Documentational aspects of integrated management systems on the example of a plastics manufacturing company

Richard Rößler¹, Helen Lachmann², Werner Esswein³

Abstract: Due to increasing competitive pressures and growing and increasing sustainability-oriented stakeholder requirements, companies are forced to shape business processes efficiently by integrating their management systems (MS). Previous research provided more general, theoretically based insights with a lack of practical relevance and links to the theoretical knowledge base. In contrast, this paper provides a comprehensive compilation of current research results that have been obtained on the basis of a literature review, and compares them with the integration processes and problems of a practical case study. The following five specific problem areas were identified: (1) Different objectives, (2) concentration of responsibilities on a few people, (3) limited information value of key figures, (4) low synchronization of documents, and (5) absence of a coherent information database. The documentation and IT support being influenced the most. Findings regarding documentational aspects of integrated management systems (IMS) are discussed in the context of the current state of research. The urgent need for further research efforts in this area is underlined.

Keywords: Integrated Management Systems, Management Systems Documentation, ISO 9001, ISO 14001, ISO 50001, Case Study

1 Introduction

At the present time, companies are in a fierce competition and under constant pressure to achieve cost savings and a lower consumption of resources. Thus, there is a need to continuously adapt changing market and framework conditions. In addition, they have to face diverse stakeholder needs, which have greatly increased in recent years [Ló10]. First of all, the main focus was on the satisfaction of customers. Nowadays this also applies to the expectations of employees, shareholders and society [ZS05]. Due to the complexity of the requirements a systematic approach with clear structures is necessary. As a result, more and more frequently standards-based MS are used, which serve to focus and coordinate the achievement of objectives within an organization [As10a]. These include for example standards for the management of quality (ISO 9001, [In08]),

¹ Technische Universität Dresden, Lehrstuhl für Wirtschaftsinformatik, insb. Systementwicklung, Münchner Platz, 01062 Dresden, richard.roessler@tu-dresden.de
² Technische Universität Dresden, Lehrstuhl für Wirtschaftsinformatik, insb. Systementwicklung, Münchner Platz, 01062 Dresden, helen.lachmann@mailbox.tu-dresden.de
³ Technische Universität Dresden, Lehrstuhl für Wirtschaftsinformatik, insb. Systementwicklung, Münchner Platz, 01062 Dresden, werner.esswein@tu-dresden.de
environment (ISO 14001, [In04]), energy (ISO 50001, [In11]), risk (ISO 31000, [In09]) and occupational safety (OHSAS 18001, [Oh07]), whereby quality and environmental management are the most commonly used MS [Si14].

The application of various separate MS is usually associated with big operating expenses and efficiency losses, for example due to the duplication of tasks and sub-optimal use of resources [ADV14]. These disadvantages can be avoided by companies by integrating their required MS and thereby fulfill all relevant stakeholder requirements in an efficient and effective manner. The objective of an integrated management system (IMS) is to integrate different business processes in a central system and to make processes more efficient [ZS05].

However, a problem is the complexity of the implementation process of an IMS and related efforts. Different areas of the company need to work closely together to synchronize strategies, processes and documents. Despite the number of theoretical approaches and guidelines the implementation of an IMS often proceeds in an unstructured way [JK04]. Due to their limited capacities especially small and medium enterprises are often overwhelmed by the sheer number of requirements and relatively high implementation costs [Sa11].

The present work is to provide practical insights and analyze how the integration of MS occurs in a medium-sized manufacturing company. The focus is primarily on the challenges and problems that may occur during the integration process and the documentational aspects of such an MS. Existing research on IMS and related difficulties was mainly carried out on a theoretical and abstract level. In this paper, however, the operations are thoroughly investigated to identify specific problems by using qualitative analysis methods. Early detection of obstacles thus creates the possibility to early counteract and to develop appropriate solving strategies.

This article consists of six sections. Subsequently, the research objective and the research methods are explained. The contents of the third section constitute the theoretical basis for the topic of IMS. Section four contains the conduction of the case study. In section five the results of the case study are presented and their transferability to other companies is discussed. Furthermore, findings are discussed in the context of the current state of research. The article concludes with a summary of the main findings, a critical appraisal and an outlook on future research directions.

