

FACULDADE DE ENGENHARIA DA UNIVERSIDADE DO PORTO



# **Graphical User Interfaces for Television Production Software**

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Master in Informatics and Computing Engineering

Supervisor: Maria Teresa Galvão Dias (PhD)

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# Abstract

User interfaces are very important. They are the face of a piece of software, and quite often, the only metric that a user has to assess the quality of that software.

The constant evolution in software quality and functionality calls for equal improvement in usability, so that extra hardware and software power can be harnessed and put to good use. It is therefore imperative to subject graphical interfaces to the same scrutiny and care that the internal, functional parts deserve.

This document presents a study of the usability of television production software. It focuses specifically on news production software. A study is made, of the workflow journalists use everyday in a typical news broadcaster: RTP. The workflow, its processes and software are explained, and suggestions for improvement are made.

A proposal of an application that fulfills these needs for improvement is made: the application is called newsRail, a news selection system, for easy selection, filtering and usage of news material from news services, such as Reuters and Lusa.

As part of an iterative user-centered design approach to the development of the software, a Heuristic Usability Evaluation is made. Evaluators are trained and the results are discussed, both the benefits to the software's development, as well as the benefits for the host company (MOG), with the sensibilization and training of their staff in usability matters.

# Resumo

Os interfaces gráficos do software são extremamente importantes. São a face visível de uma aplicação de software e, frequentemente, a única métrica pela qual um utilizador apreende a qualidade desse mesmo software.

A constante evolução da qualidade e funcionalidade do software pede igual evolução na usabilidade, para que as capacidades cada vez maiores de hardware e software sejam correctamente aproveitadas. É imperativo que os interfaces gráficos estejam sujeitos ao mesmo escrutínio e cuidado que as partes internas do software recebem.

Este documento apresenta um estudo sobre usabilidade de software de produção de televisão. Foca-se mais concretamente no software de produção noticiosa. É feita uma análise do processo de trabalho "workflow" que jornalistas utilizam no dia-a-dia num estúdio típico de produção noticiosa: a RTP. O workflow, os seus processos e software utilizado são explicados e são feitas sugestões de melhoramento.

É proposta uma aplicação de software que promove as ditas melhorias, chamada newsRail, um sistema de selecção de notícias, que permite visualização, filtragem e escolha de material de várias fontes noticiosas ao mesmo tempo, como a Reuters, ou a Lusa.

Como parte do processo iterativo de desenvolvimento "User-centered Design", é feita uma avaliação heurística. São treinados avaliadores, e os resultados são discutidos, tanto os benefícios para o desenvolvimento de software como os

benefícios para a empresa anfitriã (MOG), com a sensibilização e formação dos seus colaboradores na área da usabilidade.

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# Abbreviations

MXF - Material Exchange Format

MOG – Media, Objects and Gadgets S.A.

MVC – Model-View-Controller

IT – Information Technology

# Chapter 1

## Introduction

This project is about Usability aspects of Graphical Interfaces for TV Production Software, and also about the journalistic workflow during production.

An analysis of a specific workflow on a real news station is performed, and points of improvement are highlighted. A proposal for improvement is made, consisting in a central news selection software tool, named "newsRail".

An approach of the specific usability needs of professional video news production software is made, taking into account the specific needs of said software, and also MOG Technologies' resources.

## Context and Scope

The professional video industry's move to file-based workflows enables a range of IT solutions for processing video from capture to broadcast.

MOG Technologies was created in 2007, with the ambition to explore a new professional market based on the development of centralized ingest solutions for broadcasters. They have been involved in the development of the MXF professional file format, since its very beginning.

News production poses specific challenges and needs to the market, because good journalism is dependent on having the best tools for the job. It is those tools that enable the modern, file-based, journalistic workflow, and the better they are, the more productive professionals can be.

Professional software must be as usable as possible, given that user error, frustration and failure to complete tasks are potentially disastrous and can be very costly to an organization. Developing with usability in mind also comes with a cost.

Ideally, a solution that maximizes results for time and effort expended is needed, so that the methods are most effective, and more likely to be applied to all software projects.

## **Motivation and Goals**

Motivation for this theme arises from its relevance and importance.

It is undeniable that good journalism is crucial, in a modern democratic society. General perception of any given theme is highly affected by its news coverage, putting heavy responsibility in today's journalists' shoulders.

To perform the best possible job, journalists need to have at their disposal the best tools available. It is then challenging and motivational to enable better news production, as all society benefits from it, immediately.

This project's goals are:

- The analysis of a real journalistic workflow
- The highlighting of issues in that workflow, and proposal of software improvements (as mockups)
- The usability analysis of that software (mockups)
- The implementation of a functional prototype

In summary, a work process is analyzed and improvements are proposed; mockups are created and later evaluated in respect to their usability. Then, a working prototype is made, using Adobe Flex.

## **Document Outline**

This document is organized in 9 sections. The first, this one, presents an introduction to the theme of this dissertation, its objectives and motivation, and this outline of the rest of the document.

The second section presents a literature review, a theoretical description of the themes it will approach. The third one "Video News Production Workflow Analysis" contains an real-case analysis of the video news production workflow in RTP.

The fourth describes a software application that could solve some of the problems found in the workflow analyzed in section 3. Section five explains all decision factors and options considered when designing the software's interface.

Section six contains the results and interpretation of the usability study that the mockups were subject to, as well as proposals for changes.

Section seven refers to the working prototype implementation details, the technologies involved and architecture.

Section eight presents conclusions to the work done and proposes future improvements. Finally, section nine contains reference material.

