

May 2016

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Recommended Citation

DeMichelis, Nichole (2016) "VFX librarianship: designing a global asset library for a visual effects studio," *VRA Bulletin*:Vol. 42: Iss. 2, Article 5.

Available at: <https://online.vraweb.org/vrab/vol42/iss2/5>

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VFX librarianship: designing a global asset library for a visual effects studio

Abstract

This article is an anecdotal outline of the author's work and experiences creating an asset library at a visual effects studio. It aims to start the conversation about librarianship and visual resource management's role within film production industries.

Keywords

asset management, digital asset management, VFX, visual effect, film production, new technology, custom vocabulary, database design

Author Bio & Acknowledgements

Please use acknowledgements from previous draft.

As technology progresses and information sources multiply, the role of the librarian follows in step. Many industries are being inundated with data, and as such, professionals accustomed to libraries, archives, and museums are finding work in nontraditional settings. Visual effects (often abbreviated to VFX) is such an industry: a wealth of visual resources need to be tracked, stored and archived, and I believe that the field of library and information studies (LIS) is up to the task.

When I first took on the role of Digital Librarian at Method Studios in March 2015, I struggled to find any resources within the Library and Information Science or the Visual Resources fields. Within VFX, rumours circulated about other studios that staffed librarians, but as I never met any of these mysterious creatures or found any related publications, I had no pool of communal knowledge to draw on. My goal with this paper is to provide an anecdotal outline of my work and my experiences creating an asset library at Method Studios and to start the conversation within our field of what our role is within film production industries.

My first year in this role revolved largely around one project: creating a global asset library for all of Method Studios' locations. Asset management requires expertise in metadata and information organization, and seems like a natural role for an information professional. In this article, I will outline the design of the resulting software in broad terms and some of the challenges associated with the unique nature of this industry and its materials.

What is VFX and Why Would They Want a Librarian?

Visual effects (VFX) refer to the techniques and processes used to create and modify images outside of a live action shot. While puppets, costumes, makeup, body doubles, miniatures, and optical illusions can all be used on set to create a particular effect, this is just the beginning. After the director yells "cut!" and the shots are sent off, VFX step in. VFX encompass many processes: it can be filling in a green screen, creating computer-generated imagery (CGI), adding a scar to the protagonist's face or making a shot filmed in the day look like night. There are many kinds of work undertaken by a VFX studio, such as 2D elements, simulations, crowds, etc., but I will focus on 3D assets as they have represented the bulk of my work.

While this is a gross simplification, a 3D asset's creation often follows this pattern:

1. A Modeler sculpts a 3D model.
2. A Texture artist adds texture to the model.
3. A Lighter maps how light will interact with the asset.
4. A Rigger creates a 'skeleton' for the model that can be animated.
5. An Animator adds movement to the model.

Each step introduces a new asset, which combine to make the “3D asset”ⁱ. The term *asset* is thus used to describe both the pieces of a 3D asset (model, texture, rig) and the sum of these parts. *Asset management* refers to the process of tracking and documenting all of these assets to ensure that they remain connected and readily accessibleⁱⁱ. An *asset management system* keeps these pieces organized during production, but after the project wraps it may still be useful to keep track of these materials: depending on the asset, they may be eligible for reuse.

Creating a VFX asset is expensive. It involves many artists, licenses for third-party software, in-house software development, coordination, and facility/operations costs. That said, many assets are very generic. Cars, plants, animals, background characters-- anything based off of reality and not specific to one project-- has the potential for reuse. If a VFX studio is bidding on a project that has a shot that includes a stampede of horses and they know they have 10 horses modeled, rigged and ready-to-go with only a few detail changes, this might just be the edge that wins them the project. The system I designed, called *Warehouse*, documents and stores assets that have the potential for reuse. This library of assets includes 2D elements, 3D models, reference images and more, and allows the assets to be searched, viewed, and shared across all Method Studio locations.

