

WORKFLOW MANAGEMENT: DESIGN MANAGEMENT SUPPORT IN PROFESSIONAL AUDIOVISUAL PRODUCTION

Per Erik Eriksson, Thorbjörn Swenberg
Moving Image Department
Dalarna University
Falun, Sweden

Yvonne Eriksson
Department of Information Design
Mälardalen University
Eskilstuna, Sweden

ABSTRACT

This paper deals with the need for design management support within the Audiovisual Industry, due to the increasing variety of video file formats and codecs available to professionals. The amount of video file formats and codecs are referred to as ‘the file format jungle’ by moving image professionals, and needs to be navigated by managerial staff that are not electronic engineers or technicians, but responsible for audio-visual design work within film and TV production.

We have evaluated a prototype for a design management support tool that compares file formats and codecs for different production tools, with the help of Swedish moving image industry producers. The core principals of the support tool prototype are found to cohere with the needs for design management support within film and TV production, and the tool is therefore an option for commercial development.

INTRODUCTION

Managing Video File Format Constraints

Few would argue that new codecs and new video formats are worse than the ones they replace. Still, this newness sometimes poses problems in moving image production systems when it ‘clashes’ with old equipment and older formats and codecs. New media standards are estimated to be under way, but the challenges are diverse (Hoffman, 2011). Thus, in spite of Digital Picture Exchange (DPX) conforming, this may remain an issue for some time to come since over the years the plethora of digital video formats and codec has found its way throughout this industry’s production apparatus. This calls for ways to avoid the digital cruxes that emerge when new and old media collide.

This paper describes the conceptualization and Support Evaluation of a design management support tool for the Swedish audio-visual film and TV-industry. The design management support tool is a planning and support tool in the form of an interactive on-line checklist that we call MI-Flow (Moving Image Flow, www.mi-flow.se). This checklist aims at supporting design management in the pre-production stage of TV and film productions. By functioning as an early warning system that identifies file format conflicts and need for conversions at the overall project level, it is a simulation approach that recognizes desirable patterns (cf. Lindemann et al., 2009) in order to free up *creative space* for audiovisual designers.

Space for Creativity and Aesthetic Problem Solving

In this context we consider *creativity* as aesthetic problem solving (Brinck, 1999) – not technical problem solving. All moving image productions are unique, yet the design processes of the TV/Film industry are becoming increasingly industrialized (Eriksson and Swenberg, *in press*). Thus, it is possible to compare the factors that define the *creative space* in industrial settings and assess their respective constraints for the creativity of the agent that is expected to deliver quality image features. Therefore, creative space must be managed in order to become optimal.

From a theoretical perspective, the purpose of this paper is to highlight and discuss the TV and Film industry’s need to identify design process related problems that spring out of the technological shift from analogue to digital production modes as well as exploring ways of dealing with such problems. The concept behind the design support management tool discussed in this paper is based on the notions that design process improvement requires an understanding of the influences on design process behavior and the growing awareness that environmental influences and constraints on designers thinking and actions must be considered in the

improvement of design processes (Le Dantec, 2010). Hence, the theoretical discussion of this paper will revolve around how design process behavior and technical constraints relate to and interact with audiovisual designers' creativity.

Design Research and Prototype Evaluation

The evaluation of MI-Flow is part of the 'New Design Processes in the Audio Visual Industry' Project in which seven Swedish mid-sized moving image production companies participated. This evaluation stage represents the fourth stage of the DRM: The Descriptive Study 2 (Blessing and Chakrabarti, 2009) and was preceded by semi structured interviews with 8 interviewees (one interview was a double interview). This stage of the project consists a group interview with five industry members and an in-field try-out of the MI-Flow prototype by three professional producers. These are the primary questions that have been addressed during this evaluation:

- In what ways can MI-Flow increase designers' creative space?
- If creative spaces are increased, what is the impact in your organization?
- How may MI-Flow be improved?

