

Review of information systems research for media industry—recent advances, challenges, and introduction of information systems research in the media industry

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Abstract Global media reports clearly show a tremendous increase in spending on Information Technology (IT) and Information Systems (IS) in the media sector. Two main trends are currently visible. First, as stated in McKinsey & Company's Global Media Report, consumers continuously shift from spending on traditional media products towards rapidly-increasing spending on digital services and media products – consumer patterns have rapidly changed. Second, as stated in Gartner's reports about the media industry, spending on IT services in the media industry increases gradually, and as a whole, the media industry is the third-largest spender on IT, after banking/finance and manufacturing. Third, as reported by both authors in their works, several facets of the media industry have undergone extreme changes, including business models, declining revenue, content models, management, economics and public funding. The aim of this study is to investigate research work related to IS in the media industry, in particular in the management and economic areas. To conduct this study, we investigated a large corpus of studies that have been contributed to IS research within the Association for Information Systems (AIS) within the past decades. We utilised advanced text mining methods to identify contributions and thematic areas. Our results clearly indicate that there is a significant downward trend of research works dealing with media industry aspects. This trend was a surprise to us, as it contradicts the emergence of new digital technologies which became key drivers in the media industry

after 2009. We conclude this article by giving research directions, illustrating the opportunities and importance of investigating media industries within the context of IS, and introducing the research field of *Information Systems in the eMedia Industry*.

Keywords Media industry · Media business · Broadcasting · Social media · Print industry · Information technology

JEL classification L82 · L86 · O35 · Y20 · Z10

Introduction

Today, more and more consumers are faced with the digitalisation of media services. Entertainment and media content is delivered and distributed as a digital service – from digital books, Internet TV, digital games and motion pictures to mobile phone apps. The Global Media Report by McKinsey & Company illustrates the tremendous change in the global media and entertainment sector from the viewpoint of consumer spending: by 2019, spending on digital media products will increase to a market share of over 50%. This is a rather alarming number for traditional media industries, which seem hardly able to cope with the tremendous transformation of the industry that is taking place. Three basic drivers are identified by the report, and are also supported by other literature: 1) a growing number of connected consumers (Ben-Shabat et al. 2015), (Mehra 2014), (Perkins et al. 2015), (Bothun and Vollmer 2016); the rise of global content intermediation and distribution (Hess and Von Walter 2007), (OECD 2010), (Benton 2015); and 3) an increase in digital media advertising (Slefo 2016) and (emarketer 2016). This trend is not essentially a drawback for the global media and entertainment sector. The same

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report foresees 6.4% – a total of 2.1 trillion USD – of growth in global media spending between 2013 and 2018.

IBM (IBM n.d.), SAP (SAP Solutions for Media Industry n.d.), and Google (Google n.d.) are leaders in industry providing information systems solutions across industries. Solutions provided by these players give insights into current solutions they provide for media industry. Thus by taking a look at their issues in developing information systems for media industry, we see seven major directions:

- Digital content end-to-end, advertisement analytics, and real-time consumer intelligence;
- Social media marketing, data warehousing, targeted marketing, and the creation of new revenue streams;
- Collaborative productions, increase consumer loyalty, digital archiving, and social media analytics;
- Audience trends, personalized offerings, marketing, subscriber marketing, digital asset management, and media services;
- Subscriber management, individualized offerings, and financial performance management;
- Increasing revenues from IPs, targeting niche audience groups, and audience preferences;
- Consumer feedback management, non-real-time consumer intelligence, and understanding audiences.

They Both, IBM and SAP, benefit from the trend in increased spending on IT infrastructure by corporations. As stated in Gartner's report, the results of which have been informed by TechCrunch (Lomas 2013), the media industry is the third-largest IT spender, after banking/finance and manufacturing. This trend is underlined by steady growth predictions, in the range of 4.4% yearly spending on IT systems in the communications and media industries. Despite the latest forecasts predicting a decline in global IT spending of 2.5% across all media sectors, media and communication remain steady drivers in IT spending forecasts (Gartner 2015).

The technological and economic environment of media companies has accelerated during the past decade. Traditional media organisations are attempting to transform into digital media houses and cope with the emergence of new forms of digital media. New technologies will have an impact on the intra-organisational level, especially on information systems. (McLuhan 1994) stated that new technologies integrate old technologies, but they also cause market fragmentation and might render old forms of media obsolete. He also stated that new technologies transform society and how we apply this new technology (McLuhan 1994). In today's world of digital media, we can find many examples: digital advertising, personalised services, changing revenue streams, online portals and publishing, data journalism, and mobile apps, for example. But the question is, how can media corporations cope with these trends? In particular, which

research directions should IS research consider, in investigating potential solutions for today's media managers? How can IS research media managers help to cope with problems and issues in handling these trends?

The goal of this article is to investigate the gap between IS research and typical issues discussed in media industries. The topic of how IS research can be applied in media industry settings was first introduced in Lugmayr 2013a, and is the core topic of the AIS special interest group AIS SIG eMedia (SIG-eMedia n.d.). It can simply be defined as *systems processing and "managing information as a strategic resource for improving organizational performance [and] involv[ing] the development of strategies and introducing systems and controls to improve information quality over time"* Chaffey et al. (2011)), in the context of the media economic sector. Thus, the challenge is to create a link between the research field of IS and media management/media economics. As the research field of media management/economics (see p. 1029 (Albarran 2014)) is already rather complex, evolving, and affected by many external forces requiring a clear differentiation in relation to other economic sectors, the issue becomes more challenging. Nevertheless, media companies, according to (Hess 2014), are in the process of transforming from professional publishers who produce or aggregate, bundle, and distribute content in the pre-digital era, towards "organizers [sic!] of public, media-based communication which today operate as content providers, as platform operators, or in hybrid forms" (Hess 2014). Their media managers range "from [being] CEO of a media conglomerate, director of small agencies, sole proprietor of a for-profit, technology startup, or as single owner or freelancer" (Hollifield et al. 2016). These viewpoints of the media industry provide an excellent starting point for further discussion.