## **Chapter 2**

# **Literature Review**

### **Professional Video Production**

Professional Video Production can be defined as a series of steps and phases that allow the complete creation of a program, encompassing planning phases, rights acquirement, casting and writing, through filming, editing, audio production and all the way to distribution, broadcasting, storage and archival.

This workflow includes several separate services and environments. The linkage between them used to imply the physical transport of material in labeled tapes or, in some cases, transmitting uncompressed information through synchronous networks. It is now possible to work in what is known in the industry as a file-based workflow, using computer hardware, digital files and production software. The following sections will explain all this in more detail.

It can be argued that the advent and success of this kind of software and industry process shift is tightly linked with the definition of the MXF standard.

## **Workflows**

A workflow is a process for video production. This process involves several stages, but in a simplistic way it can be assumed that they are: capture, editing, broadcasting and archival.

The recorded video is ingested into the system, stored in temporary work servers, where it is accessible by the editing platforms, playout and archive servers.

Ingestion is the process of importing video from the medium it is recorded in, altering it so that it is conformant with the system's formats and needs.

Playout, as the name suggests, is the act of broadcasting the finalized media.

There are, essentially, two types of workflow: tape-based and file-based. These differ in the way video and audio are transported, handled and stored.

In a tape-based environment, video is recorded to tape, then, the tape is physically transported to an editing room, where it is edited and a final copy is recorded to another tape, which is then transported to a playout server that broadcasts it.

In a file-based environment, all media is stored in computer files. The process is fundamentally similar, but files bring enormous advantages over tapes, in convenience of handling, transport, archival and durability, as well as possibility of transfer over standard IP networks, storage in generic storage facilities and faster-than-real-time transfer. Also, editing files on disks brings the great advantage of random access, which lies at the heart of the nonlinear editor. In playout, playing files from disks saves wear and tear on tapes, decks and robotics. Modern professional video cameras can shoot as files and store on a variety of media, including solid-state memory, optical disk and hard drive, allowing for a completely end-to-end file-based workflow

Mixed workflows also exist, some companies are still using older tape cameras, and capture the video in specialized departments (in-house) so that from then on they can work with digital files.

## **MXF**

MXF, the Material eXchange Format, is a standard file format defined by SMPTE, the reference organization when it comes to standardization in the Television and the Motion Picture industries [MOG].

It is an extensible XML-based wrapper for professional digital video and audio, offering, among other things, support for several channels of both audio and video, allowing for different resolution versions and multiple audio channels and configurations.

It was designed to address a number of problems with non-professional formats. MXF has full timecode and metadata support, and is intended as a platform-agnostic stable standard for future professional video and audio applications [MOG].

This allows synchrony between variable resolution video and audio, which in turn enables the streaming, previewing and manipulation of one (typically lower resolution) source of video, and having the possibility of directly applying the same editing changes to the higher resolution version, for broadcasting.

The inclusion of metadata in the format adds very interesting functionalities, such as description of the content, transcripts, specific video and/or audio details, keywords, as well as data encryption, digital signing, integrity checking and key management.

This, in turn, allows for quick search in archives with many files and the enforcement of digital rights.

All this information, in a file-based workflow, is always available throughout the whole process, making the MXF format “the foundation technology driving the adoption of Information Technology in the professional media market” [MOG].

MOG Solutions is a recognized leader in the development of MXF technology. Their engineering team, former researchers at Portuguese R&D institute INESC Porto, actively participated in the development of the MXF standard itself. [MOG]

Future TV production architectures will be based around networked file servers with disc-based storage rather than tape-based storage. The majority of future program

material exchange between organizations and systems will be accomplished by file-to-file transfer rather than by exchange of tapes. A widely accepted standard for file interchange will therefore be essential for efficient and cost-effective TV production.

Since MXF has the support of all the major manufacturers and end users, it is likely that MXF will become the most widely used and accepted format for program exchange [MXF].

## Usability Evaluation

Usability is the study of the ease with which people can employ a particular tool or man-made object in order to achieve a goal. In computer science and human-computer interaction, it studies the elegance and clarity with which the interaction with computer applications is designed. It encompasses methods and techniques to measure said ease of use.

Usability evaluation is an integral part of the design process, consisting in collecting information of user experience when interacting with a software application or computer system, to obtain information on the ease of learning and use, as well as user satisfaction, enjoyment, or frustration.

Several methods of evaluation exist; some of which involve users directly, while others take into account psychological user needs that have been studied before.

There are three approaches to evaluation [IDES]: Usability testing(1), Field Studies(2) and Analytical Evaluation(3). These consist of watching users perform tasks in controlled environments (1), watching users use the system in natural conditions (e.g. in an office, at home) (2), and measuring software compliance with usability norms, guidelines, and estimating user performance (3).

Sometimes, approach (3), as does not require as much, if any, user input, is called a “discount” usability evaluation method, opposed to the costlier techniques that involve users.

A mix of all approaches is common in the same study, and good results can come even with the application of only one of them. The following sections will detail these three approaches, grouped by user input needs: Usability testing and Field Studies, and Analytical Evaluation.

## **Usability Testing / Field Studies**

This technique involves users and watching them perform tasks, being it in a usability laboratory, with controlled conditions and no distractions (Usability Testing) or watching users use the system in a real environment, taking into account all the extra factors that it implies (Field Studies).

Usability Testing is all about quantifying users' performance when doing specific tasks with the system. This usually takes place in a laboratory, or laboratory-like conditions, eliminating distractions or other users' input. It has been very important over the years, aiding the development of products that go through many generations, such as office software, wordprocessors, spreadsheets or databases. The findings and measurements can then be stored and later compared with future versions.

