and a macroeconomic viewpoint. The Presidial Board of DIN therefore asked research institutes to initiate research into the economic efficiency of standardization, with the aim of making the costs and benefits of standardization transparent from both economic perspectives.

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2. BENEFITS FOR BUSINESS

The effects of standardization: Results of the company survey and interviews with experts by Technical University Dresden, Faculty of Economics and Business Management.

The four partners in the standardization process are linked in a number of ways. A framework of hypotheses was established on the basis of the literature and the principles of industrial economics. A company survey was then carried out in Germany, Austria and Switzerland to check the validity of these hypotheses.

In close cooperation with the national standards bodies, ten sectors of industry were selected, in eight of which standardization activity is particularly intense. For control purposes, two sectors in which there is less activity were also selected. Over 4,000 companies were selected at random and sent a printed questionnaire. The response rate was over 17%.

The present summary presents the most significant empirical results of the company survey and the expert interviews, which are compared with the abovementioned hypotheses.

This study focuses on the effects of standards on a company, as well as on that company's interaction with its immediate business environment. These effects have a direct influence on company strategy. In particular, the study concentrates on the effects of standards on costs in general, on research and development, and safety. The effects on the company's own business sector include potential competitive advantages over other companies, and the formation of strategic alliances. Finally, the relationship between the company and its national standards body was examined.

2.1 Strategic Significance of Standardization

Companies are generally unaware of the strategic significance of standards. They are at least partly aware of the strategic potential of standardization and can benefit from it. An example of this can be seen in the fact that 75% of the businesses surveyed confirmed that they are involved in activities at the German Institute for Standardization (DIN), the Austrian Standards Institute (ON) or the Swiss Association for Standardization (SNV). Because these companies want to have an influence on international standardization, 60% of their national involvement is at the European or international level.

The survey showed further that businesses which are actively involved in standards work more frequently reap short- and long-term benefits with regard to costs and competitive status than those which do not participate. Participating companies have more of a say in the adoption of a national standard as a European or International Standard. In this case, the company gains a competitive edge because it will not need to make extensive modifications in order to conform with a European or International Standard. When a legislative body requires a technical rule, it will frequently turn to standards. If a company has been actively involved in developing these standards, it can adopt the standard before it becomes law, avoiding costs which would otherwise be incurred at a later stage. 25% of the businesses surveyed had already chosen such a strategy at least once. Of these, 36% had been able to make large to very large savings (on a rating scale of five ranging from very little to very large).

- Where national standards are adopted as European and International Standards, participation in standards work more frequently results in advantages regarding costs and competitive status
- Involvement in standardization in order to anticipate new legislation and so avoid costs

2.2 Potential Competitive Advantage through Standards

- Competitive advantage more through company standards than through industry-wide or private industry standards
- The advantage of insider knowledge
- Insider knowledge more important than time advantage
- Competitive advantage through influencing contents of standards

2.3 Standards in Global Markets

Companies are confronted by different standards in foreign markets.

- Export strategy of businesses: Conforming to European and International Standards
- 80% of the businesses surveyed do not know the exact cost of adapting to foreign standards (figures given ranged about +/-100%)

Harmonized European and International Standards result in businesses reducing their trading costs. 62 % of the businesses surveyed stated that European and International Standards simplified contractual agreements. 54 % of the businesses surveyed stated that European and International Standards had lowered trade barriers in their sector. National standards can be used as non-tariff trade barriers against economic regions with different standards. With the globalization of the marketplace, there are increasing demands for a worldwide system of standards (ISO/IEC Standards). At a European level, this demand is met by European Standards. 61% of the businesses surveyed stated that there are costs involved in conforming with European and International Standards. In 37 % of the companies these costs are incurred because staff involved in standardization work have an increased workload through travel, using foreign languages, etc. 37% of the businesses surveyed feel increased pressure from their rivals because of the existence of European and International Standards. 46 % of them were able to save money because they did not need to adapt their products for export markets. 39 % of the businesses surveyed saw improved opportunities for cooperation, and 36 % benefited from a greater choice of suppliers. The businesses surveyed claimed to have saved a total of €15,5 million per year as a result of European and international standardization. However, only 9.3 % of them provided actual figures, giving average savings of €233,000 per year. The figures given costs of range from €2 million to cost savings of € €6,5 million.

- Advantages of harmonized European and International Standards
- Lower trading costs
- Simplification of contractual agreements

- Lowering trade Barriers
- Costs and savings due to the application of European and International Standards
- Only 9 % of the businesses surveyed were prepared to give actual figures for costs and savings

2.4 Cost Reduction through Standardization

Standardization can lead to lower transaction costs¹⁰ in the economy as a whole, as well as to savings for individual businesses.