The reader who would be interested in investigating the changes that the media industry is currently undergoing has numerous research works to choose from. In particular, the shift from traditional towards digital media companies, and that shift's effect on media management/economics research is discussed in many works (e.g. (Albarran 2014); (Hess 2014); and (Wirtz et al. 2013)). Other researchers address the issue of product portfolio management as a success factor, as well as increased profits through providing searchable, re-contextualised, and repackaged content (Perkins et al. 2015; Friedrichsen et al. 2015). In particular, we would like to refer to the activities conducted by the AIS SIG eMedia (SIG-eMedia n.d.) and its publications ((Lugmayr 2013a) and (Lugmayr 2013b)) related to this issue, for example, (Lugmayr 2013c), (Stockleben and Lugmayr 2013), (Scheib 2017), (Lugmayr 2013d), (Lugmayr and Stojmenova 2013a), (Lugmayr and Stojmenova 2013b), and (Stojmenova and Lugmayr 2013). In this study, we examine IS research between 1981 and 2015. We introduce IS research in the scope of media management/economics as a research field, and pinpoint research gaps where

the IS community fails to address media management and media economics-specific issues.

Research method and approach

To better research with this study's topic and contribute to epistemology, we divided the study into four research approaches:

- 1) automated retrieval of a set of publications from the AIS library, and creation of simple statistical information such as discipline areas, keywords, publication channels, trends, and authors
- 2) automated text-based analysis of the complete corpus of the AIS library between the years 1981 and mid-2015 (based on the approach presented in (Lugmayr and Zotto 2015a) to identify trends, topics, and themes through topic clustering, categorisation of publications, and examination of corpus characteristics
- 3) identification of current research issues in the media industry through a literature review
- 4) applying epistemological theories with coherent guidelines, to decide where IS research is lacking in terms of media management and economics, through a literature review and cross-examination of the found results.

We based our automated text-based analysis approach (as described in (Lugmayr and Zotto 2015a)) on the complete corpus of the AIS digital library between the years 1981 and mid-2015. We searched for a broad range of media industry related keywords (see Table 1) in paper titles, leading to a set of 2143 publications. We attempted to extend the set of results by adding more media-related keywords, but discovered that this still produced the same set of publications. An approach to extend searches towards other fields such as abstracts led to too many ambiguous and false-positive results. We also restricted the search to publications from the AIS database, as we could not automate the retrieval of search queries when

Table 1 List of keywords for search queries in the AIS eLibrary (2,143 publications, of which 1,761 were published as part of a series, and 382 as journal articles)

Media, social media, television, print, magazine, motion pictures, cinema, digital games, games, film, mass communication, mass media, advertising, web, broadcast, video games	Recording industries, print media, book, newspaper, internet, content, online, creative industry, recording, virtual reality, augmented reality, TV, video	Audience, www, mobile, blog, RSS, podcast, radio, animation, live action, documentary, news, journalism, publishing, audio recording, music
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searching across all repositories and obtain publication titles, abstracts, authors, venue, and publication keywords. Our goal was not to have a historical study of media-related contributions to IS, but to identify which issues are important in the field of IS when integrating media management/economics research. We deemed this an appropriate approach for this study.

The automated text analysis process was conducted in four phases (Lugmayr and Zotto 2015a) provides a detailed description of these). First, we applied text cleaning methods to clean the corpus, removing special characters, unessential characters, stop-words, and stemming. Second, we conducted a word level analysis of several publications, which included a simple term frequency analysis, document term matrices, word clusters, and publication vocabulary. Third, we applied automated topic and sub-topic classification utilising the *Latent Dirichlet Allocation* (Blei et al. 2003a), to identify and cluster themes within the publications. Fourth, we performed a manual *Keyword in Context (KWIC)* analysis to investigate the publications manually, to gain further insights into what is covered in current IS research, and what should be covered in addition.

IS-research on the media industry between 1981 and mid-2015 covered by existing IS research

Publication channels

To investigate publication channels, we distinguished between conference publications and journal articles. The division of research of IT in media industry between journal articles and scientific conference publications is 18% journal articles (382), and 82% conference articles (1761) during the investigated time period.

Conference publications

Based on the keyword search of the complete publication database described in the research methods section above, we identified the most prominent IS conference venues for publishing results related to media industries. The analysis of media-related keywords, in combination with specific conferences mentioned within AIS, shows that Americas Conference on Information Systems (AMCIS), 54%), followed by International Conference on Information Systems (ICIS, 15%), and Pacific Asia Conference on Information Systems (PACIS, 13%) are the most significant conferences for media research. Both Bled EConference (eBled, 9%) and European Conference on Information Systems (ECIS, 8.5%) contribute about 9% each, while Australasian Conferences on Information Systems (ACIS) lags far behind others with 0.7%. The Midwest Association

for Information Systems (MWAIS, 0.6%) only appeared twice, therefore the data is not representative.

Journal articles

To gain an understanding of the publication channels of media-related journal articles, we conducted a similar analysis as with scientific conferences. Two journal series publish 59% of media research: Communications of the Association of the Association for Information Systems (CAIS, 36%), and Management Information Systems Quarterly (MISQ, 23%). A small share of articles covering media industry topics are distributed over other journals such as Journal of the Association for Information Systems (JAIS) and Journal of Information Technology Theory and Application (JITTA, each 10%), whereas other journals such as Business & Information Systems Engineering (BISE, 7.6%), Scandinavian Journal of Information Systems (SJIS, 4.7%), and others more or less lack media industry coverage, which includes AIS Transactions on Human Computer Interaction (3.9%), Pacific Asia Journal of the Association for Information Systems (3.7%), and the Revista Latinoamericana Y Del Caribe De La Association De Sistemas De Informacion (1%).

Publication coverage of media industry topics

Since the 1980s, dynamic growth in media markets has been mainly driven by new information and communications technologies. In the last 20 years, the internet changed all added-value structures of the media industry. One prime example is music industry, where online download stores as e.g. Apple's iTunes disrupted existing business models through the introduction of online music stores. The results of the analysis in (Wirtz et al. 2013) show a downshift of the number of papers that deal with research on the internet from 2006 to 2010, compared to the previous four-year period. Thus, in 2010, internet topics were equally often published as music- and film-related papers. Traditional media research in media management and economics (MME) focused on individual media genres, thus can be considered as research considered in silos. This form of research still exists, but it plays more and more a subordinate role today (Wirtz et al. 2013).

Figure 1 shows the share of media industry-related IS papers for the period 1981 to 2015. The rise of media-related IS research shows a gradual awareness of media-related issues within IS from 1981 to 1999. Between 1981 and 1994 there were only 7 neglectable contributions related to media. Between 2000 and 2009, most papers had been published, peaking at 10% of total publications in 2009. In 2010, it seems that obsolete of media-related papers began.