Field Studies are performed in natural settings, to understand how a product is used, and how it mediates users' activities. This kind of testing can help identify opportunities for new technology, establish usability requirements or even facilitate the introduction of a given product, having the knowledge of how it is being used.

## Analytical Evaluation

This technique can be divided into two subcategories: inspections and theoretically based models.

Theoretically based models are used to predict user performance, and are useful for comparing the efficacy of different interfaces for the same application, as well as optimal arrangement and location of features.

There are two kinds of inspections, heuristic evaluation and walkthroughs.

Walkthroughs involve a specialist simulating a user's behavior and problem solving process in each step of an activity with the system. This allows for the comprehension and measurement of a user's ease of learning, without him/her being present. The results will not be as accurate as a real world field test, but a trained specialist can obtain interesting and useful results, at a lesser cost, as well as faster than when testing with people.

Heuristic evaluation involves evaluators examining the interface and judging its compliance with recognized usability principles, called "heuristics". They are based on common sense knowledge, as well as general usability guidelines, often obtained after many hours of user observation, and condensation of several studies.

Jakob Nielsen proposed 10 heuristics [HEUEV] which became de facto standard for the industry. They are:

**1. Visibility of system status** - The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

**2. Match between system and the real world** - The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

**3. User control and freedom** - Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

**4. Consistency and standards** - Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

**5. Error prevention** - Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

**6. Recognition rather than recall** - Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

**7. Flexibility and efficiency of use** - Accelerators -- unseen by the novice user - may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

**8. Aesthetic and minimalist design** - Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

**9. Help users recognize, diagnose, and recover from errors** - Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

**10. Help and documentation** - Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

## **Characteristics of Usability Problems found by Heuristic Evaluation**

Heuristic Evaluation typically finds both major and minor problems in a user interface. As is expected, more serious problems are easier to find than minor problems, as with user testing. Studies (Nielsen, 1992) show, however, that apart from finding the major problems, minor usability problems tend to dominate the lists of problems found, something that would be very difficult to achieve with user testing, and would require extensive specialized tests. This is why severity ratings form a useful complement to a heuristic evaluation.

## **Classifying Problems - Severity Ratings**

Assessing the relative severity of the problems found by Heuristic Evaluation can be very useful. These ratings can later be used to allocate the most resources to solve the most serious problems.

The severity of a usability problem is a combination of three factors (Nielsen, 1994): the frequency of a problem's occurrence (common or rare), its impact on the user (easy or difficult to solve), and its persistence (it happens repeatedly or it is a one time thing). The severity can be classified as a numeric value, from zero to four, being zero not a usability problem, and four a catastrophic one.

Given that these ratings are mostly based on opinion, the statistical value of one judgement cannot be assumed as completely accurate. However, averaging the ratings of three or four evaluators, provides for a statistically acceptable metric (Nielsen, 1994).

## **Educational use of HeuEV**

Users can be trained to become evaluators. Their proficiency in finding usability problems is not very high, at first, but with practice and discussion of combined usability problems found by co-evaluators during tests improves this proficiency. This can be of great value to train not only good Usability professionals but also more competent interface designers.

## **User-Centered Design**

User-centered design (UCD) is an approach to design that grounds the process in information about the people who will use the product. UCD processes focus on users through the planning, design and development of a product. [UPRO] It is also known as pervasive usability, because these user needs are given focus in all project development stages.

### **A Typical UCD Methodology**

User-centered design methodologies suggest specific activities to be performed, and the time within a process when they should be completed. UCD activities can be broken down into four phases: Analysis, Design, Implementation and Deployment, with suggested activities for each phase.

## **Chapter 3**

# **Video News Production Workflow Analysis**

### **Context/Work Done**

RTP is the Portuguese public service broadcast organization, encompassing both public radio and television. It has its main offices in Lisbon and Porto.

This study consisted of two visits to their Porto offices, in Vila Nova de Gaia and a subsequent analysis of the journalists' workflow when producing news content. Both the visits as well as the study are focused on television news production; radio and text (printed or online) news content were beyond the scope of this dissertation. What is described in this chapter is then the process analysis concerning the production of video news segments.

The first visit was on the 14th of October, and the second on the 10th of November, in 2010.

In the October visit, a technical view of the process was provided by RTP staff, as well as a tour of the premises and a technical demo. Several things were evident as of this visit: all work is collaborative and the systems used (software and hardware) provide a flexible and efficient work environment. These systems are detailed further on the next sections.

The November visit was longer and much more journalist-centered; it provided for a comprehensive view of the work process of everyday journalist's tasks producing news content, with great emphasis on content gathering and video footage processing

workflows. It was after this visit that a complete picture of the news production process was formed and the process analysis became possible.

## **Information Sources**

There are several sources of information available for producing news content. RTP's journalists have access to the following: News Agencies, print media (newspapers, magazines), radio broadcasts, viewers' contributions, internet websites, other competing news channels, as well as contacts in specific areas of expertise.

These sources are often the trigger or reminder of a specific theme or subject, after which the theme is pursued in accordance with the news director's approval.

RTP has a specific department called "Agenda de Informação" (Information Scheduling) which keeps track of several sources of information and performs a pre-parsing of subjects and themes. They are responsible for about 60% (estimation by RTP staff) of the reporting of subjects that eventually become news segments.

Staff from that department filters websites and paper editions of several newspapers and magazines, forwarding interesting themes to journalists and information coordinators in that area of expertise. These themes can sometimes be follow ups of a news story, or alternative takes on the matter by competitors.

