A basic outline of the scientific discipline of business informatics in general and with a view to OTH Regensburg

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Abstract

This article provides a basic outline of the scientific discipline of business informatics (WI) in general and with regard to OTH Regensburg. Firstly, the subject matter of WI, namely information systems, is considered in more detail and the aims of WI are explained.
As SII is an interdisciplinary subject, the determining basic sciences of SII are then presented within the framework of the basic system of sciences. The influence of different disciplines also promotes methodological pluralism in SII. The two fundamental research paradigms in the form of the behaviour-oriented and the design-oriented approach are examined in more detail in the contribution.
After a brief insight into the development of German-language SII over time, the topics and fields of activity of SII are discussed in more detail.
Finally, the WI at OTH Regensburg is presented and an outlook on the challenges in WI is given.

Introduction

The changes in society and the economy, driven above all by digitalisation and globalisation, demand and promote the constant further development of the scientific discipline of business informatics (WI). This change influences research and teaching in equal measure. In research, for example, the pressure to evaluate is increasing and teaching must keep pace with the technological changes of our time in order to provide students with an education on current topics.
In order to do justice to the changes in teaching, the German Informatics Society (GI), for example, publishes a framework recommendation for training in business informatics at universities, which is constantly adapted to technological developments at regular intervals, combined with a progressive consolidation of the subject. (*GI 2017, P. 5*).
This ongoing need for adaptation is rooted in the subject matter of economic information, which is examined in more detail in the following section.

Object of the WI

"The subject of business informatics is information systems (IS) in business, administration and the private sector. IS are socio-technical systems that integrate human and machi components (subsystems)." (*GI 2017, P. 7*).

The technical part of the so-called software system comprises the application software (e.g. an office application) and basic software (e.g. an operating system), while the hardware system comprises computers and other technical equipment. The software and hardware system form the application system (technical focus), which only characterises the term information system (IS) in interaction with the human component (see Figure 1).

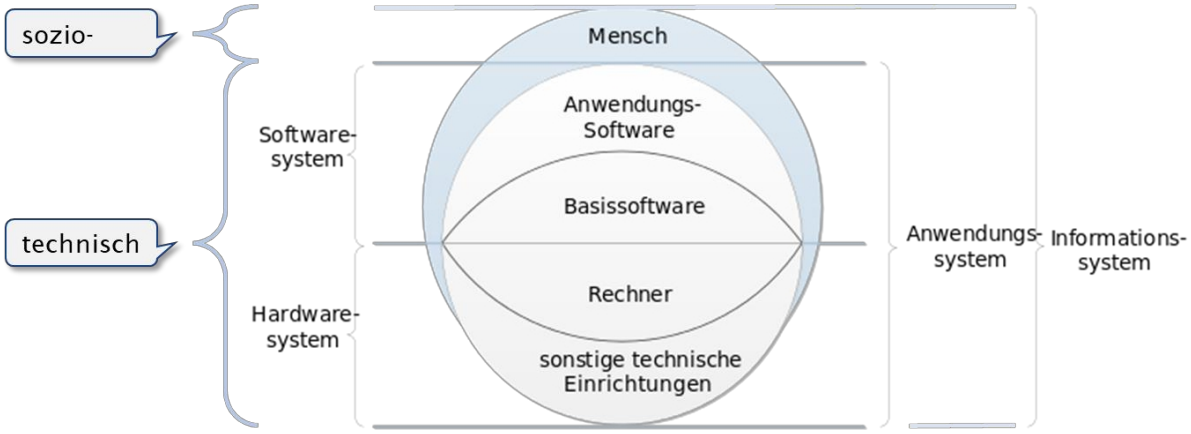

Figure 1: IS as a socio-technical system (based on (*Teubner 1999, p. 26*))

As modern information systems (IS) form the basis for increasing digitalisation, they are equally important in the areas of business, politics and society and will continue to gain relevance in the future (*GI 2017, p. 7*).

