MAM (Media Asset Management). Introduction of MAM digitization in TV channels in Spain.

Rubén García-Loureda Díaz [CV] [ ] [ ] Associate Professor PhD. Department of
Communication Sciences / ruben.garcia@usc.es

Oswaldo García Crespo [CV] [ ] [ ] Associate Professor PhD. Department of
Audiovisual Communication and Advertising / oswaldogarcia@uvigo.es

Silvia García Mirón [CV] [ ] [ ] Associate Professor PhD. Departament of
Audiovisual Communication and Advertising / silviamiron@uvigo.es

Abstract
Introduction: This work analyzes the introduction in Spain of the first systems of production and
television broadcasting based on computer files technology, also known as MAM (Media Asset
Management). The establishment of the different MAM systems as a digitization has meant the
replacement of the technology based on video tapes, due to the obsolescence of this system.
Methodology: This work also establishes a parallelism in the MAM digitization between CNN
(Atlanta, USA), Telecinco-Spain and Telemadrid-Spain. **Results:** this study seeks to gather
information on the consequences of the change in the workflow in television that MAM digitization
brings about. **Discussion:** The implementation of MAM technology has meant a profound
transformation of the basic processes of the production system in television. **Conclusions:** this paper
reflects on the labor transformations of the different jobs that involved the adoption of the first MAM
systems in the three television stations analyzed CNN (Atlanta-USA), Telecinco-Spain and
Telemadrid-Spain.

Keywords
television; history; technology; media asset management; digitization; video tape recorders.

Contents

Translated **by Eva Celeiro Loureda**.
Master´s Degree in English Philology. University of Santiago de Compostela. Spain.
Master´s Degree in Translation and Interpreting. University of Vigo. Spain.

1. Introduction

It is argued that the "digitization" process has been understood in audiovisual literature as the movement or transformation from analogical video and audio signals to digital or numeric format (Fandiño, 2001).

From 1998-1999 on, the concept of MAM digitization (Media Asset Management), as a new term, co-exists causing confusion with the one described at the beginning of this section. Therefore, we find that digitization (MAM, to be precise, but also sometimes DAM: Digital Asset Management) begins to be understood in a different way, above all in television, but also applied to branches of digital management and transformation of information at corporate level, as widely illustrated by Austerberry (2004).

Therefore, MAM digitization is a deployment of technological processes, but also a new workflow. Thus, as soon as a TV broadcaster introduces a MAM system, a need to integrate it into a global system of audiovisual content in the form of computer data files is established. There is no physical support or tapes for those assets or multimedia files, which could be simultaneously reached by every employee in the TV station. This Media Asset Manager (MAM) digitization system should encompass the whole television process, from the introduction into the system (input), its montage or processing (either in edition or post-production), its broadcasting (playout, preferably in an automated playout) and its filing in a documentation manager which can retrieve those materials quickly and efficiently at any given time. (Pittas, 2002)

MAM is a procedure which does not only contemplate changes in the workflow, from the input of data in the system, their edition and broadcasting, but also, and mainly, (as opposed to other digital processes) a data file management system in which the various audiovisual files, the audiovisual media, can be documented, filed, stored and retrieved by an event management system. What we intend to call Media Asset Management (audiovisual content management system, more accurately) or MAM (Lizarralde, 2009; 157-181).

Thus, the present paper will be dealing with digitization, understood as MAM digitization.

2. Method

The specialized literature related to MAM digitization has been thoroughly reviewed, both in English and in Spanish. However, the present paper is mainly based on a series of personal interviews made

with the technicians responsible for several regional public television channels who have allowed access to original first-hand accounts on the implementation of this new technology in Spain.

3. Historical Perspective
3.1. CNN, world pioneers

«CNN Becomes First U.S. Beta Test Site for Sony/EDS Digital Asset Management System.

Digital asset management is an open framework or platform that supports the acquisition, creation, manipulation, storage, archival, retrieval, transmission, and display of digital assets. Digital asset management applications include asset acquisition (applications that log content ante the digital asset management system); Asset management (applications that archive, browse, and query digital assets); content creation (applications that generate digital content); and asset distribution (applications that deliver and display multimedia)» . (Information Today, 1998).