This department also manages viewer contributions, via mail, e-mail or telephone, and is the hub for institutional communication with RTP; they receive local, regional and national events announcements and presidential schedules, only to name a few.

Journalists themselves perform some of the same research, in their specific areas, when not producing news content; however, it is the department's responsibility to assist in that area and filter viewer and institutional contributions.

Journalists and information coordinators choose which themes should be pursued or not.

Other very important sources of information and media are news agencies. Reuters, CNN, EBU, Lusa, are all well known agencies with collaborators and sources all over the world. They provide an important service, delivering news content from a great variety of subjects, reported by their many collaborators throughout the world.

It is because of these agencies that small and medium broadcasters can produce news content from places or events they didn't cover, or where they have no news correspondent or assigned reporter.

Journalists use these agencies' feeds to enhance their news reports with information and video content obtained in a much more convenient fashion.

This convenience comes at the expense of possibly (and probably) not using unique content, as various broadcasters can use the same sources.

This is particularly evident in last minute events or conflict reports; sometimes only one News Agency has footage on the subject, and most broadcasters end up reporting the same information, accompanied by the same video. This problem is outside of the scope of this dissertation; emphasis will be given on the useful aspects of these services, in general.

## **Software and Infrastructure**

Journalists use the following software, in RTP:

### **ENPS**

The Essential News Production System is a broadcast news production system developed by the Associated Press' Broadcast Technology division. It integrates with editors, storage and outgest software, enabling a workflow that allows users to produce, edit, organize and run news broadcasts. It is scalable and flexible enough for use in small and large organizations alike, whether they are local news producers or large enterprises, with offices in multiple countries. [ENPS]

This is the central point of all news production in RTP.

### **sQ Cut**

Cut is Quantel's basic video editing software. It is a non-linear video editor, supporting most video editing features needed to produce a typical news story; it allows complete timeline editing, and voice over recording.

### **sQ Edit**

Edit is Quantel's best featured software editor and has all the facilities of sQ Cut plus mix, wipe and custom transitions". [QUANTEL] It possesses a suite of tools to solve picture issues, such as color balance, as well as advanced features, such as masking faces and multi-layer compositing.

### **Web Browser**

The web browser, despite seeming ubiquitous and not particularly relevant, is an essential tool for a journalist. It is through it that the journalist accesses a great part of the content to produce a news segment. It allows access to websites, online newspapers and magazines, blogs and, most importantly to this analysis, to the news providers' websites.

In terms of infrastructure, journalists in the Porto offices have access to an open-space office, comprised by several general purpose editing isles, department isles and a central work isle.

An isle is a group of desks with standard desktop computers, organized so that users are facing each other when using them. This allows better communication and enables collaborative work. General purpose and department isles have about four to six computers, and the larger, central one has around fifteen. The offices in Lisbon are similar in organization.

Every journalist is allowed to work on any computer available in the office, and his or her windows desktop preferences are accessible on every machine.

Journalists usually work either on their department/speciality isles (sports, politics), or on any of the general purpose isles, depending on the amount of free computers. As days off vary within RTP staff, there can be more and less crowded days, varying the number of available computers.

The larger, central isle has identical computers to any of the other isles, and its purpose is to join together all journalists that are producing content for or working on the next news bulletin. This allows for faster decision making when changing or adding things to the bulletin.

On another floor, next to a video ingest room, there are four specialized editing isles, with more powerful computers, equipped with Quantel's more powerful editor sQ Edit. These machines have access to the same desktop preferences and profiles, allowing for seamless transition of work between computers. Journalists can (and do) edit their content in the general purpose computers on the main office, save a draft version of a news piece, log in on one of the editing isles, and proceed with work, using sQ Edit's more advanced features, when necessary.

## **Work Process**

The work process for RTP's News Production Workflow consists in five stages: Theme acquirement, content gathering, Editing/Dubbing, Publishing and Broadcasting. Journalists usually follow these stages in the order described, except if changes are necessary, and some stages may need to be repeated.

These stages were defined after the visits to the RTP offices and careful observation of their workflow in action.

The titles of the stages are fairly self-evident, but a more detailed explanation follows:

### **Theme acquirement**

This is the process where a journalist finds, or is attributed a theme for a news piece. Themes usually come from one of the sources described in the previous section "Information Sources", and is approved by the news director. After this phase, the journalist already has a theme for a news piece, and will proceed to explore it.

### **Content Gathering**

This is the second phase; the journalist already has a subject to work on, and proceeds to investigate it, wether researching on the field, interviewing relevant people or reading and watching other content already existent. Recording footage of an event, and reactions from intervening persons is a typical Content Gathering case. It's important to note that it is in this phase that journalists tend to read and watch news reports from News Services the most.

Content is created, as well as gathered (hence the name!) from other sources. The journalist will then edit it.

### **Editing/Dubbing**

This phase is a logical follow up of the previous one. Created and gathered content needs to be edited, cut and arranged into a coherent, original and interesting story, for publication. Dubbing is introduced as part of the name, as it is a very common and important technique when producing news. When content is ready for playout, it is

stored in common access network storage and flagged accordingly, via special endings on filenames. This will be more evident in the next phase, Publishing.

### **Publishing**

Content, after creation and editing, is stored in playout servers, where it is available to ENPS for metadata insertion.

This is a very important step: it is in this metadata that the journalist defines the script that the bulletin anchor will say to introduce the news piece, as well as important information for directors and production staff, such as oracle content (information text displayed on a highlighted bar on the bottom of the screen), among other necessary informations.