Not all VFX companies will benefit from such a system. Because of the nature of client contracts and the highly stylized nature of certain work (such as cartoons), there may be very few assets that are eligible for reuse. There are several factors that indicate whether a company may benefit from an asset management system for material not associated with current projects:

1. Research and development: the artists are developing assets independent of client contracts.
2. Budget for assets not associated with clients: if a client has to pay for the creation of an asset, they likely won't be keen to share it.
3. Third-party libraries: the company is purchasing assets which are eligible for reuse and internal sharing. Note that many third-party libraries will not allow reuse; consider the terms of service closely.
4. Client contracts that only have ownership over the version of assets submitted for delivery: it is not uncommon for an asset to have many variations submitted to the VFX supervisor for consideration; just because one variation does not fulfill the original purpose does not mean it may not be useful in a different project.
5. Closed network that limits artists' access to reference material available online: for the client's security, a VFX studio may choose to limit the artists' internet access, increasingly the need for locally stored reference imagery.
6. Highly realistic work that features similar scenes across projects: trees, cars, debris, cityscapes-- certain assets are very generic.
7. Contracts with franchises: sequels will reuse assets.

Warehouse: Asset Upcycling

Warehouse is composed of several pieces:

1. A permanent space on disk where assets are saved as read-only files.
2. A SQL database which holds records for each of these assets.
3. A web interface by which anyone at any of the company's location can use to browse the records for any other location.
4. An automated transfer mechanism, which can be activated from the web interface, to copy an asset from one location to another.

Essentially, *Warehouse* is a library and catalogue for every different asset "collection" Just like with any catalogue, *Warehouse* uses highly structured metadata to facilitate access.

Metadata Schemaⁱⁱⁱ

The unconnected makeshift libraries, which preceded *Warehouse*, used flat, free-form "tags" to organize assets. These tags included everything from project name, format, subject headings, creator, etc. Alternatively, some libraries were essentially a directory system with an image browser, which together acted as a semi-structured hierarchical subject heading system. Each system had pros and cons: the tags were flexible, and an asset had multiple tags which increased recall, but relied on users' uncontrolled terms and muddled fields so you had to query them all at once. The directory system was more precise and structured, but only allowed one location for assets and didn't have any metadata beyond the folder names.

My design seeks to encompass the strengths of both systems while minimizing the disadvantages. Introducing a database structure allowed me to design "fields" (i.e., attributes or elements) which could be indexed as access points, maintained as descriptive data, or used for administrative purposes.

All assets in *Warehouse* follow the same schema based off Dublin Core. This rigidity has caused some challenges: the library contains images, videos, models, etc.--traditionally one would use multiple DC applications. I opted to use only one for several reasons:

1. Directive from my superiors: they were keen on a simple design.
2. Flexibility: *Warehouse* is designed to house any kind of asset, even kinds that did not exist yet.
3. Ease of interface design: having a dynamic search interface for various asset types would cost a significant portion of our limited development hours.

There are two kinds of records in *Warehouse*: records that point to files, and records that act as containers for other records. Figure 1 shows a record of a 3D asset; this record is a ‘container,’ and does not relate to specific file on disk, although it may point to a folder. A 3D asset is actually composed of multiple pieces: a model, texture, rig, etc. Each of this asset’s components also has records in *Warehouse*, and those point to specific files. Both kinds of records use the exact same schema, and are connected through their relations. I will go into more detail regarding the relations field below.

VFX application of Dublin Core

Field name	Description	Example
Payload path	Asset’s location on disk.	/warehouse/3Dasset/horse/horse1/
Location	Geographical location/Network (only necessary if you company has multiple networks).	Vancouver
Type	What kind of asset is it, from a controlled vocabulary?	3D asset
Title	Identifying title; no uniqueness constraint, since it was too hard to enforce.	Horse 1
Description	Unindexed description, offering details that an artist/supervisor may find interesting.	Tall mustang wearing a saddle. Rig is a bit wonky on the front legs; needs cleaning.
Subjects	Subject headings-- from a constantly-growing semi-controlled hierarchical vocabulary.	Creature, animal, horse, saddle
Creator	Who is primarily responsible for creating the asset? For retrieval and rights management purposes.	NULL
Contributor	Other persons involved in asset creation (includes name of the creators and contributors)	Belinda Mack, Colin Cross, Amos Wilson, Shelly Curry, Alonzo Santiago ^{iv}