Despite media industry still being the third-largest IT spender, this downturn required us to dig deeper into the data to find out why there was such a strong downturn. Due to the

recession of 2008, legacy media companies were spurred "to dramatically cut their permanent workforces through layoffs and attrition and increase the number of contract and freelance workers they hire[d]" (Hollifield et al. 2016). This may partly explain why the media management/economics-related research declines dramatically in 2009. Nevertheless, the share of topics throughout the years is depicted in Fig. 2.

Contributions towards information systems research themes

When focusing on the themes of the contributed media industry and media management/economics-related research works (see Fig. 3), most of the research was conducted in the fields of eBusiness and eCommerce. These themes apply to 48% of publications of media-related research, followed by Management Information Systems (MIS) research (13%), social and behavioural research (7%), and communication and communication technology (9%). Typical issues discussed in the media industry, such as marketing (2%), mass communication (1%), and, in particular, advertising (0.5%), show a clear lack of research contributions that matter in the domain. Though, we have to stress, that we only have been considering a sub-set of IS literature, and researchers might not consult IS literature as primary source when investigating marketing and advertising. We only would like to argue, that if IS research would like to attract media scholars, these typical media industry topics would need to be more emphasized.

Contributions of IS research to the media industry

The results of the analysis show that traditional technical clusters of media types are no longer valid. We dug deeper into the data to identify a bottom-up model of themes and subthemes based on media-related IS papers. To cluster the topics of several publications, we applied the Latent Dirichlet Allocation (LDA) as developed by Blei et al. (Blei et al., 2003b). Despite the model converging earlier, we selected a high number of iterations (> 400) to increase the precision of the model. The model was parametrised with 5–20 clusters, from which the most suitable cluster was selected for further processing. The number of topic clusters was selected manually, after reviewing the results. The analysis demonstrated that topic clusters <10 showed too little granularity and lacked a sufficient amount of subthemes to create a representative analysis. There was a direct correlation between an increasing number of topic clusters, and insights into covered themes and subthemes.

Table 2 illustrates the 10 topics, and their subtopics, that were identified as part of the analysis process. Interestingly, topic clusters formed alongside different media genres or application areas. Significant examples are topic cluster V3,

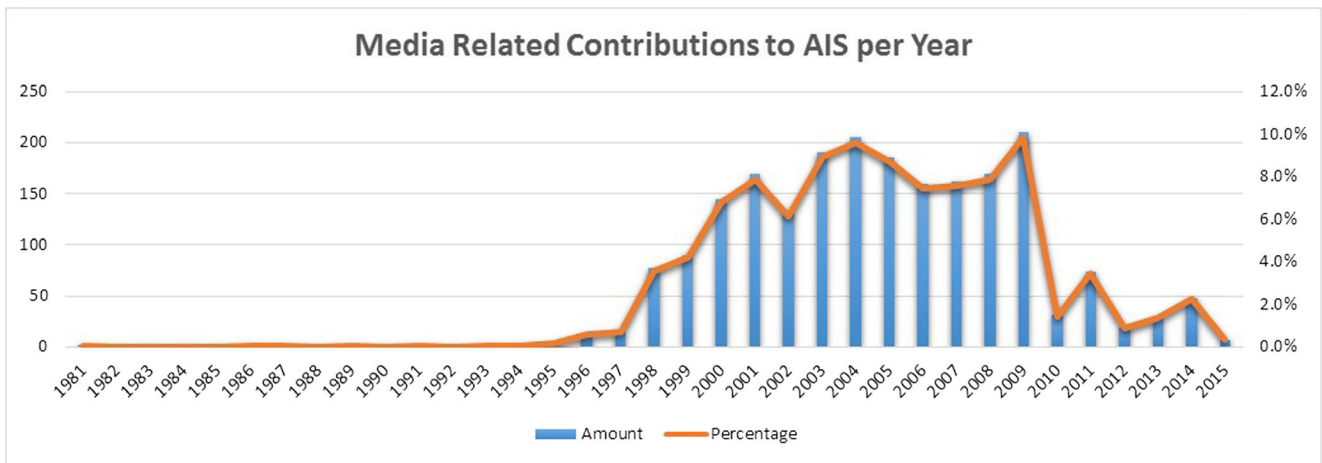


Fig. 1 Distribution of media industry-related topics in information systems research between 1981 and mid-2015

which is centred around health care; or topic cluster V10, centred on eLearning and education. This information is important because it demonstrates the key topics of research that has already been conducted.

Profound developments have characterized the media, communication and technology industries, which have substantially grown in influence and size over the past two decades. Media management has emerged as a new discipline, to

respond to the researchers’ interest in the intertwined evolution of those industries. Media are, on the one hand, no longer gatekeepers for specific publication channels – as in their traditional business – and, on the other hand, no early adopters in digital business. Thus, the terms concerning developments in the digital area are not media-specific. Therefore, making it is not possible to cluster media-related issues by specific keywords for certain disciplines – as we did