2 Research Design

The aim of this paper is to investigate the subject area of IMS. Based on a case study, the main focus of the analysis is on the barriers and problems in the integration process. A case study is a special form of qualitative-empirical methodology, in which a current phenomenon is investigated in depth and within its real context [Yi09]. Case studies are preferably carried out for the analysis of complex or innovative issues as they allow a
comprehensive and detailed picture of social reality. On the other hand, case studies have openness to new insights and thus promote the development of new fields of research [BG07].

For conducting the case study a personal interview in the form of an expert interview was used as the primary method of data collection, as the technical and background knowledge of a specialist is needed. A document drafted from the findings of the literature review served as an interview guideline. The following research questions should be answered:

RQ1. What specific problems and constraints occurred during the implementation and maintenance of the IMS in the case company?

RQ2. What are the challenges in terms of documentation and how do these findings fit into the state of research?

3 Literature Review

Typically, companies have a wide variety of motivational reasons to integrate their MS. On the one hand, there are external incentives that require the implementation of an IMS. These include, for example, the satisfaction of customer expectations, pressure from the government and competitors or regulations from the parent company [ZTL10]. On the other hand, the independent use of individual function-specific MS in practice may cause disadvantages, which may hinder their internal operations. Amongst others, these include an increased management overhead, the formation of subcultures in the company and thus a slower exchange of information [ZSL07].

By merging the implemented MS and the related use of synergies a sleek, efficient system is created, which can avoid these disadvantages [Sa11]. An analysis of existing literature shows that in addition numerous benefits can be realized by the integration of MS. The possible advantages mainly can be achieved in the following five areas: (1) internal processes (e.g. [ZTL10]), (2) communication and motivation (e.g. [KW98]; [L610]), (3) costs (e.g. [ZTL10]), (4) documentation and paper work (e.g. [Ze11]), as well as (5) audit and certification (e.g. [ZS05]) (Figure 1).

| Internal Processes: Easier, more effective operational procedures |
| Communication & motivation: Improved communication, higher staff motivation |
| Costs: Reduced costs |
| Documentation & paper work: Uniform documentation, lower administrative effort |
| Audit & certification: Integrated audits, reduced certification costs |

**Improved company image and competitive advantages**

Fig. 1: Advantages of IMS
Due to the different requirements that need to be combined, the integration of MS is a challenging process. In addition, every organization is structured individually, pursues certain goals and has different resources and initial conditions. For this reason, it is not possible to develop a universal solution for an implementation strategy of an IMS [RSS14]. Rather, a general methodology or guideline is needed, which can be tailored to the company’s individual operating conditions and objectives [Lö10]. For this purpose numerous theoretical models are presented in literature. Table 1 provides an overview of the main approaches. It should be noted that the approaches are similar to some extent and therefore sometimes it is difficult to distinguish them from each other.

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Short Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stepwise approach</td>
<td>Integration can be carried out in a stepwise manner where it proceeds from partial to full integration [Be03]</td>
</tr>
<tr>
<td>Integration at various hierarchical levels</td>
<td>Integration needs to cover activities at all hierarchical levels in the organization [JRM06]</td>
</tr>
<tr>
<td>Integration through a „TQM“- approach</td>
<td>Use of integrated resources to achieve satisfaction of all stakeholders operating in a TQM [WD01]</td>
</tr>
<tr>
<td>Enhancing the MS standards approach</td>
<td>Integration and enhancing of existing and prospective MS standards [RSK07]</td>
</tr>
<tr>
<td>Systems approach to integration</td>
<td>Business is viewed as a single amorphous system that changes its shape depending on prevalent stakeholders [As10a]</td>
</tr>
<tr>
<td>Process embedded design of IMS</td>
<td>IMS is designed around the core processes focusing on stakeholder requirements [As09]</td>
</tr>
</tbody>
</table>

Tab. 1: Methodologies for the integration of MS

Besides the advantages, experiences from the introduction of an IMS show that companies also face a variety of problems and obstacles that hinder the integration process [Si14]. Depending on the conditions and characteristics of the organization, these barriers may vary and affect the implementation process in various ways. In analogy to [Be12] integration difficulties can be grouped in three categories: (1) standards-related difficulties, (2) external difficulties as well as (3) internal difficulties (Table 2).