STATE OF THE ART

Design in Digital Production Chains

The recent shift in production technologies in the moving image industry has increased the interaction between diverse technical systems ('objects') and agents. One example of such an emergent situation in the moving image industry is the complex interactions between various file formats in increasingly complex digital production chains. This situation is sometimes referred to as "the file format jungle" (Eriksson and Swenberg, *in press*). In comparison to the traditional production chain of celluloid production, the digital production chain is – deceitfully – similar. Yet, the crucial conforming stages differ. Thus, the digital production chain allows for other kinds of creative input (Eriksson and Swenberg, *in press*), see Fig. 1.

In academia, moving image production is a neglected area of research. Still, there are some exceptions that, on behalf of the audience, aim to generate a better understanding of the role of perception and cognition in audiovisual production. In this sense, the main idea is that technical systems and the management thereof in the TV/Film industry must be considered central in order to guarantee quality output.

Similarly, texts generated by the industry itself often focus on how to aid cognition in order to make moving image production look (and sound) better. Most of these books (or manuals) are written by industry specialists and deal with specific crafts explaining the pros and cons of some specific technique or/and a favorite equipment.

Some deal with a complete set of skills needed in a specific profession or/and mode of production. Still, most of these production manuals treat the various production phases as separate, isolated activities and do not explicitly address issues of interconnectivity. Unfortunately, this craft laden approach excludes a kind of holistic design process perspective that would make it possible to identify the weak points/parts in the production chain.

However, recently cinematographers and videographers in charge of the first crucial link in the production chain – the recording phase - have conveyed the concern that correct production decisions and workflows are essential prerequisite to success. Much is at stake in the early phases of a film production process, if something goes wrong later on, the cinematographer is likely to have to take the blame. In other words, because much data is generated in contemporary production milieus, precaution and "digital awareness" must be fostered throughout the complete production chain. In the development of MI-Flow we have developed this approach, considering the interconnectivity of activities within digital moving image production a primary concern.

Understanding Organization and Constraints

The implicit understanding of this paper is that recent theories in the cinema discourse do not generate much useful input concerning the actual production processes of films and TV, or the optimization thereof. In spite of the plausibility that real production analysis and 'theoretical' discussions of production are embedded and take place in and around the tools of the workplace, little research grounded in this "on the floor" perspective exists. The analysis of this paper will in part fill this void, coupled as it is to design theories and based on the assertion that the critical intelligence of audiovisual designers must be the main unit of analysis in any attempt to improve the production processes of TV and film.

Within television and film production related discourses, TV and film workers' critical intelligence have come to mean a variety of things, including designerly abilities and creativity. In the development of the support tool we have identified TV and film workers' critical intelligence as an ability to envision a mental image that is to become realized by other designers. Another aspect of this kind of critical intelligence includes understanding the organizing principles behind collaborative production chains. This draws attention to aspects of motion picture production that is constrained by factors external to the individual professional's realm, factors that cannot be regarded lightly when quality is to be attained or maintained (Eriksson and Swenberg, *in press*). Therefore, an attempt to understand contemporary conditions for design activities in moving image production must be attentive to the organizing thereof. If not, it is likely that

designers' creative space will decrease (Eriksson and Swenberg, *in press*).

Collaborative Design in Audiovisual Production

Clearly, both “logistics” (i.e. financing, management, organization, equipment, scheduling, workflow, archiving, etc.) and artistic intentions play a role in the creation of films. To what degree the one or the other is deemed more relevant varies according to whether one considers moving image production as primarily an art-production venture or not. Authors of handbooks in production management and budgeting convey the view that other things than artistic intentions are decisive in the creation of a certain aesthetic. Management researcher Marja Soil Wadman, on the other hand, defends film as an artistic venture. In *The Aesthetics of Capitulation* she questions the notion that successful drama productions must adhere to a highly structured management philosophy: “[...] it is sometimes vital for the director to be able to refrain from intervening. In other words, the director must be open to the aesthetics of capitulation” (Wadman, 2003). Likewise, to scholars that adhere to some form of auteur theory, the formal position of the director as the ultimate leader who grants creativity to crew members and actors is undeniable. To others the status of the director as a creative genius is much more problematic, especially in the light of the recent development of digital technology that has generated new collaborative and creative constellations. Thus, it seems sensible for researchers to maintain openness to moving image production as creatively manifold endeavors.