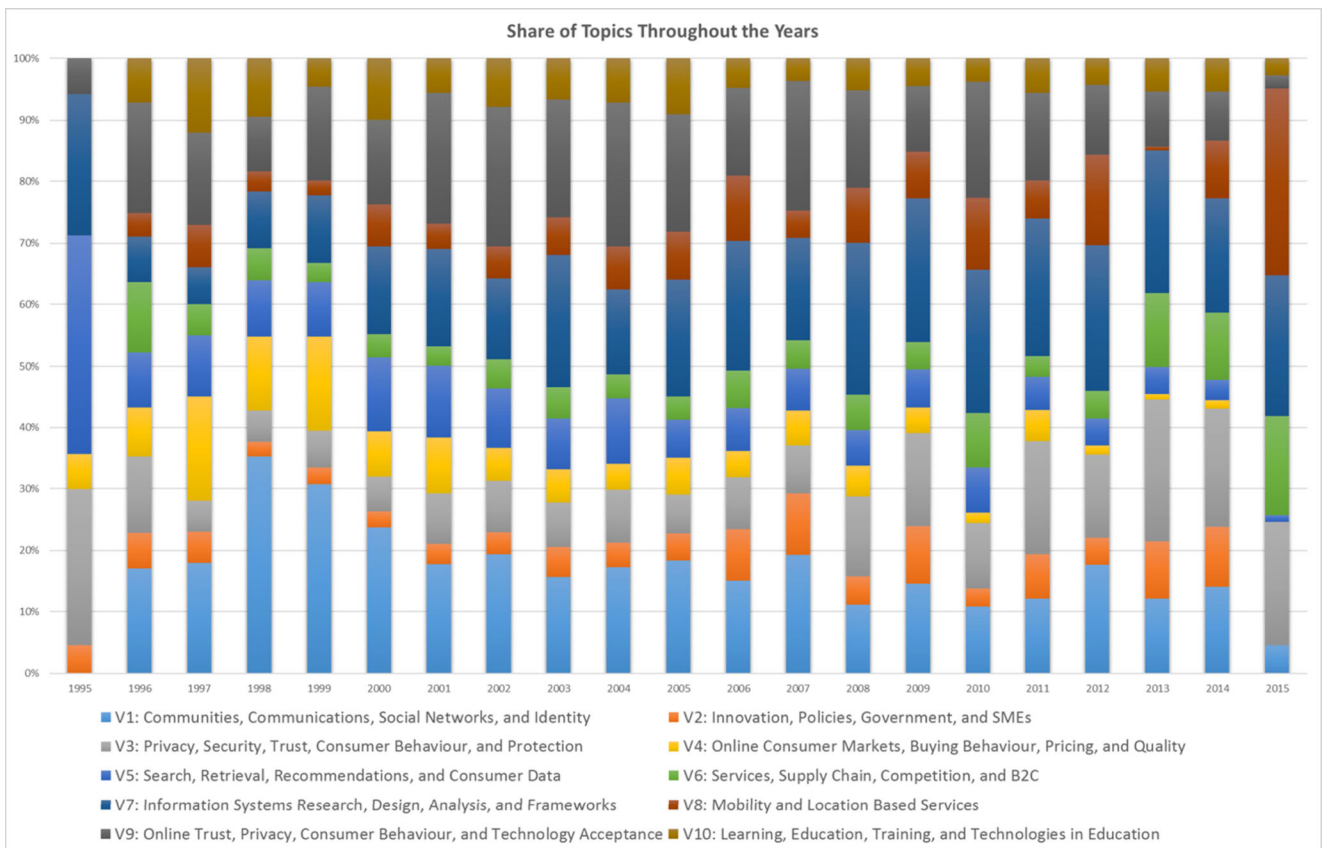


Fig. 2 Share of different topics relevant to media issues contributed to the AIS library between 1995 and mid-2015. Visualization of the share of topic clusters per year, and in comparison, to the overall trend of topics

during the observation period. See Table 2 for a more detailed explanation about the different topic clusters

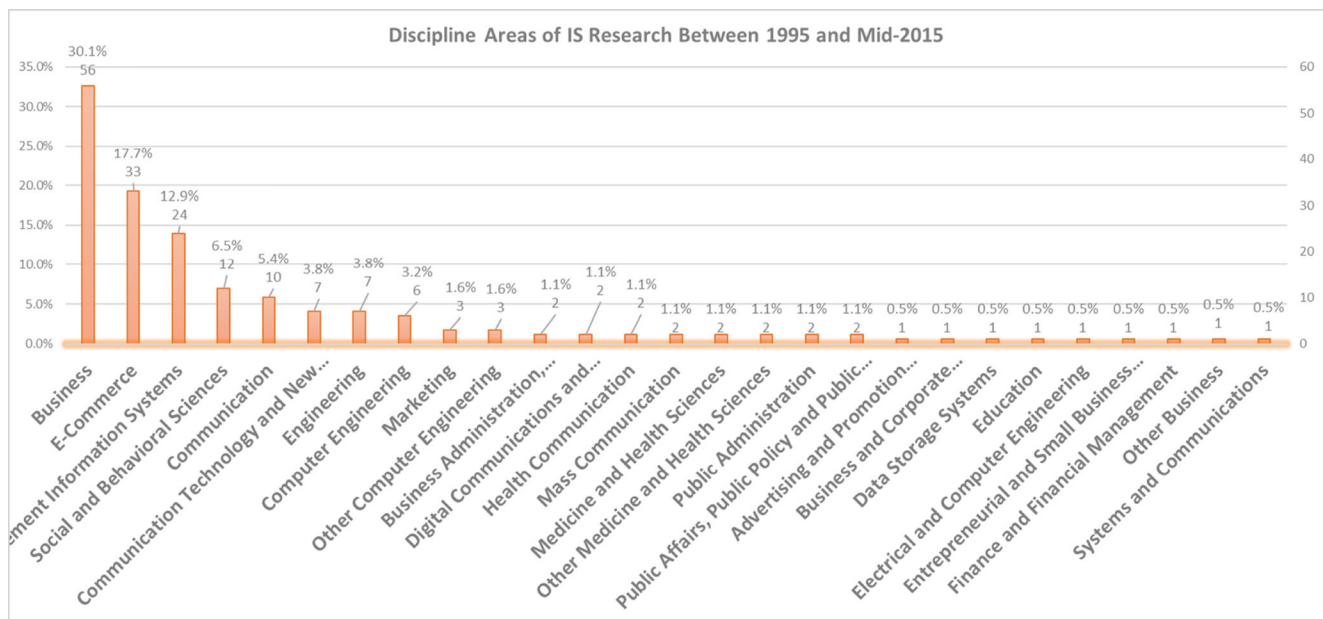


Fig. 3 Discipline areas relating to media management/economics research between 1995 and mid-2015

in our basic framework. Many more insights about specific media-related research areas can be generated if they are re-mixed and re-built by using topic-clusters, as we show in this study.

Our clusters show three fields of “evergreen” business topics (V2, V6 and V4) which are deeply influenced by digitalisation, e.g. specific industries like banking, government, telecommunication (V2), different business activities like value, supply chain, CRM or marketing (V6), and consumer-related topics like buying behaviour or prices (V4). Then there are completely new fields: “digital born” topics like Social Networks and Communities (V1), Search and Recommendation (V5), web-based education and collaboration (V10), and location-based services and mobile applications (V8). To keep systems running and improve them according to new possibilities and challenges, an important research field is IS-related technical infrastructure topics like IS research, design, analysis, and frameworks (V7), or IT security from a public (V3) or business (V9) point of view.

