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RESULTS OF A QUALITATIVE SURVEY ABOUT THE APPLICATION OF BUSINESS INFORMATION SYSTEMS IN GERMAN CRAFT ENTERPRISES - FIRST FINDINGS OF AN ONGOING RESEARCH PROJECT

Marius Schönberger

Institute for Information Systems (IWi) at the German Research Center for Artificial Intelligence (DFKI) and Saarland University, marius.schoenberger@iwi.dfki.de

Thomas Kleinert

nstitute for Information Systems (IWi) at the German Research Center for Artificial Intelligence (DFKI) and Saarland University, thomas.kleinert@iwi.dfki.de

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RESULTS OF A QUALITATIVE SURVEY ABOUT THE APPLICATION OF BUSINESS INFORMATION SYSTEMS IN GERMAN CRAFT ENTERPRISES - FIRST FINDINGS OF AN ONGOING RESEARCH PROJECT

Research

Schönberger, Marius, Institute for Information Systems (IWi) at the German Research Center for Artificial Intelligence (DFKI) and Saarland University, Saarbrücken, Germany, marius.schoenberger@iwi.dfki.de

Kleinert, Thomas, Institute for Information Systems (IWi) at the German Research Center for Artificial Intelligence (DFKI) and Saarland University, Saarbrücken, Germany, thomas.kleinert@iwi.dfki.de

Abstract

The present study shows the current status of a preliminary study about the use of business information systems (BIS) based on five exemplarily selected case studies in German craft enterprises. The question of whether similarities and differences concerning the application of information and communication technologies (ICT) exist in practice. For this purpose, exemplary case demonstrating the scope and usage of organizational ICT in various crafts are presented. The case studies are based on a survey of CEOs and IT managers of selected craft enterprises. Based on the results of the survey, hypotheses about the use of information technologies were derived. Based on these hypotheses, interdependencies of craft enterprises are presented and justified regarding the use of BIS, the actuality of the hardware, the requirements to branch-specific IT solutions, the measures taken toward data protection and data security and the visibility on the Internet. As a result of the preliminary study it can be stated that a widely heterogeneous IT landscape as well as good IT competence can be found in the enterprises involved.¹

Keywords: Business information systems, Craft, Mittelstand, SME

1 Introduction

This paper was developed in line with the "Mittelstand digital" project that was founded by the German Federal Ministry of Economics and Technology (BMWi). Within the framework of this project, 38 competence centres were established all over Germany, so-called "eBusiness-guides", in order to provide small and medium-sized enterprises (SMEs) and craft enterprises with vendor-neutral and practical information on relevant topics in the field of eBusiness. Furthermore, the competence centres support SMEs in the search for suitable and affordable ICT solutions.

¹ The authors would like to thank Mr. Peter Fettke for his collaboration, numerous discussions, tips and support during the development of this contribution.

This paper follows on from the main research focus of the BMWi. In May 2014, a study was carried out by employees of the eBusiness-guides in cooperation with the Chamber of Crafts with the goal of developing a vendor-neutral catalogue of requirements for sectorial IT solutions. In the form of a survey, the study aimed to derive hypotheses about the deployment and use of business information systems (BIS) in craft enterprises based on the analysis and evaluation of the survey results. Moreover, regarding the re-use of the questionnaire for further quantitative studies, statements are to be elicited regarding the need for an elaboration of the questionnaire concerning form and content. To this effect, the following research questions form the basis of the paper:

1. What is the status quo in the craft enterprises observed concerning the use of BIS?
2. Can figures be derived on the basis of these investigations which can help in the characterisation of the IT affinity of craft enterprises?
3. Do the results of the investigation permit the detection of similarities and differences, regarding the use of BIS?

This contribution is structured as follows: First, the necessary terminological basics are explained in section two. Existing research in relation to the adoption and use of ICT is presented in section three. In section four, the underlying research methods are described. In section five, the results of the preliminary investigation are presented and evaluated. Following this, the results are compared and analysed with regard to the research questions in section six. Finally, the contribution concludes with a summary of findings and an outlook on further research activities in section seven.

