# Translating Texture: Design as Integration

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### ABSTRACT
This conceptual essay uses the notion of *texture* to articulate the relationship between data infrastructure (the attributes and value parameters that give data its shape) and data environment (the mode of implementation in which data is stored and manipulated). We take experimental datasets that we authored with unorthodox, weird data infrastructure and translate those datasets from one data evironment to another. In performing these translations, we surface integration as a design activity. Integration work is often tedious, mundane, and technical—but it is nonetheless design. We show how texture arises from the integration of material components, demonstrating the effects of integration work upon user experience.

### Author Keywords
Data; infrastructure; metadata; materiality; critical design

### ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

### INTRODUCTION
Last summer, I moved to a new university and into a new office. The new office had many similarities to the old one: it had similar furnishings (bookshelves, filing cabinet, work surface, desk chair, visitor's chair) and was a similar size and shape. Both offices had a window on one wall and were painted a similar off-white color, with similar beige berber carpet. All my belongings—books, papers, photographs, brightly colored rug—traveled with me. It should have been pretty much the same as my old office. But the new office was terrible. Why?

My new office is on the garden level, or half basement. While the window is decently sized, it's higher up the wall than my old office, and trees in front of the building block the sun. An artificial light source is necessary at all times of the day. But the overhead lights in my new office are harshly fluorescent.



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The change in light most affected the function of that brightly colored rug. In my old office, the rug integrated with the light to draw people in. Nothing else in my old office was special, but people would refer to the rug as they remarked how the office seemed so warm and inviting. In the new office, the rug changed. Its colors seemed harsh and abrasive, and the office too felt grating and prickly. I tried moving the furniture in all sorts of combinations, but that didn't help. Finally I got some lamps, and some Marimekko wall hangings, and turned off the overhead lights. I tried to recreate the warm texture of the old office by changing the character of the light, not its intensity.

With these changes, the office now feels more like the old one. But visitors don't mention the rug anymore. Although the new office experience now approximates the old one's warmth, the function of the rug has permanently changed.

My rug story is not unusual. Many of us can point to similar experiences, where initially the integration of components in a new environment seems like it will be a mundane matter of technical implementation—just unpacking. But then you unpack, and something is off: the composition is out of balance. The design situation has shifted, and the relationships between components must be renegotiated. Still, although common, integration work is not often remarked upon as a design activity, except when the new environment is radically different from the original: designing for a Web-based application instead of a desktop one, or for mobile instead of the Web. When the environment change is more subtle, like moving to another office—or when migrating data to another database, or replacing one data source with another—integration seems closer to implementation, with less effect on experience.

But as "computer" interaction continues its turn towards data, integration requires more direct attention as a design activity. Infrastructural components that might have once seemed tangential to user experience—outside the core work of design—increase in importance. Here's an everyday example: when Netflix simplified the "altgenre" categories displayed on its main page, simplifying complex categories like "Visually-striking cerebral crime thrillers in Japan" to "Cerebral" or "Crime" or "Thrillers," the whole experience changed for me, even as the filmstrip-style interface and content remained the same. I had much less interest in scrolling down or across. Previously, I might have said that the filmstrip interface encouraged browsing, but after the change in data infrastructure, I realized that the *relationship between* the filmstrip interface, intriguingly complex categories, and available video selections encouraged browsing, not one or the other in isolation. Similarly, if you had asked me before the move, I'd have said that my rug itself was warm and welcoming. The old office was not exceptional, and I did not think that the environment itself had anything to do with the experience of the rug. Moving to the new office showed that the rug itself was not warm: it was the integration of the rug in the office that produced that feeling of warmth.

This paper examines integration and design through the lens of *texture.* As introduced to the HCI community by Robles and Wiberg, texture describes the "the intersection of surface and structural form" that arises through the integration of material components [14]. The relation between components in my office produces its texture. Here, my co-authors and I use texture to understand the relationship between data infrastructure (the attributes and value parameters that give data its shape) and data environment (the database implementation in which data is stored and manipulated). We take experimental datasets that we had authored with unorthodox, weird data infrastructure and translate those datasets from one database implementation to another. Performing these translations enables us to critically examine the design work of integration. It also enables us to reflect upon the interaction between data infrastructure and data environment, and to describe the resulting effects on texture. Although our ruminations on texture arise through empirical work, however, this paper is a conceptual essay, not a report on study findings. We use our design work to explore ideas, not to evaluate a hypothesis or to demonstrate the utility of a particular design approach.

This paper makes several contributions. First, we surface the work of integration—work that, because it may seem tedious, mundane, and technical, is often marginalized as mere implementation, incidental to the primary work of design. Second, we show how texture arises from the integration of material components, demonstrating how integration work bears directly upon user experience. Third, we extend recent conversations on digital materiality and design. Our project provides evidence for the view that materiality arises from relationships between components, rather than from components themselves.

Although integration work has always been a necessary element of software development, the increasing role of data in *constituting* experience makes the relationship between integration work and experience design particularly salient at this historical moment. We challenge the notion that data is merely an input to design. We believe that design must integrate data—that it must concern itself with data infrastructure and data environments—and not merely provide access to data by creating interfaces on top of those components.

Our paper proceeds as follows. First, we situate this essay within conversations about digital materiality, focusing on the notion of texture. Next, we describe our translation project, where each co-author integrated data infrastructure that we had created for one data environment into a different data environment. We describe two of these translations in detail, focusing on the challenges posed by the original designs, the integration work we undertook to meet those challenges, and the effects of our integration work on texture. We conclude by reflecting on texture as the product of integration work.