The topic clusters show that it was never the traditional media genres which gained ground in IS research. All of the topics are connected to media, but do not hit core traditional media types. Even though it is obvious that media-related topics are present in a wide range of research questions in IS papers, media seems to be more a means than an end in IS papers.

Convergence of IS research and research in the eMedia industry

IS research, and research supporting managers in the media industry, each benefit the other. Through the research theme

Information Systems in eMedia, a re-interpretation of IT usage supports managers in media industries in overcoming the current phase of creative destruction.

Both IS research and the media industry mutually benefit from each other’s knowledge. IS research needs to adopt a more interdisciplinary approach, and open up to non-core IS topics that are required to address research themes in the media industry. In turn, and due to the fact that the media industry is currently confronted with a digital transformation phase, the media industry benefits from gaining insights into knowledge on how to cope with increased digitalisation. As stated by Schumpeter, discontinuous change is usually not enforced by economic actors dominating old industries – they are confronted with a “process of creative destruction [as part of a] process of industrial mutation [...] that increasingly revolutionizes the economic structure from within, destroying the old one, and increasingly creating a new [...] gale of creative destruction” (Schumpeter n.d.). The media industry is currently in the process of such a change, and is confronted with creative destruction in the form of digitalisation. IT skills, additional expertise, and IS knowledge will support media managers in decision making processes to create additional revenue streams and reinterpret their IT usage to cope with the ‘creative destruction’ that is currently taking place.

Figure 4 illustrates the different business activities and processes typically found in media industry to the different media industry segments. This basic matrix allows an easy categorization of the different types of activities relevant for various media genres. From an information systems perspective, the figure illustrates also how IS research and media industry research can converge in its core: thus, relating people – technology – information to the particular fields in media research.

Table 2 Topic clusters, their subtopics, and selected representative works

Topic	Subtopics	Selected Representative Works
V1: Communities, Communication, Social Networks, and Identity	Social media, virtual environments, Facebook, Blogs, Twitter, offline applications	(Oestreicher-singer and Zalmanson 2009), (Leong et al. 2015), (Loebbecke and Huyskens 2008)
V2: Innovation, Policies, Government, and SMEs	Banking, politics, governmental organisation, policy, globalisation, telecommunications, citizens, cultural applications	(Beckinsale and Levy 2004), (Davis and Vladica 2006), (Yang et al. 2009)
V3: Privacy, Security, Trust, Consumer Behaviour, and Protection	Healthcare, telemedicine, eCommerce, publishing, work	(Tuunainen and Hovi 2009), (Gürses et al. 2008), (Xu et al. 2008)
V4: Online Consumer Markets, Buying Behaviour, Pricing, and Quality	Online markets, music, auctions, goods, gaming, firms, retailers, trading, sales	(Sheng and Chen 2005), (Wells et al. 2011), (Constantiou and Damsgaard 2004)
V5: Search, Retrieval, Recommendations, and Consumer Data	Advertising, news, agents, search engines, data mining, semantic modelling, advertisements, websites	(Li and Karahanna 2015), (Uhlmann and Lugmayr 2008, Uhlmann and Lugmayr 2011), (Lugmayr et al. 2008a)
V6: Services, Supply Chain, Competition, and Business-to-Consumer (B2C)	Business-to-Business (B2B), B2C, relationship management, value chain, travelling applications, sales, supply chain, relationship management, production, Customer-Relationship-Management (CRM), web, marketing, vendor applications	(Ochara et al. 2008), (Liu et al. 2010),
V7: Information Systems Research, Design, Analysis, and Frameworks	Web, management, analysis, processes, technologies, design, software, organisations, work	(Bodker et al. 2004), (Charki and Boukef Charki 2008), (Scharl and Brandtweiner 1998)
V8: Mobility and Location Based Services	Mobile applications (TV, video, mCommerce, WAP ...), mobile phone, payments, advertising, multimedia technology, telephony, platforms, providers	(De Vos et al. 2008), (Löfgren 2007), (Lugmayr 2013b)
V9: Online Trust, Privacy, Consumer Behaviour, and Technology Acceptance	Online, shopping, technology acceptance and adoption, literature, models, theory, eCommerce	(Mantymaki and Raitoharju 2008),
V10: Learning, Education, Training, and Technologies in Education	Students, teachers, education, web-based education, collaboration, universities, classrooms, tools for education (multimedia, video, virtual, ...), distance education, higher education	(Gaskin and Berente 2011), (Eryilmaz and Ryan 2013), (Lugmayr 2011), (Lugmayr 2013c)

As media industry differs from other industries, the notion of people, technology, and information requires an adoption to a media industry viewpoint. Thus e.g. people issues related e.g. to audience, society, or public policy. Technology issues are centred around content, workflows, or dedicated hardware. Information issues are dealing with aspects of aesthetics, communication, or content formats. Thus media industry requires and adoption of the IS perspective on information systems to cope with media industry particular issues. To state an example: people aspects in IS research relate e.g. to audience, society, and media culture; technology aspects are covered through hardware or content management issues; and finally, information aspects relate to issues of aesthetics or media as a product. There are many new disruptions to come: ambient media, media environments embedded throughout the physical world through the Internet of Things (IoT), ubiquitous, and pervasive technologies are just some examples (see e.g. (Lugmayr et al. 2012), (Pogorelec et al. 2012), and (Lugmayr 2012)).

Media managers need to handle the increasing scope and velocity of change in the global business environment, which we could describe as “try fast – fail fast”. Therefore, media

managers need competence in project planning to cope with these rapid business cycles of content, business, and technology innovation. This is especially important as some media firms produce niche content, and rely on different revenue streams which media managers need to be able to manage successfully. Human resource management is another area where role complexity has risen. This includes aspects such as more autonomy for employees or, different collaborative relationships add additional layers of difficulty (Hollifield et al. 2016).

Methods, tools and the body of IS research requires an adoption to today’s needs of media houses provide media managers with the essential support along media industry typical business function to transform from traditional towards fully digital media houses.