<table>
<thead>
<tr>
<th>Problem categories</th>
<th>Possible problems and obstacles</th>
</tr>
</thead>
</table>
| Standards-related difficulties (e.g. [As09]) | • Different scope and structure of the MS  
• Inadequate standard harmonization  
• Different models used in the standards |
| External difficulties (e.g. [RSS14])       | • Lack of international standard  
• Lack of government support  
• Continuous change of regulations and guidelines |
Documentational aspects of integrated management systems

<table>
<thead>
<tr>
<th>Internal difficulties [Si14]</th>
<th>Lack of qualified employees</th>
<th>Low motivation or resistance of employees</th>
<th>Lack of knowledge and understanding for integration</th>
<th>Lack of resources</th>
<th>Lack of strategic planning</th>
<th>Inappropriate organizational culture and structure</th>
</tr>
</thead>
</table>

Tab. 2: Problems of IMS

4 Case Study

A company from the plastics processing industry is used in order to perform the case study. The corporation represents a suitable case example as it has already implemented several MS, which have been linked into an IMS. According to the case study theory it can be seen as a “typical” case, i.e. the underlying circumstances and conditions of the company examined could also apply in a similar form to other organizations. The company, which has been examined in the case study, is one of the production sites of a group from the field of plastic processing industry and is located in East Saxony/Germany. Altogether almost 150 employees work at the production site. In 2014 a revenue of about €40 Million was achieved. At the site a total of five certified MS are being operated. They are presented in Table 3 including the year of their first certification.

<table>
<thead>
<tr>
<th>Management aspect</th>
<th>Underlying standard</th>
<th>First certification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality management</td>
<td>ISO 9001:2008</td>
<td>1993</td>
</tr>
<tr>
<td>Hygiene management</td>
<td>HACCP</td>
<td>2002</td>
</tr>
<tr>
<td>Environmental management</td>
<td>ISO 14001:2004</td>
<td>2002</td>
</tr>
<tr>
<td>Quality management for food</td>
<td>BRC/IoP</td>
<td>2005</td>
</tr>
<tr>
<td>packages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy management</td>
<td>ISO 50001:2011</td>
<td>2013</td>
</tr>
</tbody>
</table>

Tab. 3: Implemented MS of the sample company

The management representative for occupational safety, for environment and energy was chosen as the interview partner for the present case study. He is one of the persons mainly responsible for the integration of MS within the production site. Due to the close cooperation with other management representatives of the group, the interviewee has a
Richard Rößler, Helen Lachmann und Werner Esswein

good overview of all procedures within the company. He has been involved in the integration process from the beginning on and therefore fulfills the role of an expert.

An appointment at the locations of the company has been agreed to in order to conduct the interview. The conversation lasted nearly two and a half hours and was based on a previously developed interview guideline. Along with the answering of the questions an insight into the documentation- and IT-structures of the company was granted.

5 Results

5.1 Analysis of the case study

The analysis of the interview reveals that some of the theoretical approaches from the literature review also occur in the case example. They include, for example, customer requirements and guidelines on the part of the parent company as external incentives as well as reduction of costs as an internal incentive. Regarding the implementation strategy the company primarily build a quality management system according to ISO 9001 and integrated the other MS afterwards. This corresponds to the first integration strategy by [KW98]. The application of a special integration methodology, however, could not be determined. The implementation of a new MS is rather based on the associated standard.