## RELATED WORK

We draw on a body of interdisciplinary scholarship that seeks to understand the qualities of digital artifacts and how those qualities emerge through the integration of materials, people, and practices [8]. In these studies, the work of design serves to locate, express, and accentuate qualities such as playability and suppleness in digital artifacts [11, 17]. Similar accounts describe the work performed to create properties in physical materials, as when furniture designer David Pye proposes that materials such as walnut are "made" through the activities of workmanship, and not "found" in nature [12]. In HCI, research emphasizes how material qualities emerge through complex relations between materials, designers, users, and activities. For example, Dourish and Mazmanian consider how digital and film photography structure different activities and focus attention on different material qualities of photographs, even as the content of an image might remain the same in both modalities [3]. Rosner, likewise, illustrates how materials in a bookbinding workshop reveal themselves situationally [15]. Redström describes how some aspects of design occur in use and not prior to it, as with customizing a personal computing device [13]. These explorations within HCI complement work from other disciplines. For example, archeologist Christopher Tilley argues that prehistoric rock art in Norway must be understood as the relationship between image, environment, and viewer [18].

Similarly, Paul Dourish unpacks digital media scholar Lev Manovich's contention that "databases" employ a different expressive logic than "narrative" by noting that Manovich's "database" is understood at a very high level of abstraction [2]. Dourish argues that database models, such as a relational model and a noSQL model, may emphasize very different properties. While one might implement a conceptual model in both a relational database and a noSQL database, this is not a trivial mapping exercise. Moreover, the affordances assumed by a particular logical model affect the development of a (theoretically abstract) conceptual model. Relational databases, in their requirements to develop systematic data structures prior to, and separate from, the capture of data values, foreground operations of sorting, splitting, and recombining according to well-defined, consistent structural parameters. NoSQL databases, which do not use an external schema, do not suggest such operations. The material properties of data emerge differently within the representational infrastructures of different database models.

Robles and Wiberg propose *texture* as a design quality that is produced through the integration of material components [14]. While we might speak of a material as having a texture—of wool as being rough or silk as being liquid—the texture of an artifact emerges from the manipulation of all its materials, from their relationships to each other. The texture of a wool rug might be warm and enveloping rather than rough, or it might be hard and firm, depending on the integration of materials in the composition. (While Robles and Wiberg introduce the notion of texture to HCI, texture has been used similarly in the arts and humanities; in referring to the texture of a symphony, for example, a music critic indicates the quality that emerges through the integration of each instrument's part into the whole.)

Robles and Wiberg emphasize that texture does not exclusively refer to tactile sensations or to tangible objects. They articulate texture as having equal application across digital and tangible domains. For us, texture provides a means of generalizing Dourish's observations about database implementations. Substituting wool for silk in a rug might produce an artifact that looks similar, but the texture, and the experience, will be different. To maintain a similar texture with different materials, the relationships between components may need to be redesigned. This recalibration might involve significant changes to the composition. Obtaining a liquid texture in a wool rug might involve using intricate weaving patterns to create the appearance of fluidity by a visual mechanism, rather than tactile sensation. Similarly, maintaining texture between a relational database and a NoSQL database may involve more than technical recalibration.

## TEXTURE AND TRANSLATION

Robles and Wiberg frame their discussion of texture around their own translation project [14]. They introduce the Swedish Icehotel, a seasonal structure built in a sparsely populated area of the Arctic Circle. The Icehotel comprises guest rooms, furnishings, public areas, and other common hotel features, all created from ice. Robles and Wiberg's project, Icehotel X, was to maintain the texture of the Swedish Icehotel in an indoor environment in the cosmopolitan city of Copenhagen. Robles and Wiberg articulated the texture of the Swedish Icehotel as the integration of ice, structure, and environment: the texture was produced from a particular use of ice in a time and place in the Arctic Circle, not just from creating an ice building. Accordingly, Robles and Wiberg created Icehotel X as a multimedia installation: not actually an ice building at all. Icehotel X fused ice, light, and low-fidelity digital projection to produce a texture similar to that of the Icehotel, indoors in Copenhagen.

The basic structure of our translation project was similar to that of Robles and Wiberg. We took a design that employed a mundane material in an unusual way to create a distinctive texture, and then we attempted to maintain that texture in translating the design to a new environment.

In our project, the original designs comprised small libraries of videos about the U.S. state of Texas, made with purposefully ambiguous data infrastructure, or metadata. While creating Texas-themed video libraries out of ambiguous metadata is much less spectacular than creating a hotel out of ice, our goals were similar. It seems absurd and worse than useless to create a hotel out of ice, but doing so enables us to think about ice, and hotels, and user experience, in new ways. The experience of staying in the Icehotel is clearly not about getting a good night's sleep, but it's still a valuable—if challenging—experience. Moreover, the process of designing and building a hotel out of ice enables us to understand the texture of that new experience and the material relations that produce it.

Similarly, it seems absurd and useless to structure a collection of information resources with purposefully ambiguous metadata. We typically design metadata to enforce cleanly delineated categorical divisions between resources, and so to facilitate reliable, predictable retrieval, filtering, and sorting. But there is an intractable problem with typical metadata design. The world is dynamic, unstable, ambiguous, and unruly, and it inevitably bursts through any category boundaries we might devise. Metadata is *inherently* ambiguous (even if computers are the agents collecting the data).

Star and Bowker use the idea of *residuality* to describe this phenomenon [16]. Star and Bowker assert that there's always something outside, insufficiently articulated, or split among a set of categories. Nonetheless, best practices for metadata design continually attempt to define and enforce category boundaries in a consistent, reliable way [19].

The Swedish Icehotel took an inevitable phenomenon that we would typically attempt to minimize—the severity of winter in the Arctic Circle—and exploited that phenomenon as a design resource. We did the same. We took an inevitable phenomenon that we typically attempt to minimize—residuality in data infrastructure—and exploited that phenomenon as a design resource. In our original project, each co-author created our own system of data infrastructure (metadata) that accentuated and made use of residuality, instead of trying to suppress it. We used our data infrastructure to separately organize the same small set of Texas-themed digital videos in the same data environment, a digital library system called the Open Video Digital Library Toolkit (OVDLT) [7]. (In other words, each co-author used our unique data infrastructure to organize the same videos in the same environment, so that each design differed only in its metadata.) [Findings from our experiences building these original designs appear in 4, 5.]