2 Basic terminology

2.1 SMEs in Europe

SMEs and craft enterprises play an important role in Europe's society and economy: The vast majority (99.8%) of all enterprises in the European Union are SMEs, 91% of these are micro enterprises with fewer than ten employees. SMEs employ more than half of the European workforce (67%) and are estimated to be responsible for 58% of the total turnover and the value added (Buschfeld et al., 2011, p. 40). In view of the fact that there is no single definition for SMEs nor any clear demarcation of SMEs and large enterprises (OECD, 2014, p. 380), for this research, the definition according to the proposal by the European Commission is used (European Commission, 2003). According to this recommendation, an enterprise that has fewer than ten employees and an annual turnover or annual balance sheet total not exceeding two million euros is defined as a micro enterprise. Small enterprises are companies that have fewer than 50 employees and an annual turnover or annual balance sheet total not exceeding ten million euros. Companies are referred to as medium-sized enterprises if they employ fewer than 250 employees and have an annual turnover not exceeding 50 million euro or an annual balance sheet total not exceeding 43 million euro (European Commission, 2003).

2.2 Craft enterprises and the "Mittelstand" in Germany

Due the fact that the European craft sector is very diverse and covers a multitude of different professions and trades, there is no EU-wide definition of craft enterprises (Buschfeld et al., 2011, p. 39). Therefore, the "act regulating the craft sector", also known as the "trade and crafts code" (ZDH, 2014), regulates the terms and conditions for the operation of a craft or a craft-type business in Germany (Rothgang and Trettin, 2003, p. 6). In this context, a trade can only be assigned to a craft, if this trade provides a handcrafted or craft-type service (or product) individually and directly to consumers. Furthermore, the trade must be listed in the appendix of the trade and crafts code as a licensed craft, license-free craft or craft-type trade (ZDH, 2014). Regarding this high heterogeneity of craft enterprises in Germany (Eckl et al., 2010, p. 36), a uniform definition of the German craft sector cannot be given

either. Thus, this paper is based on the demarcation of craft enterprises which is determined by the German trade and crafts code.

Germany is the biggest economy in Europe-28 (Muller et al., 2014, p. 7) and comprised the largest number of SMEs in high-tech manufacturing in 2011 (Wymenga et al., 2012, p. 10). Furthermore, Germany hosts the fourth largest SME community in Europe-28 with over two million enterprises and, unlike the rest of the EU, SMEs provides the most jobs and generated the highest value added (European Commission, 2014, p. 2). However, these facts and figures are not enough to explain the so-called "German Mittelstand". Historically the German Mittelstand emerged from the craft sector in the middle of the 18th century (Wagner, 2010, p. 26). In recent years the acronym SME has been used in Germany as a synonym for Mittelstand (Meyer-Stamer and Waeltring, 2000, p. 10). Regarding the European definition of SMEs, this translation does not precisely convey the character of the German Mittelstand. Nowadays, the Mittelstand also links qualitative aspects such as independence or family ownership. Thus, the German Mittelstand can also include larger companies (Wagner, 2010, p. 27; BMWi, 2012, p. 2).

2.3 Business information systems

Information systems deal with the conceptualisation, development, introduction, maintenance and utilisation of systems for computer-assisted information processing within companies and enterprise-wide networks (Wigand, et al., 2003, p. 1). An information system is a system composed of humans and machines that produce or use information (Ferstl and Sinz, 2006, p. 348). A long-term goal for information systems is to provide and maintain an integrated information flow throughout the enterprise. According to this, two integration layers of an information system can be distinguished: the business integration, consisting of information processing tasks and information relationships and the physical integration, consisting of people as well as computer and communication systems (Bernus and Schmidt, 2006, p. 2). To that effect, in this paper, all associated subsystems to an information system such as hardware, software, networking, data and information are subsumed under the term "business information systems".

3 Related Work

Empirical studies about the use and adoption of ICT solutions relate either to large companies or medium-sized firms. Micro or small enterprises and especially craft enterprises remain widely unobserved (Eckl et al., 2010, p. 29; Schubert et al., 2007, p. 1227). Reasons for this fact lie among other things, in the very heterogeneous structure of the specific sector which is marked by a huge number of small craft enterprises with individual interests (Eckl et al., 2010, p. 36; Buschfeld et al., 2011, p. 39). This explanation is also backed up by current figures of the German Federal Statistical Office: In 2011 the proportion of micro or small enterprises in the German craft sector amounted to approx. 98% (German Federal Statistical Office, 2014). Therefore, it is surprising that this clientele is hardly the focus of current research projects and that only a few research papers, regarding the use and adoption of ICT solutions in European SMEs and craft enterprises, can be identified (see table 1) despite the fact that research focusing on BIS in SMEs has been recommended by the research community for several years (e.g., Harindranath et al., 2008; Snider et al., 2009; Eckl et al., 2010; Leyh, 2014). The heterogeneous branch structure as described above, complicates the mapping of a complete and current literature review on the adoption and use of ICT in SMEs and craft enterprises. Thus, the results listed in table 1 do not claim to be exhaustive and should rather illustrate a general orientation of the literature.