For this reason, business informatics traditionally focuses on practically applicable solutions for these areas that enable information technology, hardware and software to be used effectively for emerging (business and private) tasks. (*Robra-Bissantz & Strahringer 2020, p. 162*)

Based on the subject matter of WI, namely information systems, the objectives pursued by the scientific discipline of business informatics can be derived below.

Aims of the scientific discipline of WI

Mertens (*1995, p. 48*) sees the long-term goal of SII as the full automation of operational processes in the sense that all activities in which an information system performs tasks at least as well as a human being should be taken over by the system ("meaningful full automation").

From this, more detailed objectives can be derived for the scientific discipline of SII. Following a unanimous decision by the joint meeting of the Academic Commission for Information Systems (WKWI) in the Association of University Professors of Business Administration e.V. and the Department of Information Systems (FB WI) in the German Informatics Society e.V. (GI), the following goals can be postulated for the scientific discipline of business informatics (*WKWI & GI FB WI 2011*):

a) "the (further) development of theories, methods and tools for gaining subjectively verifiable knowledge about IS,
b) the design-oriented construction of IS as well as the necessary (further) development of concepts, procedures, models, methods, tools and (modelling) languages,
c) the achievement of a real scientific understanding of the use, acceptance, management and controllability of IS as well as of their respective system elements, for example with regard to the behaviour of people in and with these systems as task owners or users,
d) the evaluation of risk, benefit and economic efficiency dimensions in the design and use of IS, the value creation processes changed by them and the associated strategic and organisational effects on individuals, groups, companies, industries and economic areas, primarily based on economic science, and
e) the forecast of technical and non-technical developments and effects of the use of IS."

To realise these goals, SII uses a pluralism of methods (see, among others, (*Loos et al. 2013, p. 457ff*)) that results from the different **basic disciplines** of SII, which are presented below.

Basic disciplines of WI

As already mentioned, the roots of business informatics are anchored in the operational need to recognise and exploit the potential of using information and communication technologies ("meaningful full automation"). The links to business administration and computer science therefore play a key role. (*Leimeister 2021, p. 11*)

This connection has led to business informatics being seen as an "interdisciplinary subject between business administration and computer science" (*Mertens 2019*).

In the course of its development, however, the discipline expanded its interfaces and integrated aspects of engineering and behavioural sciences (see Figure 2) more strongly (*Leimeis ter 2021, p. 11*).

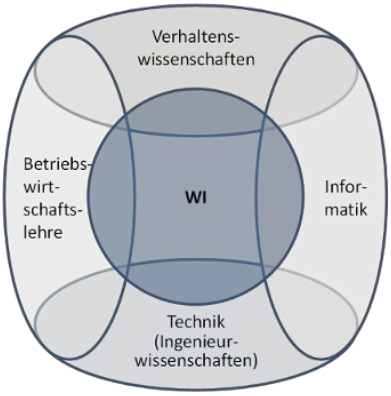

Figure 2: Classification of the WI (*Mertens 2019*)

With the help of findings from the engineering sciences, for example, an approach for the reproducible design of virtual communities was developed. Based on behavioural science findings about human behaviour, an approach has also been developed that derives design elements for ubiquitous systems in order to increase user trust and their willingness to use them. Over time, the so-called socio-technical system (see section "Subject of SII") has gained relevance within business informatics. This concept generally refers to a group of people who are connected to technologies, which in turn are structured to achieve certain results. It therefore includes both a technical and a social component. (*Leimeister 2021, p. 11*)

Other neighbouring disciplines that are important for business informatics include mathematics, statistics, sociology, psychology and law (*GI 2017, p. 8*).

Despite its interdisciplinary nature, which often leads to the development of findings at points of contact with other disciplines and frequently builds on their foundations, business informatics also has an independent theoretical core. This includes, for example, the study of human behaviour in dealing with information systems (*Leimeister 2021, p. 11/12*). This research is also used in the behavioural science-oriented Anglo-American information systems (IS) community (*Loos et al. 2013, p. 458*).

Classified in the basic system of sciences (Figure 3), the roots of the scientific discipline of business informatics extend into both the formal sciences (mathematics) and the real sciences (engineering and economics (business administration)).