### **Broadcasting**

Not considering archival, this is the last step of a typical news segment production workflow (also, most news are not archived for too long, and those important ones that do get archived, get so by the hands of Archivists). This step is relatively simple: the published news segment, available on the playout server, is added to a specific ENPS timeline. A news bulletin, then, is a collection of entries on a timeline, a playlist of sorts. The playout server then transmits the bulletin to viewers.

## **File Flow**

Taking into account that the video news production workflow is a file based process, a flow analysis of the media files becomes pertinent. The main focus point of this analysis is a specific component of the described workflow, the one corresponding to the content gathering of media files from news providers (e.g.: Reuters), but the complete flow will be shown.

Beginning the process, if content is recorded by a journalistic team, it arrives at the studio in a magnetic tape (RTP is still transitioning from tape-recording cameras to file based devices). The content is captured or ingested into the system, at the point of which is then available as files.

If content comes from a news provider, things are a little different. RTP has services in the Lisbon offices that make all videos from news providers available on their servers for faster global access within RTP. As the Lisbon and Porto offices are connected via high debit fiber optic, content is accessed through the network in either office as fast (in practice) as if it were in the same building. This makes the video content from a news provider very accessible, but not its metadata.

A journalist can only select news provider content on the servers via its file name, making it not very useful for browsing or filtering, only for retrieving a specific file. The selection is then made on the various news providers' websites, searching, filtering and sorting results, taking manual notes of the specific item's reference code, and then getting it from the RTP servers. This is clearly inefficient, and can be improved. Still, the process is relatively straightforward. After finding the required file(s), in the server, they are imported into the editor environment, edited, cut and dubbed as required to produce the news piece.

Finally, the file is saved in the playout server in an appropriate format for broadcast. It is added to the news bulletin in ENPS, and the appropriate metadata is then inserted.

## **Improvements to the process**

It is important to begin by saying that globally, the news production workflow in RTP is fairly efficient. Content is readily available on RTP servers and speed of access is not an issue at all. However, the process of news service content selection is not very good. Having the metadata separated from the content and being forced to search them individually is inconvenient, slow and error-prone.

One solution to this problem would be a more sophisticated method of news selection, that combined the metadata with the video content, so that they would be easily searchable.

A proposal of a software solution that does this is detailed in the next section.

## Chapter 4

# NewsRail

In the previous section, some issues with the workflow in RTP's news production process were exposed. It was suggested that a software application that allowed to search assets via their metadata, with a common interface for all news providers, would be an improvement over the existing workflow.

NewsRail does just that. It is a news selection system, and has several features that make it extremely useful for journalistic work. Namely:

- it allows search on several news providers servers' content, via metadata;
- it allows the preview of a news item's video;
- it allows the export of a high resolution version of a news item's video to a work server (in RTP, this is a Quantel server).

These features will allow it to provide functionality that improves the journalistic workflow.

NewsRail has the following specific terminology:

### **Basket**

A news service server. It contains all video files and associated metadata. May be a physical machine in the broadcaster's offices or a network location.

### **Asset**

A news item. It is composed by video and metadata. NewsRail sees these as the unitary blocks accessible by users.

A basket has many assets, and these assets are updated usually several times a day; old assets (typically more than a week old) become unavailable as they are deleted, for space restrictions. This happens on the basket side, and newsRail is aware of it, updating its database.

In a more technical view, newsRail should provide the following User Story:

- The user accesses the system, finds assets by filtering, sorting and keyword searching, previews their video and metadata information, and exports the desired assets' high resolution version of the video to a work server, for editing.

## Chapter 5

# Mockup Definition

Being newsRail a product for MOG, it makes sense that it works in a similar way to the company's remaining products, so as to make current company clients that already use one or more of their products more comfortable with the user interface. An analysis of current company software features is performed, detailing aspects that make sense to emulate. Of course that all interface metaphors and elements are subject to a later Usability analysis (as a product), to assess their real value, and acquire insight on which of them it is necessary to improve.

## Current Company Software Analysis

MOG currently has three products in their MXF SpeedRail product line: S1000, F1000 and O1000.

**mxfsPEEDRAIL S1000** is a powerful and flexible multi-format SDI recording system. It captures material directly into shared media storage, making it ready for editing even during recording. [MOG] In a nutshell, it allows the digital connection of a professional video camera or tape/disk reader and the recording of the video information to files. It is an entry point to a file-based workflow.

**mxfsPEEDRAIL F1000** is a quick and simple way to move media between servers and editors, with faster than real time speeds and multiple simultaneous transfers. [MOG] Put simply, F1000 allows the transcoding and transference (and their automation) of professional multimedia files between otherwise incompatible systems, enabling interoperability in heterogenous production environments.

**mxfsPEEDRAIL O1000** is a File-Based Outgest system that enables the automated stitching, export and publishing of Avid® sequences to MXF files and to the web.[MOG] This product is the bridge between editing and broadcasting, allowing the export of playout server ready files.

The interfaces of these three products are different, given that they were developed some years apart, but still, some metaphors are common.

These will be defined in the section "Adaptable Metaphors", below.

## **Adaptable metaphors**

Some characteristics of the company's current software are well thought out and been on the market for some years; input from users has been very positive. It makes absolute sense for newsRail to adapt some of these metaphors, to make the most use of the established base of product experience, as well as some of its code.

The main adapted metaphors are:

**Dark overall colour tones** - As most video production software is used in dark studios, darker tones are better at reducing eye-strain from computer usage. NewsRail typical users will also work in regular offices, with regular natural and artificial light, but given that most software they use (Quantel editors, enps and other professional video editing software) also has the pattern of darker tones for backgrounds, it makes sense to make them similar for less contrast between applications. This is not visible on the mockups themselves.