In creating these original designs, we learned some things about ambiguous metadata and the kinds of experiences that ambiguous metadata might support. The Swedish Icehotel might be terrible for a good night's sleep, but what kinds of experiences does it enable? Thinking about such questions can help us think about other kinds of experiences for hotels, in addition to restful sleep: the hotel as immersive sensory environment. Similarly, our original designs were terrible at facilitating retrieval. But we proposed that our designs also enabled other kinds of experiences with data [4]. Following Tim Ingold, we described the form of experience supported by ambiguous metadata as wayfaring, or exploring a landscape [10]. If typical metadata is supposed to support retrieval of items, ambiguous metadata supports understanding the relationships that make up a collection of items. If typical metadata is supposed to have a lucid, clean, articulated texture, like clear plastic pipes, ambiguous metadata has an organic, layered, interconnected, shaggy texture, like roots of a plant.

The Swedish Icehotel is rebuilt every winter in the same location by different designer teams. Each winter's Icehotel is different, but the textural similarity between designs enables the Icehotel Web site to articulate a coherent general experience that spans the years [9]. We also rebuilt our metadata designs with new designer teams, who used a different set of videos on a different theme, and the texture of the designs—organic, layered, interconnected—was similar [5]. At that point, just like Robles and Wiberg, we found ourselves pondering texture. Robles and Wiberg had asked themselves if it was possible to recreate the texture of the Icehotel outside of its original environment in the winter of the Arctic Circle. In turn, we asked ourselves if it was possible to recreate the texture of our original designs in another data environment. Robles and Wiberg translated the original rural, Arctic Icehotel to the urban, indoor Icehotel X. We translated our original video libraries from the OVDLT, which operated like a relational database, to a new data environment, Scalar, which operates using a "rhizomic," graph-based paradigm.

In subsequent sections, we'll describe two translations in detail, focusing on challenges posed by the original designs, integration work we undertook to meet those challenges, and effects of that work on texture. First, though, we compare the OVDLT and Scalar. In Robles and Wiberg's translation, differences between their two environments are readily apparent: empty snowy landscape and cosmopolitan city. In our case, the differences between the OVDLT and Scalar require a somewhat technical explanation. But part of our contribution arises from confronting this thicket of detail: although the particularities of the OVDLT and Scalar might seem mind-numbingly specific, texture emerges from these particularities, just as it does from snow and city.

### Comparing Two Very Different Data Environments: The OVDLT and Scalar

The OVDLT and Scalar are as different as the rural Arctic of the Swedish Icehotel and the cosmopolitan Copenhagen of Icehotel X. The OVDLT experience is modeled around actions typically enabled through relational databases—filtering, sorting, selecting, searching. In contrast, Scalar operates around a network paradigm where "anything can do everything to anything" [1]. (While there is now a 2.0 interface for Scalar, our translations were developed using the original 1.0 version.)

The following comparison between Scalar and the OVDLT helps us to subsequently explain how the material quality of texture emerges through what appear to be tedious, specific details of particular data environments. Our translation project demonstrated the extent to which texture was ultimately dependent on integration work with these environmental particularities. These details are tedious and complicated, to be sure, but they have a direct relationship to texture. Materiality emerges through the boring details!

To begin, we'll compare describing a video in the two systems (see Figure 1 for a visual representation). The OVDLT is a digital library system for a single kind of entity: videos. The OVDLT provides features for designers to define different kinds of metadata to apply to videos, to add videos, and to catalog videos according to the metadata structure that the designer has specified. Each video in the library has its own catalog record that displays the video's metadata in a standardized interface.

OVDLT users browse, search, filter, sort, and select between videos in a collection via the metadata infrastructure. For example, a user can browse the videos associated with a particular descriptor (a descriptor is a designer-defined label, or tag) and then select between videos in that category by viewing other metadata associated with each video. Or users can browse thematic playlists annotated by the library designer. (OVDLT designs in Figures 2 and 4 display some of these features.)

In the OVDLT, controlled descriptors are defined in sets, using an administrative interface. For example, a designer might create a descriptor set called Location, with associated descriptor values (typically just called *descriptors)* such as Austin, Dallas, and Houston, or a descriptor set called Characters, with descriptors such as Mavericks and Believers. A descriptor, such as Austin or Believers, can then be applied to videos in a separate cataloging interface. As presented to users, descriptors are associated with their sets. On the home page, a user opens a menu called Characters and clicks Believers to obtain the videos associated with the Believers descriptor. This process aligns with a relational model of an attribute/value pair assigned to an entity.

In contrast, "everything" in Scalar is conceptualized as a "page," where a page operates as a node in a network. Pages are empty containers, initially represented in Scalar as a blank display area. The Scalar designer fills pages by adding content such as text and embedded media. A "tag" in Scalar is a relationship between pages: a page displays links to the other pages that "tag" it. The Scalar implementation of tags is different from most tagging systems; a tag is not a different "thing" from the resource it describes. In Scalar, a tag is relationship between functionally equivalent pages.

