

TOWARDS A SYSTEMATIZATION OF STANDARDIZATION -Classification of Research Activities on Standardization in Business Economics and Engineering Business-

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—Abstract —

The term standardization has been present in academic discussion and industrial practice for many years. In general standardization aims for conformity and offers a set of principles for managing complexity and variety. Driven by the growing complexity of modern technology standardization has become increasingly important, too.

But the definition about the scope and the content of standardization still differs both in literature and practice. Based on a literature review the authors identified seven distinct fields of research on standardization in business economics and engineering. These fields will help to structure research topics and promote a better understanding of standardization in discussion.

Key Words: *standardization, research activities, systematization*

JEL Classification: M20

1. INTRODUCTION

1.1. Motivation

Numerous studies have been carried out on standards and standardization, different types of standardization have become a focus of attention in academic

discussion and the idea of standardization has gained acceptance in industry (De Vries, 2006). Although the concept and application of standardization has been a subject of research over the past decades, various authors stated a lack of clear distinction in academic research and industrial practice and pointed out a need for further progress in research (Schubert, 2008) (Straube, 2007).

This work will present a classification scheme to promote a distinction of research activities on standards and standardization. Based on existing differentiation criteria for standards and standardization the authors develop criteria which are suitable for categorizing research activities in the field of standardization.

First, an overview of existing definitions in the field of standardization will be given to create a common base of understanding. Secondly, a summary of existing classification approaches follows. Based on these classification criteria, the authors develop seven categories to classify research activities. The paper concludes with an outlook on further research topics.

1.2. Standards and standardization

The terms standard and standardization are widely used in business economics and engineering. But the large and complex body of literature on standardization is leading to different meanings or synonymic use in literature and current language (Straube, 2007).

For a definition of standardization we based ourselves on DIN 45020. According to DIN 45020 standardization is the “*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*” (DIN, 2006).

It improves “*the suitability of products, processes and services for their intended purposes, prevention of barriers to trade and facilitation of technological cooperation*” (DIN, 2006).

A standard is the result of standardization. It can be defined as “*a set of specifications to which all elements of products, processes, formats, or procedures under its jurisdiction must conform*” (Tassey, 2000).

These definitions give a general idea of what standardization is about, but for a classification of research activities a more detailed examination is necessary.

1.3. Methodical approach

This paper follows a theoretical research based on a literature review including its classification and analysis. It gives an overview of the current theoretical and empirical state of knowledge in the subject of standardization. The presented approach was carried out in three phases.

- In phase 1 a literature review in the field of engineering, management and business economics was conducted to collect existing classification criteria for standards and standardization (see Table 1).
- In phase 2 the literature review was extended to get an overview of research activities in the field of standardization which were represented by academic and practical publications. For the search we used the expression [standardisation OR standardization OR standard] in three portals for scientific literature – Google Scholar, ScienceDirect and Ebscohost. Since this study has a technical and economic focus literature of the fields engineering, management and business economics was its main source. Other fields such as medicine, mathematics or biology were not considered. For each portal the first 300 results were sighted whether they were suitable for an inclusion in our study.
- In phase 3 the criteria which have been identified in phase 1 were used to structure research activities of phase 2. Following the MECE principle the activities were divided into subgroups (categories) that comprehensively represent the group of research activities without gaps or overlaps as far as possible (Rasiel, 2008:6).

2. CLASSIFICATION OF STANDARDIZATION RESEARCH

2.1. Existing classification approaches

Table 1 gives an overview of common classification criteria in literature we identified in phase 1.

Table 1: Classification criteria for standards and standardization

Criteria	Parameters	Author
Purpose	Reference standards, compatability standards	(Hemenway, 1975) (David, 1990)
Degree of coercion	De jure, de facto	(David, 1990)
Sponsorship	Un-sponsored, sponsored	(Stango, 2004)
Economic range	Micro-economic, macro-economic	(Straube, 2007)
Addressed market	Capital goods, consumer goods	(Schubert, 2008)
Type of standard	Coordinating standard, regulating standard	(Lessig, 1999)
Management level	Ressource (e.g. IT, knowledge), process, result (e.g. product, service)	(Albrecht, 2006:82) (Amberg, 2012)
Relationship to product structure	Product-element, nonproduct	(Tassej, 2000)
Function of standard	Compatibility/Interface, minimum quality, Information/measurement, variety reduction	(David, 1987)
Development mechanism	Hierarchy (governmental, in-company), cooperation (formal, consortia), market	(Hesser, 2006a)
Actors of standardization	Companies, standards bodies, government, users, scientific community, associations, certification bodies	(Hesser, 2006a)

3. CLASSIFICATION OF LITERATURE

Based on these criteria the authors developed the following categories. Each category is representing a field of research on standards and standardization:

Table 2: Categories of research activities

Field of research activity	Literature (excerpt)
1 Variant management	(Fisher, 1999)(Pil, 2004)(Ramdas, 2003) (Scavarda, 2010)
2 Establishment of standards	(Besen, 1994)(Farrell, 1985)(Stango, 2004)(Economides, 1996)
3 Cooperation guidelines	(Christmann, 2004) (Kahan, 1997) (Lutgart, 1999)
4 Strategy and marketing	(Chiesa, 2002)(Greenstein, 2004)(Jain, 1989)
5 Economics of standardization	(Knoop 2006) (Swann, 2010)
6 Mass customization	(Da Silveira, 2001 & 2012) (Davis, 1987)(Kotha, 1995) (Pine, 1993)
7 Business improvement program	(Hartlieb, 2009) (Hesser, 2006a&b) (Perera, 2006)

The following paragraphs will describe the fields of research and their respective characteristics. An additional useful criterion was the industrial branch research focused on, e.g. automobile industry, plant engineering, service business, etc.

3.1. Variant management

The first field of research contributes theoretical approaches to avoid, reduce and manage variety, i.e. variants in production and product developments. The research concentrates on variety management on a product level. Both capital goods and consumer goods are regarded.

Since automobiles are very complex products with a wide range of product variety, many authors focus on the management of product and part variety in the automotive industry (Schubert, 2008) (Pil, 2004).

3.2. Establishment of standards

Approaches and tactics to establish standards on an end-product level in a market are the central themes in this field of research. Here standardization means the adoption of a common standard by all market participants (Stango, 2004).

The establishment of products as a market standard is especially important for companies which are acting in “network markets” – markets where users want to buy products compatible with those bought by others (Besen, 1994). The term “standard wars” is a common theme through the literature in this context (Stango, 2004).

A recent example of forces that stimulate adoption of standards was the protracted battle between Blu-ray and HD DVD to become the dominant format for the third generation of optical disks (Den Hartigh, 2009).

3.3. Cooperation guidelines

How standardization can create conformity of business processes and policies to improve especially international business relationships and trade is the focus of this category. It covers internal standardization efforts of multinational companies as well as the cooperation between companies on a national and international level.

Research typically focuses on sourcing strategies, influence and management of national lawmaking, standard and master contracts or business conduct guidelines.

3.4. Strategy and marketing

The difference between the competitive strategies individualization and standardization is the driving theme in this field. Research concentrates on methodologies to find a suitable degree of standardization. Especially

multinational companies have to decide whether they should pursue a strategy that is standardized across national markets or adapted to individual national markets.

3.5. Economics of standardization

The impact of standards and standardization on economy and society is the central theme in this field. Research concentrates on the estimation of cost and benefits of standardization from a micro- and macro-economic perspective. Especially how standardization affects single companies and the economy or how government can increase the economic benefits obtainable from standardization are of special interest.

3.6. Mass customization

Standardization enables companies to produce uniform products in large quantities by exploiting economies of scale. But customers prefer products designed for their specific needs. The solution of this conflict between individualization and mass production – the concept of mass customization – is the central theme of this field of research.

While in 4.4 the main focus is on the strategic question whether a company should follow a standardization strategy or not, the focus of this field lies on the practical implementation of standardization strategies in a production environment.

3.7. Business improvement program

The design and practical implementation of standardization activities in a business is the main focus of this field. These standardization activities are organized in a business improvement program.

Companies use standardization-based business improvement programs to internally increase business efficiency. This increase is reached mainly by the reduction of technical (e.g. product variety) and organizational complexity (e.g. global coordination of engineering activities). The programs are planned and implemented according to the rules and practices of project management which results for instance in a strict budget and time schedule, a specific organizational structure or accompanying control mechanisms. Programs are usually implemented not on a single management level (e.g. resources, process, product). Thus research does not concentrate on one management level (like variant management (4.1) which is limited to the product level) but has to consider cross-level design and management of standardization activities (Amberg, 2012).

Standardization programs are focused on the management of complexity but the scope standardization activities highly dependent on the respective enterprise. On a product level companies can choose e.g. commonality part approaches, platform concepts or modularization concepts to manage their product complexity.

Standardization programs are a popular approach in plant EPC business (engineering, procurement, construction) to increase efficiency in engineering - besides value engineering, IT-support or quality and knowledge management. To tap the full potential of standardization, not only the development of standardized products and a clear definition of modules, standards and work packages is important. The optimization of engineering requires a standardization of processes and an integrated IT system to support the engineering process as well.

4. CONCLUSION AND OUTLOOK

This paper described seven fields of research activities on standardization. These categories help to structure standardization literature and to get an overall picture of this field.

The literature review showed that a large body of literature has been accumulated in 4.1 – 4.6 over the last decades. Although standardization as a business improvement program (4.7) is known to exist in practice, it has not been adequately investigated by academic research. Literature is limited in providing in-depth research know-how on the integration and management of standardization activities on different business levels. Also implications resulting from the project character of these programs are often neglected.

For further research, first a common understanding of standardization as a business improvement program and its scope and content in an industrial environment is needed. Furthermore research to gain knowledge about the design, implementation and management of standardization programs is necessary.

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