We strongly argue that IS research has huge potential for media research in the digital era, but needs addressing in the context of media industry-related issues. Despite the fact that the literature review above is not fully representative, and the selected data would need to be extended, it allows insights into which additional topics need to be addressed to introduce the research field *Information Systems in eMedia*. First of all, the

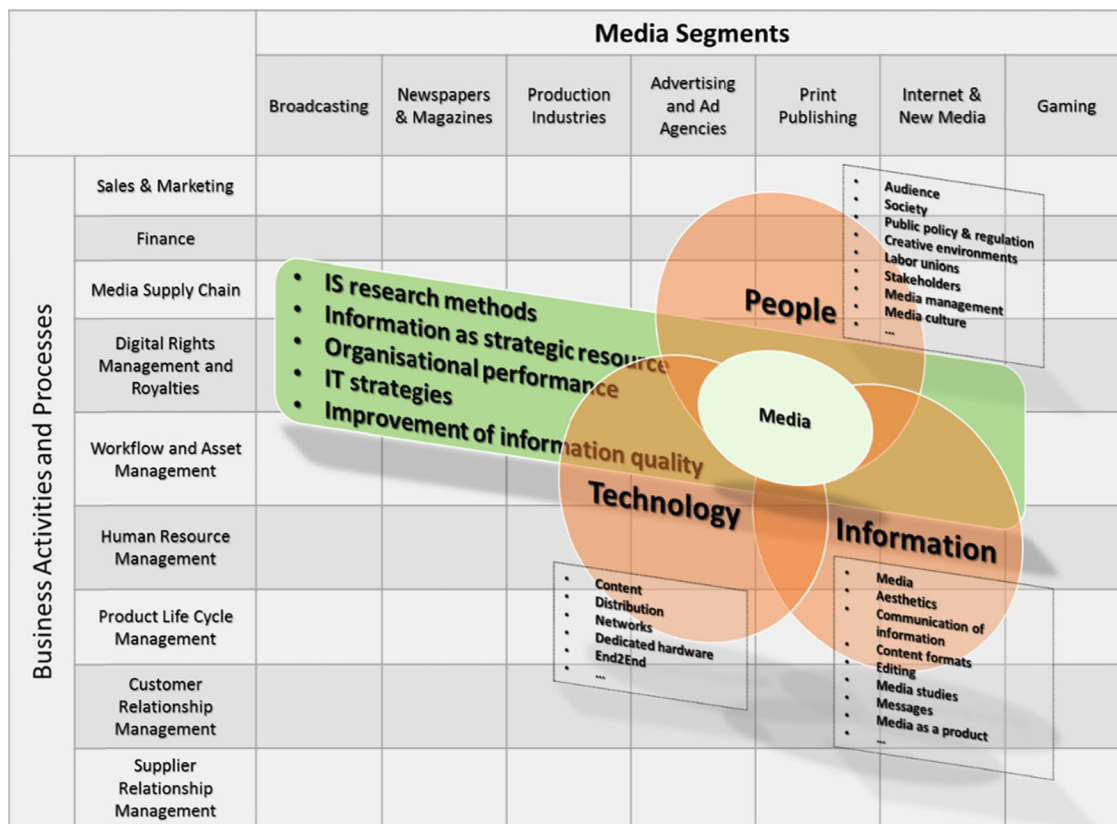


Fig. 4 Adoption of IS core methodologies to business activities/processes and media segments, including discipline areas relating to research according to the AIS database

investigated corpus illustrates that the main key disciplines that have been contributing to IS research are eBusiness, eCommerce, technological matters, terms of general interest (e.g. Web 2.0, social media, Internet) or Management Information Systems (MIS). It is not easily deductible that these issues directly address the current needs of the media industry. These themes are important for managers of corporations dealing with digital services, but only indirectly significant for managers of traditional or digital media houses. To support managers of digital media corporations, it is essential to adopt the requirements of different media segments to IS research and its business activities (Laudon and Laudon 2010; Luadon and Laudon 2003). Figure 4 illustrates how IS research can be embedded across media segments, business activities and business processes.

The mass media industry is financed by users and / or advertisers, who use media-contents as a vehicle to reach as many prospective customers as possible. Audience demand is obviously the key to both sides of the market. To hold the

attention of their audience, a very important core theme in the media industry is audience research, understanding audiences, and analysing consumer preferences. A data-driven approach can immensely enhance the digital content business. IS research (see Table 2, topic cluster V5) offers many solutions in this area. Audience content consumption patterns and the automated provision of ratings data support the content offerings media industries can provide. IS in eMedia research needs to address this theme, especially as today's media companies' analytics and decision making rely on granular content analysis of their content offerings. Thus, IS research can heavily contribute to content analysis based on micro-characteristics of dozens of variables based on consumer data (Madrigal 2014).

Due to cost-cutting after the 2008 recession, permanent positions in media industries were greatly reduced. Some might argue, that the reason for decline of media management and economic related research declines due to cost cutting. This would definitely require a more thorough examination,

and might be a valid statement. However, our goal was to illustrate another interesting consequence of these cost cutting: media entrepreneurship of former media industry staff. As one flow-on effect, former employees and people with media backgrounds came up with fresh ideas beyond traditional media, and created a new wave of ‘media entrepreneurship’ driven by new technologies. Media managers transformed towards entrepreneurs and CEOs of their own start-ups (Hollifield et al. 2016). Large media firms have adopted this way of working, and encourage entrepreneurship inside their corporate houses to stimulate innovation. Here especially, IS research can contribute to solving issues around financial management, project management, and corporate cultural issues to support entrepreneurship.

Information Systems in eMedia research needs to address IS in each organisational level, map business activities and processes to meet the needs of the media industry, and cover issues on intra- and inter-organisational levels and media specific infrastructures.

IS research insufficiently covers the core competency of the media industry as a content industry, and how it can be supported through IT production, distribution, aggregation, and sourcing. This notion did not appear in discipline areas (see Fig. 4), or in topic clusters (see Table 2). Table 3 gives an overview of which content-related business activities require additional attention, by outlining business activities and processes of typical issues in the media industry. The table also names a few main literature resources for each issue. This follows up one of our research questions – which topics and themes need to be addressed in IS research. IS research provides data already focused on business information systems and infrastructure research, and their design, analysis, and frameworks, especially in the domain of IT security. The eMedia industry can benefit from this existing knowledge, particularly through the solutions IS provides in the domains of eCommerce and eBusiness. Our results also show that IS research is covering key issues in the media industry which originate entirely in the digital domains, general technical aspects, or technical solutions. Media firms, which are shifting more and more towards multimedia houses, will benefit from the results of IS research, especially with regard to social networks, search, or mobile applications.