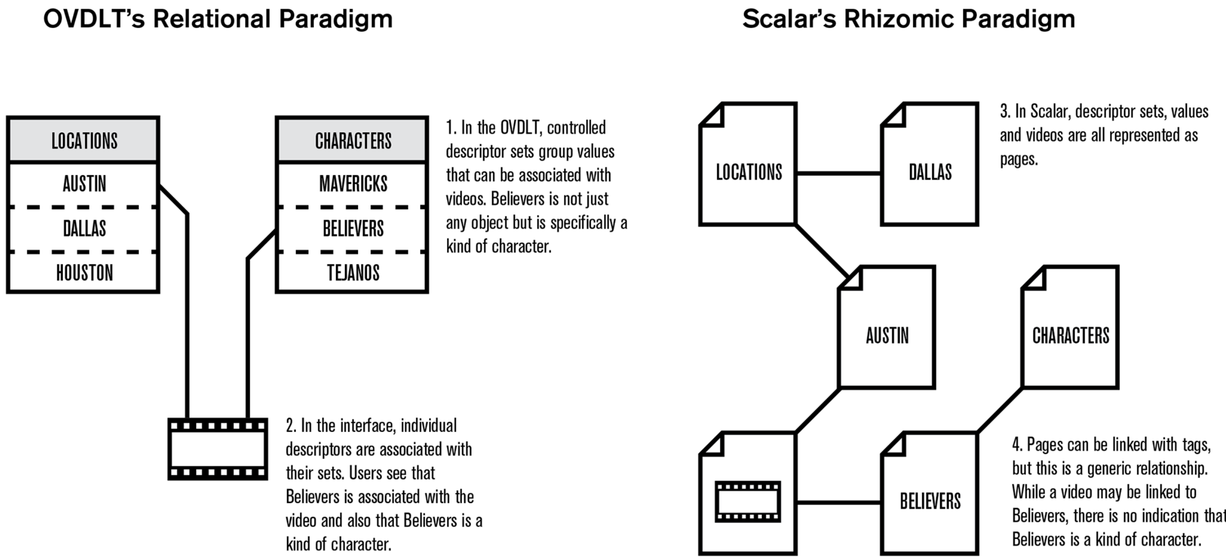


**Figure 1. Differences in data structure as perceived by designers working with the OVDLT and Scalar.**

Scalar does not predefine a mechanism to recreate the idea of a video (entity) associated with a Character (attribute) called Believers (value). One can create pages for all of these constructs: a page for the video, a page for Characters, and a page for Believers. From the perspective of Scalar, however, there is no conceptual difference between a page with an embedded video and pages meant to represent concepts like Characters or Believers. While a page called Believers could have a tag relationship to both Characters and to a page with an embedded video, there is not a native mechanism to indicate that Believers are Characters, or that the relationship between "Believers" and a video and "Believers" and Characters is conceptually distinct.

Comparatively, the OVDLT constrains design choices. Beyond the customizable metadata elements, nothing in the user experience can be changed. Videos are the only allowable resource type. User operations are limited to those enabled by the OVDLT: users can access a list of all videos, they can use menus to filter by descriptor values, they can create sets via text search, and they can access playlists. From within an individual video's metadata page, users can click descriptor links to access other videos associated with that descriptor. Designers cannot create additional means to discover and and arrange resources.

In contrast, while a Scalar "book" (the name for a collection of pages in Scalar terminology) can describe and enable access to media resources, expression of that functionality to users requires extensive designer intervention. In Scalar, designers determine content and arrangement for each page individually. Pages can be "tagged" to other pages; pages can be connected via embedded Web-like links; pages can be set in a linear order in a grouping structure called a "path." Pages can also be listed in a persistent "main menu" that appears to the left of the page display. The final structural element in Scalar is the annotation. Annotations are a form of relationship similar to tags, except they link a page to a specific point within a media file (a whole-part relationship instead of a whole-whole relationship). For a video, annotations link another page to a particular point or duration within the video. The 30-second appearance of a cowboy in a video might be annotated with a page that discusses cowboy symbolism, for example. If that video were then embedded within a subsequent page, the Cowboy Symbolism annotation would accompany the video.

Using tags, embedded links, paths, and annotations, the creator of a Scalar book determines its unique navigational structure. All page content is individually specified and can combine any number of media elements with embedded text. Custom JavaScript can be added to adapt the visual design of each page beyond a set of provided themes. The user experience of a Scalar implementation is thus specific to each design. Although the navigational features of tags, annotations, links, and paths are limited, they can be deployed by the designer in flexible, diverse ways.

The differences between Scalar and the OVDLT facilitate our exploration of texture through translation well. Scalar presents itself to both designers and users through a network model, while the OVDLT presents itself through a set-based, relational model. One can make a digital video library in Scalar, but Scalar doesn't prescribe a structure to present such functionality. Set-based filtering operations are built into the OVDLT interface; this is not the case in Scalar. The OVDLT clearly separates resources (videos) from attributes and values (descriptors and their sets). In Scalar, everything operates as a page. But Scalar's flexibility enables an approximate representation of everything in the OVDLT to be expressed in a Scalar book, although the mode of that representation might vary extensively depending on the book designer. For example, an OVDLT descriptor might be represented as a tag,

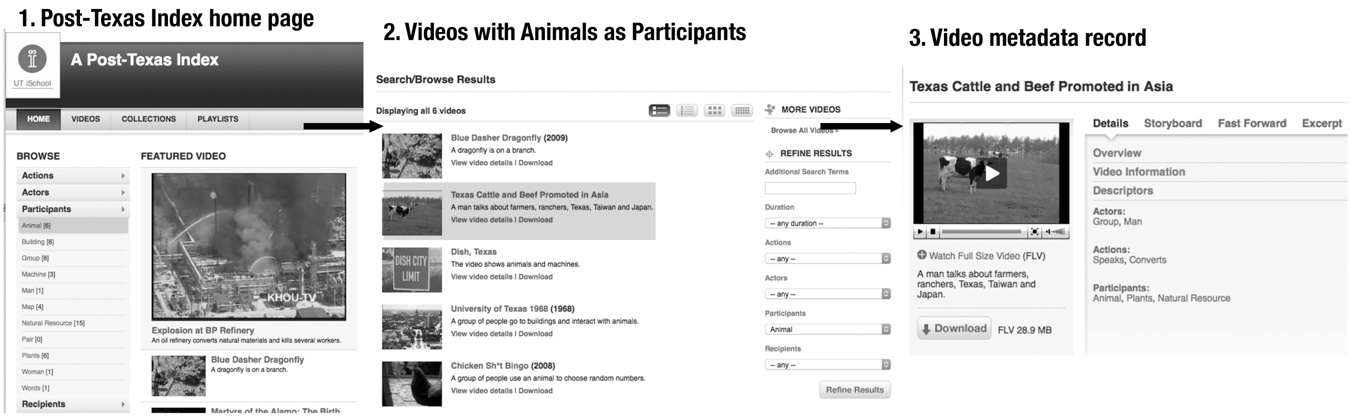


**Figure 2. Post-Texas Index in the OVDLT. (1) is the home page. By clicking Animals under Participants in the Browse menu, a list of videos with Animals as Participants (2) appears. Clicking a video title brings up its metadata record (3).**

annotation, path, or link in Scalar—or as some combination of these. In the next sections, we describe our project to translate the OVDLT designs in Scalar. We explain our integration work to manipulate the data environment—Scalar—and maintain the material quality of texture in the translated designs. As with the descriptions of the OVDLT and Scalar, the details of our manipulations may seem tediously specific, but our project shows how texture depends on such mundane integration activities.