	associated with all assets contained within this asset).	
Team	What department was this asset created for? This field is an artifact from the old systems: many users were nervous about having their records mixed in with other teams, so this field offers a way for users to easily query records from their legacy libraries.	Modeling
Mediator	What software do you need to edit this file?	Maya 14
Project	Which project does this asset come from? For retrieval and rights management purposes.	Cars Fight Robots 14
Date	When was the asset created? More detailed timestamps are stored as administrative data, noting any updates to the record.	Nov 24, 2014
Rights management	How can an artist use this file legally?	For reuse, with modification
Relations	Does this asset relate to any other assets in the system?	HasPart: Horse1 Model; HasPart: Horse1 Texture; HasVariation: Horse2.

Fig 1: This is an example record which shows the fields, a short explanation of their significance, and an example value. All example values are fictional.

Warehouse Search for assets...

DSC_6660

Path `///Reference/sky/DSC_6660.JPG`

Description

Type `Reference`

Subjects `cityscape` `cloud` `environment` `evening` `landscape` `nature` `night` `overcast` `weather`

Mediators

Locations `Method Studios Vancouver`

Job `vt`

Team

Creator

Contributors

Rights `For reuse, with or without modification`

Extent `7.1 MB`

Format `jpg`

Resolution `-`

Created `2016-05-02 09:50:11`

Updated `2016-05-02 14:48:05`

Relationships

No relationships found.

Figure 2. Screen capture of a record in Warehouse. Preview image and several field values have been blurred out. Like many of the entries in Warehouse, this record is missing several fields: Description, Mediators, Team and Contributors are blank. The button in the top right corner that says “Edit Record” is only visible to users with the appropriate authentication.

Connecting the Record to the Asset

Warehouse is essentially a catalogue. It contains records that point to a permanent space on disk where the actual collection lives. The most important aspects of the space on disk are:

1. The same top-level directory exists in each of the company’s geographical locations,
 - a. Each asset only has one file path, but can have many locations: the same asset can be at `/warehouse/3Dasset/horse/horse1` in Vancouver, London and LA.
2. This space is reserved for *Warehouse* assets,
 - a. This is for data integrity: everything on disk must be in the database; everything in the database must be on disk.

3. This space is read-only,
 - a. *Warehouse* does not currently check on the collection to make sure everything is where I left it, so everything is fastened down; if the user wants to use an asset, they have to make a copy.

Payload Path

The Payload Path field is what connects the record to its space on disk. Future versions of *Warehouse* will allow applications to read from this field and open the asset associated with the record, but for now it is up to the person consulting *Warehouse* to follow the file path to the asset's location.

Location

Method Studios has multiple locations. *Warehouse* allows artists to browse other locations' assets and copy over the ones they select. The Location field records which network the asset is stored on. If a user decides to copy the asset to their location, the Location field automatically updates to include both locations. Since every location has the same disk space reserved for *Warehouse* assets, the file path (Payload Path) is the same in every location. The mechanism used to copy assets across locations was already in place for syncing data during production.

Main Access Points

While there is an "advanced search" function that allows the user to construct complex SQL-style queries, this is used primarily for administrative purposes and the users have shown little interest in it. The default "browse" interface combines three mechanisms for searching: a quick search, a faceted search, and a hierarchical subject heading search.