The topic of creativity has generated research that aims to explain why some organizations are more likely than others to innovate (create new useful ideas, processes, and products). A key understanding of this research is that individual creativity is not enough, but that creativity must infuse complete organizations in order for companies to become innovative and, hence, flourish. This is deemed a long-term process – not something achievable over night. However, up until now little research concerns the role of technology as a “creativity inhibitor” in organizations because it is deemed not a constructive approach to merely attend to the concrete processes and problems that inhibit creativity, but, instead, there need to be a focus on the management of ideas (i.e. The Leader’s vision). Similarly, in the audio-visual sector little attention is paid to concrete creativity inhibitors. Yet, the case for viewing technology as a disabler (and enabler) in media organizations is not irrelevant. In the light of an industry that has not been attentive to the management of ideas, and in which the success of the dispersed, temporal organizational set-ups of production teams hinges on how well technology is managed, the case for viewing technology as interdependent on creativity is indeed quite strong.

Artistry and Technology

Obviously, both digital cinema and traditional cinema depend on artistry. In the film scholar community, most scholars tend to agree with the statement that films ‘work’ when they generate the feeling of authenticity, a kind of perceived cohesiveness regarding the worlds constructed out of filmic expressions. This construction is in part “artistic”, in part technical. In digital filmmaking, the expression of this dichotomy has become more multifaceted and complex. Formal and aesthetic film aspects continuously evolve through new conceptual possibilities, allowed by digital technologies. Studying cinema related artistry in the digital era, then, must include the study of technology.

THEORIES

Complex Organizations and Technological Shifts

From an organizational perspective, technology is highly ambiguous, as are the effects from it. Organization and management scholar Katherine Miller states that the cause-effect relationship in organizational transformations is hard to define because of the interdependence between work task, structure, culture and strategy (Miller, 2011). This relationship is even harder to establish in moving image production teams because of the unique, temporal, parallel and dispersed dimensions of such teams. However, organizations must be expected to be as complex as their activities (Miller, 2011). And to survive in changing business environments, organizational functioning must keep developing (Miller, 2011). The Swedish moving image industry is in the middle of such transformations, becoming ever more complex. The importance of information handling and skills in complex organizations is something we have taken into regard in the development of MI-Flow.

Organizational challenges and responses caused by new technologies are not particular to the audio-visual sector. According to Kathryn Henderson the resistance towards new technology within the graphic design industry springs from staffs’ arduous attempts to grasp and tackle the structural changes and new workflows brought about by technological shifts (Henderson, 1999). This is likely also the case in other design industries - such as the Swedish moving image industry. Thus, our research questions that have informed the design of MI-Flow revolve around organizational responses to the digital technological shifts.

Artistic Creativity and Cognition

Philosopher Ingar Brinck defines artistic creativity as aesthetic problem-solving. It is aesthetic problem-solving with an open and undecided end (Brinck, 1999). Artistic creativity is also characterized as distributed and dependent on context (Brinck, 1999). Artistic creativity is also “an

embodied, experience based craftsmanship” (Brinck, 2007). Brinck emphasizes that artistic creativity becomes real as cognitive activities by agents in the world, where the immediate surroundings have a major importance (Brinck, 2007). The tools and artifacts constrain the conditions for what space there is for “possible actions for the agent” (Brinck, 2007). In this space the relation between actor and the source of content is a functional one (Brinck, 1999). However, equally important is the agent’s relation to the material that is being worked on and her use of the technology in use (Brinck, 2007). In a moving image production context, technological tools are, then, extensions to our bodies that help us ‘touch’ the digits in the digital image files. Thus, they aid cognition in shaping the expression of information (Brinck, 1999). The complex worlds of moving image production constraints the range of choices for the professional and provides motives for certain designs, or certain production values.