As IS research is also centred around technological and software issues, the media industry is further confronted with the importance of automation, and the introduction of software to the contemporary dynamics of content production and media consumption (P. M. Napoli 2014). Technology-driven automated solutions enable advanced new services, such as real-time bidding for advertising, dynamic pricing models, or increased automation of workflows. Thus, IS research could assist in managing key-performance indicators to support media managers. This can be a helpful tool in

managing the complex processes of cross-media content products, and can transform processes by including performance indicators to support decision making for management, even in real-time. Thus, it leads to an increase in the speed and accuracy of data-driven decision making (Grüblbauer and Haric 2016).

Information Systems in eMedia needs to address core issues in the media industry, such as innovation management, strategic management, and the internationalisation of the content business.

As discussed in Wirtz et al. 2013, the media industry is trending towards more functional and media-specific aspects for all media forms. This includes aspects such as intellectual property (copyright); digital creation and distribution of content; and content aggregation, production and sourcing. This trend implies that future research needs to focus on innovation, strategic management, and internationalisation. One practical example is the replacement of sales branches of TIME magazine through mobile content formats and social and cross-media offerings.¹ Strategic management is covered by IS research under the theme of Management Information Systems (MIS), as illustrated in Fig. 4. Media managers need knowledge of IS research, and appropriate skills, to control and optimise the strategic processes of media firms. This makes decision making easier, especially for things like data-driven portfolio management (Grüblbauer and Haric 2013). Nevertheless, innovations are not only applicable to the media industry – it is necessary to apply information systems research in other domains, such as healthcare (Lamminen et al. 2003).

IS research can also contribute to research in the eMedia industry in the simulation of business developments. This field can include how good innovations will serve businesses in making well-informed and grounded decisions. Media managers at all levels, who are aware of performance indicators in real-time, are able to react to changes more quickly. Media monitoring, and the introduction of real-time live blogging can support this trend. Data journalism is one example, where adequate data visualisation techniques are the key issue. A simple approach is to use dashboards, which visualise fast moving trend cycles by accumulating data from different sources, and support ‘real-time management’ using meaningful infographics.

Last but not least, internationalisation is one of the current features of the media industry. This aspect of the industry lacks current IS research. Media are a global phenomenon (see (Albarran et al. 2005; Albarran 2014) and (Wirtz et al. 2013)), and global expansion is essential and a necessity to diversify revenue streams and gain effects of scale in niche markets. Thus, IS and its methods can assist to investigate “cultural differences in

¹ Based on 50 questionnaires, answered by international and renowned scientists in the area of MME from universities and research institutes.

Table 3 Requirements specific to the media industry, as a starting point for investigations in the research field of IS in eMedia

	Media Industry Issues	Examples	Related Works
Core Media Industry Functions and Activities	Sales and Marketing	Promotion, order processing, market analysis, price determination, demand analysis, sales forecasting, consumer needs, dual market model (selling audiences to advertisers/content to audiences), rating analysis, media research metrics ...	(Luadon and Laudon 2003), (Philip M. Napoli 2003), (Webster et al. 2006), (Topf 2010), (Yan Yang 2011)
	Content Production, Pre- and Post-Production Firm's Financial Functions	Content production, IT infrastructure, technical setups Financing, accounting, media finance networks, TV funding models, crowdfunding, advertising, media markets	(Lugmayr et al. 2008b) (Baumann and Eulenstein 2011), (M. Friedrichsen 2011), (Lischka et al. 2011), (L. A. Lasrado and Lugmayr 2014; L. Lasrado and Lugmayr 2013)
Activities Across Business Functions	Human Resources Management	Organisation of freelance workers and project based HR infrastructures	(Laudon and Laudon 2010), (D'Agostino 2003)
	Media Supply Chain	End-to-end industry, integration of social networks, content distribution	(Tassel and Peo-Howfield 2010), (Reese 2011), (O'leary 2011)
	Digital Rights Management (DRM)	Content protection across the supply chain, piracy, technologies, DRM free products	(Burke 2010), (Roth 2007)
	Customer Relationship Management	Adding value to content, long-tail-content, information about customers, cloud services, crowd phenomena	(Buttle 2009), (Riedl et al. 2010, (Daubs 2011)
	Supplier Relationship Management	Decision support, business models, competition analysis	(Wulf and Zamekow 2011), (Brocke. J and Buddendick 2007)
	Product Life Cycle Management	Scenarios such as online gaming, virtual goods, online gambling	(Reber 2012), (Lehdonvirta and Virtanen 2010)
	Workflow, Asset, and Content Management	Workflows as dominant ways media products are created, work sub-division, media genre specific processes, content centric workflows, metadata workflows...	(Forsyth 2004), (Vitari et al. 2006), (Lugmayr et al. 2004)
Global and Inter-Organisational	Licensing and Royalties	Content protection on a legal basis, royalties, capital investments, cost contract analysis, profitability analysis, budgeting, rights in media genres (e.g. broadcast rights), licensing models, open source, user contributed content, freelance work, open access	(D'Agostino 2003), (Malkawi 2007), (Kubelka and Fawcett 2006), (Ashley 2009), (Priest 2012)
	Convergence	Convergence across levels: technology, media industry, consumer, organisational, management	(Lugmayr and Zotto 2015b, 2015c), (Peng et al. 2002)
Media Genre Specific Infrastructures	Issues particularly relevant for the media industry, particular genres e.g. specific IT infrastructures	Standards in media industries, broadcasting standards (e.g. SMPTE, DVB), genre specific technical architecture	(SAP Solutions for Media Industry n.d.), (Bachmayer et al. 2009a; Bachmayer et al. 2009b)

content preferences and tastes varying to national laws and politics" (Hollifield et al. 2016).

Conclusion

We are aware that our research design could be improved, as we did not integrate a larger corpus of media-related IS papers,

nor did we extend our keyword searches more exhaustively. But this was also not our primary goal of this paper. The goal of this paper was to initiate a discussion on what IS research should consider in the domain of media management and media economics, rather than to give a coherent review of existing IS research. Thus, our focus was to contribute to epistemology by examining a subset of the available data, and contributing a position paper that should act as a starting

point for researchers. We were able to identify several areas where IS research can enrich media management and economics research, and to illustrate which issues need to be discussed in IS research to cope with the needs of the media industry, to begin research on *Information Systems and Management Research in eMedia*. We framed the thematic area, reviewed basic literature, and applied a text mining method to gain a basic understanding of where both fields can benefit from each other.