- Reducing transaction costs through standards
- Costs of developing company standards and industry-wide standards are not easily quantified
- Company standards help lower production costs more than do industry-wide standards
- Positive effect of company and industrywide standards on interdepartmental communication

2.5 Effects of Standards on the Supplier-Client Relationship

The survey revealed that standardization was rated positively in its effect on buying power over suppliers (+13,8 on a scale of –50 = very negative to +50 = very positive). The application of standards and participation in standards work relevant to the supplier market can therefore enable a company to exert market pressure on their suppliers. Thus, it may be concluded: The dependence of a business on a single supplier can be reduced by standardization. Standards can help businesses avoid dependence on a single supplier because the availability of standards opens up the market. The result is a broader choice for businesses and increased competition among suppliers. Companies will also have increased confidence in the quality and reliability of suppliers who use standards. Standards are also used by businesses to exert market pressure on companies further down the value added chain, i.e. their clients. Those surveyed rated the effect of these standards in this context as slightly positive (mean value +11.6). Businesses are thus able to use standards to broaden their potential markets. However, this also exposes them to more competition. The effect of standardization on the market influence on suppliers is considerably - that is, statistically significantly - higher than that on clients.

- Standards have a positive effect on the buying power of companies
- Standards offer a wider choice of suppliers with the same degree of quality
- Standards are used to exert market pressure on clients

- Standards effect relationship with suppliers more than that with clients

2.6 Standards and the Formation of Strategic Alliances

Industry-wide standards form a collection of harmonized technical rules. They have a positive effect on cooperation between businesses.

The surveyed companies rated the effect of private industry standardization on cooperation with competitors as positive, when forming strategic alliances. Cooperation between businesses can result in cost reduction but also in monopolization.

2.7 Standards and Research and Development

The results of the company survey show that industry-wide standards present less of a hindrance to innovative projects than do other factors.

Businesses can reduce the economic risk of their activities by participating in standardization.

Businesses not only reduce the economic risk of their activities by participating in standardization, but can also lower their own costs.

2.8 Reaction Time of Standardization

Since it takes an average of five years to complete an industry-wide standard, such standards are particularly relevant in markets where product lifespan is longer than five years. Where product Lifespan is short, there is little difference in the significance of private industry standards and industry-wide standards. Where product lifespan is long, industry-wide standards are more significant than private industry standards

2.9 Product Safety and Liability

The results of the interviews revealed that standards contribute to lower accident rates. Accident insurers, such as the Allgemeine Unfallsversicherungsanstalt, see standards primarily as a factor in accident prevention. Representatives of consumer organizations generally participate in the standardization process when there are questions of product safety. They see their involvement as having increased industry's awareness of the importance of product safety, and safety requirements are now more likely to be included in standards.

2.10 Public Interest

Because standards reflect the current state of technology, they can help businesses reduce their liability risk. In questions of liability, legislators often fall back on a general clause which specifies that technical products are to be designed to recognized technical rules, such as standards.

Current legislation refers to approximately 20 % of the DIN standards collection. Because they are formulated by experts, standards are of great use to the state in drawing up legislation, for it can refer to them. If the state feels that the requirements set out in a standard are not sufficiently stringent, modifications can be made.

2.11 Standards Work

The company survey showed that approximately 70 % of respondents support a system of majority decisions, and 66% of them want the standardization process to be shorter.

- Companies prefer majority voting
- A switch to majority voting is less important than other desired changes to the standardization process
- Possible changes to the standardization process
 - more project management
 - more information for non-participants
 - increased use of electronic media
- Representatives of minority interest groups, such as consumers, are largely in favour of consensus

The most frequently given reason for supporting consensus was that standardization depends on knowledgeable discussion and should a political vote.

2.12 Standards Bodies

DIN, ON and SNV – the German, Austrian and Swiss national standards bodies, respectively – are often seen as being bureaucratic. The companies surveyed agreed with this viewpoint. They also agreed that DIN, ON and SNV are overly expensive in relation to the services they provide (59.8). However, they do not consider the standards institutes to be superfluous (16.8), but rather as necessary instruments in creating technical rules (79.5).

All partners in standardization would incur more costs without the help of DIN, ON and SNV. Even in sectors where national regulations are valid, cooperation with DIN is necessary to have an impact on European and international standards work.

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3. BENEFITS FOR THE ECONOMY AS A WHOLE

Standardization and technological change, the effects of standardization on the German economy and foreign trade by Fraunhofer Institute for Systems and Innovation Research (FhG-ISI).

