Sustainable infrastructures for content services of special interest publishing houses

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Institute for the Study of the Book, Professorship for E-Publishing and Digital Markets

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Outline

1. **Motivation**

2. IT as basic infrastructure in the digital world

3. IT in media industries: State of the art

   a. State of the art in literature
   b. Empirical analysis 1: survey
   c. Empirical analysis 2: case study

4. Sustainable IT infrastructures as a research topic

   a. Learnings
   b. Reference models as basis for sustainability
   c. Outlook

Publishing houses as content (service) provider

- Since hundreds of years Information, knowledge and entertainment is distributed to society by written and printed media as books, pamphlets, newspapers or magazines
  (e.g. Eisenstein 1979, Burke 2011, Gitelman 2014)

- If content shall fulfill this important function
  - it needs to be presented in the right form depending on the reader's reception situation and
  - readers (or users) need to find the right content and to get access to it

Colporteur in Paris 1623
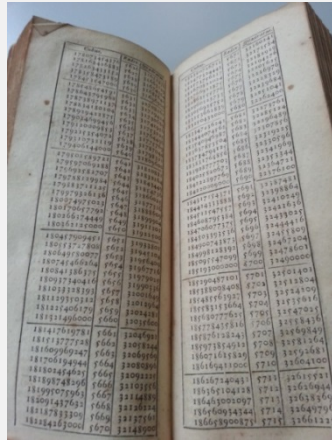
Joh. Paul Buchner's Tabula Radicum, Quadratorum & Cuborum. Nürnberg 1701

Storage of Reclam, 1930. Source: Lyons, M.: Das Buch. Hildesheim 2012

Source: Lyons, M.: Das Buch. Hildesheim 2012
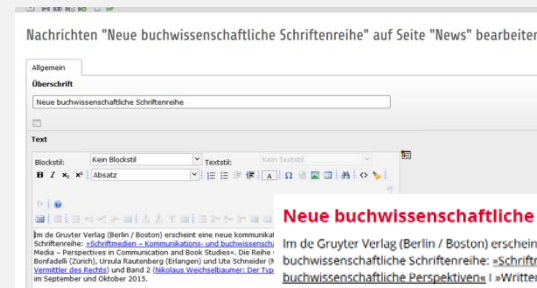
3

Information technology is needed

- For long times in the publishing industry technology was only needed at the reproduction state (›printing‹)
  but not at the stage of collecting, editing , bundling and archiving of content
  (›publishing‹ mainly as intellectual work)

- Nowadays technology is needed at all stages *(e.g. Knaf/Hünemörder 2012; Koblinger 2002, Hill 2010)*
  - typing and editing the content
  - bundling and formatting the content: especially for providing reader's individual content services
  - reproducing the content (printed as well as digital)
  - distributing the content and the media (storage management and logistics)
  - accessing and using the content

Herrmann, R.: Linotype – damals und heute.
In: Typojournal Nr. 4 (2015), S. 5.

Lyons, M.: Das Buch.
Hildesheim 2012, S. 168.

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Data as part of IT

- Data used for description of
  - certain entities of the real world like products, customers, authors, rights
  - the relationship between them
  - and states like stock of products in the warehouse
  → utility data, to work with

- Data used to steer processes
  - Use case 1: select all articles of one author to bundle a reader
  - Use case 2: select all articles bought by one specific customer
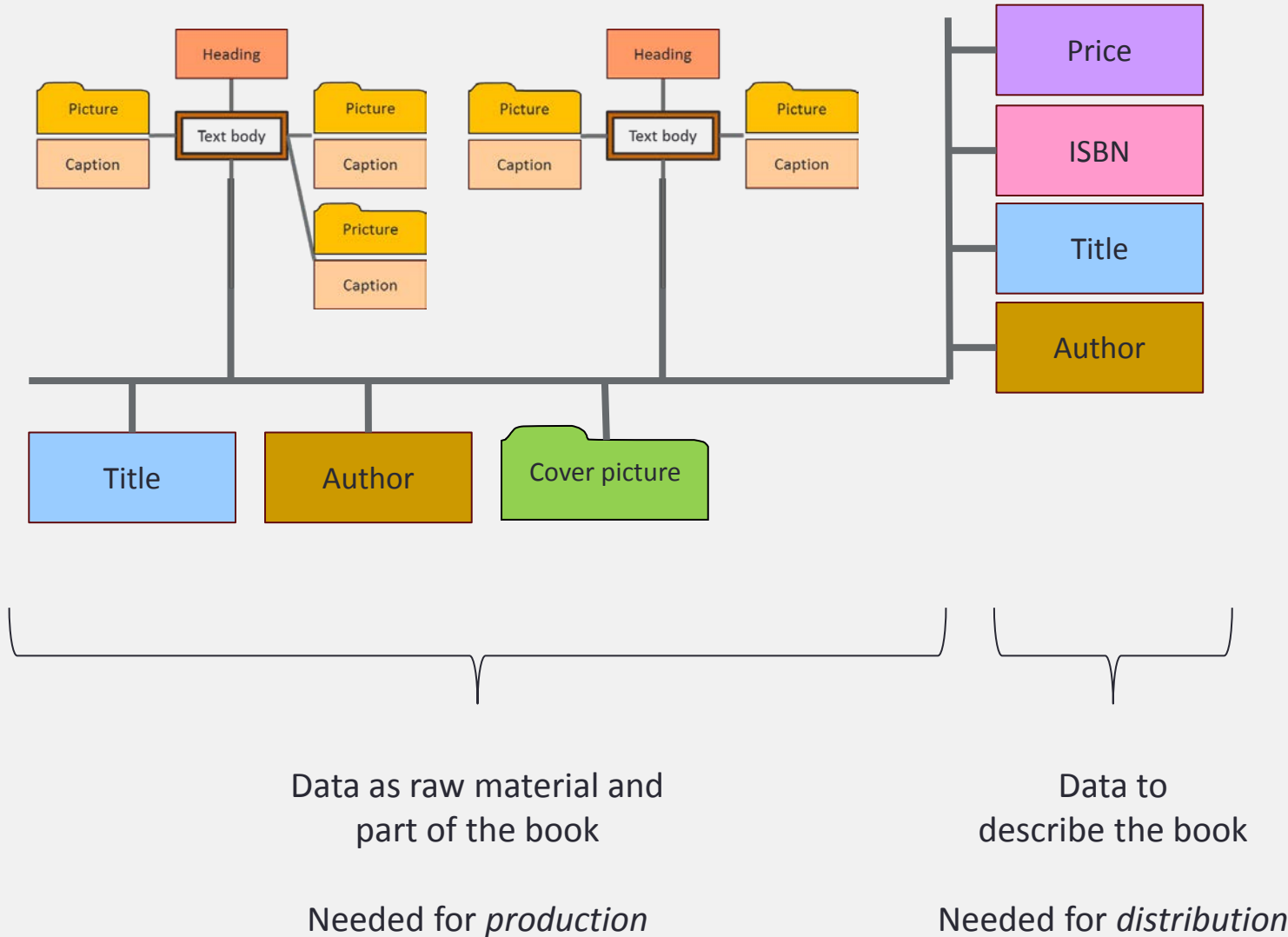 - Use case 3: deliver all new papers to a certain customer
    → control data

- Data as part of the product
  → raw material, assets

Data is a crucial resource
It needs to be managed

This is a ›book‹

Data as raw material and
part of the book

Needed for *production*

Data to
describe the book

Needed for *distribution*

Software applications as part of IT
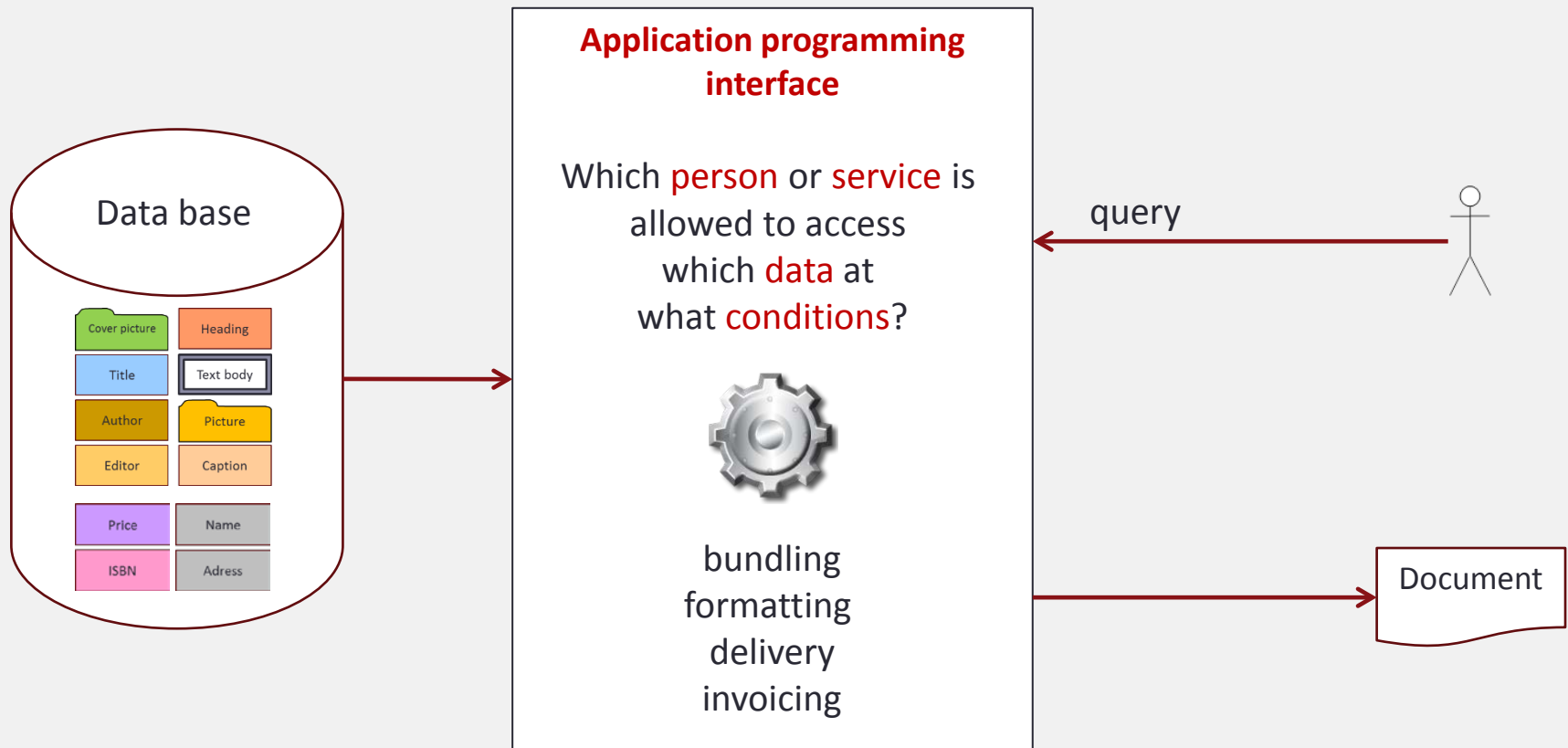
- Software is a tool