For readers with an interest in *Information Systems in eMedia* research, we would like to point to the following resources:

- Association for Information Systems (AIS) Special Interest Group (SIG) eMedia (SIG eMedia) website: <http://aisnet.org/group/SIG-eMedia>
- IS in eMedia email list: http://mail.ambientmediaassociation.org/mailman/listinfo/ais-sig-emedi_ambientmediaassociation.org
- Conference tracks: ECIS Track “IS in Media Management” and PACIS Track “IT in Media Industry”
- Essential readings to begin research and further investigation: (Lugmayr 2013e)

To conclude, the convergence of media management and media economics research with IS research – introducing the research field of *Information Systems in eMedia* – mutually benefits both industries. The media industry is currently in a transformation phase, and IS-centred research is one potential pathway towards digital media houses; IS research in turn benefits from adopting a new application area, with a wide range of information contributing to its body of knowledge.

Appendix: topic classification

The full (and simplified) analysis process is illustrated in Fig. 5, and involved the principal steps of pre-processing, training and scoring, and post-processing and is based on prior work (Lugmayr and Zotto 2013) and has been applied in e.g. financial news sentiment analysis (see (Lugmayr and Gossen 2012) and (Lugmayr 2013f)). The main tool for text processing was R. The approach described below is based on various literature resources as e.g. (Blei et al. 2003a), (LDA n.d.), (Jockers 2014), and e.g. (A gentle introduction to topic modeling using R n.d.)

Pre-processing

The first step in the analysis process was to perform pre-processing on the corpus C , which included stop-words

processing, lemmatization, parts-of-speech processing, and lexicalization to obtain a cleaned corpus.

Lexicalisation of all documents and creation of a vocabulary list

The given corpus C consists of M documents $D_{1..M}$ and associated metadata $F_{1..M}(T, Y, A, C, S, G)$ such as title, year, author, category, source, and abstract. Each document D_j consists of N_j unique terms, where the total sum of N terms can be calculated through $N = \sum_{j=1}^M N_j$. The total term list of the corpus is given through $V_{1..N}$, and the number of a particular term V_n in document D_j is annotated as $N_{V_{nj}}$.

Calculation of the identity matrix in all documents

As described in various R manuals and in (Jockers 2014), we began by the calculation of the term frequency document matrix $TF_{j,t} = \frac{N_{V_{nj}}}{\sum_{f=1}^N N_{V_f}}$ to calculate the number of times a term is in a one document. To gain insights about into the importance of single terms, we calculate the logarithmic scaled inverse fraction (or inverse document frequency) $IDF_{j,t} = \log \frac{M}{1 + |\{d \in D: V_t \in d\}|}$, resulting into the term-frequency/inverse document frequency through $TFIDF_{j,t} = TF_{j,t} \times IDF_{j,t}$, in short annotated as W .

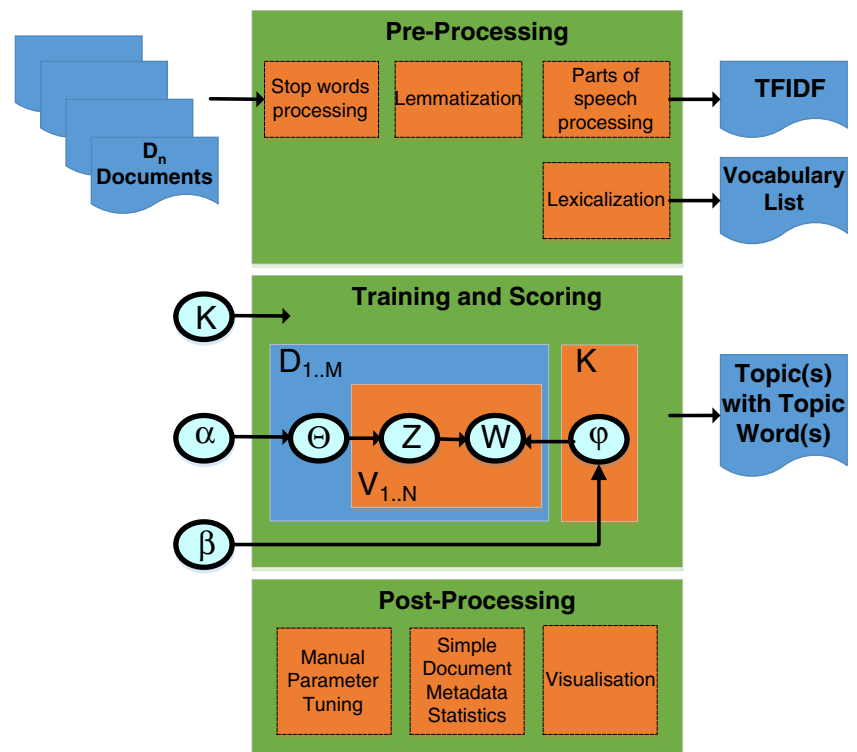
Training and scoring

To train topics and perform scoring, we utilized the Gibbs Sampler LDA (Blei et al. 2003a) (LDA n.d.). α and β are the pre-known (assumed) parameters of the Dirichlet distribution, as e.g. described in (Wikipedia n.d.). K is the number of assumed topics in the corpus C , and $Z_{n,j}$ contains the topic of the n th word in document D_j . $N_{V_{nj}}$ is the number of terms in one particular document. Topic(s) including topic word(s) were obtained through $P(W, Z, \theta, \varphi, \alpha, \beta) = \prod_{k=1}^K P(\varphi_k; \beta) \prod_{j=1}^D P(\theta_j; \alpha) \prod_{t=1}^W P(Z_{j,t} | \theta_j) P(W_{j,t} | \varphi_{Z_{j,t}})$.

Post-processing

Post-processing included parameter fine-tuning (e.g. appropriate selection for pre-given parameters of the Dirichlet distribution and selection of topics), followed by some statistical processing of topics and document metadata, as well as the visualization of results. In addition, we performed a keyword in context analysis to understand the topics and argumentation of each contribution on a semantic level.

Fig. 5 Schematic and Simplified Overview of the Processing Steps



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