## TRANSLATING TEXTURE

Each of the four coauthors translated their own OVDLT design into Scalar. In formulating this act of translation, we emphasized conceptual integrity of the original texture. We were not interested in reproducing formal and functional details from one environment to another, but in understanding the integration work to renegotiate relationships between data infrastructure and environment.

We describe two of our four translations in detail, focusing on the challenges posed by the original designs, the integration work we undertook to meet those challenges, and the effects of our integration work on texture. We limit our discussion to two examples in order to present their interpretive analyses in greater depth, although we did use all four designs to develop our overall account of the work. Because the other two translation strategies align with the included examples, this omission simplifies our discussion without changing our argument.

These translation descriptions include nitty-gritty details of integration work to express the texture of a particular data configuration in a new environment. For designers who focus on visual or physical designs, and not the design of data itself, the work we describe may seem unfamiliar. The operations that we describe—changing a descriptor to an annotation, a set to a path—are the design work of data infrastructure, as implemented in each data environment.

## TRANSLATION 1: POST-TEXAS INDEX

In this section, we describe the integration work we performed to translate one of our original designs from the OVDLT to Scalar. First, we introduce the original design and characterize its texture. Next, we describe how we integrated the data infrastructure of the original design into the new Scalar environment. We conclude by assessing the texture produced through that integration work.

### The Original Design and Its Texture: Post-Texas Index

Post-Texas Index, the original design in the OVDLT, employed its descriptors at an unnaturally high level of abstraction, focusing description on the basic action of identified entities in the videos (see Figure 2). The human significance of the video content was not engaged. Descriptor sets included Actions, Actors, Participants, and Recipients; descriptors in the latter three were identical. Actions values included generic verbs such as Speaks and Converts; Actors, Participants, and Recipients values included generic, abstract nouns such as Animal, Group, Machine, and Man. Sentence summaries for each video repeated the banal, abstract metadata of the descriptors. A video documenting an oil rig explosion might be summarized, for example, as "A man speaks." (In fact, fifteen videos are summarized as "A man speaks.")

We've previously discussed our initial characterization of ambiguous metadata as having a layered, interconnected, organic texture. In Post-Texas Index, the metadata is layered, interconnected, and organic—the metadata is not, for example, applied consistently to each video—but the texture of the overall design is that of an artificially generated meshwork, not a natural one. The conceit motivating Post-Texas Index was that of an alien life-form from sometime in the future attempting to make sense of humans as a type of specimen, and the highly abstract description *is* alien; while it is accurate and objective to describe a video's contents as a man speaking, it is not how people describe things. From a human perspective, this objective and accurate metadata is arbitrary and absurd.

The design technique used to convey this idea in the OVDLT relied on the repetition of individual metadata statements (such as the Actor in a video being "Man" and the Action being "Speaks"). Texture in Post-Texas Index

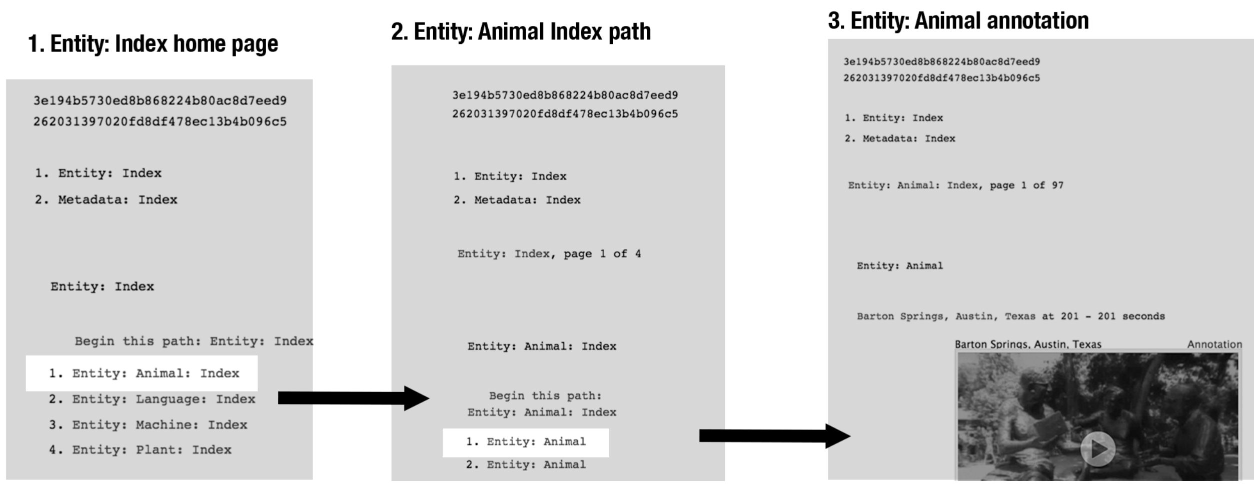


**Figure 3. Entity: Index Scalar translation. (1) Entity: Index home page. (2) 97 identically named pages appear in a linear "path" when Entity: Animal: Index on (1) is clicked (only the first 2 pages in the path are in the figure). (3) appears when the first Entity: Animal page is clicked on (2). This page annotates a segment of a video (Barton Springs, Austin, Texas) with Animals in it.**

arose from the continual rediscovery that structural sense (a Man is indeed a type of Actor in the videos) can lead to conceptual nonsense (this is true but useless for purposes of understanding what each video means, in human terms).