- It supports workflows within a business, e.g.
  - ›from manuscript to book‹
  - ›from license request via contract conclusion to license in-payment‹

- Software works with data

analyzing the tasks within an organization, their sequences and dependencies
as well as the needed and produced data
is the key factor concerning having the right software support

Data & software for producing and distributing content

Data base

Cover picture | Heading
Title | Text body
Author | Picture
Editor | Caption
Price | Name
ISBN | Adress

Application programming interface

Which person or service is allowed to access which data at what conditions?

bundling
formatting
delivery
invoicing

query

Document

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Publications with focus on process management

Title	Authors	Year	Published in
Book-On-Demand: Entwicklung eines Konzepts zur Integration der Buchweiterverarbeitung in einen digitalen Workflow	Thielen	2003	Monograph (Chemnitz)
Koordination – Digitaler Workflow in Print-Unternehmen	Friedrichsen	2006	Scholz (Ed.): Handbuch Medienmanagement. Berlin, Heidelberg 2006, p. 377–391
Do process standardization and automation mediate or moderate the performance effects of XML?	Benlian/Hess	2009	Proceedings of the 13th Pacific Asia Conference on Information Systems (PACIS 2009) 2009, Paper 12.
IT Standard Implementation and Business Process Outcomes - An Empirical Analysis of XML in the Publishing Industry	Benlian/Hess	2010	Proceedings of the 31st International Conference on Information Systems (ICIS 2010) 2010, Paper 50.
Change Management in Fachverlagen: Am Beispiel der Einführung eines Redaktionssystems	Heinold, E.; Hagenhoff	2010	Brancheninformationen der Deutschen Fachpresse
Die Standardworkflow-Elemente. Berliner Werkstatt Herstellung – Ergebnisse 2010.	Berliner Werkstatt Herstellung	2011	Working paper (Berlin)
Instituting an XML-First Workflow	Rech	2012	Publishing Research Quarterly 28 (2012) 3, p. 192–196.
Management kreativitätsintensiver Prozesse Theorien, Methoden, Software und deren Anwendung in der Fernsehindustrie	Becker, J.; Schwaderlapp, W.; Seidel	2012	Monograph (Berlin)
Process-Oriented Business Modeling - An Application in the Printing Industry.	Malsbender et al.	2014	Zelm et al. (Ed.):Enterprise Interoperability 2014, p. 47–54.

Publications with focus on data management

Title	Authors	Year	Published in
Identifikation und technische Bewertung von integrierten Datenverteilungsvarianten für eine effiziente Mehrfachnutzung multimedialer Medieninhalte	Benlian	2004	Working paper (München)
Verbreitung, Anwendungsfelder und Wirtschaftlichkeit von XML in Verlagen. Eine empirische Untersuchung.	Benlian et al.		Ferstl et al. (Ed.): Wirtschaftsinformatik 2005. Heidelberg 2005, p. 209–228.
Semantic Web Technologies for content reutilization strategies in publishing companies.	Andreakis et al.	2006	Proceedings of the International Conference on Web Information Systems and Technologies (WEBIST06) 2006, p. 491–494.
Aufbau eines Data Warehouse für ein Verlags-Controlling.	Bücker/Ross	2010	Gleich/Klein (Ed.): Controlling von Dienstleistungen. Freiburg, Berlin, München 2010, p. 181–204.
XML-basierte Anreicherung von Texten: Potentiale für Verlage.	Haußer	2014	Working Paper (Erlangen)
Datenlizenzierung als Diversifikationstreiber in der Medien-industrie.	Pellegrini	2014	Rau (Ed.): Digitale Dämmerung. Die Entmaterialisierung der Medienwirtschaft. Baden-Baden 2014, p. 267–280.

Publications with focus on application systems

Title	Authors	Year	Published in
IT in der Medienindustrie. Trends und Anforderungen.	Hartert	2001	Buhl et al.: (Ed.): Information Age Economy. Heidelberg 2001, p. 43–54.
Present state and emerging scenarios of Digital Rights Management systems.	Fetscherin	2002	Journal of Media Management 4 (2002), 3, p. 164-171.
Systeme für das Management digitaler Rechte.	Hess/Ünlü	2004	Wirtschaftsinformatik 46 (2004) 4, p. 273–280
IT-Verhalten und Defizite in KMU	Meyer/Tirpitz/ Koepe	2010	Monograph (Köln)
Softwareunterstützung für die Bereitstellung klassischer Medienprodukte und -dienstleistungen	Hess/Dörr	2012	Working paper (München)
The Inevitable Shift to Cloud-Based Book Publishing.	Hill	2012	Publishing Research Quarterly 28 (2012) 1, p. 1–7
Mission Possible. Über die Einführung von Unternehmens-software in der Film- und TV-Branche.	Knaf/Hünemörder	2012	Becker et al. (Ed.) Management kreativitätsintensiver Prozesse. Berlin 2012, p. 88–98.
Der Einsatz von Content-Management-Systemen beim crossmedialen Publizieren in Fachverlagen: Ergebnisse einer Erhebung.	Hagenhoff/Pfahler	2013	Alt/Franczyk (Ed.): Proceedings of the 11th International Conference on Wirtschaftsinformatik (WI2013) 2013, p. 359–374.

Publications with focus on ›reference models‹

Title	Authors	Year	Published in
Referenzmodellierung für Buchverlage	Tzouvaras	2003	Monograph (Göttingen)
Generische Bücher - ein graphentheoretisches Modell zur logischen Strukturierung von Büchern in on-Demand-Publikationsprozessen	Kreulich	2002	Monograph (Chemnitz)
Konstruktion eines Referenzmodells für das Online Content Syndication auf Basis einer Geschäftsmodellanalyse.	Pankratz, G.; Benlian, A.:	2004	Becker/ Delfmann (Ed.): Referenz-modellierung 2004, p. 125-149.
Referenzmodell für technische und organisatorische Abläufe bei der international verteilten Medienproduktion	Engelbach/Delp	2006	Working paper (Stuttgart)
Ein Referenzmodell für die Herstellung von Fachmedienprodukten.	Delp	2006	Monograph (Heimsheim)
Referenzmodellierung technologischer Hauptprozesse der grafischen Industrie	Reiche	2008	Monograph (Chemnitz)
Erstellung eines Metamodells zur Entwicklung einer kolla-borationsplattform für die kundeninduzierte Orchestrierung komplexer Dienstleistungen in der Druckbranche	Eine/Stelzer	2014	Kundisch/Suhl/Beckmann (Ed.): Tagungsband Multikonferenz Wirtschaftsinformatik 2014 (MKWI 2014). Paderborn 2014, p. 1808–1820

Synopsis

- Literature review continuously done (English and German media)
- Selection is done very strongly (not everything connected with ›technology & media‹, focus is data management, workflow modelling and application landscapes)

- Not very much literature concerning the topic ›IT and IT infrastructures in the publishing industry‹
- Lack of reference models (workflows, data, system landscape)
- Lack of basic literature about industry specific views and therefore a lack of precise wording, esp. concerning ›data management‹

Topic	Number of publications	Published between
Workflows and workflow management	9	2003-2010
Data and data management	6	2004-2014
Application systems: descriptions of certain systems, existence of systems, implementing processes	8	2001-2013
Reference models	7	2003-2014

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Basic data of the survey

- Focus of interest: state of the art of software support concerning *customer relationship management* at *publishing houses providing expert content* for branches, professions or hobbies

- Motivation: expert content publishers need to have close contact to their readers to deliver the content they need and to develop suitable new content services

- Qualitative survey in 2013, semi-structured interviews, category system for interpretation

  o Part A:
    Meaning of ›focusing on the customer‹ within the publishing industry

  o Part B:
    How is the topic ›customer relationship management‹ grounded concerning organization, instruments, and IT infrastructure

  o Part C:
    General relevance and progress of the topic within the publishing industry

Respondents

Position of the respondent	Company
Content strategist	Specialist publisher: > 250 employees provding content in the field of law, economics, public administration, finance & taxes, health, transportation
CEO	Specialist publisher: > 250 employees provding content in the field of logistics, pharma, electronic, engineering, automotive
Assistant of CEO	Specialist publisher: < 250 employees provding content in the field of law
CEO	Specialist publisher: < 250 employees providing economic news
Senior manager	Business consultancy with media industry department
CEO	Business consultancy with focus on publishing industry
CEO	System provider
Product manager	System provider
Product Manager	System provider
Manager	System provider
CEO	Umbrella association

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Selected results in a nutshell

- Data about customers (readers as well as advertising companies) are collected

- Collected data is about transactions (what was bought when by whom, who has birthday when);
- Collected data is not about
    - the readers content needs
    - what the reader does with the provided content
      (e.g. how does the attorney work with the paragraphs)
    - the customers complaints

    or this data is not utilized

- Publishers do appreciate that integration of customers knowledge into development
  of new content services is needed
- But anyhow new content services are ›armchair decisions‹

- Individualized content services are typically not provided due to missing information about the
 reader / user

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Basic data of the case study

- Focus of interest: *publication workflow* and *design of the IT infrastructure* in publishing houses
- Aim:
  - identifying which data is stored how and were?
  - identifying which working steps are done how?