3.1 Approaches and Objectives

The potential for innovation is an important factor in maintaining competitiveness and economic growth in a high tech economy. However, innovation is only a necessity and not in itself sufficient for an economy to remain competitive in a global context in the face of high labour costs. New products and improved methods of production must quickly assert themselves as broadly as possible for a positive economic development. This means that national policy should not only stimulate innovation, but must also ensure its efficient diffusion. In addition to private sector marketing strategies, state legislation and public procurement programmes, standardization by non-government standards bodies, such as DIN, is a suitable instrument for disseminating new ideas, products and technologies.

This part of the study presents the first economic analysis of the interaction between technological change and standardization, and the implications for the German economy and foreign trade.

3.2 Results of the Analysis of the Connection between Standardization and Technological Change

Technological change was assessed using as indicators the number of registered patents, while standardization was assessed by the number of published standards and technical rules listed in PERINORM, the Beuth Verlag database. A first step was to examine the connection between innovation in Germany and its dissemination by means of standardization. Using the ICS subject classification of standards as a basis of study, a significant correlation between the numbers of patent registrations and existing technical rules was found. This confirms that more new standards are published in innovative sectors than in those which are less so.

The research shows that German standardization responds adequately to technological change.

- The lifetime of standards is shorter where there is greater technological change
- Standards as a positive stimulus for innovation Positive influence of standards on innovation Standards should be withdrawn as soon as they are technically outdated

Because standardization is a form of technology transfer, it is particularly important to get businesses that are leaders in their sectors more involved in new standards projects.

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3.3 Significance of Standardization for the Economy as a whole

Another step in the analysis was to examine the effects of standardization on the economy as a whole. In a macroeconomic analysis covering the period 1960 to 1996, the business sector was examined using the conventional production factors, capital and labour, as well as three output indicators of technical progress: the number of registered patents, German expenditure on licences for foreign patents, and the number of standards and technical rules. The contribution of each production factor to overall economic growth was derived from a regression analysis. When the three factors were compared, it became evident that standards were at least as important for technical innovation as patents. This makes it clear that innovation potential is not the only deciding factor in economic development, but that it must also be broadly disseminated by means of standards and technical rules.

3.4 Significance of Standards for Foreign Trade

While in the past, political and economic discussions focussed on trade barriers such as duties, after GATT and WTO agreements, discussions concentrated on non-tariff trade barriers. Standards and technical rules were often misused as such. In the 1970s and 1980s, a confrontation arose from the difference between the metric and the American systems of measurement for screws. This made it evident that differing national standards can be used wittingly or unwittingly as an instrument in foreign trade policy, thus having a generally negative effect on the economies of the trade partners, although there may be a certain advantage at the national level.

Despite the existence of contradictory national standards, the very fact that the standards exist is positive because they make the characteristics of domestic investments and consumer goods more transparent, in particular for foreign producers and consumers. There are cost and quality advantages for businesses who use standards.

The aim of analysis of the link between standards and foreign trade was to find out to what extent standards have a positive or negative effect on foreign trade in Germany and whether particular sectors are affected in a certain way. One has differentiated between national and international or harmonized European standards to examine their different effects on the major trade partnerships in Germany.

- Positive effects of standards on foreign trade
- Standards are an indicator of innovative technological competitiveness
- A cross-section analysis of the most important bilateral trade relations was carried out
- The number of existing standards cannot explain in all cases structures in bilateral trade relations

- An analysis by economic and technology sectors was undertaken. In one-third of technological sectors, standards play a positive role in creating export surpluses
- Standards have a generally positive effect on exports
- International standards encourage intra-industrial trade more than national standards

A first model was used to examine the influence the size of the standards collection and technological specialization have on German exports world wide and on German imports. Further, bilateral trade between Germany and the UK and Germany and France was examined.

- Development of the national standards collection has no significant influence on total German exports
- National German standards are not trade barriers
- International standards improve the competitive chances of domestic producers

The results of the cross-section analysis empirically confirm the positive role of international standards. Exports are basically determined by the technological portfolio of a nation, but international standards in particular can act as a catalyst in rapidly diffusing new technical knowledge and thus securing advantages in the international technology race, strengthening the national innovation system.

- Overall, there is empirical support for the theory that international standards lead to international competitiveness

3.5 Comparison of the Results of the Macroeconomic Analyses with those of the Company Survey

As a final step, the results of the sectoral and macroeconomic analyses on the basis of official statistics were compared with the responses to the company survey. The responses to the survey corresponded in the main with the analyses based on economic statistics. There are only minor differences in matters of detail, which can however be explained by the insufficient comparability of the questions put in the survey and the statistical analyses.

- Businesses do not regard standards as outdated.
- Contradictory effects of standards on R&D
- Most businesses benefit from participating in standards work
- Standards do not hinder Innovation

- Standards are internationally Respected
- Standards make technical specifications more transparent
- The majority of businesses use European and international standards because of their positive effect on exports

A German standards collection which has European and International standards as its basis has a positive effect on exports and imports. Most businesses in the survey make use of European and International Standards because of their positive effect on exports.