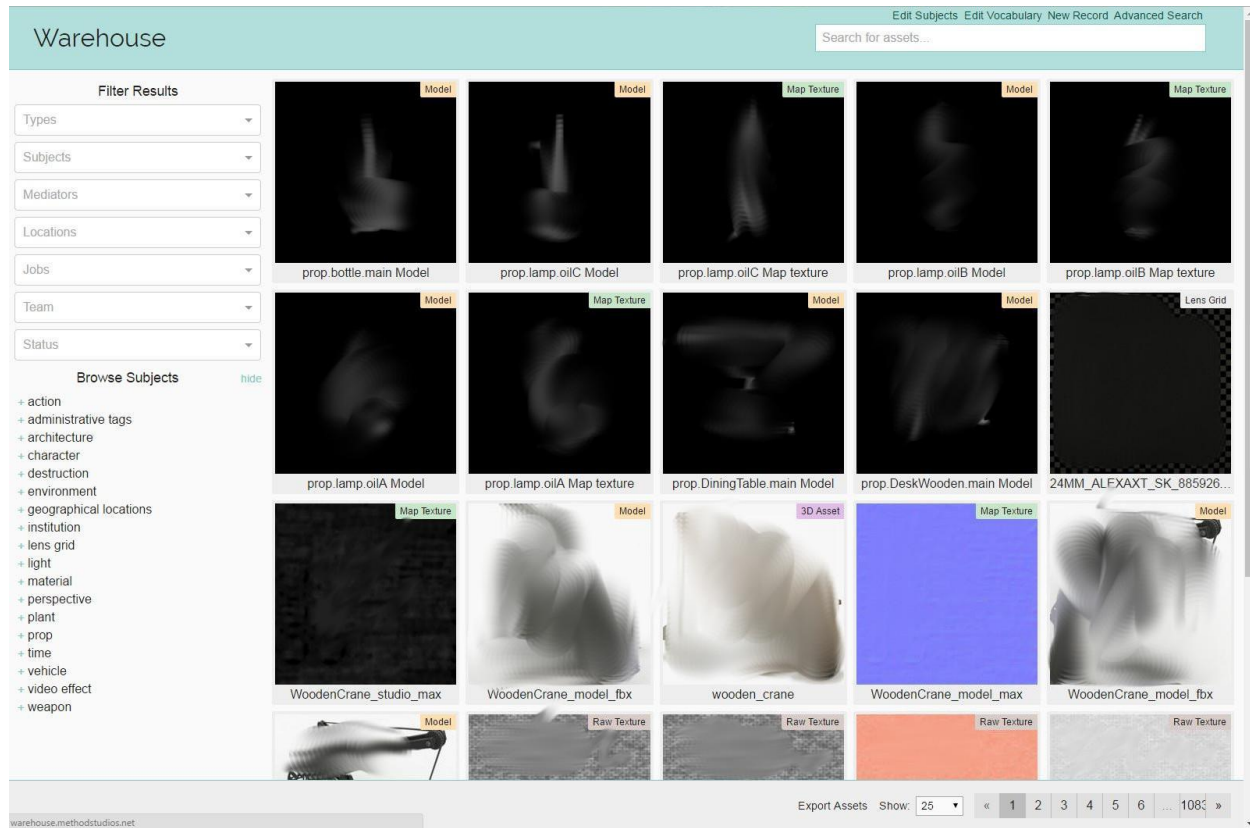


Figure 3: Default view of *Warehouse* (administrative access, includes additional options in top right corner: Edit Subjects, Edit Vocabulary, New Record). Users can expand the subject in the left sidebar, or hide them. Users can apply filters to the entire library to browse, or use the quick search bar in the top right corner. The preview images have been blurred out.

Quick Search

In the top right corner, there is a search bar. When the user enters a query, the system matches the terms against the record's subject heading, title and description. These fields are weighed: a match in the subjects is weighted most heavily, followed by title and lastly description.

Faceted Search (filters)

The faceted search works by applying filters to the result set. The default result set is all records in the system. After the user uses the quick search, the initial result set shrinks; the user can then use the "filters" to further refine their result set. I chose to only include the most common access points in the default interface as defined by my conversations with the artists. From the advanced search interface, the users can refine any field on the record, but I wanted to keep the default interface as simple and intuitive possible. The filters are:

1. Type: asset type (e.g. 3D asset, model, raw texture); controlled vocabulary.
2. Subjects: asset subject; autocomplete from all subjects; works like “tags”.
3. Mediator: software associated with asset; controlled vocabulary.
4. Location: geographical locations/networks where assets can be saved; controlled vocabulary.
5. Job: projects from which assets originate (e.g. films); controlled vocabulary.
6. Team: team with which assets are associated; controlled vocabulary.
7. Status: only visible to administrators; shows assets that are flagged or approved for deletion.

Hierarchical Subject Headings

After a series of interviews with the artists who would form the bulk of the library’s users, it became clear that the primary access point would be through content description/semantic data (this corroborates larger studies on artists’ information-seeking behaviour). Additionally, my academic research on artists’ information behaviour highlighted the importance of browsing and broadening searches.

