Fulfillment: a field guide to the logistical city

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Abstract

Fulfillment: a field guide to the logistical city is a web-based immersive virtual reality (VR) project, currently in production, that invites the user to explore the sedimented landscapes of logistics traversing urban centers of consumption and their related distributive networks of warehousing, transportation, dataveillance, waste and wilderness management. Inspired by Amazon's logistical empire and specifically, by e-commerce-driven promotions of "seamless" flows in our on-demand economy, this project offers an interactive tour of the dark side of supply chain capitalism – that is, the hidden buffer zones, glitchy seams and uncanny folds of logistical spacetime that enable the "magic" of consumer "fulfillment" to seem always just one online click away.

Our aim is to establish a platform from which to observe the behind-the-scenes realities of supply chain infrastructures and their impact on labor, consumption, wellbeing and the environment. The project opens up new avenues of interdisciplinary collaboration between anthropology, design, science, and engineering for our team, while paving the way for new interdisciplinary educational opportunities. *Fulfillment* contributes to exploring how VR can be used as a medium for anthropological field research and in turn, make anthropological findings more accessible to a broader audience.

Keywords

Logistics, Multimodal Ethnography, Virtual Reality, Sousveillance, Infrastructure, Supply Chain Capitalism, E-Commerce, Environment

Introduction

Fulfillment: a field guide to the logistical city aims to provide audiences with ethnographic insights into the impact of e-commerce-driven logistics on labor, environment and more-than-human relations of value and wellbeing. Specifically, this project explores how contemporary Amazon-driven algorithmic models of circulation between urban consumer centers and their exurban transport and warehousing corridors laminate on to prior landscapes of settler-colonial and military-industrial modes of distribution. Through an immersive virtual reality (VR) web-based interface, participants take on the perspective of the computational system and its algorithms in navigating the flows of commerce between exurban warehousing and transit corridors and the zone of "last mile" logistics in urban consumer centers. Drawn from collaborative ethnographic research and multimodal experiments across "hotspots" of logistical mediation, this project is currently in the final phase of production with the aims of launching in fall 2024.

This paper describes (1) our research methods, (2) novel theoretical concepts that guide the research and development of the VR project and (3) the current state of the project in the context of our interdisciplinary collaboration.

Interdisciplinary Research/Design Team

Fulfillment draws from research insights accrued over the past five years through a collaborative interdisciplinary project entitled "Logistics in the Making of Mobile Worlds." This project has brought together a global network of scholars and practitioners to engage in experimental on-site investigations in several intermodal logistical hubs across the American Midwest, Paris, Seoul and the Korean DMZ. Beyond the co-authors of this paper who represent the fields of anthropology and media arts, contributors to the conceptualization of this project include other social scientists and experts in mathematics, engineering and design from several research institutions spanning the U.S., Europe and Asia. The project started in 2018 and shifted to virtual development during the COVID pandemic. For the team, the project opened new avenues of collaboration between anthropology, design, science, and engineering. At the same time, it opened up further opportunities for students to contribute to the advancement of anthropological research through the use of multimedia technologies.

Project *Fulfillment* (in a nutshell)

Project *Fulfillment* brings media technologies to the forefront of anthropological research and immerses the

audience in the guided first-hand observation of the behind-the-scenes workings and effects of supply chain capitalism on ecology, labor and socio/economic wellbeing. These are aspects of logistics otherwise hidden from consumer experiences of our contemporary on-demand economy.

As a 360 immersive online experience, *Fulfillment* will orient the user to the increasingly pervasive yet often obscured ways in which the infrastructural and operative logics of commercial logistics—or what we might call the science of managing commodity flows in space and time—are reshaping the way we work, live and relate to each other and to our built and "natural" environments. Once considered a niche expertise of a military science, logistics has emerged as a commercial field of central importance to the postwar globalizing economy as innovations in shipping, information technologies and commodity production converged to promote the economic reorganization of capital and its related flows (e.g., in goods, people, information) across more flexible and distributive global supply chains. While much has been written about how "revolutions" in digital technologies and Post-Fordist manufacturing have shaped contemporary economic and social life in what some scholars have termed "supply chain capitalism" [1] [2], the central role of logistics in bringing together these innovations in computational sciences and economic management has been largely neglected by academic researchers and journalists until the past few years (though it has long been in the purview of the military sciences and applied business research).

Why VR?