**Movable panel approach** - S1000 uses this method for allowing users to configure their work environment, as well as both Quantel editors, and ENPS. Although not an essential functionality, professional video production software users are used to it, so it makes sense to cater to those needs.

**Top Bar with main controls** - This is also inspired by S1000 and the Quantel editors, which have, respectively, top and bottom control bars.

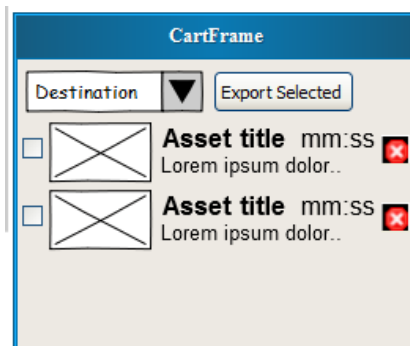
**Video Player** - the video player component (and its controls) is similar to almost all other web video players, with play/pause button and timeline below. This is mainly to follow conventions and not "reinvent the wheel" to confuse users.

## Functionality

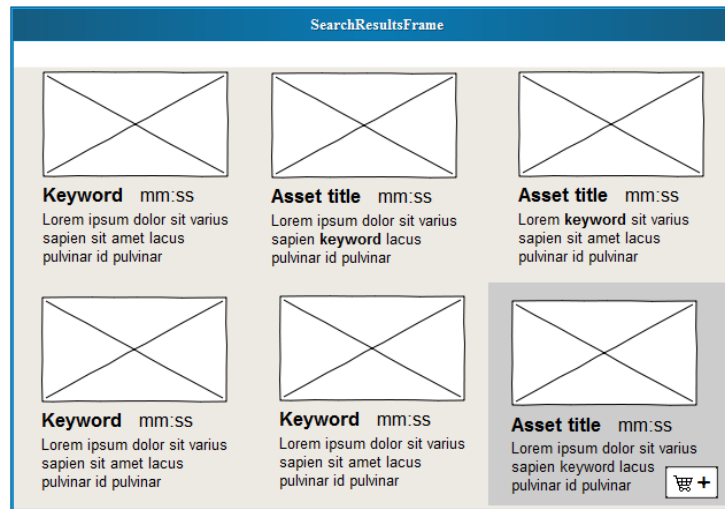
Mockups for newsRail were defined considering existing company software and other professional software used by journalists. All artifacts are intended to aid in the completion of the main tasks the software is intended to do.

The main artifacts created were:

**Cart List (Export List)** - This is a list of assets to export, a playlist of sorts. It was designed to give journalists the option of temporarily storing assets they may or may not export, for reference and convenience. It uses a shopping cart metaphor to approximate the similar functionality provided by e-commerce websites (adding things to a shopping cart to view later, or in aggregate). It looks like this:



**Asset List** - This is a search results panel, showing several assets' information, as a mini-preview. Items from this list can be selected for video and metadata full preview, and added to the Cart List. It looks like this:



## **Chapter 6**

# **Usability Analysis for newsRail**

### **The Methodology**

The analysis of newsRail functionality had a double purpose.

Being a heuristic evaluation, expert evaluators would be needed; these soon-to-be evaluators were chosen among MOG's staff, to be diverse in training and experience.

This training is very advantageous to the company, as defended in Chapter 2.

Staff becomes increasingly more aware of usability problems, and can notice them during day to day use and development of software, even when showing it to clients, or performing support.

In practice, two sessions were done.

First, a more general knowledge presentation about usability was given, to all company staff. This went very well, and listeners seemed interested and curious about usability.

Secondly, a 1h training session was performed, specifically about Heuristic Evaluation, with four staff members; each with different background and function in the company. Members were from the Business Development Department, as well as from the Quality, Consulting & Innovation and Executive Departments. After some training in Heuristic Evaluation and some practical examples, an individual evaluation was performed by each Evaluator, taking an additional 30 minutes to 1 hour (shortest and longest approximate evaluation times).

The evaluations were performed with the evaluator looking at mockups and asking for actions, that were performed by the facilitator (the author).

The mockup system that was used was Evolus Pencil [PENCIL], an open source Firefox extension that allows both high and low level prototyping, and has a tabbed interface. These tabs allow the simultaneous use of many states of a mockup, effectively working as a tidier alternative to paper mockups with flaps and post-its.

During evaluation, the facilitator took note of problems highlighted by the evaluator, to keep notes consistent between evaluators and keep the evaluators concentrated in the software.

After all evaluations, evaluators were requested to rate the severity of a list with all usability problems aggregated. As described in Chapter 2, the aggregated severity results are statistically significant, as at least three measurements were taken into account.

Evaluators were asked to rate the problems from 0 (not a usability problem) to 4 (serious usability problem). All responses were averaged, for the aggregated results.