This presented an immediate challenge: what kind of vocabulary can be used in a collection that includes everything from explosions and animations to people and furniture? I opted to develop a custom hierarchical vocabulary in-house^v. Users can still assign “tags” to assets when they submit them to *Warehouse*, but these “tags” are slotted into a semi-controlled vocabulary after the fact (the interface recommends terms that already exist in the vocabulary, but the user has the option of adding a new term)^{vi}. New terms are manually added to the hierarchy as they appear. The vocabulary also includes synonym rings for equivalent values (ie “person” and “human” both generate the term “human” when added to an asset, and searching for “person” retrieves the results associated with the term “human”). As of May 2016, *Warehouse*’s top-level terms, visible in Figure 2, are:

- Action
- Administrative tags
- Architecture
- Character
- Destruction
- Environment
- Geographical location
- Institution
- Lens grid
- Light
- Material
- Perspective

- Plant
- Prop
- Time
- Vehicle
- Video effect
- Weapon

The top-level terms represent the main themes of the subject “tags” that were associated with the assets.

Users have the option of browsing the vocabulary as a point of access. When the user clicks on any of the top level terms, the child terms appear below it, and so on. This allows the user to see, at a glance, what kind of material is in the library, which is particularly important given the high staff turnover in the VFX industry. While an information professional may cringe at the lack of conceptual coherence, this vocabulary is far more structured than its flat-tag predecessor, while still allowing the flexibility to catalogue everything from motion-capture data to photographs and video clips. The vocabulary evolves constantly as the collection grows, and requires regular maintenance.

The main strength of the vocabulary is its hierarchical inheritance: when a term is associated with an asset, that asset inherits all its broader terms. For example, adding “pencil” to an asset will automatically ensure “stationery”, “office supply”, and “prop” are added as well. On the record, the subjects are linked; the user can easily move to a result set based off one of the asset’s broader terms (in this case, click “office supply” to see all of the records associated with that term).

Rights Management

As with all forms of librarianship, rights management is very important in VFX, and perhaps even more so because clients are not shy about auditing the companies they work with. In our library, there are three different levels of usage rights:

1. For reference only.
2. For reuse, with modification.
3. For reuse, with or without modification.

For Reference Only

This applies to assets that are proprietary, but may still serve the artists as reference material. Some reference material is catalogued as “Type: Reference”, which is usually images and

movies guiding the creation of a particular asset. For example, when our client commissioned the creation of a cobra, our artists downloaded a huge array of images, movies and sounds to learn about how cobras look and move. These materials are not owned by our company, but can be used as reference material under fair use/fair dealing. Other assets may be saved from previous projects where the contract does not allow reuse, but the assets may serve as creative reference or technical guidance. Many assets from highly guarded clients will be labeled as reference only, as well as any asset specific to a project or world (for example, a CG double of a recognizable actor).

For Reuse with Modification

“For reuse with modification” is the default setting for rights management. This indicates that an asset can be the basis for *a new asset*, but must be modified in some significant way to distinguish it from the original asset. The degree of modification required varies, but as a general rule the new asset should not be immediately recognizable as its original asset. The new asset is added to *Warehouse* as a variation of the original.

For Reuse With or Without Modification

If we purchase an asset from a third-party library with the appropriate license (such as Shutterstock, Turbosquid, Texture XYZ), create an asset outside of the scope of a client’s project (usually R&D or an in-house project), or have a particularly relaxed contract (more likely from a commercial than a feature film), we can occasionally take an asset from *Warehouse* and add it directly to a new project. Realistically, an asset will always require some level of modification to work in its new environment, but these modifications may be minor. By labeling an asset as eligible for reuse without modification, it clarifies to the user that they can use this asset however they like on their new project without risking legal repercussions.

Conclusion

When I started as a VFX librarian, it often felt like I was wandering in undiscovered territories. After the completion of this first project, it seems clear that, in an industry overrun by visual data and thriving off efficiency, there is room for an information and visual resource professional’s insights.