### Integration Work: Translating the Data Infrastructure of Post-Texas Index into the Scalar Data Environment

The repetition strategy did not align well with the Scalar environment at the same scale as it did in the OVDLT. In the OVDLT, one could create a descriptor with the same label (Man) in multiple descriptor sets (Actor, Participant, Recipient), and the OVDLT provided facilities to keep these separate and distinct. In Scalar, one could create multiple pages titled Man, but there was no easy mechanism to maintain distinctions between these pages. We found it impossible to keep duplicate descriptor pages (Man, Group, Woman, Animal, and so on, in Actor, Participant, and Recipient variations) straight in Scalar. Our situation was like trying to replicate an actual ice hotel in Copenhagen: it would be a terrific effort to accomplish, and the relationship between components and environment—the material quality of texture—would shift anyway.

Accordingly, to maintain the texture of alien, artificial interconnection in the translation to Scalar, we dramatically narrowed the data infrastructure in the translation, Entity: Index (see Figure 3). We eliminated the OVDLT descriptor sets (Actors, Participants, Recipients, Actions), along with most of the other metadata elements (such as sentence summaries). Indeed, any sense of the design as a collection of discrete videos was eliminated. Instead, Entity: Index has a hugely limited function: users progress linearly through all the video segments where four "entities" appear: animals, language, machines, and plants. (Humans are a type of animal in this classification.)

The Entity: Index home page presents a list of these four "entity" types. Upon clicking one of the four, a list of all annotated appearances of that entity are arranged in linear order. Each annotation has the same name. For example, clicking Entity: Animal leads to a path with 97 identically named annotations. Clicking an annotation in the list retrieves the video cued where that entity (e.g., an animal) appears. The "database," such as it is, no longer represents videos at all, and the notion of Texas has likewise disappeared. Entity: Index merely lists all the video segments where the four "entities" appear.

### The Texture of the Translated Entity: Index

Reading about the scale of the integration work performed for this translation, it might seem as if Entity: Index was unrelated to Post-Texas Index. Post-Texas Index was, recognizably, a collection of videos about Texas. Entity: Index is not even clearly a collection of videos, and nothing in Entity: Index mentions the location of Texas. But although videos were important to the OVDLT as a data environment, and Post-Texas Index had to accomodate that in its original design, the texture of Post-Texas Index arose primarily from its strategy of abstract repetition.

In the OVDLT, repetition was enabled through manipulation of diverse metadata elements. The same abstract information—that there was a Man in a video, for example—was repeated in multiple ways across different metadata elements (different descriptor sets, sentence summaries, and so on). This *breadth* of repetition was not replicable in Scalar. Scalar, however, enabled *depth* of repetition that wasn't possible in the OVDLT. In using the Scalar annotation feature to associate "entities" with video segments instead of entire videos, Entity: Index heightened interconnection by focusing user attention on the web of entity appearances, rather than discrete videos. In Scalar, moreover, user action could be constrained to enforce repetition. Unlike the Post-Texas Index, the Entity: Index user can only progress through entity annotations (traverse the network in a linear fashion) and cannot filter, sort, or

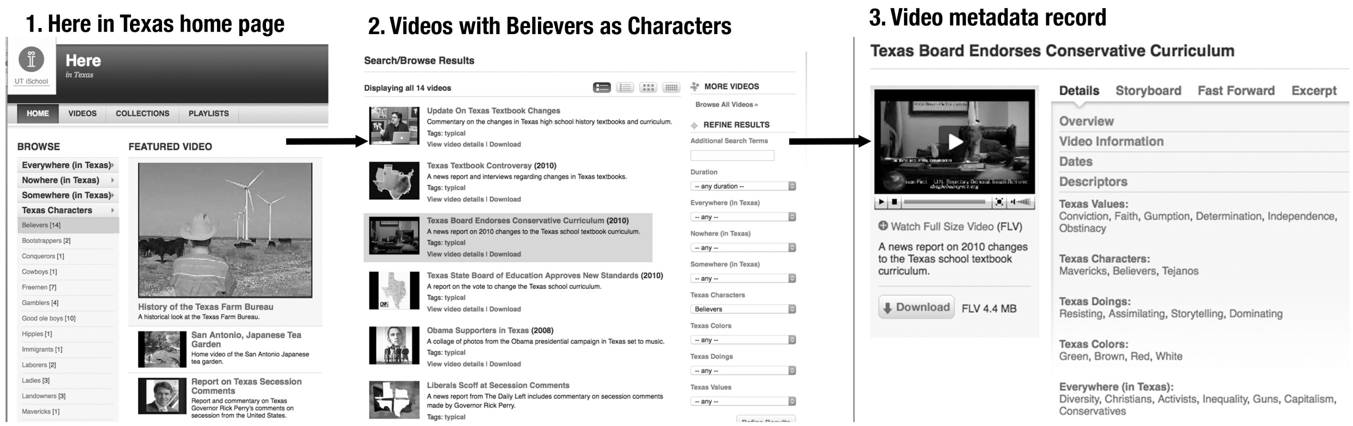


**Figure 4. Here in Texas in the OVDLT. (1) is the home page. By clicking Believers under Characters in the Browse menu, a list of videos with Believers as Characters (2) appears. Clicking a video title brings up its metadata record (3).**

otherwise compare or analyze them (the user cannot create or manipulate entity sets).

Although repetition is implemented quite differently in the original design and in its translation, the two designs feel similar: the texture of alien interconnection is maintained. The result is like that achieved by Robles and Wiberg in Icehotel X; while the material components of the original and translated design are very different, their integration maintains similar relationships, and the texture reflects this.

## TRANSLATION 2: HERE IN TEXAS

In this section, we describe the integration work we performed to translate another of our original designs from the OVDLT to Scalar. The structure of this section is identical to the previous one. First, we introduce the original design and characterize its texture. Next, we describe how we integrated the data infrastructure of the original design into the Scalar environment. We conclude by assessing the texture produced through that integration.

### The Original Design and Its Texture: Here in Texas

The strategy of abstraction and repetition employed in Post-Texas Index could have been applied to any dataset: it wasn't particularly important that the data infrastructure created for Post-Texas Index (descriptor sets of Actors, Participants, Recipients and Actions) was employed to structure a set of videos about Texas. In contrast, this original design, called Here in Texas, relied on a much deeper integration of infrastructure and environment with the data content. Here in Texas used the application of its data infrastructure to the video data to simultaneously endorse, reject, and question perceptions of "Texas" as a distinctive place and of "Texan" as an identity.