Production Value as an Aesthetic Framework

‘Production Value’ is an aesthetic concept that is almost worldwide agreed upon among all film and television production firms. This concept infers that some films look and sound “cheap”, and some – that have high production value – look and sound “expensive”. Moving image productions are kinds of value adding chains and, as such, this concept becomes a measurement/evaluation tool of values – such as picture quality for instance - of different kinds. Recently, technological shifts, internet based networks and changed business strategies (outsourcing for instance) have resulted in that these value adding chains have become broader as moving image production becomes more and more complex. Therefore, *Production Value’s* set of conventions function as a stabilizer to this complex situation (Eriksson and Swenberg, *in press*). Moving Image’s designs may be open ended at the start of production, yet, there are conventions that guide the respective designers as they create audiovisual expressions. Consequently, this infers that the tools by which to realize the designs often are the same and “think” in similar ways. Thus, Production Value is the aesthetic paradigm in which Brinck’s “aesthetic problem solving” take place. Accordingly, the framework for, and the industrial setting in which MI-Flow is to be used, is aesthetic problem solving for High Production Value in the Moving Image Industry.

Creative Space in Audiovisual Design

In the conceptualization of MI-Flow, we have expanded on Brinck’s notion of a “space of possible actions for the agent” as a functional creative space (Brinck, 2007). In doing so, we agree with Brinck in emphasizing the significance artists’ relation to the material that is being worked on and her relation to the technology in use (Brinck, 2007), see Fig. 2.

The choices of tools and decisions on workflow are crucial for moving image postproduction since this is decisive in the configuration of the digital material and its flow through production. In terms of creativity this means to deliver the *right* digital material to each professional craftsman right from the *start* of her work-shift. Only then can the full amount of time planned for each design task can be spent accordingly. These are the conditions for the maximum degree of creativity.

Regardless of type of production (High budget, mid or low budget), the expressive potential of each step of the image processing is limited by two things: the capacity of the tool and the user’s skill. The tool’s capacity includes its sophistication in terms of advanced functions and ways of processing the digital material, as well as the amount of data it can process and at what rate. The user’s skill is the capacity of the individual in handling the tool, as well as mastering work routines of the production method.

The image material to be worked on is made out of digital information that is available for processing, and depends on what file it is contained within, and how the codec has “packed” that information. A generous codec and a suitable file format make the most amount of digital information possible available for the image processing.

Thus knowing the codec and the file format means knowing how that digital material will behave, what its limitations are.

In summary: the time to spend on the image processing, the tool at disposal, the digital information available and the knowledge and skills of the individual makes up the creative space for design activities in moving image production.

METHODOLOGY AND RESEARCH PROGRESSION

The Need for Management of Creativity

The conceptualization of MI-Flow was preceded by and based on the analysis of an initial Descriptive study (DRM stage II). This analysis, in turn, was based on empirical data gathered from interviews. These interviews were coded according to a meaning coherence schema (Aspers, 2007).

The analysis revealed that some of the designated codes interrelate. To all but two informants (6 out of 8) it is not possible to reason about a workflow matter - that also includes the tools and methods in use - without making reference to file formats and codex (Eriksson and Swenberg, *in press*). Clearly this is not only an issue of code assignment, but a result that show that some statements are a confluence of layers of meaning in the same reasoning. The analysis also revealed that the codes for *workflow*, *production method* and *file formats* were overrepresented. The key issues in the digital/celluloid technological shift for Swedish audiovisual companies appear to concern how file formats flow, or do not flow,

through technical production systems. In addition the analysis revealed how these companies have responded to the file format “crises”. Perhaps most importantly, the analysis also revealed that there is a need for production processes to be effective, smooth and fast, with enough creative space. The wish for a “smoother” production apparatus indicate that most cruxes relate to insufficient knowledge about what digital technology requires from the organization of production, “knowledge management is a critical aspect of collaborative work, particularly when the team is dispersed over time and space” (Poggenpohl, 2009). This is an overall project managerial issue.