The implementation of such an evolutionary and complex system as MAM is difficult to date accurately; however, the literature seems to agree that the very first system to be tested on a significant TV station was Sony/EDS at the well-known US news channel CNN, at CNN-Center, Atlanta, Georgia, USA. The project started in June 1998 (Pagani, 2001). On the other hand, some primitive MAM systems began to be shown at the Nab meetings (National Association of Broadcasters) of 1995-1996, according to Alcalá (2015).

The technology was so new that not even Sony had provided it with a commercial name. The system was introduced at the conference of the National Association of Broadcasters as a Sony project together with the US Eds Co. (Electronic Data Systems), while the research and articles back then referred more often to Digital Asset Management, (Dickson, 1998), or Content Asset Management than MAM (Media Asset Management), which would become prevalent later. (Pagani, 2001)

As pointed out by Pagani (2001), in 1998 CNN was one of the most successful news channels, or even the most. It comprised 6 TV channels broadcasted via cable and satellite, 2 radio stations, 10 websites and its own CNN news agency. Back then, CNN was the most widely hired news service in the world. During its final implementation, the MAM hired by CNN would provide hundreds of journalists with access to video and audio pieces, greater ease and inmediacy to be on air, as well as improved news content. This allowed the CNN to create and introduce a wide range of digital content to be used in the already existing platforms quoted and in the new distribution systems (indirectly referring to the Internet and other media).

The system was then presented as a Beta Test (or pilot), but, finally, it was the very first end to end system of processing (production-broadcasting) and files storage in a television.

The system comprised a massive Digital Library of Sony PetaSite video files (1 Petabyte=10 to the 15th byte, the next step from Terabyte), a series of Sony Dtf data tape readers where backup copies and non-immediate documentation media were saved, an EDS software, a Media Vault, for immediate image processing and the Avalon Archive Manager (AAM) software, for files management. It is worth noting that images were still captured back then on a video tape, therefore a real time input of the

material was necessary. That is, it took 20 minutes to ingest into the system a 20-minute video tape. (Information Today, 1998)

The system was faced with the painstaking task of digitizing 700,000 different video pieces which comprised the storage work of 18 years. That is why the joint marketing effort of Sony and Eds required employing various software and hardware technologies to be discussed next which would become common for MAM systems (Pagani, 2001). The deployment of such technologies constituted also a new market niche for the TV industry, and also for the ever increasing demand for MAM-type content management in diverse industries, such as cinema, music, news agencies, advertising, publishing houses, even governments. Those MAMs, adapted to each company's needs, would enhance its capacity to file, have access to and redistribute its media (image, sound, texts, etc.) in such a way that their intrinsic value would increase, given that there was no longer a need to make copies for each different need. Then it was possible to have access to the same file to be sold or distributed to a multiplicity of different clients/users. (Information Today, 1998)

Thanks to this digital migration, the CNN achieved total access to the ingestion, creation, manipulation, storage, documentation, retrieval, broadcast and viewing of its TV files.

EDS's software Media Vault, experts in data management systems, was a scalable system, allowing different users in client/server mode (clients/users would log in to a central server managing the software) to manage any kind of medium (video, audio, still pictures, texts and data from the MIS data system), in any environment, including the CNN intranet as well as its Internet sites.

On the other hand, the software Avalon Archive Manager (AAM) was a file-documentation manager responsible for managing the robotic digital data tape library owned by Sony. The AAM, together with the video servers (huge hard drives capable of recording and playing at real time speeds –or even faster- video and audio files) would retrieve information in real time either from the video servers or from the PetaSite Library. This was done by reading their DTF data tapes (rather than video tapes, as it used to be the case), which were much faster than the old video recorders, thus turning this type of management into a fully automatic system. The system's backup data was stored in those tapes, together with the non-immediate media or file documentation. In case an operator needed them, they were put into a DTF data tape reader (data recorders, to make it understood), which was curiously based on Sony's Digital Betacam technology.