According to the interview analysis, basically five main problems can be distinguished (Figure 2). These include differences in the objectives between the parent and the production plants. Due to this divergences conflicting goals can emerge which need to be determined and adjusted. Another problem is the concentration of responsibilities on only a few people. On the one hand, this leads to a concentration of knowledge on individual employees. On the other hand, the number and variety of tasks may cause the result that the employees responsible have less time for developing the system. A third important aspect is the limited information value of the key figures used. Thus, an evaluation and comparison of the production sites is difficult to achieve. Furthermore, the low synchronization of documents in the different locations leads to a very extensive thus confusing documentation and to duplication of records. This causes redundancies, which complicate the daily operational processes. The last problem area is the absence of a coherent information database. As a result, the maintenance and updating of documents is very work-intensive and inconsistencies between documents and systems occur. Moreover, it is difficult to create a comprehensive overview of relevant group processes.

4 Similar to [EH06] the following six question areas were developed on the basis of the literature review: (1) motivation, (2) planning of integration, (3) implementation of integration, (4) integration level, (5) obstacles and problems as well as (6) advantages and disadvantages of the IMS. The questionnaire can be requested from the authors.
As already mentioned, the problems result primarily from the different framework conditions at the parent and production plants. These include, in particular, the differing product portfolios as well as the variation in the implemented MS. Due to these divergences, the systems have to be aligned constantly and an easy transfer of the elements is not possible. These interface problems have to be recognized and resolved through the development of the IMS.

The results of the case study have also shown that the theoretical concepts from the literature are partially inconvertible or even occur in another form. For example, the appointment of a single integration representative for the entire IMS is not possible as the required expertise and effort would be too high. A similar problem arises for the implementation of integrated audits.

![General conditions:](#)
- Group with several production sites
- Different requirements for parent plant and sites

<table>
<thead>
<tr>
<th>Different objectives</th>
<th>• Conflicts in goal definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concentration of responsibilities on a few people</td>
<td>• Pooling of knowledge • Lack of time</td>
</tr>
<tr>
<td>Limited information value of key figures</td>
<td>• Difficult evaluation and comparison of agencies</td>
</tr>
<tr>
<td>Low synchronization of documents</td>
<td>• Confusing documentation • Duplication of records • Redundancies</td>
</tr>
<tr>
<td>Absence of a coherent information database</td>
<td>• Work-intensive maintenance of documents • Inconsistencies • Lack of comprehensive group overview</td>
</tr>
</tbody>
</table>

Fig. 2: Identified problem areas from the case study

There also exist differences between theory and practice related to the corporate problems and obstacles. For example, the external difficulties mentioned in the literature review were not addressed during the interview. A similar fact was noticed with the standards-related difficulties, which were not mentioned by the management representative either. In this context it was only stated that the practical relevance of some requirements, which derived from the management standards, could not be clearly determined. The request for more practically oriented standards becomes apparent. One aspect, which could be found in theory and at the company, is the lack of resources, particularly the lack of temporal resources. Furthermore, also the prevailing group structure plays a key role. Particular obstacles for the comprehensive implementation of an IMS are the different structures and strategic focuses of the several group locations.
It is anticipated that the five identified problem categories from the case study may also occur in other companies. This would primarily be possible if similar circumstances in the sample company apply, e.g. in a group with several production sites where different framework conditions occur in the parent factory and the agencies.

5.2 Documentational aspects of IMS

From the results of the case study the particular relevance of the information and documentation aspect can be derived. Three of the identified five problem categories concern this aspect either directly or at least indirectly. While *Low synchronisation of documents* and *Absence of a coherent information database* directly indicate problems of an inconsistent and partially redundant documentation, *Concentration of responsibilities on a few people* rather addresses the aspect of knowledge concentration on individuals and an impaired availability of information to third parties. These findings are in line with the findings in literature.

Various authors confirm that the documentation can have a significant impact on the overall success of an IMS. According to Simon et al. [SKC12], an insufficiently integrated documentation is the biggest obstacle to proper management. Pho and Tambo [PT14] emphasize issues related to the document flow and the complex adaptation of function-specific aspects to new documentation requirements of an IMS. Von Ahsen [Vo14] actually concludes that the cost reduction derived from the introduction of an IMS can be eliminated by a very complex documentation.