Arriving at the Concept of MI-Flow

Audiovisual Designers’ “creative space” we believe is a re-occurring aspect and phenomena that can be identified within most film and TV productions. Hence, it is a critical phenomenon to be managed (Eriksson and Swenberg, *in press*). However, designers themselves cannot manage their own creative space – although many try – but the people planning collaborative design activities can. Only management can address the problems that are a consequence of production teams dealing with new “digital issues” in a timely and structured way. Still, individuals having ad hoc knowledge of parts of new technologies, but lacking overarching technical perspective on new production chains often face these issues and deal with them (often unsuccessfully). Thus, several “digital issues” are solved in an unplanned fashion. When a production team solves problems in an unprepared and unplanned fashion, this cost frustration, lots of time and therefore money. Resources would be better spent on artistic creativity and increased quality in the production. This is the urgent cause behind the development of the Intended Support (MI-Flow): the audio-visual industry is in need of design management support tool to gain control over technical production constraints. In gaining this control, value stands a chance to become maximized (cf. Petein et al., 2010).

Developing MI-Flow as an Intended Support Tool

In summary, the main conclusion of Descriptive Study 1 is that good control of file formats and codex can be achieved by a management support tool that can handle complex and delicate technical parameters in temporal organizations in an unambiguous way to avoid uncertainties and errors, wherever it is needed within the organization (Miller, 2011). In other words, we suggest the Intended Support must address the key environmental influence on moving image design processes: ineffective workflows and the knowledge gaps at several instances about the workflows’ importance and how to achieve them (see Table I). Only then may designers be able to be fully creative.

The core functionalities of the Intended Support (MI-Flow) have now been identified:

- The Intended Support makes management foresee technical grid-locks (i.e. it *predicts*)
- It handles complex data (file formats, codex and image resolution)
- It simulates a workflow
- It functions at an overall project level (in the pre-production stage).

In the Prescriptive study (DRM stage III) the core functionalities of the Intended Support were further elaborated upon and conceptualized. This resulted in a design management support concept in the form of an interactive on-line checklist (www.mi-flow.se).

In concurrence with the idea that fruitful Product Development must begin with recognizing that the customer is the ultimate guide (Rhea, 2005), we believe that on the top of the hierarchy of moving image production organizational matters we find ‘the image’. This is a shared mental image and the main concern of the viewer (i.e. “customer”). Accordingly, the images’ parameters/requirements must be decided upon first. In MI-Flow these parameters/requirements are then translated into tools to choose from. These preferences are then translated into preferred file formats and codex. Finally, workflow is suggested by the tool, and any file format crux is indicated, see Fig. 3.

In the Descriptive study 2 (DRM stage V1) we attempted to assess the extent to which our solution will function as intended within the industry (i.e. verification of that support fulfills the requirements), and evaluate it with the help of those who have used it. In this stage, we are careful not to fixate any solution in haste, or/and regard MI-Flow as a final “silver bullet” model - as the design community recommends (Clarkson and Eckert, 2005).

Support Tool Evaluation

The Evaluation of the Support Tool consists of two phases and includes two related but slightly different research methods. In the first phase, we introduced the MI-Flow concept as a “dummy” (interactive, but incorrect output) to five industry members in a group interview setting. These professionals were not part of the interviewees of the previous DRM-stages. This group interview was videotaped, transcribed and coded. All coded statements were analyzed for over-lapping codes (multi-coded data) that indicate that the relation between codes must be studied closer (Aspers, 2007). Similarly coded statements were then related to the different informants for identification of meaning coherence. Concepts that emerged from this analysis were then induced into our analysis as first or second order constructions (Aspers, 2007).

The Second phase of the Intended Support (MI-Flow) evaluation process, we let three industry members (two

producers and one operations manager) try the IS (Intended Support) in their respective industrial setting. They are all men, aged 35-40 – representing the situation in this industry. We stated that they used the IS at least twice (in a situation of their own choosing). They were then asked to answer a qualitative questionnaire based on our research questions. The answers were then crosschecked with the previous coded statement categories in order to be able to hone in on discrepancies and commonalities (and explain these).

RESULTS

Analysis of the Support Evaluation

In summary, these are the specific feedback of the Support Evaluation:

All Informants: ensured the logical functioning of IS, at least at the lowest level; grasped IS's core functionality; agreed with the intended use in pre-production; could maneuver the IS's menu.

Two informants: thought IS should "contextualize" compability problems and explain the underlying reasons; indicated that the IS would not replace current practice; ruled out that the IS could be used in customer negotiations.