- Publisher 1 (of about 12 to 15):
  - publishing house providing expert content for the beverage industry
  - about 20 employees
  - products
    - 4 magazines (1 of which is published in 3 languages)
    - 1 newsletter
    - about 120 books

Software application landscape (extract)
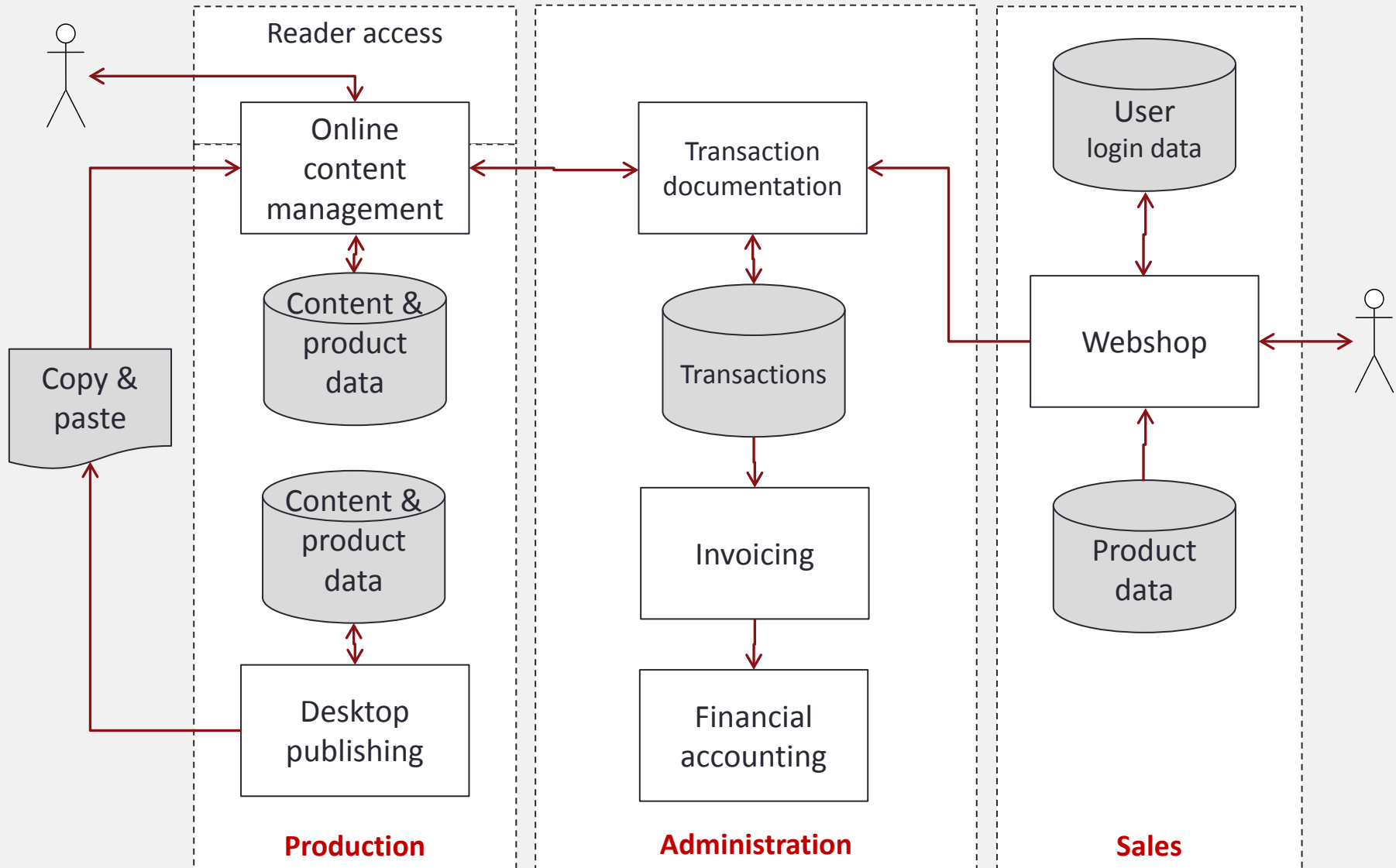
Selected results in a nutshell

- Data are stored redundantly
  - content as raw material is separated in offline and online production
  - product data (title of a publication, author,…) are in the production system as well as in the sales system

- There is no integrated databased storage of data

- There are a lot of legacy applications with a lot of interfaces in between

- Content management system as ›digital assembly line‹ is a critical resource
  - dependency from software providers is high
  - lifecycle costs of a new system would not be covered by extra revenues generated by ›digital content services‹
    -> investment is not financeable

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Synopsis of the situation

- Standard software applications are often too big for small and medium sized publishing houses

- Data pools as well as software applications did grow uncontrolled (patchwork approach), they are not result of modelling work

- Using standard software applications causes dependency from software providers regarding a critical resource (e.g. content management systems as ›digital assembly belts‹)

- A balance is need between
  - workflow and data management efficiency
    - employees need to concentrate on editing the content and not on managing data
    - total cost of ownership include cost of manpower and cost of infrastructure
  - Responsiveness towards (future) requirements in the content service industry

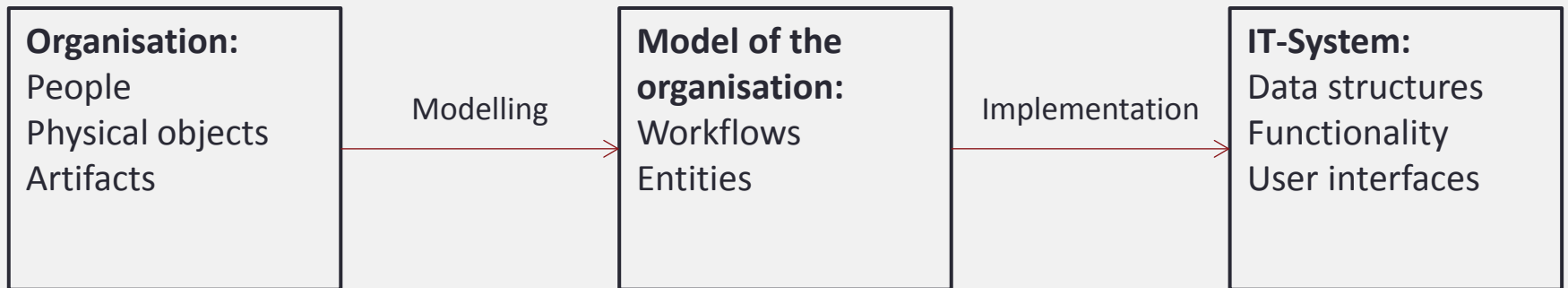- There is a lack concerning reference models as a blueprint or model pattern