So as to round up this section devoted to the first MAM, 3 years later, in 2001 (Brown, 2001), the CNN announced that they would digitize their whole archive again, together with their new partners at Sony and IBM (21 years), with an estimated cost of 20 million dollars. (Smith, A. 2009)

3.2. Telecinco Spain, first MAM in a European television

Telecinco, the Spanish private channel, (Peñafiel et al, 2009) started a digitization process in 1998 that was completed in 2005. They began by digitizing the newsroom, that is, deploying an MAM just for that department. It was the first European TV station to do that (Peñafiel et al 2009), which triggered an unstoppable process of digitization in Spain. The implementation was not all of a sudden, but required a gradual process stage by stage. The digital newsroom was the first one, followed by the digital archive; later on the other program departments, edition and post-production departments and

all the sets were gradually incorporated. Finally, Telecinco updated its new central command center and launched a system integrated in its digital platform for the storage, production and broadcasting of audiovisual and text content. «This new technology allows Telecinco to be a content factory in order to improve image quality, increasing the value-added services, distributing its content through any means of support—satellite, mobile, ADSL and fiber— and increasing the offer of channels for either of our own programs or third parties. The new digital platform also manages the reception, production and delivery of all types of audiovisual content, increasing added services such as subtitles in several languages, sound 5.1 or interactive market services, as well as the automatic delivery of content according to the programming type (commercial or themed channel, video and news service, among others). Besides, the new system allows receiving and managing more than 500 audiovisual signals simultaneously». (Producción Profesional, 2005)

The system included the NewStar solution (Sanz, 1998) for newsroom and edition, the text editor, mainly, and EditStar for video and audio management. This had some flaws, given that it could only work at high resolution and using video servers, rather than data ones, thus limiting joint access to 14 or 15 pc stations (Alcalá, 2015). This was also the kind of Sony/Eds system that the CNN's MAM was based on, with similar limitations.

In that sense, the following quote illustrates the structural difficulty existing then for the transition or total discontinuation of the online, non-linear edition of video recorders, at peak moments of pressure in a news show. This was often mentioned as the main issue with the new MAM system. «Thus, the first TV channel to deploy the newsroom integrated in the news show was Telecinco in early 1999 (SIC), on the occasion of moving the channel's studio, a circumstance which was used to carry out a technological and format redevelopment of the news shows. They started by implementing an integrated newsroom station working simultaneously with the traditional edition cells, which would be gradually displaced until they became a tool to be used only for breaking news where non-linear edition is slower» (Luzón, 2001, p. 86)

Telecinco's MAM system, limited to the newsroom, started on Saturday August 22, 1998 (Moreno, 1999), and it became official on September 7. From that moment on, the Telecinco Digital Newsroom was operating. «This system allows journalists to edit digitally a news item with the picture, the text and the voice over from their computer. So, the piece, totally finished up, moves on to the central command ready to be broadcasted. Thus, each PC becomes an editing booth. The final goal is providing the viewer with quality information, and our challenge is to improve that information day after day", according to the Telecinco news managers. However, how does the viewer benefit from this digital management of information? In the words of Luis Fernández, general vice-manager of news programs, «there is no difference in the short run, but in the middle term, it will become apparent that the journalism made by Telecinco is brilliant and creative». The immediacy when delivering information is one of the concepts used in the Digital Newsroom. «Thanks to the implementation of the new system, some images that just arrived at 2.25 can be quickly edited and included in the 2.30 newscast», according to Juan Pedro Valentín, News Shows submanager. To Luis Fernández, the key to the functioning of the Digital Newsroom lies in the fact that «it merges two usually opposing concepts: technique and information» (Moreno, 1999). The new system's deployment raised the usual concerns among journalists, however the 90 editors working at Telecinco's Newscast «would kill now if this

was changed», warns Juan Pedro Valentín. ICTs have even created a new position: the «media manager». They are responsible for organizing work at the newsroom, so that the relationship with digital devices goes as smoothly as possible. As journalists, they understand the editorial priorities and will distribute resources according to them. The future is here to stay. TVE, Telemadrid and Antena 3 TV followed on the footsteps of Telecinco, already preparing their digital newsrooms. In turn, Telecinco is considering broadcasting its newscast on the Internet in the middle term» (Moreno, A. 1999).

Thanks to the deployment of that MAM in 1998, Telecinco would take the lead before the rest of TV channels in Spain (Telemadrid will be second one year later) with an integrated system in which journalists manage and mount their images, thus becoming responsible for their images from the ingestion to the broadcasting moment. NewStar was the software used for text editing, while EditStar was used for mounting video and audio. By deploying this MAM, Telecinco shortened the editing time, which enabled a quick broadcast if necessary (Moreno, 1999), with the exceptions already noted here by Peñafiel *et al* (2009).