Below, the contents of the identified literature sources, as shown in table 1, are briefly explained and summarised. These contents refer to

- factors affecting the adoption and use of ICT in SMEs (Harindranath et al., 2008; Ramdani and Kawalek, 2008; Antlova, 2014; Sezgin and Oezkan, 2014),
- barriers and issues with reference to ICT adoption in SMEs (Costello et al., 2007; Harindranath et al., 2008; Antlova, 2014),
- differences and similarities in ICT usage amongst European SMEs (Plomp et al., 2014; Ruivo et al., 2014),
- necessary infrastructure for ICT adoption and use in SMEs (Gaere et al., 2008),
- the investment in ICT and the level of innovativeness in SMEs (Schubert et al., 2007) and
- the knowledge about the use of E-Business solutions in micro or small enterprises of the German craft sector (Eckl et al., 2010).

Standardised online questionnaires and structured interviews were used primarily for data collection (e.g., Schubert et al. 2007; Antlova, 2014). Only in a few cases, were telephone surveys or case studies conducted (e.g., Harindranath et al., 2008; Sezgin and Oezkan, 2014). The research contributions focused mainly on the SME sector, with the exception of the research work by Eckl et al. (2010), which was aimed at micro or small enterprises of the German craft sector. As can be seen from table 1 the investigation of the craft sector by Eckl et al. is very similar to the present study. A distinction between the two studies can be made regarding the underlying definition of the objectives and the research questions. While Eckl et al. focus on the use of e-business software in micro and small enterprises and on the resulting effects on the company's success, the present study refers to the analysis of the use of BIS and the collection of figures to characterise the IT affinity in those craft enterprises examined.

The results of the identified research contributions have some similarities. Antlova (2014), Ruivo et al. (2014), Eckl et al. (2010) and Harindranath et al. (2008) report on the need for the application of ICT in SMEs in order to avoid comprehensive competitive disadvantages. However, most SMEs lack skills and expertise in choosing suitable ICT (Harindranath et al., 2008; Ramdani and Kawalek, 2008; Gaere et al., 2008; Plomp et al., 2014; Antlova, 2014). Although SMEs are trying to invest in best-practices and employee training to improve their business (Costello et al., 2007; Schubert et al., 2007, Harindranath et al., 2008; Sezgin and Oezkan, 2014; Ruivo et al.; 2014), some do not recognize the opportunities and possibilities of modern ICT (Costello et al., 2007; Harindranath et al., 2008; Antlova, 2014).

Author(s)	Year	Methodology	Research topic	Focused sector	Focused country/ies
Antlova	2014	Structured interview	ICT Adoption	SME	Czech Republic
Costello et al.	2007	Questionnaire and structured interview	ICT Adoption	SME	England
Eckl et al.	2010	Questionnaire and case studies	E-Business Usage	Craft	Germany
Gaere et al.	2008	Structured interview	ICT Adoption	SME	Sweden
Harindranath et al.	2008	Online questionnaire and telephone survey	ICT Adoption and Usage	SME	England
Plomp et al.	2014	Online questionnaire and telephone survey	ICT Adoption	SME	Netherlands

Ramdani and Kawalek	2008	Structured interview	ERP, CRM, SCM and E-Procurement Adoption	SME	England
Ruivo et al.	2014	Online questionnaire	ERP Usage	SME	Sweden, Denmark, Portugal and Spain
Schubert et al.	2007	Online questionnaire	ICT Usage	SME	Switzerland
Sezgin and Oezkan	2014	Case studies	ICT Usage	SME	Turkey

Table 1. Related work focusing on the use and adoption of ICT solutions in European SMEs and craft enterprises

In summary, the results of the research contributions show that SMEs have difficulties in choosing and implementing appropriate ICT because they do not engage E-Business or attach priority to ICT. Therefore, the results are consistent with statements about the ICT situation in European SMEs (Selhofer et al., 2010; OECD, 2005). It should also be noted that although Turkey does not belong to the European Union, the proximity of Turkey to the European Economic Area is still relevant (see table 1).