One informant: thought the core-functionality was too narrowly defined and desired one additional constraining factor (color mismatching between PC and Mac computers); thought IS's solution page was incomplete and wanted emphasize on "solution" not the problem (i.e. did not want to try several workflows until there were no warnings); desired more data (i.e. more choices); expressed concerns that IS would replace valuable social relations; deemed IS "educational" rather than "enabling"; appreciated IS's way of simplifying technical requirements; suggested the IS could be used as a file format data base; indicated an alternative use for the IS during production.

DISCUSSION

We can establish that the IS (MI-Flow) has the potential to increase designers' creative space, when used in a pre-production meeting. All informants indicated that this core aspect of the IS is consistent with its functions. In addition, the IS's ease of use seems to be the IS's key asset. The IS offers a highly accessible and easy workflow guidance in the design process planning stage. Yet, it does not offer ready solutions in the sense that it corrects faulty choices – it only brings attention to faulty choices. This calls the user's profile into question – for whom does this "trial and error" architecture work? To this, as of yet, there is no conclusive answer. This architecture does not admit that there might be degrees of functionality - perhaps there are good reasons to indicate certain pros and cons in regards to certain workflows, instead of just label

them "good" or "bad"? It is also obvious that there is ambivalence in regards to what is too much context, and what is too little (as represented by the IS's interface). Complexity must be sorted out (made less complex) but not at the expense of disguising or hiding causal relations.

It is also apparent that the IS will not replace current practices and other support schemes, but, if used, complement existing support. The question is, then, in what way will the IS interact with existing design support schemes? To this we have no answer, and this would be hard to figure out, since many other support efforts/tools are unique for the respective companies. The suggestion that the IS could be used as a database for production is intriguing because this implies there is a need to ensure that the workflow is maintained (or/and not altered without a very good reason).

Possible improvements suggested for the IS regard both its core function and its visual communication capacity. A fully developed IS must include all relevant moving image production tools (cameras and software), and all the digital file formats, codecs and image quality settings they include. However, these parameters must be constantly upgraded as manufacturers release new products to the market, which would require much human resources. A better function of the logic of the IS would be if steps 4 through 9 were checked first for compatibility, before that chain is checked against the chosen camera. An alternative camera could then be suggested. Alternative software tools could also be suggested to improve a workflow, however at the expense of reference to what tools are available to the IS user (which is what the IS user puts into the IS when using it). A simple improvement would be to specify what file formats and codecs are clashing at the incompatibility warnings, as an explanation, and possibly suggest conversion plug-ins needed.

CONCLUSION

In this paper the interrelations between creativity, Design Management Support, Audiovisual Design and Film/TV production have been discussed. From a theoretical perspective, we have discussed the TV and Film industry's need to indentify design process related problems that spring out of the technological shift from analogue to digital production modes as well as exploring ways of dealing with this. The recent shift in production technologies in the moving image industry has increased the interaction between diverse technical systems ('objects') and agents. The more complex the situation becomes and the more complex the production processes become, the more urgent is the need for management support, therefore we propose support in the form of a "simulation approach" that identifies desirable patterns (Lindemann et al., 2009). In the development of our support tool – an interactive on-line checklist - we have

identified audiovisual designers' critical intelligence as an ability to envision a mental image that is to become realized by other designers. Another aspect of this kind of critical intelligence includes understanding the organizing principles and constraining factors behind collaborative production chains. In the conceptualization of the Intended Support (MI-Flow), we have expanded on Brinck's notion of a "space of possible actions for the agent" as a functional creative space. In a Descriptive Study 2 (DRM stage VI) we attempted to assess the extent to which our solution will function as intended within the industry (i.e. verification of that support fulfils the requirements), and evaluate it with the help of those who have used it. We conclude that the IS (MI-Flow) has the potential to increase designers' creative space, when used in a pre-production meeting. All informants indicated that this core aspect of the IS is consistent with its functions – although the question of what is too much context and what is too little for managers (or/and producers) remains unanswered. MI-Flow needs to be further developed.