Some Here in Texas descriptors reflect popular images of Texas. For example, in the Characters descriptor set, such values include Good Ole Boys, Bootstrappers, and Mavericks. Other Here in Texas descriptors comment upon the insufficiency of these popular images. In the same Characters descriptor set, such values include Unfortunates, Immigrants, and Laborers. Moreover, these descriptors are applied to videos in ambiguous ways that reflect conflicted thoughts and feelings. The Character descriptor Believers is a representative example. Believers on its own implies the religious belief of fundamentalist Christians, a group often associated with Texas. In Here in Texas, Believers is often applied to videos that endorse the secession of Texas from the United States to be its own sovereign country, a position sometimes held by extreme political conservatives. However, Believers is also used as a descriptor for videos of politically liberal commentators who scoff at secession. As employed in Here in Texas, Believers suggests similarities of faith and dedication in groups with disparate, strongly opposed views. The stereotypical image of Texan Believers is not as simple as it first appears. (See Figure 4.)

As implemented in the OVDLT environment, the texture of Here in Texas relies on a strategy of directed, but flexible movement through the video content. To understand Believers, users must employ available actions of browsing, filtering, and sorting to traverse the database, creating and comparing sets of videos with different descriptors, interpreting how Believers is applied across the collection in conjunction with other metadata choices. (What kinds of Values do Believers tend to be associated with, for example)? In Post-Texas Index, the texture of alien interconnection was achieved by a user's merely observing the repetition of extreme abstraction. But in Here in Texas, the texture required a more active user engagement. Users had to find, and then follow, different paths associated with a descriptor like Believers to feel the more organic (as opposed to alien) interconnection of this design.

### Integration Work: Translating the Data Infrastructure of Here in Texas into the Scalar Data Environment

To maintain the texture of organic interconnection produced in the OVDLT version of Here in Texas, we attempted to enact directed, yet flexible movement in the translation. This combination was difficult to achieve in Scalar, where everything is implemented as a page: descriptor sets (like Characters) descriptor values (like Believers) and the videos themselves (see Figure 1).

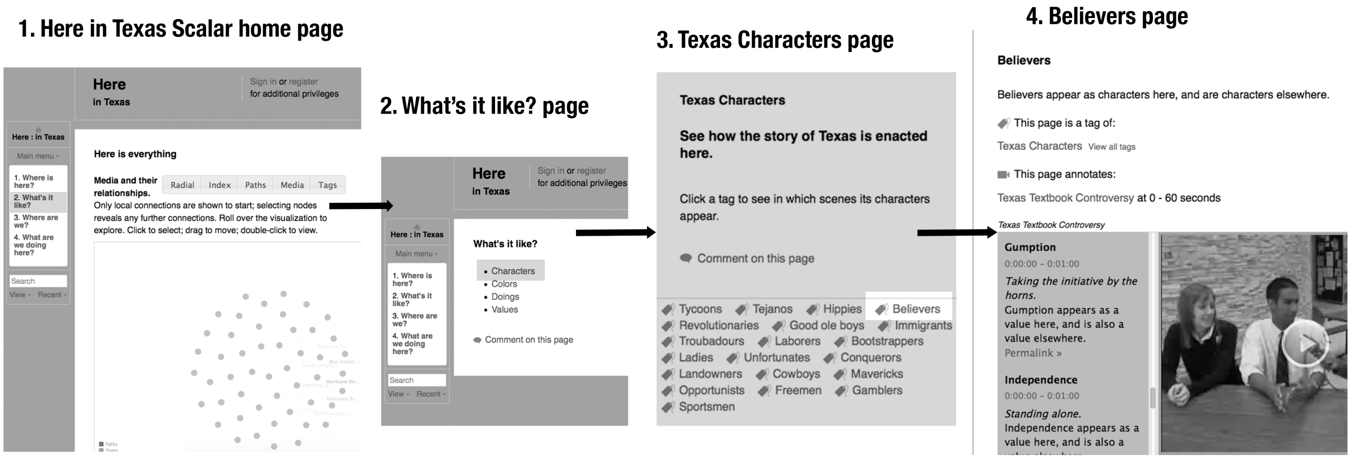


**Figure 5. Here in Texas Scalar translation. (1) is the home page. (2) provides access to descriptor sets (such as Characters) via *internal links.* (3) displays descriptors (such as Believers) as *tags*. (4) includes all videos *annotated* with Believers. Each video lists all its additional annotations (other descriptors, such as Gumption and Independence). The annotation caption gives a sense of what the descriptor signifies (Gumption is "taking the initiative by the horns") and clarifies the descriptor set (Gumption is a Value; Independence is also a Value). Clicking Permalink under Gumption opens a page with all the videos annotated with Gumption.**

To establish distinctions between descriptor sets, descriptors, and videos, we imposed our own artificial constraints on three types of Scalar linking mechanisms. We used the Scalar tag feature *only* to relate descriptors (like Believers) with their higher-level categories (like Characters). We used the Scalar annotation feature *only* to link descriptors and videos. We created additional pages with internal links *only* to provide access to descriptor sets (such as Characters, Doings, and Values). With these constraints, we hoped to manipulate Scalar (the new data environment) to maintain the compositional relations—texture—of the original data environment (the OVDLT).

But although these constraints—using tags, annotations, and internal links *only* for one kind of relationship—were necessary to establish distinctions between descriptor sets, descriptors, and videos, they were not sufficient. The differentiation between these three mechanisms in Scalar was too subtle. Moreover, the function of a Scalar page with *only* a linking mechanism as its content (such as a page called Characters with no content other than its tags to descriptor pages such as Believers) was not apparent. We resorted to explanatory text to clarify the function of different pages. For example, the Characters page tells users to "click a tag to see in which scenes its characters appear" (the tagged pages are the descriptors, such as Believers). To invoke that organic texture, we also included slightly more indirect and evocative text, such as "see how the story of Texas is enacted here." (The flow from page to page is documented in Figure 5.)