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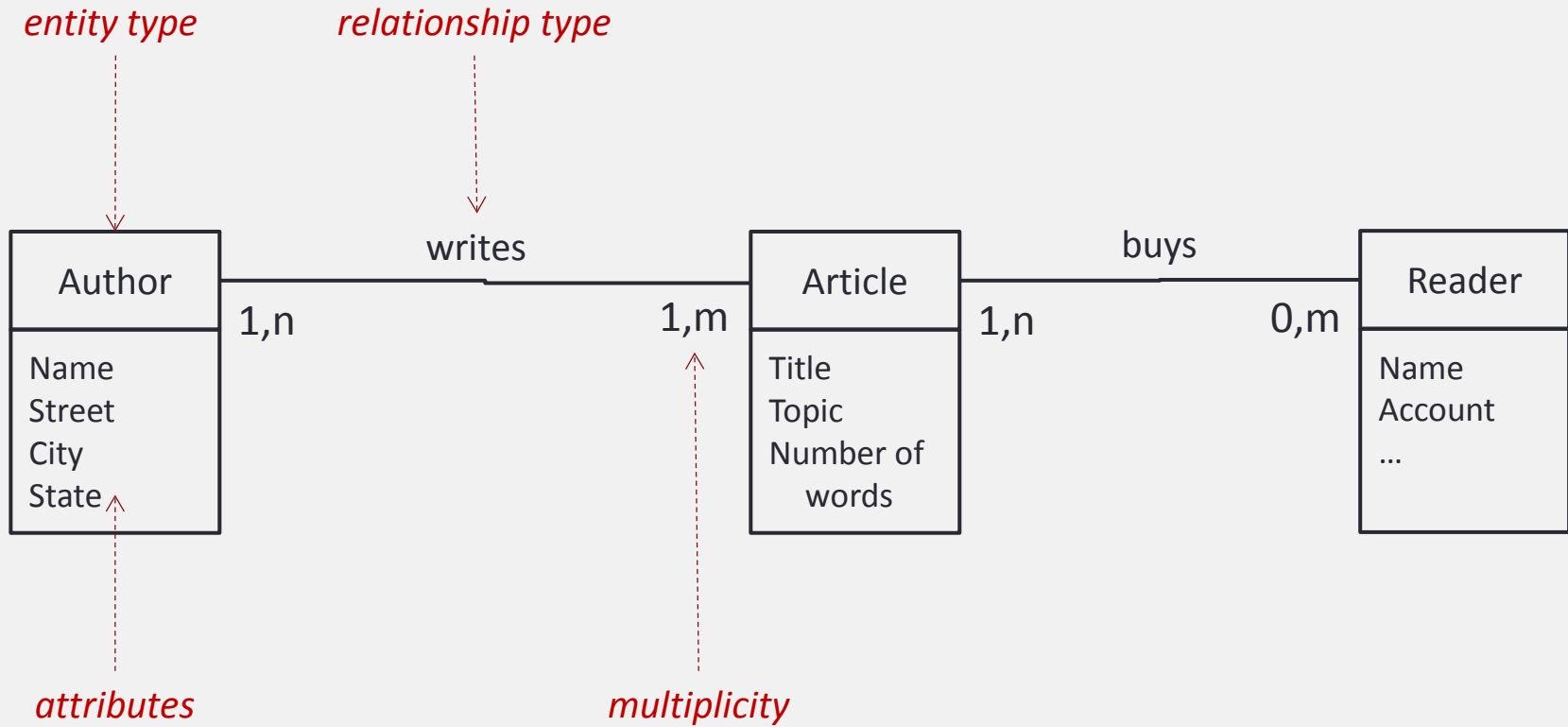   c. Outlook

Reference models

- are general models of a certain class of issues
- describe objects, their typical characteristics and the relationships between them

- can be used
  - as design patterns for creating individual solutions efficiently (blue print, recommendatory artifact)

  - as communication means to understand the issue better

  - as means of standardization within a branch
    → cutting back complexity, uncertainty and avoiding re-inventing the wheel

- It can describe
  - domain specific data, their structure and relationships

  - workflows

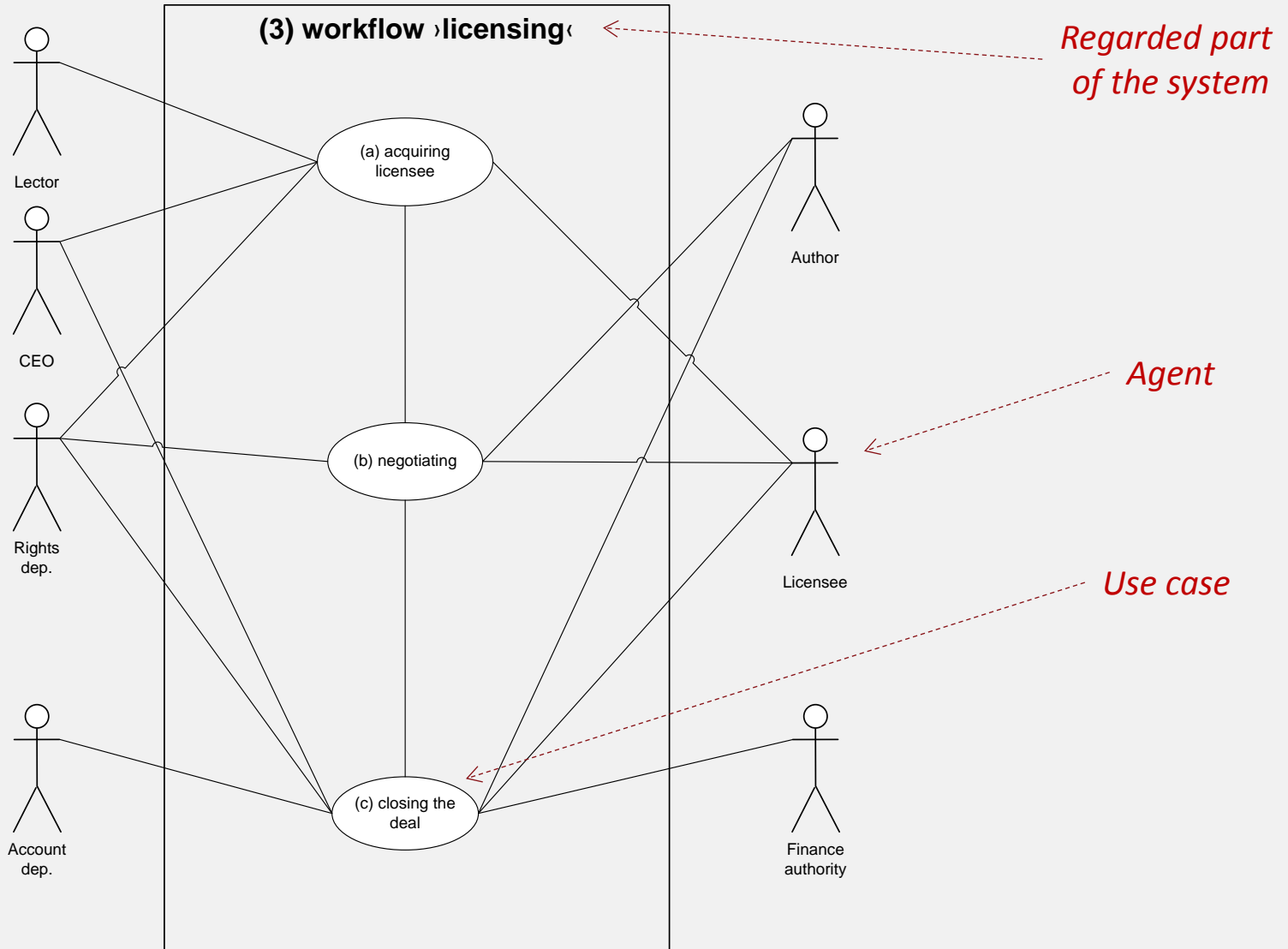 - software application landscapes

See e.g. Fettke, P.; Loos, P. 2003 / Prieto-Dıaz, R. 1990.

Model between real world and IT system

Organisation:
People
Physical objects
Artifacts

→ Modelling →

Model of the organisation:
Workflows
Entities

→ Implementation →

IT-System:
Data structures
Functionality
User interfaces

Example: data modelling

entity type

relationship type

Author
| Name
Street
City
State

writes

1,n

Article
| Title
Topic
Number of
words

1,m

buys

1,n

Reader
| Name
Account
...

0,m

attributes

multiplicity

See for data modelling e.g. Batra, D.; Marakas, G. 1995 / Chen, P.: 1976.

Example: workflow modelling

(3) workflow ›licensing‹

Regarded part of the system

Lector

CEO

Rights dep.

Author

Agent

Licensee

Use case

Account dep.

Finance authority

(a) acquiring licensee

(b) negotiating

(c) closing the deal

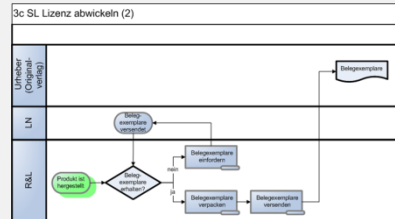*See for workflow modelling with UML e.g. Fettke, P. et al. 2007.*

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Remaining research
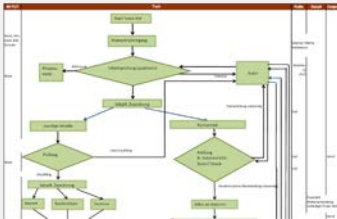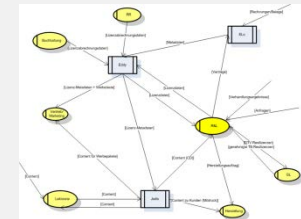
Case study 1　　　　Case study 2　　　　　　　...　　　　　　　Case study 15

distilling reference models
concerning publication workflows and data
for the publishing industry

- Case study based analysis: spring to autumn 2015, each case 2 days locally, using standard notations
- Deduction of the abstract models autumn 2015 to spring 2016

PhD thesis of Jörn Fahsel

Literature

Batra, D.; Marakas, G.: Conceptual data modelling in theory and practice. In: European Journal of Information Systems 4 (1995), S. 185-193.

Burke, P.: A Social History of Knowledge II: From the Encyclopaedia to Wikipedia. Hoboken 2011./ Eisenstein, E.: The Printing Press as an Agent of Change. Cambridge 1979.

Chen, P.: The Entity-Relationship Model - Towards a Unified View of Data. In: ACM Transactions on Database Systems 1 (1976), 1, S. 9-36.

Fettke, P.; Loos, P.: Classification of reference models – a methodology and its application. In: Information Systems and e-Business Management 1 (2003) 1, S. 35-53.

Fettke, P. et al.: Using UML for Reference Modeling. In: Rittgen, P. (Ed.): Enterprise Modeling and Computing with UML. Hershey 2007, S. 174–205.

Gitelman, L.: Paper knowledge. Durham 2014Knaf, J.; Hünemörder, C.: Mission Possible – Über die Einführung von Unternehmens-software in der Film – und TV-Branche. In: Becker, J.; Schwaderlapp, W.; Seidel, S. (Hrsg.): Management kreativitätsintensiver Prozesse. Berlin 2012, P. 87-98.