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FIGURES AND TABLES

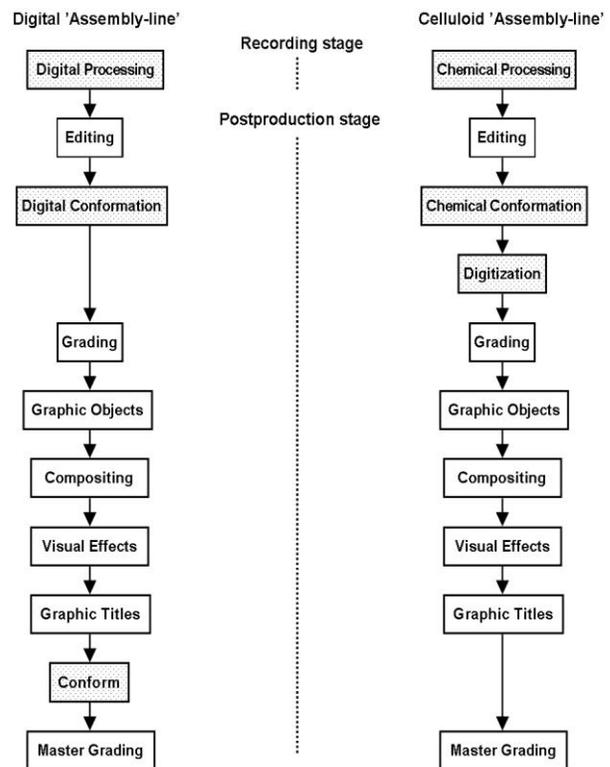


Fig. 1 General Digital and Celluloid Assembly-lines in moving image industry production processes.

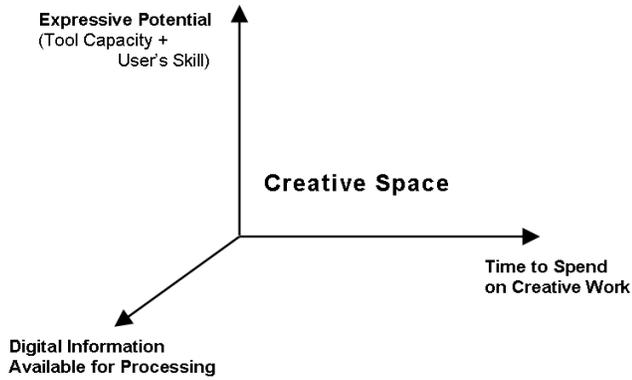


Fig. 2 Creative Space as a metaphor combining definable dimensions of creativity in media design work.
(Eriksson and Swenberg, *in press*)

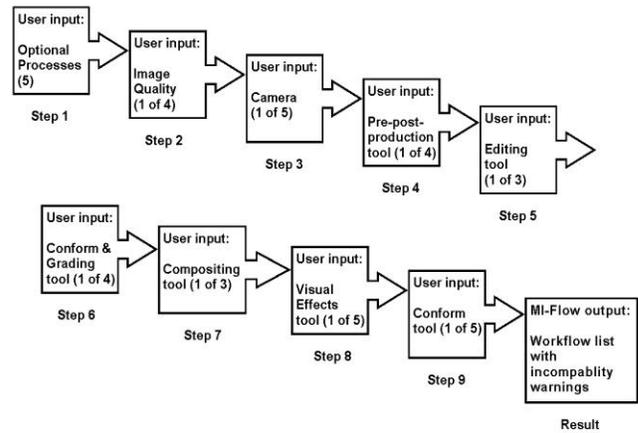


Fig. 3 A sequence diagram of the user interface of the design management support tool MI-Flow.

Table 1. Audiovisual Design Process Problematics, Support Tool Tasks, and Wanted Results

| Problematics to solve | | | | |
|---------------------------|-------------------------------------|--------------------------|---------------------------------|---------------------------------|
| <i>Existing Situation</i> | File format clashes | File format 'jungle' | Multiple workflow options | Ad hoc Design Support |
| <i>Support Tool Tasks</i> | To identify needed conversions | To organize complex data | To simulate suggested workflow | To avoid technical bottle-necks |
| <i>Wanted Result</i> | Planned or avoided file conversions | Knowledge transfer | User specific, adapted workflow | Plan for workflow |