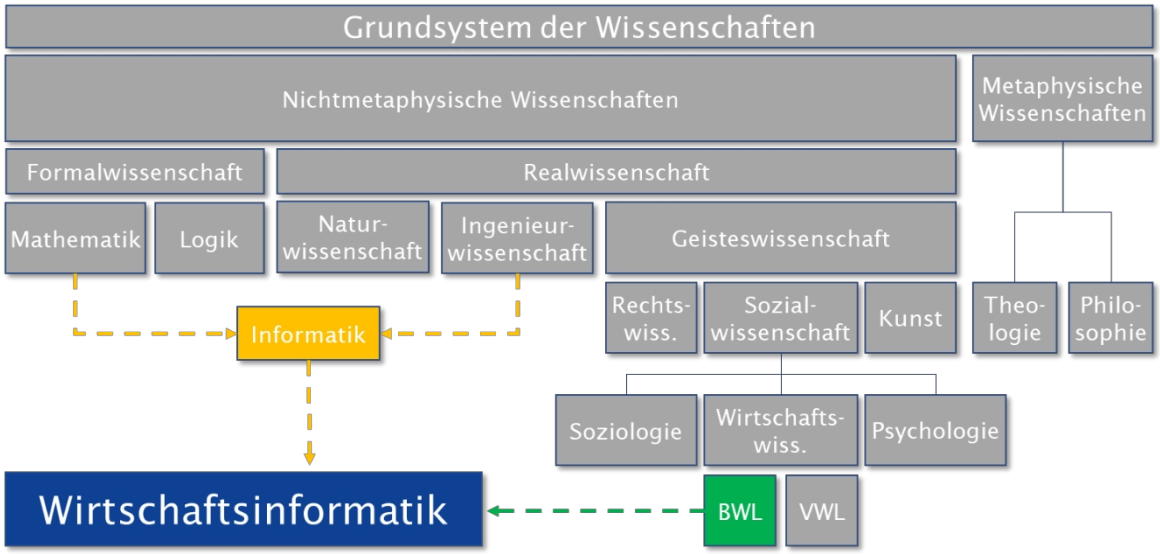

Figure 3: Interdisciplinarity of business informatics in the basic system of sciences (based on *(Chmielewicz 1994, p. 33)* and *(Raffée 1995, p. 23)*)

Cooperation with various academic disciplines enables business informatics to utilise a wide range of research methods and approaches (*Leimeister 2021, p. 11*). Parts of this palette are presented below.

Research methods in WI

As an interdisciplinary science (see Figure 2 and Figure 3), business informatics utilises a variety of research methods ("methodological pluralism", see

et al. (*Loos et al. 2013*)). In principle, this diversity can be assigned to two basic research paradigms (*Leimeister 2021, p. 11*):

1. the behaviour-oriented and
2. the design-orientated approach in research.

The related discipline "Information Systems (IS)" developed somewhat later than German-speaking SII in the USA. Although IS and SII have many similarities, they differ in their areas of specialisation. German-speaking SII concentrates primarily on the development of application systems, often up to the prototype stage, and thus focuses on a construction and design orientation. In this context, the term "relevance" is often used in German-speaking SII (*Robra-Bissantz & Strahringer 2020, p. 162*). (*Buhl & Lehnert 2012, p. 2*)

In contrast, the discipline of IS is more concerned with the evaluation, impact and acceptance of systems developed by others. Methods of social science field research are often used, which indicates a stronger behavioural orientation ("behaviourism") and empirical orientation. (*Buhl & Lehnert 2012, p. 2*)

The term "rigour" is often used here to describe the rigour with which the research results are achieved (*Robra-Bissantz & Strahringer 2020, p. 164*).