4 Research steps and methodology

4.1 Research process

Due to the complexity of the research topic, the heterogeneity of existing software products on the market (Ramdani and Kawalek, 2008, p. 1; Hoyer, 2008, p. 48) and the fact that the human factor and its individual needs and expectations are not directly measurable quantities (Hassanzadeh et al., 2014, p. 102), a qualitative and explorative approach was chosen for both data collection and data analysis. Therefore, the study does not claim to be representative regarding the current IT situation on the use of BIS in the craft sector. Instead, the study aims to identify the complexity of deployed information systems and the heterogeneity of the IT landscape in order to formulate hypotheses for representative studies. The research process is based on a general three-stage investigation structure (Jenkins, 1985), which is described in more detail in the following chapters. Figure 1 shows the overview of the research process.

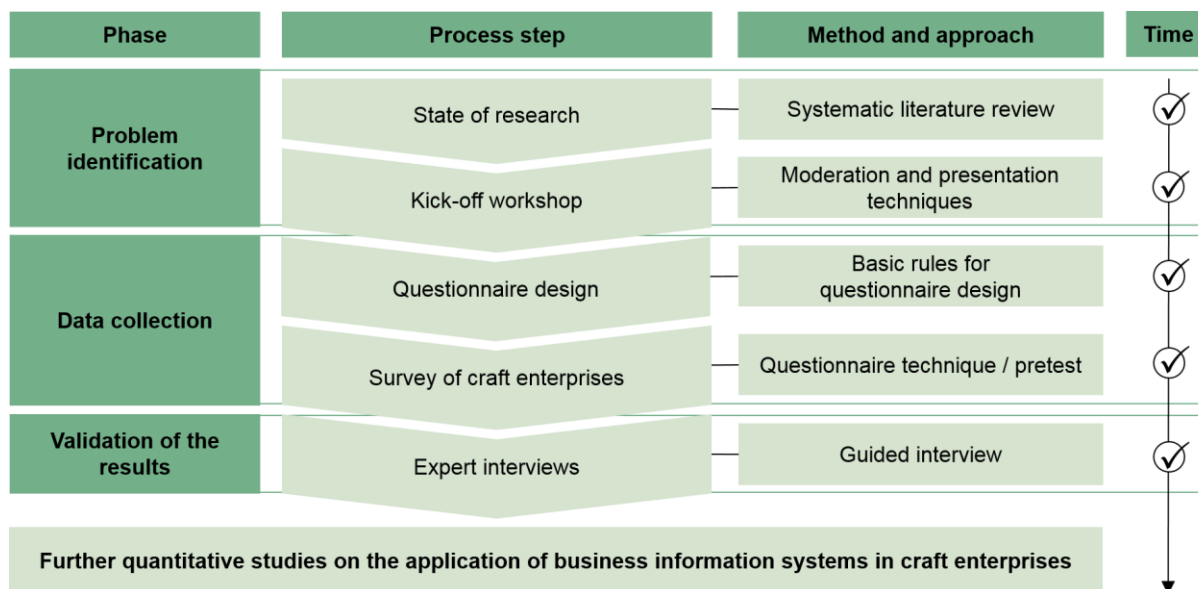


Figure 1 Overview of the research process

Based on qualitative research methods for evaluating computer information systems (Kaplan and Maxwell, 2005), the multiple case study and the qualitative empirical cross-sectional analysis are suitable for the achievement of objectives. According to the triangulation approach (Denzin, 1970) a qualitative cross-sectional analysis was performed in order to answer the research questions. Regarding the challenges in the communication with the target group (see section 4.2), the survey was conducted by means of standardised questionnaires as well as semi-structured interviews. The detailed study of the results in section 5 will be based on multiple case studies.

4.2 Access to the target group

Although micro and small enterprises dominate the craft sector in Germany, it was difficult to establish contact with locally based craft enterprises at the beginning of the research project due the lack of contact data and contact persons. In relation to a uniform understanding of the research topic, language barriers were another access-restraining factor. Access to the target group opened up due to a request to the Chamber of Crafts, which provided contact information for potential enterprises in the respective district. Furthermore, the Chamber of Crafts first made contact with the craft enterprises and gleaning their consent to participate in the preliminary investigation.

4.3 Kick-off workshop

The implementation of an initial kick-off workshop took place in October 2013 with CEOs and IT managers from five craft enterprises, a representative of the Chamber of Crafts and a representative of the eBusiness-guides. As previously described in Section 4.2, the Chamber of Crafts selected the participants of the workshop. The enterprises selected have a wide range of IT affinity and existing know-how. Following this, an overview of the ICT used in the enterprises was necessary in order to determine requirements for branch-specific IT solutions. For this purpose, specific moderation and creativity techniques were used for the survey's initial aspects.