Moreover, and this is one of the added value characteristics of MAM systems, according to Telecinco's news team, the quality of the pieces was enhanced, given that it was possible to make a more creative and brilliant type of journalism. Besides, back in 1998, there was an immediate chance of watching the news show on the Web in real time. (Moreno, 1999).

Telecinco completed (implementing an MAM entails an evolution through time), its MAM digitization process in 2005, at least the first stage (Professional Production, 2005), by opening in July 2005 its new Central Command and Broadcasting Center, integrated in a new MAM, and allowing the national private channel to broadcast content through multiplatform, DTT, themed channels, mobile telephones and the Internet (Formulatv, 2010). Its own annual report praises that process. «Telecinco, continuing its on-going quest for innovation, has completed in 2005 a process launched in 1998 for the total digitization of its facilities, opening last July the Central Command and Broadcasting Center. This Center possesses state-of-the-art technology for improving the workflow qualitatively and operationally. The Central Command and Broadcasting Center is a project involving more than 115 people from several technical, content and services departments. This completed a 7-year project with an investment of 50 million euros. Thanks to this project, the channel became a leader in the implementation of the technology in Spain, paving the path to the deployment of DTT (Digital Terrestrial Technology), being the first national open TV with a fully operational digitization process. This new digital production and broadcasting platform increases the content distribution possibilities through satellite, fiber, mobile and ADSL. Moreover, it manages the reception, production and delivery of every type of audiovisual and text content in digital format, increasing the range of added-value services offered, such as subtitles in several languages, sound 5.1 and interactive market services. All of this provides significant advantages to the viewers' choice. » (Telecinco, 2005)

3.3. Telemadrid, the first regional public TV which implemented a MAM in Spain

Telemadrid began in 1999 implementing a MAM based on an AvidNews software for managing and editing news texts (digital newsroom) and a ClipEdit software, for the editing-mounting of video and audio (Alcalá, 2015), while the MAM developer was a SONY turnkey system (NewsBase). (Sanz, 1998)

The system of this public regional TV channel from Madrid started working in June 1999, and the technological innovation was then commented upon and maybe even exaggerated by the press. (1 euro= 166.386 pesetas). «Digital technology has burst into television. Apart from allowing a greater quality of picture and sound, it unveils a real revolution in working methods which can turn video tapes and editing booths in museum exhibits. With an investment of 1,100 million pesetas (6,611,133 euros), the Telemadrid integral system of programs and news shows is, according to its managers, a pioneer in the world and possesses more advantages than those implemented in other Spanish channels». (Gómez, 1999)

Silvio González, from RTV-Madrid (Telemadrid) described the digitization process thus: «Silvio González said yesterday that this is the most important digitization system in the world». He also pointed out that no Spanish TV station has such a complete mechanism» (Gómez, 1999).

Back at that time, the Telemadrid MAM system was so pioneering that one of the disadvantages of those systems (i.e., the scarce options of the MAM process in case of failure, given that it was a new and not very tested system, with little presence in the market). MAMs were so new that they required a backup system, «by uploading news on videotapes, for instance. It was estimated that around 60% of the news content was made using that digitization system, although the operative had a back-up plan. (Gómez, 1999)

The core of the «digital computer system» was not called MAM yet; it was a huge videoserver with more access capacity than the videoservers existing in Telecinco back then, for example. This video server would store the signals which reached the newsroom daily. Up to 120 editors took them and had access to images for their news from their PCs, by editing them on the PC and adding the voice over right there. This eliminated the need to handle tapes and increased speed, given that there was immediate and shared access to the files: one didn't have to wait for an editor to finish watching a tape so that another one could use it. Besides, the former need to wait for an edition booth was eliminated, while the time needed for locating filed pictures in documentation was drastically reduced. The daily server had a storage capacity (video and audio) of 115 hours. Its low resolution mirror, the newsroom server, used to work by journalists in their PCs, reached the amount of 500 hours. The system also facilitated the editors' task, given that they could change the news show step-outline from the emission server, changing the order of the news items. (Gómez, 1999).