## The Results

Next follows a list of the usability problems found. This is a compiled list of problems from all four evaluators:

Nº	Description	Category
1	Missing state information (already seen, exported)	Assets
2	Missing visual source information	Assets
3	Unnecessary Video duration information	Assets
4	Missing specific filters (last hour, today)	Search
5	Search tabs not very well visually connected to list of results	Search
6	Inflexible search controls	Search
7	Missing search number of results	Search
8	Search results window title doesn't change according to search made	Search
9	Missing logical operators support in search (AND, OR)	Search
10	Keyword field too disconnected from search control bar	Search
11	Missing multiple selection support for search results	Search
12	Missing "drag to export" functionality	Search
13	Missing select all/none controls in search results	Search
14	Unnecessary "add to cart" button	VideoPlayer
15	Better placement for "add to cart" button should be on video player timeline end	VideoPlayer
16	Video player in lesser prominence than expected	VideoPlayer
17	Shopping Cart metaphor not ideal or necessarily evident	General
18	Panel approach unnecessarily complex for benefits that brings	General
19	on/off Cart button too prominent for lesser functionality	General
20	Metadata not enough visually linked to video	General
21	Panel titles not evident enough	General
22	Missing mini preview (tooltip) of asset details on search results and export list	General
23	Home button not evident enough	General
24	Missing differentiated interface views/contexts for each work phase	General
25	Missing asset preview on export list asset click	Export
26	Missing export time left to completion	Export
27	Missing export list select all/none controls	Export
28	Missing access to already exported assets	Export
29	Missing informative tooltips on cancel export and remove from export list controls	Export
30	Export list destination selection and export button order not evident	Export
31	Original asset location link title should be more evident	Metadata

**Table 1 - List of usability problems**

Each description is combined with a category name for better identification. They are not ordered by any particular criteria, just aggregated by category.

They were assigned numbers for easier reference from this point forward; next follows a better statistical view of results obtained.

Problem Number	Number of reports	Average severity
1	1	2,75
2	2	2,75
3	1	1
4	1	2,25
5	2	3
6	1	2,25
7	1	2,5
8	1	2,75
9	1	2
10	2	2,5
11	1	2,75
12	1	2,25
13	1	2,5
14	1	1
15	1	1,5
16	1	1,5
17	2	3,75
18	1	1,75
19	2	2,25
20	1	2
21	2	2,5
22	1	2
23	1	1,25
24	1	1,75
25	1	2
26	1	2
27	2	2,5
28	1	2,75
29	1	2
30	1	1
31	2	2,25

**Table 2 - Details of usability problems**

This table details how many evaluators found each problem, and an average severity rating. As expected, some problems are found by more than one evaluator and some are rated more severe than others.

Some problems were found by more than one evaluator. No problem was found by more than two evaluators, this is attributed to the relative inexperience of the evaluators (none of them had any previous experience evaluating interfaces).

The following table presents a list of the most common found problems:

Nº	Nº of reports	Average severity	Category
2	2	2,75	Assets
5	2	3	Search
10	2	2,5	Search
17	2	3,75	General
19	2	2,25	General
21	2	2,5	General
27	2	2,5	Export
31	2	2,25	Metadata

**Table 3 - Most found usability problems**

And this one has a list of the most severe, as judged by the evaluators:

Nº	Nº of reports	Average severity	Category
17	2	3,75	General
5	2	3	Search
2	2	2,75	Assets
1	1	2,75	Assets
8	1	2,75	Search
11	1	2,75	Search
28	1	2,75	Export
10	2	2,5	Search
21	2	2,5	General
27	2	2,5	Export
7	1	2,5	Search
13	1	2,5	Search

**Table 4 - Most Severe Usability Problems**

From careful observation of both tables, it is possible to gather the following:

The most commonly found problems are usually rated higher than others. Six out of eight of the most common problems were rated with a mean of 2,5 or higher, classifying them as high priority usability problems; This can mean that those problems most found are inherently more serious and also more visible, as predicted in theory [FUPHE92]. With such a small sample of evaluators, it can also be argued that the results can be biased, if evaluators rate problems themselves found higher than others, as 50% of evaluators found the most found problems. To prove or disprove that, it would be necessary to re-conduct the evaluations with more evaluators for more significant statistical results.

Both most commonly found problems and those rated as most severe are distributed more or less proportionally among categories. This in itself means than no section of the software is worse or better than another, given that they have similar proportions of high prominence problems. It can be argued that sections of the software with more problems would be worse designed, but it is assumed that as some are necessarily more complex than others, they are likely to have more problems, globally.

## Chapter 7

# Prototype Implementation

A functional prototype was implemented to further assess the artifacts chosen and provide for a better (more realistic) platform for testing and improvement.

Technologically, some options were made to make the most use of MOG's existing codebase and know-how, to speed up development, instead of a more pondered and application-specific approach.

NewsRail uses graphical interfaces made with Adobe Flex and uses Bobsled for middleware/backend control. MOG uses Adobe Flex for its latest graphical user interfaces, and developed Bobsled completely in-house for its middleware needs.

This allowed great expansibility potential, for newsRail, as well as a bigger overhead of time learning the technologies.

Adobe Flex is a framework for building web applications that deploy consistently on all major browsers, desktops, and operating systems via the Adobe Flash Player and Adobe AIR runtimes. MOG uses Adobe Flash Builder for Flex Development. [FLEX]

Bobsled is a highly extensible and modular middleware platform. It allows control via SOAP and REST interfaces, to perform all newsRail functionality. It was developed by MOG to allow better flexibility and extensibility to their products. In fact, newsRail functionality is a Bobsled extension. It also uses existing Bobsled methods, such as authentication.

The Flex interface connects to the middleware platform using modified versions of O1000 connectivity classes. Almost all artifacts were developed specifically for newsRail, except for the top control bar and the window controls that were already existent.

All intended functionality is available, whether it is keyword search, sorting and filtering assets, and previewing them. Preview displays the proxy video on the video player, and the metadata on a metadata panel. Export functionality is available but the

original cart metaphor is not implemented, given that it was suggested by the heuristic evaluation that it wasn't very adequate.