### The Texture of the Translated Here in Texas

While Entity: Index looks very different from the original Post-Texas Index, the translation of Here in Texas appears quite similar to the original design. All of its many descriptor sets and descriptor values have been instantiated in the translation, and users can travel between sets of videos for each descriptor (from the videos annotated with Believers to the videos annotated with Gumption, for example). It's clear that the Scalar Here in Texas is a collection of videos about Texas that tells a story about a place, which can be unravelled by following the descriptor annotations. We successfully made Scalar mimic a kind of database. In many ways, the Scalar translation replicated the OVDLT version with surprising fidelity.

However, despite the painstaking effort we took to manipulate Scalar features in the service of our design goals, we did not recreate the texture very well. While the Scalar translation of Here in Texas maintains its layered interconnections, it does not feel organic. We had to force Scalar into submission, enacting our own artificial constraints and then writing explanatory text to tell users what to do and what to think. As we constrained Scalar, we also constrained the design's ability to reveal itself, organically, through interaction. Yes, one might come to understand all the different applications of a descriptor like Believers in the Scalar translation, and see how Believers can be conservative or liberal, dogmatic or inspirational. But this understanding would come because the data infrastructure said so, not because the data infrastructure supported its potential discovery. We had done exactly the wrong thing: metaphorically speaking, we had built a replica of the Swedish Icehotel in Copenhagen, exactly the approach avoided by Robles and Wiberg with Icehotel X.

## DISCUSSION

When we were finishing our translations and beginning to reflect on our activities, some of us were more satisfied with the integration work in the Here in Texas project. We had retained all the primary elements of data infrastructure and data content in the Here in Texas translation, and we had manipulated Scalar (a system whose functions aligned with a graph-type database) to mimic the OVDLT (a system whose functions aligned with a relational database). This seemed like quite an achievement.

However, in maintaining relationships between primary design components, we had altered relationships between those components and the data environment, and the design texture changed. In the Here in Texas translation, we had acted more like engineers in keeping to a set of specifications, and not like designers responding to a changed situation. As an engineering feat, what we had done was indeed impressive. But as a design translation, we were focusing on the wrong things. In the Here in Texas translation, we put tremendous effort into maintaining the integrity of the data infrastructure and data content, performing convoluted technical maneuvers to get these components to “work right” in Scalar. But in focusing our attention on the components, we neglected the relationships between infrastructure, content, and environment, and the texture changed around us.

Like Robles and Wiberg, our translation project involved speculative designs, to set the notion of texture and the role of the data environment into high relief. We needed to work with atypical metadata to perceive how texture emerged from the integration of data infrastructure with data environment, because in everyday applications, the textural relations are more subtle. But the basic situation that we found ourselves in with the Here in Texas translation is very typical. We were trying to “plug in” data infrastructure and data content as prefabricated components, merely changing the environment in which the data was stored and accessed. We were treating data infrastructure and data content as mere inputs to design, and not as objects of design. As a consequence, our attempt to recreate a particular design texture was almost sure to fail.

To return to my rug story from the beginning of this paper, with Here in Texas, we were trying to recreate the warmth of the old office by moving around the furniture in the new office, trying to find the best place for the colorful rug. But although it was the “same” rug, it was different in the light of the new office, and moving it around was an exercise in futility. In the rug story, I needed to change the light itself (the data infrastructure) and get some wall hangings (adjust the data content) in order to maintain the texture, and even then, the function of the rug in the overall composition changed. With Here in Texas, we may have found the “best” possible configuration of Scalar without altering the data infrastructure and data content—and yet, even though we kept them perfectly intact, the data infrastructure and data content nonetheless changed, just like the rug did. Within the altered balance of the new composition, the data itself had changed, even though we did nothing to it. The change in design texture made this clear.

It’s not uncommon practice for design projects in HCI to treat data infrastructure and data content as replaceable inputs that might be swapped out with minimal effects on user experience. As one example, Gaver and colleagues describe the design of 150 “datacatchers” to convey socioeconomic data about a user’s current location, such as the employment percentage in the neighborhood [6]. The datacatcher project involved tremendous effort to design and build the custom devices, to distribute them in the community, and to film stories of their use. The data conveyed through the device is much less present in the design narrative: the devices “draw on hundreds of datasets from 14 online sources.” Data in numerical or category form is transformed into sentences with “templates.” Beyond this reformatting, the researchers portrayed data itself as an input to the design, not the object of design.

This was exactly our miscalculation in our Here in Texas translation. Our focus on manipulating Scalar to work with our existing data—on redesigning the data environment, but not the data infrastructure or content—resulted in significant changes to the design texture. We did not adequately approach the integration work of this translation as a design problem, and our engineering approach to integration dimished the resulting user experience. In contrast, the Entity: Index translation treated all design components—data infrastructure, data content, and data environment—as design objects. In the Entity: Index translation, integration work was design work, and the experience texture was more effectively maintained.

With data, perhaps more than with other design materials, it can be easy to miss how its character can change from one environment to another, even as the data itself is kept apparently pristine. For example, rainfall totals in a spreadsheet should be the same as rainfall totals in a database...right? Integration work between spreadsheet and database would be likely to focus on the display of the data, and not on the data itself. The rainfall amounts aren’t changing!

The heightened perspective of our translation projects helps to understand this everyday situation in a new way. By translating our strange data from one environment to another, we can see more clearly what happens in all such cases: that manipulating only the data environment and not the data infrastructure and data content affects design texture. In the case of rainfall, precipitation totals wouldn’t change from one environment to another. To maintain the texture from one design composition to another, however, the size and complexity of the total dataset might *need* to change. (A database with few, simple records seems, in its own way, as impenetrable as a spreadsheet with an excess of columns and rows—a database needs enough data in it so that query results aren’t empty.) Our projects demonstrate that using data must involve translating it. Whenever you integrate data into a new environment, you might need to redesign the data as well. An engineering approach to force the new data environment to act like the old one—to make a database act like a spreadsheet—affects compositional balance. *Texture* provides a means to calibrate the design work of such integration.

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