Warehouse represents a huge undertaking: creating the schema, vocabularies and descriptions associated with over 30,000 assets has taken the better part of a year. While we are still collecting usage data, the feedback on this project has been universally positive. New departments are contacting me regularly, asking to have assets added to *Warehouse*. The

database is also serving as a model for my latest project which documents the company's archival tape library. *Warehouse* is now in use at multiple locations, but there is still work to be done. Over the next year, we hope to integrate the various artist applications, introduce new asset types, and create customizable profiles for each user. And, of course, just like with any library, collection maintenance is never complete.

Recommended Reading & Works Cited

The VES handbook of visual effects: Industry standard VFX practices and procedures 2014. Vol. 1. Beaverton: Ringgold Inc.

“Part 5: Visual Effects and Titles” & “Part 7: Restoration and Archiving” from Arundale, Scott, Tashi Trieu, and Taylor & Francis eBooks. 2015;2014;. *Modern post: Workflows and techniques for digital filmmakers*. New York: Focal Press, Taylor & Francis Group.

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Kanellopoulos, Dimitris. 2012. Semantic annotation and retrieval of documentary media objects. *The Electronic Library* 30 (5): 721-47.

Nesterova, E. I., and A. A. Smogorzhevskii. 2014. The properties of developing metadata ontologies for the media industry (based on the example of creating hardware conference-hall complexes). *Automatic Documentation and Mathematical Linguistics* 48 (2): 86-95.

Tsui, Eric, W. M. Wang, C. F. Cheung, and Adela S. M. Lau. 2010. A concept–relationship acquisition and inference approach for hierarchical taxonomy construction from tags. *Information Processing and Management* 46 (1): 44-57.

Valentino, Maura, and Brian Shults. 2012. Creating a digital library of three-dimensional objects in CONTENTdm. *OCLC Systems & Services: International Digital Library Perspectives* 28 (4): 208-20.

Yoon, JungWon. 2009. Towards a user-oriented thesaurus for non-domain-specific image collections. *Information Processing and Management* 45 (4): 452-68.

ⁱ This is a very simplistic explanation of a very complex process. For more information on how the asset-creation process actually works, I recommend *The VES handbook of visual effects: Industry standard VFX practices and procedures* 2014. Vol. 1. Beaverton: Ringgold Inc.

ⁱⁱ Asset management usually refers to assets as the project is being worked on, whereas my work was managing assets from projects that are no longer active. For information on more conventional asset management, I recommend Jacobsen, Jens, Tilman Schlenker, Lisa Edwards, Books24x7 IT Pro Collection. 2005;2014;2012;. *Implementing a digital asset management system: For animation, computer games, and web development*. Amsterdam;Boston: Elsevier Focal Press.

ⁱⁱⁱ While the schema and vocabulary I used ended up being highly customized, I consulted many resources from adjacent industries that were often helpful:
Nesterova, E. I., and A. A. Smogorzhevskii. 2014. The properties of developing metadata ontologies for the media industry (based on the example of creating hardware conference-hall complexes). *Automatic Documentation and Mathematical Linguistics* 48 (2): 86-95.
Kanellopoulos, Dimitris. 2012. Semantic annotation and retrieval of documentary media objects. *The Electronic Library* 30 (5): 721-47.
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Felicetti, Achille, and Matteo Lorenzini. 2011. Metadata and tools for integration and preservation of cultural heritage 3D information. *Geoinformatics FCE CTU* 6 : 118-24.

^{iv} These aren't real people. Thanks <http://random-name-generator.info/> !

^v Converting flat tags into a hierarchical controlled vocabulary was an intense manual process which was facilitated through Stephen Smart's software design. Other initiatives to automate this process have been put forward; I recommend reading: Tsui, Eric, W. M. Wang, C. F. Cheung, and Adela S. M. Lau. 2010. A concept-relationship acquisition and inference approach for hierarchical taxonomy construction from tags. *Information Processing and Management* 46 (1): 44-57.

^{vi} Marrying folksonomy with taxonomy has been successful in many cases, but depends on the level of labour the system maintainer can devote to the process and/or the intelligence of the automation process. For more information, I recommend: Yoon, JungWon. 2009. Towards a user-oriented thesaurus for non-domain-specific image collections. *Information Processing and Management* 45 (4): 452-68.