Another important change in Telemadrid was that the new NewsBase system allowed documentalists to start analyzing the new «raw» digitalized materials, directly into the PC at the work station, editing them and thus making the documented material to be filed. However, the material was stored in conventional videotapes. It is important to note that, in Telemadrid's MAM, the robotized library system allowed an automated broadcast. A Sony LMS library was also used to load filed images from video tapes into a system (Alcalá, 2015) which was still limited with regard to its capacity to upload lots of filed hours, given that the amount of Terabytes was scarce.

The News Base system grew gradually until it reached a capacity of 1700 hours of video in 2005, with 72 dynamic input/output video ports (out of which 22 would be assigned to the sets); 8 high-resolution nonlinear editors and 350 low-resolution edition positions for editors. (Telemadrid, 2008)

One of the main characteristics of Telemadrid's MAM was its duality for accessing ingested/digitized material into NewsBase. Editors would view and edit their news items, managing the materials coming from a videoserver which worked with the ingested materials at low resolution. Meanwhile, the final compiling and broadcasting process was done at high resolution. (Alcalá, 2015).

The difference between working at low and high resolution was very clear, compared to Telecinco's MAM which worked exclusively at high resolution, which greatly limited access with regard to the number of journalists capable of accessing information at the same time. In the case of Telemadrid, it was almost 300 users, while in Telecinco it was 15. Telemadrid's MAM, with its "duplicated" low and high resolution videoservers, multiplied times 20 Telecinco's access capacity. (Alcalá, 2015).

As regards filing and documentation, and the journalists' capacity to retrieve those materials for their news items, the work procedure continued to be in the form of requesting documentalists for materials, which would be done by putting the tapes manually inside their videoreaders, digitizing the material and making it available to editors. The total of Sony's NewsBase, with its approximately 200 hours of storage and 300 users, was estimated at around 1000 million pesetas (6,010,121.04 euros) (Ibid.)

Another advantage of the Sony turnkey NewsBase system pointed out by Alcalá (2015) (external to Telemadrid and complete as regards its configuration) was that, being a fundamentally computing data system, many of the breakdowns could be remotely solved by a simple request to Sony, which would access the servers via IP, and fix the system.

Telemadrid's moved from the former facilities to downtown Madrid, in García de Paredes St. where they shared resources with the EFE news agency and Telemadrid didn't have its own resources, in 1997 Telemadrid involved a series of studios in the need for digitization. These systems began to be introduced at the NAB in 1996, while in 1997 Vicente Alcalá Boces, Technical Vicemanager of Telemadrid, drafted a study for an initial digitization project, with a mind to the new headquarters. (Ibid.)

After moving to the new facilities in downtown Madrid, and given that Telemadrid lacked financial resources then for digitization, a number of interim edition booths were prepared at the new headquarters, keeping the old videoreaders of the former facilities at Efe, although aware of the need to change them in a few years' time. Actually, a couple of years elapsed before the first phase was completed and the manufacturers could provide sufficient warranties for an efficient digitization. (Ibid.).

When Telemadrid launched a tender for digitization, the technical specifications contained the production needs, the workflows to be agreed, etc., however, the system's architecture wasn't exactly defined, since it was to be proposed by the manufacturers. 4 or 5 proposals were put forward, among them Avid, and, above all, two serious proposals by Phillips and Sony systems. In the end, Sony was the manufacturer that achieved the contract award with their Sony NewsBase. (Ibid.)

At that point in time, no system was better than others. These were the most relevant disadvantages posed by the Telemadrid MAM system: «There is a very high risk concentration with this system, since you have one single system to tackle the whole news cast; there's no alternative edition booth to make the piece. Moreover, the most relevant risk with new systems was that you could purchase a system and remain alone, while no-one else has bought it; this would mean that the system will not be further developed, given that the research, evolution and enhancement of any system are «shared» among the various purchasers. (Alcalá, 2015)

Certainly, there were risks, but also advantages. «These were systems sold theoretically, you couldn't see them operating, so manufacturers would sell them for 1000 million pesetas (6,010,121.04 euros) instead of selling them for 2000 million pesetas (12,020,242.09 euros). Another consequence of Sony winning the tender was that Phillips soon quit manufacturing the system, given that they considered that it would not be possible to sell it at such a competitive price to anyone else, since Telemadrid hadn't bought it» (Ibid.)