4.4 Questionnaire design and pretest

The evaluated results of the kick-off workshop served as a basis for the development of a standardised questionnaire, which was used for ascertainment of the IT situation in German craft enterprises. The questionnaire was divided into the following topics:

- General questions about the company,
- Questions about electronic data processing (EDP) use in the company,
- Questions for future EDP in the company and
- General questions about EDP in the company.

The questionnaire comprised a total of five pages with 14 questions in German. The questionnaire design and the formulation of the questions followed general and agreed construction rules (Bradburn et al., 2004; Brace, 2013). In this context, short and understandable, as well as open and closed questions were formulated with simple words (Bradburn et al., 2004, p. 151 ff.). In addition, questions were provided for the collection of preferences or assessments with a five-point rating scale in order to give those people questioned the ability to use more than two graded response categories when answering (Brace, 2013, p. 55 ff.).

As part of a pretest, the questionnaire was checked for intelligibility, consistency of content and the required processing time (Bradburn et al., 2004, p. 317). The enterprises which participated in the kick-off workshop were selected for the pretest. The survey was conducted by conventional mail and included a personalised covering letter in addition to the questionnaire.

The first part of the questionnaire (questions 1 to 4) was used to collect general data about the company, such as the nature of the craft or the number of employees. The second part of the questionnaire (questions 5 to 7) aimed to get more background information about the current IT situation. In this context, data was collected about hardware devices currently in use, such as desktop PCs or smartphones, and software products, such as standard office software or individual software. The following set of questions (questions 8 to 10) was used to collect data on planned hardware and software and future hardware and software. In particular, questions were formulated to provide information on the requirements and objectives associated with the introduction of new hardware and software. The questionnaire concluded with general questions (questions 11 to 14) about the current IT situation in the company. In that case, respondents had to evaluate the current IT situation in the company, for example with regard to actuality of the IT or the existing IT budget.

4.5 Expert interviews

To complete the survey results and to get closer information about the current IT situation, expert interviews were conducted in cooperation with the companies involved in the pretest as well as with representatives of the Chamber of Crafts and the eBusiness-guides. In May 2014, the interviews were carried out in the craft enterprises in the form of a semi-structured interview. The guide used for this interview was constructed on the basis of the results of the pretest. Each interview was recorded in writing and digitised for further use. In addition to demographic data and information about the company, questions were asked in particular regarding the application and use of existing IT.

4.6 Selection and characteristics of the case studies

The questionnaire study, which was carried out in February and March 2014 as well as the expert interviews, which were conducted in May 2014, are the basis of the case studies, which are presented in section 5. One craft enterprise each from the craft trades *tile layers and pavers*, *painters and varnishers* and *dental technicians* as well as two craft enterprises from the trade *installer, heating construction, sanitary and electrical engineering*, took part in the study. Regarding the number of employees and according to the SME definition of the European Commission (European Commission, 2003) all companies belong to the category of micro enterprises. Figure 2 shows the overview of the case studies.

Characteristic	Case study 1	Case study 2	Case study 3	Case study 4	Case study 5
Craft	Painter and varnisher	Tile layer and paver	Installer, heating construction, sanitary and electrical engineering	Installer, heating construction, sanitary and electrical engineering	Dental technician
Respondents	1 CEO and 2 IT managers	1 CEO	2 IT managers	1 CEO and 1 IT manager	1 CEO
Staff	9 employees	3 employees	10 employees	5 employees	1 employee
Self-assessment of IT skills	good	good	good	good	very good

Figure 2 Characteristics of the case studies

The collected data is based on the statements from the CEOs and IT managers of craft enterprises. In any case, the respondents are part of the staff, except the CEO. They estimated the existing IT skills within their enterprise predominantly good and once to be very good. An assessment of the different enterprises' IT affinity is made by the authors on the basis of the findings of the investigation in section 5. The companies selected for the case study are characterised by a number of similarities. In each craft enterprise persons responsible the maintenance and procurement of IT are employed for. Furthermore, all companies are located in the German-speaking area and share cultural similarities. In all cases, sufficient experience of BIS could be recorded.

5 Research findings

5.1 Methodological note

A uniform case study structure is required in order to evaluate and compare the case studies and to answer the research questions through the case studies' results. Hence, a case study grid was developed in order to assess the IT affinity of the surveyed enterprises. The analytical technique used, which is based on the inductive category formation (Mayring, 2004, p. 268), makes it possible to process the collected data openly and without distortion from theoretical preconceptions. The statements based on the questionnaire and the expert interviews were paraphrased for further analysis and subsumed into the following categories:

- Use of standard software,
- Use of individual software,
- Actuality of the hardware,
- Data privacy and data security and
- Visibility on the internet.