While there have been many discussions in the past regarding research that is relevant to practice ("relevance") versus research that is characterised by rigor ("rigour"), there is still much debate about the relevance of research.

gor") (see, for example, the focus issues of MIS Quarterly in 1999 or Communica- tions of the AIS in 2001 (according to (*Steininger et al. 2009*)) or see (*Robey 1998), (Keen, 1991), (Benbasat & Zmud 1999*)), current developments no longer see this as a contradiction, but rather emphasise the compatibility of both research views. (*Robra-Bissantz & Strahringer 2020, p. 164*)

By combining scientific rigour ("rigor") with practical relevance ("relevance"), solutions are to be developed that provide design guidelines for systems and their use, taking into account the entrepreneurial task and the people involved (*Iivari 2015*).

Further overviews of research methods in information systems can be found in (*Winter et al. 2009*), (*Heinrich et al. 2011, pp. 97-109*), (*Loos et al. 2013*), (*Robra-Bissantz & Strahringer 2020*) and (*Leimeister 2021, pp. 11-14*).

The following sections show how the scientific discipline of business informatics has developed over time.

Excerpt from the chronological development of German-language SII

Similar to computer science, business informatics is a relatively young subject area that has continuously evolved with the rapid developments in the fields of computer science, economics and business administration.
and engineering sciences.

Even though the term "business informatics" was probably not coined until 1969 (*Heinrich 2012, p. VII FN10*), 1961 can be described as the birth year of German-language WI (*Heinrich 2012, p. IX&17*), when the first relevant monograph on the subject area of today's business informatics was published with the title: "Betriebswirtschaftliche Grundlagen der Automatisierten Datenverarbeitung" (*Hartmann 1961*).

Since then, the field has experienced a dynamic historical development. It was established as a recognised academic discipline in the 1970s in response to the increased demand from the economy and the labour market for specialists with interdisciplinary expertise in information processing. Another significant development occurred around the turn of the millennium, when the term "electronic business" (e-business) emerged with the integration of the internet into operational functions and processes. (*Mertens 2019*)

From around 2013, the subject was increasingly associated with the term "digitalisation" (*Mertens & Barbian 2015*).

Figure 4 illustrates the development of the renaming of the content of the WI: from punch card technology to the topic of digitisation.

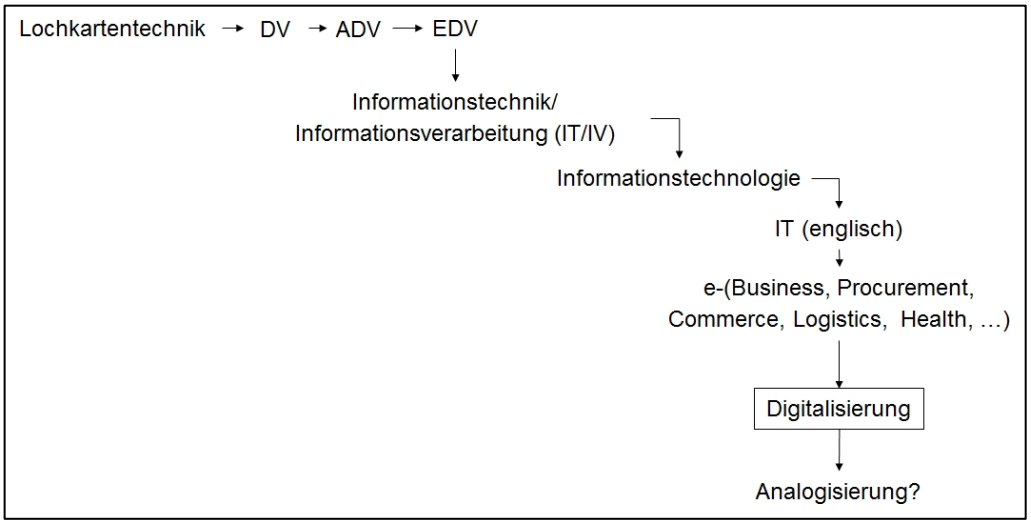

Figure 4: Renaming of the WI (*Mertens 2019*)

These renamings were also driven by changes in the range of tasks in business informatics in line with technical developments (see Figure 5).