To address the challenges of an integrated management, several solutions were discussed in literature, addressing the issue of documentation more or less. Abad et al. [ADV14] and de Oliveira [De13] emphasize that an effective integration of MS standards can only be achieved through an intensive documents integration, which forms the basis for a robust IMS. In this context the company needs to build an efficient document management [SKC12]. Pho and Tambo [PT14] emphasize that for effective document control electronic data management solutions need to be used. In the synergetic multi-level model of Zeng et al. [ZSL07] document integration is the product of an efficient integration of strategic aspects pursued by the corporate management. Asif et al. [As10b] focus on the aspect of the integration of documents. They propose a common strategy in an IMS manual, which forms the basis for the further integration process. Griffith and Bhutto [GB09] recommend the users of their proposed framework to support the introduction of an IMS by information technology. This is to promote an intranet-based documentation. The procedure of López-Fresno [Lo10] includes the analysis of the document structure in the first step. They recommend to design an integrated documentation based on a requirements matrix.

The common feature of these approaches is that the issues of documentation are rather discussed only in passing. The corresponding statements are more like a simple guidance and provide less tangible support to build an integrated documentation. According to the authors' knowledge, there are currently only two studies, which bring the aspects of
Ibarra and Calarge [IC14] recognize the need to define an information structure in an organized and efficient way to improve the performance of the information systems. As part of their work, they propose the Zachman Framework for the definition of an enterprise architecture and adapt it to the application of the integration of MS standards. The definition of enterprise architecture through this framework is the basis for the development of a corporate information system. However, the authors present the considerations rather in the form of a thinking stimulation than as a concrete artifact, so that the opportunity to direct applicability is not given. Roessler and Schlieter [RS15] develop a model-based method for establishing and maintaining an IMS. Based on a content and structure analysis of the requirements of ISO 9001, ISO 14001, ISO 50001 and OHSAS 18001 they identify four groups of requirement types. Accordingly, requirements may be identical, integrated, parallel or different. Based on these so-called integration types design templates are proposed to solve the problems of integration within a meta-model, which forms the basis for integration.

It needs to be stated that the issue of integrated documentation is yet often neglected and addressed only by relatively non-specific recommendations. Apart from the works of Roessler and Schlieter [RS15] and Ibarra and Calarge [IC14], there are no studies that address the issues of documentation as an explicit problem of IS research. The need for the continuation of the previous considerations is thus given and represents a wide field for further research.

6 Conclusions

The examination of the production company from the case study revealed that the theoretical findings of the literature review could only partly be confirmed. During the expert interview some of the internal and external motivations as well as advantages quoted in the literature were also identified in the examined case.

Moreover, some interface problems were recognized which are due to the different structure of the parent plant and the production site and which are not mentioned in the literature. In total, five problem categories were deduced from the case study, which could also occur in companies with similar framework conditions. These include (1) different objectives, (2) concentration of responsibilities on a few people, (3) limited information value of key figures (4) low synchronization of documents, and (5) absence of a coherent information database. Documentation and IT support are regarded as the most influenced internal sectors. In contrast, the staff of the company, which was mentioned as the major obstacle in the literature, plays only a subordinate role in the case example. Here, the differences between theory and practice become obvious.

In the discussion of the case study results it became clear that in particular the aspect of
the documentation and maintenance of the IMS is of particular relevance for the company. It was shown that the insights gained in this regard seamlessly fit into the existing state of research. Addressing the issues associated with the described documentation aspects open up a wide field for further research activities.

The findings of the case study are limited as the applied research methods also show some weaknesses besides their particular strengths. One limitation appears from the implementation of a single-case study making a comparison with other companies impossible. The questionnaire developed as part of this case study can be used as a tool for more extensive field studies. These could provide, for example, interesting insights on the specific characteristics of integration with respect to different company sizes and types. Furthermore, the theoretical findings gained from the literature review could be empirically tested in a broader way. However, the consideration of a single case allows a more intensive analysis of both, the internal structures as well as the cause-and-effect relationships, compared to a multiple case study. To validate the results of this article, additional case studies on this topic should be conducted. In addition, it has to be examined if further problem categories can be identified in other companies with similar conditions.

It becomes clear that the present article opens up new areas of research, which should be examined in future studies. Previous findings provide a platform for further research, especially in the field of IMS in small and medium production companies.

References