The evaluation systematics applied for the evaluation of each category is based on the visualisation of circles (Harvey Balls). This symbolism permits the assessment of the individual characteristic values and provides the authors with a basis for the evaluation of current IT affinity showing in the case studies. Based on the results of the survey and the expert interviews, these estimates are logically justifiable, but also evaluated subjectively. The results for the IT situation and the IT affinity in the craft enterprises considered, which are described in the following case studies, are used to answer the first research question and resulted in the ratings shown in figure 3.

Characteristic	Case study 1	Case study 2	Case study 3	Case study 4	Case study 5	Key:	
						Symbolism	Meaning
1. Use of standard software	◐	◐	◐	◐	◐	◐	neutral
2. Use of individual software	◐	○	◐	●	◐	○	unincisive
3. Actuality of the hardware	●	○	●	●	◐	◐	less pronounced
4. Data privacy and data security	●	●	◐	◐	○	◐	neutral
5. Visibility on the internet	●	●	●	●	○	◐	well pronounced
Evaluation of IT-affinity by the authors	◐	◐	◐	◐	◐	●	highly pronounced

Figure 3 Representation of the IT situation and evaluation of the IT affinity deduced from the case studies

5.2 Case study 1: Painter and varnisher with high IT affinity

The use of standard software in the company refers to warehouse management, quotations, purchase orders and invoices (1.: ◐). Individual software solutions are used in the company for the creation of flyers, drafts and colour schemes (2.: ◐). According to the CEO, the introduction of new hardware took place in the second quarter of 2014, so that at the time of the survey, a high topicality of available hardware devices in the enterprise can be assumed (3.: ●). Data backups are stored regularly on an external network attached storage (NAS) and in the cloud to secure corporate data (4.: ●). The craft enterprise operates a company website via a do-it-yourself platform. In combination with Google AdWords and search engine optimisation software, the company is trying increase the possibility of being found by potential customers via advertisements or search engines. Furthermore, the enterprise is present on social networks (5.: ●). Thus, the results indicate a high IT affinity in the enterprise.

5.3 Case study 2: Tile layer and paver with lower IT affinity

This craft enterprise uses only standard software to create standard letters, quotations, orders and invoices (1.: ◐). At the time of the survey, individual software was not used in the company (2.: ○). The selection and implementation of an appropriate branch software is already being planned but it is difficult due to lack of information about available solutions on the market. According to statements of the CEO, the existing hardware in the company is outdated, so prior to the introduction of a new software, investments in new hardware must be made (3.: ○). The corporate data is stored every two to three months on an external hard disk and on a USB stick. For better data protection, the USB stick is preserved in a safe deposit box (4.: ●). The enterprise is present on Facebook and owns a company website, which was developed by an external IT service provider. The contents of the website and the Facebook presence are updated by the IT manager at regular intervals. In addition to the website, the company initiated additional advertisements through Google AdWords (5.: ●). The evaluation of the results of the questionnaire and the expert interviews suggest a low IT affinity.

5.4 Case study 3: Installer, heating construction, sanitary and electrical engineering with medium IT affinity

This craft enterprise uses a standardised office software for general correspondence and for managing working hours. For the management of customer appointments, repair orders and invoices, a branch solution especially adapted for the company is used (1.: ●). Individual software is not used in the enterprise (2.: ○). In the expert interview with the IT manager, it turned out that the hardware used is up to date (3.: ●). The data of the company is secured via a backup system in combination with an external NAS. Due to a lack of trust in cloud providers, the mirroring of data by means of cloud solutions is waived. As the data is not stored physically separated from each other, the company would no longer be able to maintain its operative functions in case of theft or fire (4.: ◐). For contact with customers,

in addition to a company website, the enterprise has a newsletter tool in use, so customers can receive the latest offers promptly. Furthermore, a ticket system makes it possible for customers to send offers or repair contracts via the company's website. The craft enterprise is also present on social networks (5.: ●). Although the interview with the IT manager indicated a high level of IT affinity, an average IT affinity can be registered due to the evaluated questionnaire results and the comparison to the subsequent case study of the same trade.