The Telemadrid MAM, which started in 1999, continued to evolve (making explicit another important feature of MAMs, their permanent evolution). It may be considered that it wasn't actually completed until the following update and evolution, in 2004, when the Sony PetaSite server library (data hard drives) was purchased by them for 1 million and a half euros. This system consisted of an automated robot with SAIT data tapes by Sony (Super Advanced Intelligent Tape). These were half inch tapes containing computer data –rather than video, as the file used to be stored– with initial native capacities of 500GB and 800GB. Telemadrid's archive was digitized using this new format of data tapes. A database software called «Invenio» was also purchased the same year, manufactured by Harris; as well as an MAM management software with an automated archive. This completed Telemadrid's MAM in 2005. (Alcalá, 2015)

Considerable changes for the journalists' workflow were brought about by Telemadrid's MAM in 1999. To sum up, we could say that the whole system comprised an AvidNews software for news editing and an MAM itself (Sony NewsBase) for video files management. This process is described next, with terms and processes which were common to many MAMs from then on.

After reaching Telemadrid, the journalist would leave the raw material, which usually lasted 20 minutes, in the data uploading room, to be captured and ingested into the Sony NewsBase the BetacamSX system used by Telemadrid back then, allowed a quick uploading which entailed one quarter of the real time in the tape. In case there wasn't enough time to do it (when time was insufficient), the journalist could go to the edition booths equipped with non-linear Sony DNE 1000 editors, connected to the system. Actually, editors did not start editing physically, but would create an EDL (Edition Decision List). When the task was over, with the possibility of adding a voice over from its terminal, it was recorded as a «story». When recording its EDL, the low-resolution browser broadcasted the edited images to the ON AIR (high-resolution server). In case the news item had a specific slot in the newscast play-list, it would feature there, creating the broadcast rules found in that play-list. The ON AIR server had 3 output ports. The first one was responsible for the news item on air, the second one for the item coming up next, while the third one was used to broadcast «manually» a story which was not in line for broadcast, according to the play-list. The 150 terminals operated with the Avid News program, software for editing and managing play-lists for the computer newsroom»

(digitized or computerized newsroom). The news scripts from the agencies, the play-lists, the hosts' scripts (Auto-Cue or Prompter), the video details (duration, titles, location in the play-list) and the system itself contained the ClipEdit video editor. ClipEdit allowed searching, viewing, editing, adding music and voice over and finding in the file. (Vázquez, 2000)

4. Conclusions

MAM systems were introduced in Spain practically at the same time (1998) as the first systems implemented by the CNN in the USA.

MAM systems entailed a very expensive technological investment. Nevertheless, the prices were very competitive, due to the MAM manufacturers' need to introduce such an innovative audiovisual and computing technology. Although they were very expensive, the technological pressure of their possible advantages supported the fact of their fast implementation, in Telemadrid in particular.

The deployment of the first MAM systems brought about a change in TV stations' workflows, with ensuing organizational and labor transformations, since editors gradually became editors-montage makers.

Moreover, it is important to note the pioneering nature of Telecinco when tackling the challenge of digitization in Spain, particularly in the case of a product or service as daily news shows, associated with any channel's brand and produced live. An added risk resided in the fact that they were supported by prototype-like technological solutions, that is, solutions which were not sufficiently tested before their actual implementation.

Telemadrid established a fundamental process in the standardization of the digitization process, as well as the already mentioned duality in access to materials (low and high resolution), announcing the potential provided by the MAM technology to adapt to different productive routines and industrial contexts.

Both pioneering MAMs in Spain kick-started an unstoppable race for the implementation of different MAMs in other private and public channels in Spain.

5. Bibliographical References

Austerberry, D. (2004). *Digital asset management*. Taylor & Francis.

Alcalá, V. (2015). Subdirector de Ingeniería y Servicios de Explotación de Telemadrid. Entrevista realizada en marzo de 2015.