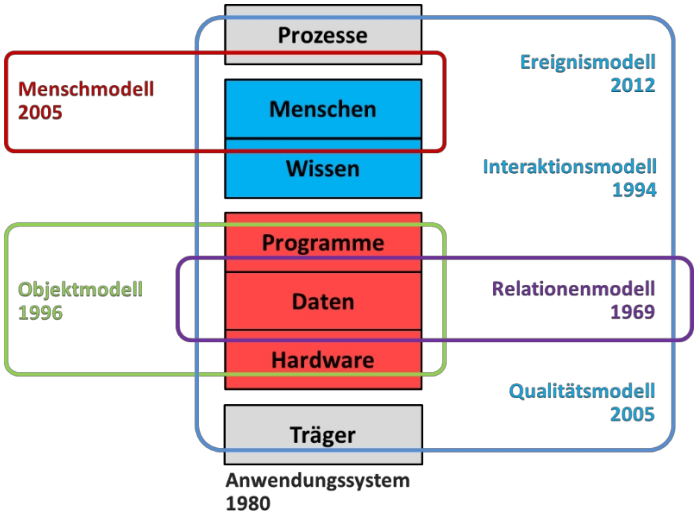

Figure 5: Development of the range of SII tasks over time

(*Source: https://www.wi-lex.de/wp-content/uploads/2021/02/Geschichte2.png; accessed on 29/01/2024*)

While in the 1960s and 1970s, for example, the focus was strongly on electronic data processing (EDP), this shifted to so-called application systems in the 1980s with the technological possibilities of the time. The increased focus on the human component in interaction with application systems then strengthened research into human-computer interaction (HCI) in the 2000s. (*Ortner 2019*)

The field of business informatics is now present at almost all universities and has established a firm place in the academic research landscape (*Mertens 2011*).

The topics and fields of activity in SII, which are described below, have also become established.

Topics and fields of activity in WI

As already described, information systems in business, administration and the private sector are the subject of SII (see section "Subject of SII").

The topics and fields of activity of SII can also be derived from this subject matter, which are always orientated towards the technological possibilities and continue to develop. Figure 6 describes five central subject areas of SII with reference to their subject matter - application and information systems (for a precise differentiation, see Figure 1) - in a process description (*Mertens et al. 2017, p. 3*):

> The starting point for SII is new information and communication technologies (e.g. internet technology in the 1990s, AI technologies (e.g. chat GPT) in the 2020s, etc.). With the help of suitable methods, e.g. from software engineering, concrete solutions for practical problems (e.g. online trading) are developed. The results are application systems, in the example of Internet technology e.g. shop systems for online trading. With the help of information management methods, the new application systems are utilised in such a way that new economic solutions are created. In the case of the use of Internet technology, a further sales channel has been created in addition to stationary retail, namely online retail (e-commerce).

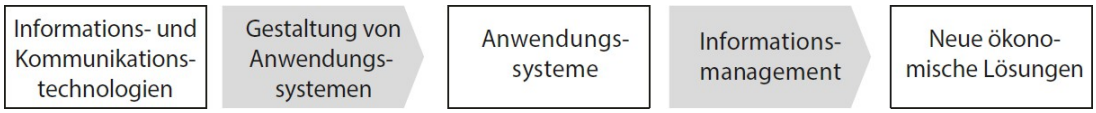

Figure 6: Subject areas of SII (*Mertens et al. 2017, p. 3*)

In addition to the above-mentioned procedure for the development of subject areas in SII, further overviews can be found. For example, Figure 7 below categorises possible topics and fields of activity in SII into the areas of applications, processes, data and information technology:

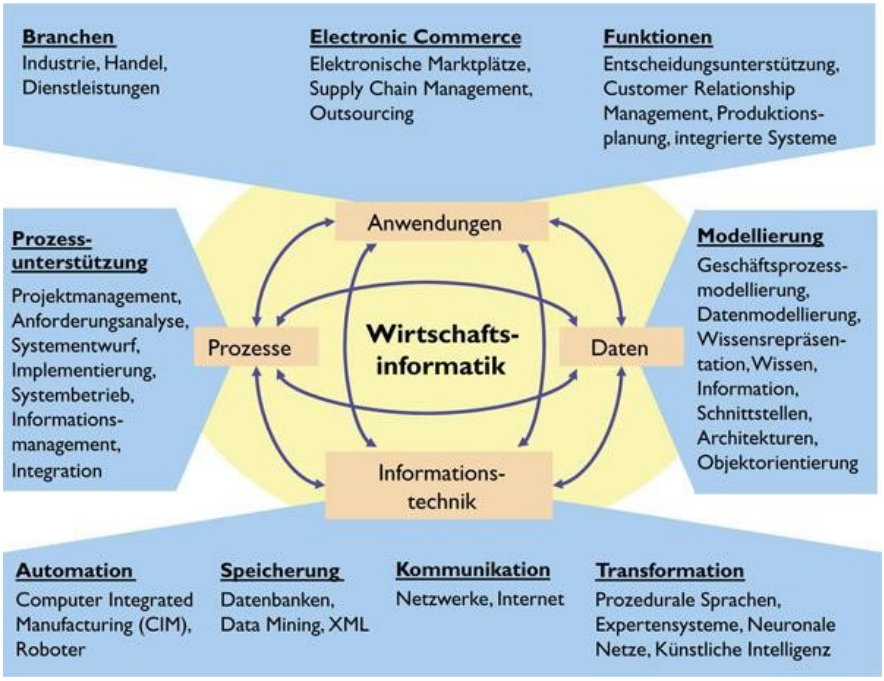

Figure 7: Areas of the WI

(Image source: http://wiki.brainstorm-werbung.de/images/0/09/Bereiche_der_Wirtschaftsinformatik.jpg (retrieved on 29/01/2024)

The aforementioned topic area of "e-commerce", which is assigned to the "Applications" area, can also be found here.

Many of these topics also play a role at the Faculty of Computer Science and Mathematics at Regensburg University of Applied Sciences (OTH Regensburg) and are briefly discussed below.

WI at the OTH Regensburg

In the winter semester of 1973/74, the Computer Science degree programme started with 24 students. 20 years later, in 1993, the Faculty of Computer Science and Mathematics was founded.

Following the introduction of a new study concept for the Computer Science degree programme, the Business Informatics degree programme (in addition to the General and Technical Computer Science degree programmes) was offered for the first time at OTH Regensburg in 1999, 26 years after the start of the Computer Science degree programme, which already included a focus on technology and business in 1973 and thus had the character of Business Informatics.

The number of first-year students at the start of what was then a degree programme in business

informatics was three in the winter semester of 2000 and rose to just under 80 in the following year.

students in the winter semester of 2023, with the conversion of the Computer Science degree programmes (General Computer Science, Computer Engineering, Business Computer Science) from Diplom to Bachelor's degrees taking place in 2006 and the Master's degree programme in Computer Science starting in 2008.

The number of graduates on the Bachelor's degree programme in Business Information Systems more than doubled from 14 in the 2009 winter semester to 33 in the 2023 summer semester. 786 graduates were trained on the Bachelor's degree programme in Business Information Systems during this period (2009-2023).

In 2023, a total of 1,977 students were studying at the Faculty of Computer Science and Mathematics in 7 Bachelor's degree programmes and 3 Master's degree programmes, 356 of whom were majoring in Information Systems.

The computer science degree programmes, and the business informatics degree programme in particular, regularly took first place in the CHE rankings from 2017 to 2021 and will continue to lead the way in Germany in 2022 and 2023.