5.5 Case study 4: Installer, heating construction, sanitary and electrical engineering with high IT affinity

The software in this enterprise is substantially influenced by the use of branch solutions for the execution of contracts and for the administration of wage tables and working hours. For correspondence matters, a standard office software is used (1.: ●). Individual software applications are used for the production of services in the field of energy consulting and the determination of heat demand (2.: ●). The timeliness of the hardware is provided by an external service provider with whom the company has signed a framework agreement for maintenance services as well as on-site or telephone support (3.: ●). The company regularly stores its enterprise data on an external hard drive that is kept in a steel cabinet in the company. As the enterprise described in case study 3, this company no longer appears to be able to ensure the operative functions will work in the event of a complete loss of data either (4.: ●). Via operating a company website, participating in social networks and using Google AdWords for the placement of advertisements, the company has a high visibility on the internet (5.: ●). Thus, the analysis of the results implies a high IT affinity of the company.

5.6 Case study 5: Dental technician with lower IT affinity

The fifth case study represents an exception to the other case studies: the observed craft enterprise gets its orders from only two customers and is run by one manager alone. Due to the resulting low administrative costs in the company, there are only a small number of standardised and individualised software solutions (1.: ●, 2.: ●). The current hardware was rated as less up-to-date by the manager (3.: ●). Measures for data protection or data security are not available in the company (4.: ○). In the interview with the manager, it turned out that the acquisition of further customers is currently not planned. The company is not present in social networks and has no public appearance on the internet. The publishing of advertising via print media or on the internet is not foreseen either (5.: ○). A high IT affinity of the manager can be detected. However, regarding the categories established (see figure 3) and compared to the other case studies, a lower IT affinity can be recorded in the enterprise.

6 Conclusions and hypotheses

Preliminarily, it can be noted that the comparison and comparability of the case studies could be realised on the basis of the case study grid (see section 5.1). Figure 4 summarises the findings from the case studies and the results of the written survey and the expert interviews. In order to clarify the survey results and the expert interviews' outcome, the results were divided into the categories of hardware, software, requirements on new software and questions about the use of IT. These categories allow the derivation and justification of the assessment of the IT situation for each case study. The data which was collected during the research process forms the underlying evaluation basis. The evaluation of the IT affinity by the authors forms the result of the comparison and is based on the individual assessment of the respective characteristics. The symbolism in figure 4 is also based on visualisation using Harvey Balls (see figure 3). The explanation of the research results shown in figure 4 will serve to answer the second research question in detail.

The respondents confirm that the work with a computer is absolutely necessary in the company. The hardware equipment ranges from stationary desktop PCs to mobile devices such as laptops or tablet PCs. In four cases, the hardware used by the companies can be characterised as up to date. Mobile

phones or smartphones are used to communicate with employees or customers. Some craft enterprises use additional messaging services in conjunction with smartphones in order to expand the traditional voice communication by sending photos or videos. These companies reported a significant competitive advantage in terms of the respective improved processing of customer orders. In general, the use of mobile solutions is considered useful by those craft enterprises observed. Furthermore, the results show that only a few craft enterprises use sophisticated measures regarding data protection and data security. To protect the data, it is saved either on a NAS system or on external storage media. Only in one case, was the data mirroring and data backup effected by means of a cloud solution. In order to protect the data from unauthorised access or to avoid the loss of data due to force majeure, it seems scarcely suitable to keep any data backup within the company (see figure 4).

The analysis of the survey results revealed that in these craft enterprises a variety of different standard software and individual software solutions is used. Craft-specific software solutions are used predominantly to manage warehouse, quotations, purchase orders and invoices. For documentary purposes or for planning tasks, standard office solutions are used most frequently. The respondents also criticised that the branch software used in the company often lacks the functions for the execution of craft-specific tasks. An expert interview revealed that one craft enterprise uses a branch software from another trade. According to the statements of the CEO, the usage of the software was justified by the fact that it was possible to realise better support of the operative functions. For the majority of the enterprises the use of internet applications, e.g. for the creation of a company website or to participate in social networks, has availed them of a high visibility on the internet (see figure 4).

Based on the comparison of the case study results, it can be seen that craft enterprises from identical trades turn out to have congruent requirements for craft-specific software solutions. Additional requirements for software solutions exist concerning user-friendliness and high quality of software. In addition, new software applications should be inexpensive and compatible to existing IT, as well as provide a means of integrating existing data. Another finding from the expert interviews is that branch solutions from large software manufacturers often do not meet the requirements of the craft enterprises. According to the respondents, this is due to the fact that these manufacturers are trying to reduce the functionality of their existing larger software solutions in order to enable the application of the software in SMEs and the craft sector. These reductions often result in the loss of necessary functions.

In summary, and, finally, to answer the second research question, it is to be noted that most of the craft enterprises that participated have a high to very high IT affinity. One exception is the craft enterprise of the fifth case study, which deliberately avoids any expansion of the company, so there is no need for it to encircle itself in a well-equipped and up-to-date IT landscape (see figure 4).