Koblinger, D.: Die Verlagsbranche im Wandel - ein empirischer Forschungsbericht. München 2002.

Prieto-Dıaz, R.: Domain Analysis: An Introduction. In: Software Engineering Notes 15 (1990) 2, S. 47-54.

Similar Horstmann, C.: Integration und Flexibilität der Organisation durch Informationstechnologie. Wiesbaden 2011, S.80.

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Sustainable infrastructures for content services

of special interest publishing houses

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Abstract

Reliable, high-quality and current content which provides information on industries, technologies, markets and institutional frameworks is indisputably an essential basis for companies to make strategic decisions and stay up-to-date with industry expertise. Special interest publishers have supplied such content to working professionals since the 19th century including printed text-based media, such as newspapers and books. Within the scope of digitalisation, information technology, which is understood as digital information and data processing using applications, has become part of a central infrastructure that must be managed and provisioned effectively. This paper presents the status quo on the application of information technologies in the special interest publishing industry as a specific sector of the media industry based on a literature review and two empirical studies. Based on this research, we define scope for further action and development and propose a domain-specific reference model as a basis for the sustainable provision of information technologies.

Keywords: information technology, application software, software landscape, data management, reference models

1   Introduction

Knowledge and information has been communicated to industry and society for centuries with the help of printed and text-based media such as books, newspapers and magazines. Information on politics and law, specialist knowledge, and development in industries or social trends delivers the basis for educated citizens, well-trained employees and strategic business decisions. As an intermediary between authors and recipients of this knowledge, the publishing industry drives social and economic development (e.g. Eisenstein 1979, Burke 2011, Gitelman 2014). Print media was the largest media market in Germany with a volume of EUR 24 billion in 2013 (PWC 2013).

Digitalisation is of key significance to the industry as authoring processes and products can be completely digitalised. In the current market, content may be published in many forms (cross media), editorial content can be compiled and delivered on demand and advertising customers expect ever increasingly targeted communications. New providers are entering the market of established publishers and disrupting existing roles and practices.

Until now, the publishing industry has demonstrated the characteristics of industrial mass production: print products – including their digital counterparts – were frequently produced (in advance) for an anonymous mass market. Aspects typical of other knowledge-based industries such as service orientation, individualisation and customer integration are the exception (for example in corporate publishing). Factors prohibiting change include small company sizes, limited cash reserves and the focus on production and sales in established product categories (Steinröder 2014). Innovative services based on individualised content and customer data have yet to become popular due to unclear user expectations and affordability. Long-term dependencies on IT service providers and high subsequent costs complicate or prevent decisions on necessary investment in technologies that support operative processes and the development of journalistic and knowledge-mediating services.

This paper addresses this gap: its objective is to illustrate current research in relation to IT infrastructures as a basis of value added in the digital content industry and provide an initial analysis of real business cases and provide future directions for research and innovation.

As part of this, the next chapter will name and investigate areas of research and development in relation to IT infrastructure. Subsequently, the third chapter will analyse

current literature and present an empirical study of a real business case in the special interest publishing industry in Germany. This paper briefly summarises the results of a survey focusing on the areas of customer relationship management (CRM) and user-integrated innovation processes. In a second empirical study, the software and system landscape of a special interest publisher is analysed with regards to which infrastructure deficits currently stand in the way of transforming its business models. Chapter 4 summarises the lessons learned from this study as well as areas for action and development. These insights are also included in a call for domain-specific reference models which is a focus for future research.

2   IT as a basic infrastructure in the digital world

Information technology (IT) is used as a collective term for digital information and data processing using applications. Applications provide functions that support specialist tasks (Schumann/Hess/Hagenhoff 2014, p. 86). In this sense, applications are tools. The functions of an application are applied to data, which can be entered, manipulated or deleted. Examples of this include when a pixel in an image is changed when the user chooses another colour in an image editing program, or invoices are created when the data of a customer of an advertising agency such as name, address, and services ordered are entered into an invoicing application. As a tool, applications always need data to work with.

Ideally, applications are designed to facilitate an entire business process and work with data from a centralised database. It is important to make a distinction between primary value-added processes and processes consisting of supporting activities. While applications for the latter form of processes are not industry-specific in their basic function, applications involved in primary value-added activities are always industry and even company-specific. Content management systems or social reading platforms are examples of such applications in the media industry. Applications in primary value-added processes are important for working efficiently, however they can also generate strategic advantages where they contribute to unique selling points or excellent service. Applications can be classified as standard software and customised software. Customised software is designed to meet the needs of a business and has been especially developed for this purpose either by the company or service provider. Standard software is developed for a mass-market and is designed to meet the standard requirements of the target user group

(Buxmann/Diefenbach/Hess 2013, p. 4). For applications to support tasks and processes adequately, organisations, processes and the required data must be analysed and requirements are formulated in the software specification based on this systems analysis.

Data is understood as formal representations (constructs of characters) from facts and thoughts in a machine-processable form (Balzert 2000, quoted according to Benlian/Hess). Conventional data processing in companies typically focuses on data that represent business service processes and management of these processes. They represent real entities of an application domain and can be related to one another (for example reader X clicked article Y). The data required and processed in these processes is usually structured data. Data is characterised by clear semantic content and can be uniquely identified. Data can be classified as reference data (master data, inventory data) or transaction data (including financial transaction data and audit data).

For unstructured data, the meaning of individual elements is not defined or specified or this must be added individually in a much more granular way for a large collection of data (such as adding content tags and jump links to video sections). These types of data are often highly complex and storage intensive (Somani et al. 2002).

Companies in the media industry are characterised as having products which consist of data: the content (facts and thoughts) is represented by data in different forms (for example static: text and images, or dynamic: audio and video). Data in companies in the media industry are therefore a material asset which is used to produce the final product. These data represent real entities of the organisation and its environment and describe the business service processes and the generated products. The management of data in media companies is not limited to the aspects of conventional business data processing; data is a core means of production based on the codification of thoughts (for example through writing) and the consolidation of assets for works in varying forms (printed book, blog article). The following figure illustrates the data structure of a work consisting of two chapters. While the *title*, the *author's name*, *headlines* and *captions* are structured data, the *cover image*, the *figures* and the *body of the text* are unstructured data. All of these data are included in the generated work. *Title*, *author's name, price and ISBN* are product metadata which describe the generated product. Metadata are needed in the distribution process in printed or electronic catalogues and directories.
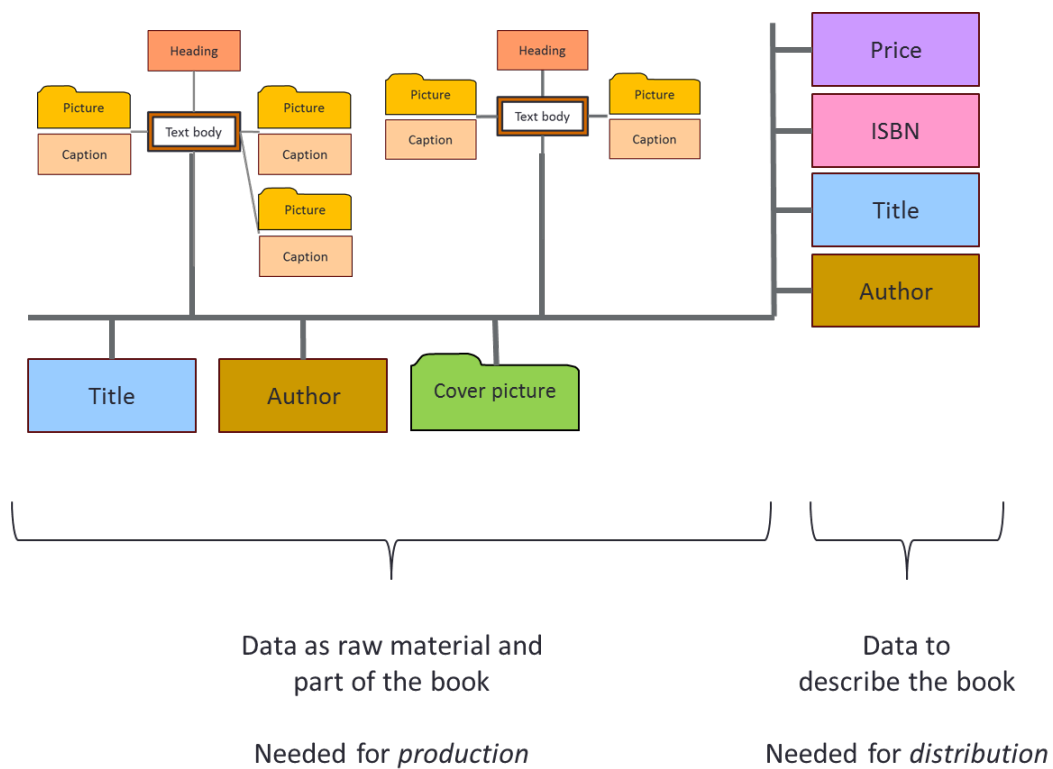
Fig. 1: Data as part of a book and its description

For a long time, technology was only relevant in the publishing industry for printing but not for collating, editing and consolidating content which are traditionally considered as intellectual activities. Today technology is a key part of all value-added stages in the publishing industry (e.g. Koblinger 2002, Hill 2012, Knaf/Hünemörder 2012). Information technology as a general-purpose technology (Helpman 1998) is needed to create and edit content, to package and format content (especially in the area of individual reader content services), to reproduce content (print and digital), to distribute content (warehousing and logistics) and to access and use content. Applications and the ability to organise data using technology have become some of the most critical resources in the media industry. Adequate IT infrastructures are required to ensure the sustainable support of business and production processes and realise business models

3   IT in the publishing industry: State of the art

3.1   State of the art in literature

The appended table (research from February 2015) shows an overview of studies related to information technology in the media industry. It is a result of continuous monitoring of publications submitted to conferences and magazines in German and English. The following organisations in the disciplines of information systems/computer science were monitored (*Business & Information Systems Engineering, European Journal of Information Systems, Journal of Management Information Systems, Journal of Information Technology, Informatik Spektrum, Americas Conference on Information Systems (AMCIS), European Conference on Information Systems (ECIS), International Conference on Information Systems (ICIS), Hawaii International Conference on System Sciences (HICCS), Jahrestagung Wirtschaftsinformatik (WI), Multikonferenz Wirtschaftsinformatik (MKWI)),* as well as the media industry (*Publishing Research Quarterly, The Journal of Electronic Publishing, The Journal of Media Innovations, The International Journal on Media Management, International Journal of the Book, Journal of Digital Media Management, Journal of Media Business Studies, MedienWirtschaft - Zeitschrift für Medienmanagement und Kommunikationsökonomie).* Regular research was also conducted in the Springerlink and WisoNet databases.