- International standards encourage trade
- International and European Standards are more significant for German exports than are national standards
- Increased participation in European and international standards work is necessary
- Standards encourage technology transfer
- Standards make it easier for foreign competitors to imitate products and processes
- Standards should be concentrated in sectors in which there is the greatest national innovation potential

The results of the macroeconomic analyses basically confirm those of previous analyses using other methods. The study shows the economic benefits of standardization as being about 1% of the gross national product (1998: €15,75 bn). However, the assessment by an earlier study that the benefits of standardization were 1 % of business sales must be corrected downwards. The positive macroeconomic effects, which far exceed the sum of individual benefits for the economy, and the relief of the state through technical standards, justify public financial support for standards work and give standardization a firm place in economic policy and research and innovation policies. In particular, the latter should take a more integral approach, taking full account of the relationship between innovation and its diffusion by means of standards

- Macroeconomic benefits of standardization are greater than the sum of individual advantages Innovation policies should support standardization

4. CONCLUSION BY THE PARTICIPATING RESEARCH INSTITUTES

With its broad-based dual approach, this study produced numerous new insights into the economic effects of standardization, giving results which are unique in the international context. However, despite the fact that a clearer understanding was gained of the significance of standardization, a number of questions remain unanswered. Because of restrictions in time

and funding, it was not possible to examine specific branches in the necessary detail. Although the comparisons with Austria and Switzerland added a European dimension to the study, further research outside Central Europe would be an important extension of the work begun here. To summarize, this study has made considerable progress in a fundamental analysis of the economic significance of standardization, while at the same time opening the door for future research.

The results can be used as the basis for a strategic discussion regarding the future of standards work. All those who are directly or indirectly affected by standards now have access to information which can help them define their future standardization strategies. First, DIN and other standards bodies can use these results to identify areas which could be improved in order to respond to current developments, and those areas with which their customers are satisfied. Furthermore, the interested parties now have a broad overview of the different effects of standardization, and can use this knowledge to shape their strategies. Overall, the study can act as long-term motivation for a strategic discussion of the future of standardization.

5. PRACTICAL EXAMPLES DR.-ING. BERND HARTLIEB (DIN)

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-ISOfix system -Geometric product Specification -Digital field protection -Construction products -Repair costs -Standardized VW –Components -Standardized DASA components 1 -Standardized DASA components 2 -Insider knowledge -Valves -Digital image compression –Lasers -Spectacle lenses -Food technology -Masonry units -Laser pointers -Manufacturer's declaration -Waste water engineering -The International System of Units -Maintenance costs -Corrosion protection -Efficiency-High-tech door locks -Dust explosions -Street lighting -The Internet –Salmonella –Biotechnology -Computer workplaces -Bathing water -Sound insulation -Wood preservatives -Military equipment

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BIOGRAPHICAL NOTES

Academic Experience: Dipl.-Ing. Geodesy, University Hannover, Dr.-Ing. Geodesy (Totalstations), University Hannover, 'Vermessungsassessor', Second Exam on

Administration and Laws, Surveying and Cadastral Administration of Lower Saxony (Niedersachsen), Professor 'Cadastral and GIS', Technical University Braunschweig, Honorary Professor of Wuhan Technical University of Surveying and Mapping (WTUSM), Wuhan, China

Current position: Professor 'Cadastral and GIS', Technical University Braunschweig, 1975 - today

Head of Division 'Surveying- and Cadastral Administration- Cadastral, GIS, Standardization, International Cooperation' of Ministry of the Interior of Lower Saxony, Hannover, 1964-2000

DIN, German Institute for Standardization: Head of Section 03 'Surveying; Geoinformation', 1975 - today

ISO/TC211: Co-chair of Advisory Group on Outreach of ISO/TC211, 2002 - today

Head of German Delegation to ISO/TC211, 1994 - 2005

CEN/TC287: Co-chair of Advisory Group on Outreach of CEN/TC287, 2003 - today

Head of German Delegation to CEN/TC287, 1992 - today

ISPRS: Representative of ISPRS to ISO/TC211, 1996 - today

International experience: e.g. Brazil, Mexico, Golf Area, China, Sri Lanka, Korea, South East Asia, Africa, Poland and East Europe, e.g.

Activities in home and international relations:

Member of DVW, Member of DGPF, FIG, Commission 3, GSDI and standards, FIG, Group on Standards (implementation), German Society for International Projects (GTZ), German Foundation of International Development (DSE), Carl-Duisberg-Gesellschaft, UN, EU, uam

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