On the Business Informatics degree programme at OTH Regensburg, students receive a sound education in computer science together with interesting content from business administration and mathematics. The following topics, among others, are addressed in the Business Informatics degree programme:

- Business management basics
- Business process management: design (BPMN, eEPK), analysis (including process mining) and automation of operational processes using suitable tools
- Information and communication systems: planning, development and operation of apps and software (software engineering), cloud computing, software and processes in companies - from purchasing and logistics to customer service via Siri, Alexa and other channels
- Business intelligence: data warehouses, data mining or data science using artificial intelligence
- Internet economy: e-business, integration of IT systems, new business models, cloud computing
- Management of IT: Management of data and IT systems, data security, IT controlling, project management, algorithms and data structures
- Artificial intelligence and machine learning
- Application-oriented basics of business informatics

- Production and logistics with specialisation in operational production planning and control, as well as supply chain management (including the SCOR model)
- Operational information systems, in particular standard software systems with a focus on the types of application systems and their relationship to the operational organisation

This means that teaching on the Business Informatics degree programme at OTH Regensburg covers current topics that are urgently needed in practice, opening up excellent career prospects for students.

As shown above, the subject areas of SII are diverse (see Figure 5, Figure 6 and Figure 7) and are constantly changing due to technological progress and the interdisciplinary nature of SII, so that SII is always confronted with new challenges.

Challenges in WI

Significant challenges in the field of business informatics include ensuring reliability and protection against attacks on systems in extensive networks, especially in the financial sector and global goods logistics. Furthermore, the focus is on developing a more intuitive and human-like interaction between humans and computers as well as between computers at different companies. Another central concern is to increase operational productivity by determining the optimal division of labour between humans and computers on a theoretical basis in order to achieve an ideal level of automation. (*Mertens & Barbian 2015*)

With a view to German circumstances (e.g. specific demographic development), (*Mertens & Barbian 2015*) identify further areas for the "Grand Challenges" of German business informatics, which are shown in Figure 8 below.

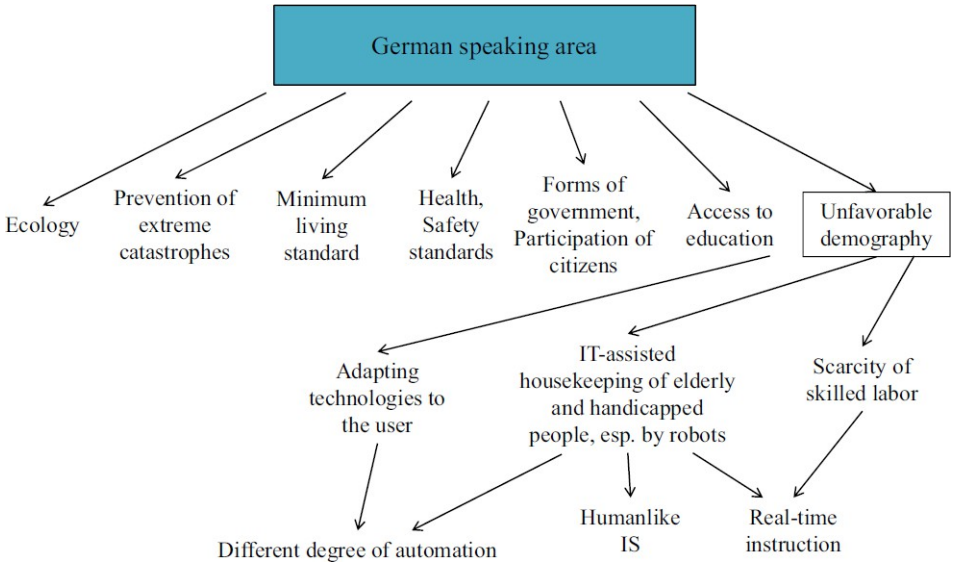

Figure 8: Fundamental problems in the German-speaking area (*Mertens & Barbian 2015, p. 401*)

For example, the unfavourable demographic development is more of a problem in Germany than in France (*Mertens & Barbian 2015, p. 402*), which requires special solutions. Other challenging fields of activity for business informatics are in the ecological view ("ecology") of the use of information systems. Topics such as green IT play a role here. However, WI will also continue to be called upon to analyse and predict extreme weather events and disasters ("Prevention of extreme catastrophes").

WI will therefore continue to be a constant companion in solving our problems when it comes to automated support for business and private activities and has long since become an integral part of our research and teaching.

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