This table shows the state of current research according to the areas of application software, workflow and workflow management, data and data management, and reference models in the media industry. The publications were selected strictly by relevance to these areas, as there is a plethora of publications with unspecific topics such as media and technology or digitalisation which are not of sufficient relevance to current research. It is difficult to classify the relevance of new technologies or prototypical solutions for the design of specific digital information products such as a travel guide with ambient intelligence components or new library services based on semantic web technologies. These studies have provided useful insights into the areas focused on in this research such as data structures and data management and logic functions for processing data. However, publications of this type, especially in the field of computer science and library and information science, are too numerous to count. A common characteristic among studies is that they showcase specific solutions and it is difficult to draw generalised findings in

relation to sustainable IT infrastructures for content services. For this reason, these types of studies were not included in the summary.

The analysis of the current state of research shows that the media industry is not often chosen as a domain for evaluating the analysis and design of IT infrastructures. This can be compared to the conclusions of Meyer et al. (2010). The listed studies were published from the year 2000 which is connected to the Internet and e-business boom at the end of the 1990s. At this time, research began to focus on the media, telecommunications and IT industries (for example Shapiro/Varian 1999, Zerdick et al. 2000) as their processes can be completely digitalised. A fragmentary element is notable in the analysis of applications. Individual systems (such as content management systems, digital rights management systems) are described without reference to system landscapes and the interfaces required for integrated data processing. There is also a deficit in process analysis required for the design of applications. Of the eight studies in this area, only a minority include specific process descriptions. Only the study by Berliner Werkstatt Herstellung led by Helmut von Berg included specific processes, however these are limited to the manufacturing sector. There was a similar finding for the management of data as a core resource. There is a lack of studies which formulate domain-specific data structures beyond individual functions and processes as well as research which contributes to adapting key terminology such as reference data, control data and metadata to the specifics of the domain. Reference models have been and will be published for many domains (Prieto-Diaz 1990, Fettke/Loos 2003) with the purpose of publishing a conceptual framework which is not related to specific scenarios. However, there are hardly any examples of such research in relation to the media industry. The available research handles specific phenomena. This results in a lack of established concepts with regards to elementary structures and processes which are massively affected by digitalisation such as primary value-added processes and business model logic. As such, objective recommendations for action and development cannot be made, and sustainable and feasible infrastructures cannot be established.

3.2   Empirical analysis 1: survey

Due to digitalisation, specialist publishers face some fundamental structural issues: digitalisation has not only made it possible for publishers to digitalise products and production and distribution processes completely; it has also resulted in the possibility of

targeting the digital recipient directly, transforming product-oriented business models into service-oriented business models (Brenner et al. 2014, Fesidis 2013, pp. 16–17), and providing content services based on individual demands. To be able to develop such services specifically and to gain and maintain readers as long-term, valuable customers amid increased competition, customer needs must be anticipated and understood at an early stage (Vargo/Lush 2004; Gummesson 2002). In the literature this is discussed in relation to customer relationship management (CRM) approaches to provide a framework for acquiring customer knowledge and using this knowledge for developing strategies and new product development processes (e.g. Ernst et al. 2011; Korell/Spath 2003). Early conceptual approaches which integrate customer relationship management and knowledge management date back to the early 2000s. They are recognised as a further development of CRM and are called 'knowledge-based CRM' (Dous et al. 2005, p. 167) or 'knowledge-enabled customer relationship management' (Gebert et al. 2003, p. 107).

However, specialist publishers are predominantly still producing editions for quasi-anonymous mass markets, which are not ideal for advertisers. The cause of the hesitant adaptation to new market requirements – in addition to a lack of resources – is an absence of knowledge as to how recipients use specialist content in their day-to-day work. There is a lack of a structured approach that describes how specialist publishers can systematically gain customer knowledge and use it in product development. A literature analysis has already been conducted in order to analyse the state-of-the-art concerning CRM within publishing houses. It was found that previous works focused on strategic aspects. Still, these works (e.g. Doyle, 2009; Gilkey 2011) are more similar to experience reports than structured elaborations that can explain how CRM-specific processes could be designed in order to develop customer-orientated offers. Clearly, an integrative concept is lacking. Therefore, a general research question is "How can specialist publishers implement and organise knowledge-enabled CRM?"

This study set out in the first instance to establish the status of knowledge-based CRM and the related IT processes at special interest publishers in Germany. In 2013, 10 experts from special interest publishers, publishing consultancies, publishing software companies and a professional association in Germany were interviewed. Participants were interviewed via telephone based on a script. A category system with common examples and coding

rules was developed and used for analysing the interview results. The kappa coefficient of the inter-rater reliability was 0.73.

Position of the respondent	Company
Content strategist	Specialist publisher: > 250 employees. Providing content in the fields of law, economics, public administration, finance and taxes, health, transportation
CEO	Specialist publisher: > 250 employees. Providing content in the field of logistics, pharmaceuticals, electronics, engineering, the automotive industry
Assistant to CEO	Specialist publisher: < 250 employees. Providing content in the field of law
CEO	Umbrella association
CEO	Specialist publisher: < 250 employees. Providing economic news
Senior manager	Business consultancy with a media industry department
CEO	Business consultancy with a focus on the publishing industry
CEO	System provider
Product manager	System provider
Product manager	System provider
Manager	System provider

Fig. 2: Interview respondents

German specialist publishers still seem to be far off advanced CRM approaches. Overall, the experts described the developmental stage of CRM in German specialist publishers as needing improvement. Amongst other factors, this deficit is caused by the lack of suitable and mature technological infrastructures that are needed to record and process the required recipient data, and suitably connect them with content management systems. It can be assumed that the use of CRM systems is particularly heterogeneous. Experts reported that depending on the size of the publishing house, CRM technology ranges from Excel files in which the customer data is stored to specialized systems like Microsoft Dynamics or Salesforce. These are, however, stand-alone solutions that hardly allow for intelligent content integration.

Furthermore, the experts were asked about the state of the customer-oriented development of services. It is still common practice in the sector for ideas for new offers to mainly be developed within the publishing house itself; customers are only involved in the innovation process in exceptional cases. According to the theory as well as the experiences of other sectors (von Hippel 2005; Gummesson 2002), bad investments can be avoided by means of user integration, especially with regard to technology-intensive and therefore resource-consuming solutions, such as customised content services (cf. Iivari 2010).

Furthermore, according to the experts' opinion, the professionalism of process documentation and optimisation is also dependent on a company's size. The majority of

specialist publishers do not conduct process analyses and documentation as part of CRM at all. With regards to customer-oriented strategy definition and new product development, the experts noted that customer orientation is often merely lip service and that ideas for new products are often developed solely within the publishing house.

3.3   Empirical analysis 2: case study

In the second empirical study, the objective was to analyse and evaluate the business model, business processes and IT infrastructure of a chosen special interest publisher. The aim of this was to gain an overview of current practice as a basis for designing future infrastructures. In the following, the results from this study are discussed (continuing the empirical study from chapter 4.3).

The study was conducted at a special interest publisher which produces specialist media for the brewing and beverage industry. The publisher is among the oldest in Germany and was founded in 1861 with the publication of an *Intelligenzblatt* (advertiser)*.* It has 30 employees and an annual turnover of several million euros. In addition to four specialist magazines, the company also publishes specialist books and regular publications related to the brewing and beverage industry. One of the magazines is published in three languages. The products are available in a printed edition and there is also an online edition of the magazines.

This case study follows the definition set out by Yin (2013, p. 16): "A case study is an empirical inquiry that investigates a contemporary phenomenon (the 'case') in depth and within its real-life context, especially when the boundaries between phenomenon and context may not be clearly evident". Data was initially collected by observing the web and social media presence of the publisher in terms of how the content was presented. Print products and company brochures were also examined at the company. Existing process descriptions were also reviewed. An intensive scripted interview was also held with the director of the publisher which lasted approximately three hours. The results of the case study were verified by the director after they had been recorded.

Business model and product portfolio

Print media is the core business of the company. In order of success, the portfolio includes a specialist magazine published three times a month in Germany, a specialist magazine distributed in three countries, a volume of industry market data and approximately 150

specialist books. The German specialist magazine consists of approximately 1600 pages per year and each edition has a circulation of 3900 copies.