Brown, P. J. (2001). "Managing assets gains importance". *Broadcasting & Cable*, 131(17), p. 82. Recuperado el 3 de febrero de 2017 de https://goo.gl/tqxyE0

Dickson, G. (1998). "Sony, EDS target asset management". *Broadcasting & Cable*. 30 Marzo 1998, Vol. 128 Issue 13, p.60. Recuperado el 3 de febrero de 2017. https://goo.gl/T313VQ

Gómez, R. (1999). "Telemadrid implanta un sistema pionero de digitalización informativa". *El País*. 18 noviembre de 1999. Recuperado el 3 de enero de 2016 https://goo.gl/72MjNn

Fandiño, X. (2001) "De Analogía a Digitalia". *Revista Latina de Comunicación Social*. Diciembre de 2001, nº45. Recuperado el 3 de enero de 2016 https://goo.gl/Zd5dXE

Formulatv (2010). "Telecinco cumple 20 años de historia". 3 marzo 2010. https://goo.gl/f3KAW2

Information Today (1998). "CNN Becomes First U.S. Beta Test Site for Sony_EDS Digital Asset Management System". *Information Today*. Jun 98, Vol. 15 Issue 6, p. 39. Recuperado el 3 de enero de 2016 de http://goo.gl/e4WSr6

Lizarralde, K. (2009). "Media Asset Management (M.A.M.) y plataformas de digitalización de contenidos de ETB". En Agirrezaldegi, T. Y Camacho, I. (Eds.) Dokumentazio zerbitzuak Euskal Herriko komunikabideetan = Los servicios de documentación en los medios de comunicación del País Vasco. Euskal Herriko Unibertsitatea = Universidad del País Vasco. pp. 157-181. 2009. Recuperado el 3 de enero de 2017 de https://goo.gl/l1GdBz

Luzón, V. (2001). *La irrupción de Internet en las rutinas productivas de los informativos diarios televisivos. El caso de TV3, Televisió de Catalunya.* Tesis Doctoral. Bellaterra (Barcelona): Departament de Comunicació Audiovisual i Publicitat. Facultat de Ciéncies de la Comunicació. p. 86

Moreno, A. (1999). "La redacción digital de Telecinco estrenó EDITSTAR en agosto de 1998". *ABC*. 21-02-1999, p. 147. Recuperado el 3 de enero de 2017 de https://goo.gl/Mkkwpm

Pagani, M. (2001). "Content management for a digital broadcaster". En Khosrow-Pour, M. *Managing Information Technology in a Global Economy*. Idea Group Publishing, 1062-1066 P.

Peñafiel, C., López Vidales, N. (2009) "Documentación digital y gestión de contenidos en la televisión de hoy". En Agirrezaldegi, T., Camacho, I. (Eds.) *Dokumentazio zerbitzuak Euskal Herriko komunikabideetan = Los servicios de documentación en los medios de comunicación del País Vasco*. Euskal Herriko Unibertsitatea = Universidad del País Vasco. pp. 61-72. Recuperado el 3 de enero de 2017 de https://goo.gl/l1GdBz

Pittas, J. L. (2002). "MEDIASET: The benefits of digital asset management". *IBE: International Broadcast Engineer*, (324), p. 22.

Producción Profesional (2005). "Telecinco concluye su digitalización". *Producción Profesional,* número 65. pp. 4-5.

Sanz, L. (1998) "Producción electrónica de noticias". *CINEVÍDEO 20*. Nº 156. Diciembre 1998. p.5.

Sanz, L. (2006). "La influencia de la tecnología en la TV". *Bit*, 158, Ago-Set. 2006, pp. 50-52. Recuperado el 3 de enero de 2017 de https://goo.gl/HeSVLI

Smith, A. (2009). "Introduction to digital asset management (DAM)". *OceanTeacher Academy Training Course, 2 – 7*. October 2009. Online. Recuperado el 3 de febrero de 2017 de https://goo.gl/ajqGB6

Telecinco (2005). *Informe Anual 2005*. Recuperado el 3 de febrero de 2017 de https://goo.gl/KXWqm3

Telemadrid (2008). *Proyecto de digitalización del archivo de Telemadrid.* Documento Inédito.

Vázquez, G. (2000). *Nuevas tecnologías en Telemadrid*. Recuperado el 3 de febrero de 2017 de https://goo.gl/xdVWLz

_____