## Chapter 8

# Conclusions and Future Work

Good User interfaces are key to a successful professional application.

The proposed work in this dissertation was fulfilled. The analysis of a real journalistic workflow appeared to be somewhat challenging, given the fact that cooperation from an external entity would be necessary. This wasn't the case. Staff at RTP facilities was more than welcoming; they were eager, willing to help. Their cooperation was instrumental in this particular goal.

The issues found in their workflow were not many: it is a rather well thought out process and quite efficient. However, there is no such thing as a perfect system, and newsRail fulfills a simple but rather inconvenient omission in their software tools.

The interface design attempted to provide all necessary functionality with the simplest, easiest and more convenient controls. Evaluation revealed what it usually does, not everything is evident to everyone, and improvements can be done.

The very process of evaluating the interface was useful for all parts involved: the designer and trainer (the author) got insightful input, the evaluators gained a better understanding of the issues and choices that need be done when designing user interfaces. Their contribution was useful for this thesis, but with enormous potential for the company, also. These professionals, now aware of these matters, will be extremely valuable, because in every interaction with a company product, on any development stage, they will be able to provide insight and suggestions to potential usability issues, even if the company isn't performing usability evaluations.

Still, adoption of these techniques is likely, as has been proved that they are cheaper than real user testing, making them a realistic choice in this case of software development.

Ideally, this evaluation should be repeated after improvements based on insights gathered are made, and after that stage, a real user test with journalism professionals would be much beneficial.

As development is still in process, these are the likely next steps to perform. The iterative user-centered design approach promises great results, taking into account what was done so far.

# References

- [ACD] D. Norman. Affordance, conventions, and design. *Interactions*, Vol.6, Issue 3, pp38 - 43, 1999
- [ACUIC] J. Nielsen. Coordinating user interfaces for consistency. *ACM SIGCHI Bulletin*, pp63 - 65, Vol.20, Issue 3, 1989
- [CUIC] J. Nielsen. *Coordinating User Interfaces for Consistency*. Academic Press, Boston, MA, 1989.
- [DQI] E. R. Tufte: *The Visual Display of Quantitative Information*, Cheshire, Connecticut, USA: Graphics Press, 13th Printing, 1993
- [DYK93] Dykstra, D. J. A Comparison of Heuristic Evaluation and Usability Testing: The Efficacy of a Domain-Specific Heuristic Checklist. Ph.D. diss., Department of Industrial Engineering, Texas A&M University, College Station, TX., 1993
- [ENPS] Essential News Production System website, available from: <http://www.enps.com/>
- [FBWF] D. Austerberry. File-based workflows. *Broadcast Engineering*, 2008. Available from [http://broadcastengineering.com/storage\\_networking/filebased\\_workflows\\_801/index1.html](http://broadcastengineering.com/storage_networking/filebased_workflows_801/index1.html)
- [FLEX] Adobe Flex, available from: <http://www.adobe.com/products/flex/>
- [FUPHE92] J. Nielsen. Finding usability problems through heuristic evaluation. *Proceedings of the SIGCHI conference on Human factors in computing systems*, 1992

- [GAEHCI] M. Turnell and J. Queiroz. Guidelines - An Approach the Evaluation of Human-Computer Interfaces. IEEE International Conference on Systems, Man, and Cybernetics, pp2090 - 2095 (vol.3), 1996
- [HCI] Human-Computer Interaction, available from: [http://old.sigchi.org/cdg/cdg2.html#2\\_1](http://old.sigchi.org/cdg/cdg2.html#2_1)
- [HEUEV] J. Nielsen and R. Molich. Heuristic evaluation of user interfaces, Proceedings ACM CHI'90 Conf, pp249-256, 1990
- [HIHCI] D. C. McFarlane and K.A. Latorella. The scope and importance of human interruption in human-computer interaction design, Human-Computer Interaction archive, L. Erlbaum Associates Inc, pp1 - 61, Vol.17, Issue 1, 2002
- [IDES] H Sharp, Y. Rogers, J. Preece. Interaction Design: Beyond Human-Computer Interaction, 2nd edition. John Wiley & Sons, 2007
- [MAO01] J. Mao, K. Vredenburg, P. Smith, T. Carey. User-Centered Design Methods in Practice: A Survey of the State of the Art. Proceedings of the 2001 conference of the Centre for Advanced Studies on Collaborative research. 2001
- [MOG] MOG Technologies Website, available from: <http://www.mog-technologies.com/>
- [MXF] B. Devlin, J. Wilkinson, M. Beard, P. Tudor and N. Wells. The MXF Book: An Introduction to the Material eXchange Format, Focal Press, 2006
- [NNG] J. Nielsen, D. Norman, B. Tognazzini, Nielsen Norman Group website, available from <http://www.nngroup.com/>
- [PENCIL] Pencil Sketcher, available from: <http://pencil.evolus.vn/en-US/Home.aspx>
- [POET] D. Norman. The Design of Everyday Things, Basic Books, 2002
- [QUANTEL] Quantel website, <http://www.quantel.com/>
- [UIEV91] Jeffries, R., Miller, J. R., Wharton, C. and Uyeda, K. M. User interface evaluation in the real world: A comparison of four techniques. Proceedings ACM CHI'91 Conference (New Orleans, LA, April 28-May 2), 119-124. 1991

[UIMETH94] J. Nielsen and R. Mack. Usability Inspection Methods, John Wiley & Sons, 1994.

[UPRO] Usability Professionals, available from: <http://www.usabilityprofessionals.org/>

[USEIT] J. Nielsen, useit.com: usable information technology. Available from <http://www.useit.com/>