In terms of digital services, the publisher offers an archive of special interest articles available to subscribers, a newsletter, and information on current events via its website and social media channels. The publisher's main revenue is generated from subscriptions and advertising (mainly from Germany) which the director confirms is stable. Currently, two areas have been identified for the development of a sustainable business model. *Increasing subscription revenue*: measures include extending digital services such as a context-specific search function for the specialist article archive for existing subscribers and a public search function for archive article abstracts. *Strengthening its position as a content provider*: the publisher's current position as a leading service provider for specialist information needs to be secured and expanded internationally. The publisher has identified the crowd as a source for achieving this by analysing social media content for current trends in the industry.

Processes and IT infrastructures

At the moment, the publisher's business processes are geared for print production. Authors are often approached at trade fairs for article submissions. Direct submissions are rare. Manuscripts are checked according to editing guidelines, collated and prepared for printing in a DTP application. Subsequently, the manuscripts are archived digitally and the archiving process is partly automated and partly manual. This includes archiving the electronic article and adding the full text of the article to the archive via copy and paste. Business processes are supported by IT applications for administration, production and sales which are partially integrated. The following figure shows the components and processes of the current application landscape.
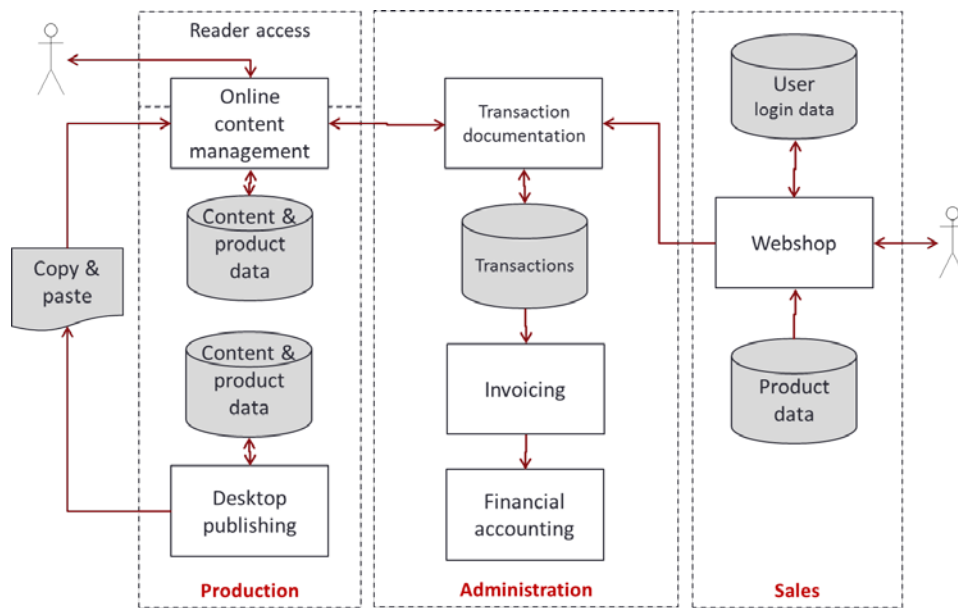
Fig. 3: Software landscape as a data flow diagram

Several areas were identified for ensuring economically sustainable processes and a suitable IT infrastructure:

1. Intelligent search function and pragmatically packaged content for individual readers: a context-specific search function combined with packaged services is planned. Initially, this includes introducing additional meta information and integrating this into the website via categories or a filter search. Packaging content without XML can be achieved using the book slicing approach.

2. Social media: current social media content should be integrated into the website. The publisher is planning to commission a specialist social media company for this purpose.

3. Sustainable platforms and XML structures: reusing granular content (Schulze 2005) based on XML structures and platforms is an objective which has specific challenges. With awareness of these challenges, the publisher is planning to introduce a standard system in the mid-term which meets the following requirements: clear description of the processes supported by the system, transparent cost structure (initial investment, maintenance) and an intuitive interface. From a technical perspective, a cloud-based solution is preferable; however data protection is a critical factor.

In summary, the first case study pinpointed challenges especially for small publishers: on the one hand, the challenges of market positioning for content providers and the necessity to deliver tailored content packages and on the other, a lack of resources for improving

business processes and IT infrastructures. A process analysis identified several issues including redundant data storage, many interfaces to different systems and only partial automation of entering and updating metadata in the content management system. This is preferable to currently available IT solutions which are unsuitable due to functionality or costs. Cloud solutions are an important option for small publishers: such cost-transparent systems are preferable in contrast to in-house systems which have considerable staff and maintenance costs. Cloud solutions also ensure that data and applications are backed up regularly with minimal effort.

This study can be characterised using a schema for case study design adapted from Yin hat Hess/Eggers/Schulze (2003, p. 26) with the dimensions of forming objectives, selecting an object, data collection, data analysis and analysing findings (see next figure).

Dimension		Characteristic		
Objective	Research purpose	**Theory formation**		Theory verification
	Research interest	**Phenomenal**	**Causal**	Actional
Object selection	Scope	Single-case	**Multi-case**	
	Unit	Embedded	**Holistic**	
Data collection	Form	**Qualitative**		Quantitative
	Technology	**Observation**	**Interviews**	**Content analysis**
Data evaluation	Form	**Qualitative**		Quantitative
	Technology	Explanation	Retrospective study	**Cross-case synthesis**
Results evaluation	Content	Theoretical perspective	**Pragmatic perspective**	
	Methods	**Reflected perspective**	Unreflected perspective	

Fig. 4: Morphological analysis of the case studies (adapted from Hess/Eggers/Schulze 2003)

The individual dimensions of the case studies conducted are characterised as follows:

- Forming objectives: reference models in the publishing industry are a relatively unexplored area of research and this study focuses on establishing theoretical fundamentals. In terms of the research interest, on the one hand the objects of analysis are described which represents a phenomenal interest, on the other hand contexts and insights were derived which represents a causal interest.

- Object selection: publishers were chosen from different sectors to fulfil the objective of generating reference models for different publishing topologies. For this reason, a number of cases are analysed to cover the entire domain.

- Data collection: why and how questions are a key part of the study. This is why the collected data is more qualitative than quantitative. In addition to scripted interviews, the study included observations and content analysis. The use of multiple data collection methods follows the principle of triangulation and ensures the quality of the data collected.

- Data evaluation: according to the research objective, common findings across the case studies were synthesised to form an overall perspective.

- Evaluation of results: the evaluation focused on abstracting suitable reference models from a pragmatic perspective. The theoretical analysis, including an analysis of the potential of digitalisation and networking for the publishing industry for the development of a sustainable reference model, is an essential part of the results. The case study method and the resulting findings were evaluated critically.

4   Sustainable IT infrastructures as a research topic

4.1   Findings

Both empirical studies and other research in this field (Hagenhoff/Pfahler 2013; Meyer/Tirpitz/Koepe 2010) show that the support of primary and secondary processes in the delivery of content services with modern and appropriate IT systems is currently lacking in (special interest) publishing companies in Germany. This is partly due to the number of small and medium-sized businesses in this industry and the availability of staff and financial resources to plan, choose and implement modern IT infrastructures. In the research literature and in practice there is still a notably high resistance against using information technology that would interfere in creative processes involved in content generation (Meyer/Tirpitz/Koepe 2010, also insights from industry authors).

The management of content (data as material), product metadata and services and customer/recipient data is separated (cf. Meyer/Tirpitz/Koepe 2010, p. 15). Currently it is difficult to integrate databases efficiently which often means the relationships between entities cannot be made or this can only be achieved through workarounds. This is once

again due to a lack of clear concepts relating to the content as a resource and its relationships to other entities of the domain (for example customers). Often topics relating to working with content and data in practice and research have been left to technically proficient employees, consultants or researchers. Their focus was on technological approaches or specific technologies (XML and semantic web) and is far from the design of business logic and application in real-world scenarios.

In relation to applications, it is evident that software for supporting the publishing process as a form of digital production line and the publishing industry is dependent on its function and sustainability to a high degree. High and difficult to calculate subsequent costs currently stand in the way of investments in modern infrastructures (XML-based integrated systems). Such decisions also involve solving how the dependency on solution providers can be reduced while supplying the industry with professional and adequate applications.

Another fundamental deficit is related to this: the lack of domain-specific rather than business-specific standardisation and defined individual business requirements in relation to processes, data structures and applications. Von Berg proposed that only 5% of all processes in publishing companies are specific, while the remaining 95% are non-company-specific and could form a basis for industry standardisation (Berliner Werkstatt Herstellung 2011). Industry standardisation enables the consolidation and aggregation of demand and consequently a better bargaining position with software providers. Alternatively, it may be feasible to establish an industry-specific software provider similar to DATEV which was founded by German tax advisers and auditors. This would reduce the dependence phenomenon identified above. In other domains, there is a differentiated discussion in relation to standardisation and individual forms of processes and solutions which the media industry could learn from (cf. for example Keil/Lang 1998, van Well 2001, Meidl 2005; Schäfermeyer/Rosenkranz/Holten 2012 and fundamental research by Anderson/Pine 1997 on internal and external variety).

As argued above, the media industry as a domain lacks a common reference model for sustainable information technology which would enable a fundamental establishment of IT requirements on an abstract level independent from specific solutions.

4.2   Reference models as a basis for sustainable IT infrastructures

For many domains, reference models for system architectures and process design were developed for the purpose of specific solutions and establishing concepts (Fettke/Loos

2003). The absence of such research in the media industry is evident in the lack of conceptualisation of elementary structures and contexts. This prevents the formulation of design proposals for sustainable IT infrastructures.