Characteristic		Case study 1	Case study 2	Case study 3	Case study 4	Case study 5
Results of the questionnaire and expert interviews						
Hardware	Desktop PC	●	○	●	●	○
	Notebook / Laptop	●	●	●	●	●
	Mobil phone / Smartphone	●	●	●	●	●
	NAS system	●	○	●	○	○
	External storage media	○	●	○	●	○
Software	Image processing	◐	○	○	○	◐
	Branch solution	◐	○	◐	◐	◐
	Office software	◐	◐	◐	◐	◐
	Mobile applications	◐	◐	○	◐	○
	Online- / Cloud-Services	●	◐	◐	●	◐
	Social media	◐	◐	◐	◐	○
Requirements of new software	User-friendly	●	●	●	●	○
	High software quality	●	○	●	●	○
	Inexpensive	○	○	●	●	●
	Compatibility with existing IT	○	○	●	●	●
Questions about the use of IT	The work with the PC is necessary in the enterprise	●	●	●	●	●
	The work with the PC represents a challenge	◐	◐	◐	◐	◐
	The IT budget meets the requirements	◐	◐	◐	◐	◐
	The application of mobile solutions is useful	◐	●	●	◐	◐
	The IT in the company is prepared for the future	●	○	●	●	◐
Rating of the IT situation of the case studies						
Case study grid	1. Use of standard software	◐	◐	◐	◐	◐
	2. Use of individual software	◐	○	◐	●	◐
	3. Actuality of the hardware	●	○	●	●	◐
	4. Data privacy and data security	●	●	◐	◐	○
	5. Visibility on the internet	●	●	●	●	○
Evaluation of IT affinity by the authors						
IT affinity		◐	◐	◐	◐	◐

Key:	
Symbolism	Meaning
○	unincisive
◐	less pronounced
◑	neutral
◒	well pronounced
●	highly pronounced

Figure 4 Comparison of the findings from the case studies

The characteristics of the individual case studies set against each other, as represented in figure 4, make it possible to identify similarities and differences. On this basis, hypotheses for further quantitative studies can be derived by comparing corresponding characteristics. Furthermore, the third research question is answered by means of the following hypotheses.

- H1: The larger the craft enterprise in terms of the number of employees, the more frequent branch solutions are used.

Hypothesis H1 is based on the finding that large companies rely on standardised branch software due to higher administrative expenditure, in relation to employees, customers and the necessary corporate data.

- H2: The higher the self-assessment of IT expertise within the company, the fewer challenges seen in the introduction of current BIS.

Hypothesis H2 is based on the finding that the craft enterprises surveyed have similarities regarding good IT skills and up-to-date hardware.

- H3: Craft enterprises from similar trades have similar requirements concerning business software applications.

Due to the supply of identical products or services within a trade, it is believed that the companies have similar requirements concerning branch solutions.

- H4: The larger a craft enterprise in terms of the number of employees, the more important the measures taken for data protection and data security.

Analogously to hypotheses H1 and H4, a positive correlation is expected between the data obtained in the company and activities used for data protection and data security.

- H5: The higher the self-assessment of IT expertise within the company, the better the visibility on the internet.

Hypothesis H5 is based on the finding that presence on the internet, participation in social networks and placement of advertisements on the internet, are dependent on the self-assessment of IT skills in the company.

7 Limitation and outlook

This study has tried to close the research gap initially mentioned by using a qualitative study. Within a survey, five craft enterprises were interviewed regarding their adoption and use of BIS. The implementation and evaluation of the study was carried out in accordance with scientifically approved methods of qualitative exploratory examination through the use of questionnaires, semi-structured interviews and multiple case studies.

Based on an especially constructed case study grid, similarities and differences between craft enterprises of the same trade as well as craft enterprises of different trades were found. This should be confirmed in further qualitative studies and, further, reasons should be investigated as to how exactly and why these similarities and differences emerge. The categories determined for the assessment of IT skills may well serve to evaluate similar case studies.

This work provides several connecting factors for further research work which goes beyond the preliminary postulated research questions. For these studies, the sample is to be expanded, to obtain a higher representativeness and to permit the use of quantitative evaluation and analysis. Finally, it should be noted that, for the collection of requirements regarding branch software, only a small selection of permissible craft trades were available under German law. The inclusion of licensed craft enterprises, license-free craft enterprises or craft-type trades in further studies would help identify requirements pertaining to craft-specific software solutions and would also achieve a broad range of knowledge.

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