Models represent specific characteristics and aspects of relevant real world scenarios. Models are usually used in developing and customising applications in the scope of systems analysis and requirement specifications. This process defines an actual/target relation between the organisation and IT. This does not relate to the actual organisation. Instead all relevant information about the organisation is abstracted within the model. An IT system or system landscape is developed and implemented according to information from the model (next figure from Horstmann 2011, p. 80).
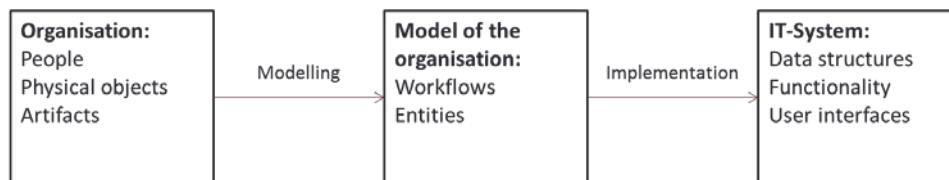

Fig. 5: Relations between the organisation, model and IT system

Reference models are a specific form of model. They can be understood as a conceptual framework which can be used as a blueprint or a model pattern to conceptualise a specific solution. The most important characteristic of reference models is that they can be, or at least are intended to be, re-used (Fowler 1997). From a descriptive perspective, a reference model is a general model of a certain class of issue. From a prescriptive perspective, a reference model is a proposal of how a class of models can be represented (Fettke/vom Brocke 2013) In relation to information technology, it is useful to create reference models for processes, data, applications, and system landscapes and use this to map the primary and secondary processes for an entire domain.

Various advantages and disadvantages are associated with reference models. Standardisation effects within a specific industry are a key benefit. These can achieve reductions in time, costs and uncertainties but also reduce competitive potential. These reference models can be used effectively where characteristics of products and manifestations of processes represent hygiene factors (cf. Hagenhoff/Fahsel 2014 and Hagenhoff/Kuhn 2015). If companies in the publishing industry compete based on content, information technology can be classified as a hygiene factor. This factor must function efficiently and sustainably across the entire industry. Reference models can make an important contribution to this.

4.3   Outlook

Based on the absence of domain-specific reference models indicated in this study, the conceptualisation of a common reference model is an important objective for future research. For this purpose, case studies will be conducted at 15 selected publishing companies. Central questions for the case study analysis are:

- For which business models and product types is content prepared and in which form? (Product and data perspective)

- How are primary value-added processes and related or controlling business processes structured to generate and provide content services? (Process perspective)

- Which requirements can be drawn from this for IT systems? (Applications and system landscape)

The publishing companies have been selected from different sectors within the industry (newspaper publisher, magazine publisher, book publisher, online publisher) to analyse as many different variations of content service generation as possible. The data collected on processes, data structures and system landscapes will be illustrated using a standardised form (for example unified modelling language). On the basis of the case studies, an attempt will be made to identify classes of publishers which have similar business models, processes and data structures. Reference models will be constructed for the identified classes from the real-world process examples which present IT or other components that are deemed ideal and representative.

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Application systems				
IT in der Medienindustrie. Trends und Anforderungen.	Hartert	2001	Buhl et al.: (eds.): Information Age Economy. Heidelberg 2001, pp. 43–54.	IT in the media industry in general
Present state and emerging scenarios of Digital Rights Management systems.	Fetscherin	2002	Journal of Media Management 4 (2002), 3, pp. 164-171.	Digital rights management
Systeme für das Management digitaler Rechte.	Hess/Ünlü	2004	Wirtschaftsinformatik 46 (2004) 4, pp. 273–280	Digital rights management
IT-Verhalten und Defizite in KMU	Meyer/Tirpitz/ Koepe	2010	Monograph (Cologne)	IT in SME publishing houses
Softwareunterstützung für die Bereitstellung klassischer Medienprodukte und -dienstleistungen	Hess/Dörr	2012	Working paper (Munich)	Description of selected application software
The Inevitable Shift to Cloud-Based Book Publishing.	Hill	2012	Publishing Research Quarterly 28 (2012) 1, pp. 1–7.	Necessity of specific software
Mission Possible. Über die Einführung von Unternehmens-software in der Film- und TV-Branche.	Knaf/Hünemörder	2012	Becker et al. (eds.) Management kreativitäts-intensiver Prozesse. Berlin 2012, pp. 88–98.	Implementation of ERP software in movie and TV companies
Der Einsatz von Content-Management-Systemen beim crossmedialen Publizieren in Fachverlagen: Ergebnisse einer Erhebung.	Hagenhoff/Pfahler	2013	Alt/Franczyk (eds.): Proceedings of the 11th International Conference on Wirtschafts-informatik (WI2013) 2013, pp. 359–374.	Special interest publishers and content management systems
Reference models				
Referenzmodellierung für Buchverlage	Tzouvaras	2003	Monograph (Göttingen)	Book publishers
Generische Bücher - ein graphentheoretisches Modell zur logischen Strukturierung von Büchern in on-Demand-Publikationsprozessen	Kreulich	2002	Monograph (Chemnitz)	Structure of books
Konstruktion eines Referenzmodells für das Online Content Syndication auf Basis einer Geschäftsmodellanalyse.	Pankratz, G.; Benlian, A.:	2004	Becker/Delfmann (eds.): Referenzmodellierung 2004, pp. 125-149.	Online content syndication
Referenzmodell für technische und organisatorische Abläufe bei der international verteilten Medienproduktion	Engelbach/Delp	2006	Working paper (Stuttgart)	Media engineering in international media networks
Ein Referenzmodell für die Herstellung von Fachmedienprodukten.	Delp	2006	Monograph (Heimsheim)	Specialist media production
Referenzmodellierung technologischer Hauptprozesse der grafischen Industrie	Reiche	2008	Monograph (Chemnitz)	Processes in the printing industry
Erstellung eines Metamodells zur Entwicklung einer kolla-borationsplattform für die kundeninduzierte Orchestrierung	Eine/Stelzer	2014	Kundisch/Suhl/Beckmann (eds.): Tagungsband Multikonferenz Wirtschaftsinformatik 2014	Web services for the printing industry

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komplexer Dienstleistungen in der Druckbranche			(MKWI 2014). Paderborn 2014, pp. 1808–1820	
Data and data management				
Identifikation und technische Bewertung von integrierten Datenverteilungsvarianten für eine effiziente Mehrfachnutzung multimedialer Medieninhalte	Benlian	2004	Working paper (Munich)	Data integration
Verbreitung, Anwendungsfelder und Wirtschaftlichkeit von XML in Verlagen. Eine empirische Untersuchung.	Benlian et al.	2005	Ferstl et al. (eds.): Wirtschaftsinformatik 2005. Heidelberg 2005, pp. 209–228.	Diffusion and usage of XML
Semantic Web Technologies for content reutilization strategies in publishing companies.	Andreakis et al.	2006	Proceedings of the International Conference on Web Information Systems and Technologies 2006, pp. 491–494.	Content tagging and modularisation
Aufbau eines Data Warehouse für ein Verlags-Controlling.	Bücker/Ross	2010	Gleich/Klein (eds.): Controlling von Dienst-leistungen. Freiburg, Berlin, Munich 2010, pp. 181–204.	Data warehouse in publishing houses
XML-basierte Anreicherung von Texten: Potentiale für Verlage.	Haußer	2014	Working Paper (Erlangen)	XML as data technology in publishing houses
Datenlizenzierung als Diversifikationstreiber in der Medien-industrie.	Pellegrini	2014	Rau (ed.): Digitale Dämmerung. Die Entmate-rialisierung der Medienwirtschaft. Baden-Baden 2014, pp. 267–280.	Data licensing

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Workflows and workflow management				
Book-On-Demand: Entwicklung eines Konzepts zur Integration der Buchweiterverarbeitung in einen digitalen Workflow	Thielen	2003	Monograph (Chemnitz)	Books on demand
Koordination – Digitaler Workflow in Print-Unternehmen	Friedrichsen	2006	Scholz (ed.): Handbuch Medienmanagement. Berlin, Heidelberg 2006, pp. 377–391	Digital workflow in publishing houses
Do process standardization and automation mediate or moderate the performance effects of XML?	Benlian/Hess	2009	Proceed. of the 13th Pacific Asia Conference on Information Systems 2009, Paper 12.	Process standardisation and automation
IT Standard Implementation and Business Process Outcomes - An Empirical Analysis of XML in the Publishing Industry	Benlian/Hess	2010	Proceed. of the 31st International Conference on Information Systems 2010, Paper 50.	Standard software
Change Management in Fachverlagen: Am Beispiel der Einführung eines Redaktionssystems	Heinold/Hagenhoff	2010	Brancheninformationen der Deutschen Fachpresse	Specialist media publishers, content management
Die Standardworkflow-Elemente. Berliner Werkstatt Herstellung – Ergebnisse 2010.	Berliner Werkstatt Herstellung	2011	Working paper (Berlin)	Workflows in publishing houses
Instituting an XML-First Workflow	Rech	2012	Publishing Research Quarterly 28 (2012) 3, pp. 192–196.	XML as basic technology
Management kreativitätsintensiver Prozesse: Theorien, Methoden, Software und deren Anwendung in der Fernsehindustrie	Becker/Schwaderlapp/Seidel	2012	Monograph (Berlin)	Management of creativity based processes
Process-Oriented Business Modeling - An Application in the Printing Industry.	Malsbender et al.	2014	Zelm et al. (eds.):Enterprise Interoperability 2014, pp. 47–54.	Printing industry