Fulfillment explores new ways of extending VR as a medium for anthropological field research and other empirical investigations, connecting fieldwork and technology in ways that have not been previously possible, and paving the way for new interdisciplinary educational opportunities. Fulfillment contributes to exploring how VR can be used as a tool to energize and reshape anthropological research by extending traditional field-based ethnographic methodologies with VR technologies, and thus, making the results of anthropological research more accessible to a broader audience. VR is unique in its capacity to situate the audience in a digital version of the ethnographic sensorium so that anthropological findings can be conveyed in more dynamic, interactive and provocative ways than what is typically made available through scholarly publications. Given the classic ethos in anthropology for doing "immersive" fieldwork, the project taps into VR's distinct capacities for enabling digital experiences of 360 immersion as a means to convey ethnographic insights in

poetic and sensory registers difficult to capture in conventional academic writing.

Through an anthropological inquiry using VR technology the project has the potential to illuminate an important aspect of contemporary society in which most people have a stake. The project raises critical questions about our role in consumer logistics and its imperative environmental, cultural and social consequences.

Drawn from collaborative multimodal fieldwork across Chicagoland, the greater Midwest and other intermodal hubs in Europe and Asia, the project aims to provide audiences with ethnographic insights into the impact of Amazon-style logistics on labor, consumption and environment in our on-demand economy. Through an immersive VR web-based interface, users take on the "systems" perspective of logistics as the algorithmic management of goods, labor, transport and data across exurban corridors of materials handling and the zone of "last mile" logistics in urban consumer centers.

Background and Inspirations

This VR project developed from collaborative research experiments with multimodal methods across various centers of logistics activity. Research strategies include ethnography, 360 videography, geolocation tracking, audio field recordings, and data visualization with the aims of yielding insights into the often obscured "black box" operations of logistics. To do analytic justice to the various scale-making capacities of logistics, this project aimed to take the heterogeneity of logistics seriously through more creative and robust forms of multimedia investigation and representation.

Logistics, afterall, can be examined productively as a multimodal form itself. Logistical sensors like the ones tracking shipments of COVID-19 vaccines, for instance, are at once concrete devices locatable in space and time and opaque translocal portals for converting all sorts of physical dynamics – temperature, speed, weather conditions, transit routes – into data streams for storage and processing elsewhere and elsewhen and at speeds and volumes that defy human legibility. In turn, our project explored how new ethnographic experiments with digital techniques of data capture, analysis, and representation – in a kind of "paralogistical" mode of inquiry [3] – might enrich research practice. Through this process, we hope to open up the often proprietary and black-boxed dimensions of logistical mediation to critical analysis and better public understanding.

In turn, our project offers a web-based interactive virtual tour or what we call a "field guide to the logistical

city" for identifying and critically engaging the various material artifacts and spatiotemporal traces that the commercial industry of logistics has left on contemporary landscapes. Our work includes experimenting with ways of representing the spacetime folds and multiscalar effects of logistics – from the impact of unassuming "small" technologies like the universal bar code and the modular cardboard box on the efficient movement of goods to the standardized large-scale designs of intermodal industrial parks, data centers and performance-monitoring software systems which now shape the flows as well as the chokepoints of our contemporary on-demand economy.

Inspired by Amazon's expanding logistical empire, this project is especially attentive to how algorithmic models of circulation between urban consumer centers and their exurban corridors of warehousing and transportation laminate onto prior landscapes of settler-colonial and military-industrial modes of distribution. The latter insight into the entangled histories of logistics emerged from collaborative research we conducted at several expanding intermodal centers in the American Midwest – the "trapezoidal" core of logistics operations in the U.S. [4]. As we discovered via ethnographic site visits across Illinois, Wisconsin, Michigan, Indiana and Kentucky, commercial hubs of warehousing and transportation were often built on prior logistical infrastructures – in this case, decommissioned military bases (e.g., arsenals for manufacturing and distributing TNT from World War I through the First Gulf War), which themselves sat alongside or on top of prior settler-colonial infrastructures for exchange (e.g., riverine and canal hubs for advancing the fur trade from the 17th to the 19th century).

Moreover, the project draws from computer games and media art installations that examine the logistical management of participant's agency as they navigate moral and economic dilemmas such as the bureaucratic pressures of border control in Lucas Pope's *Papers, Please* [5], or the overflow of consumer-driven container shipping in Joelle Dietrick's *The Speed of Thinking* [6]. Among sport simulation games, *Out of the Park Baseball* [7] and *Football Manager* [8] stand out for their real-time data structures, scalable agency, enriched user experience and user-centered interface design – all of which simulate the logics of sports management in ways that resonate with the real-time metrics that quantify and measure each actor's decisions in the world of commercial logistics. These games offer our project key design models for how logistics can be "playable" as interactive experiences.

In the remainder of this paper, we sketch our methodological experiments and conceptual interventions before describing the design of *Fulfillment* and its interactive scenarios. The conclusion outlines the key aims and future plans for this project.

Methodologies

Our team deployed multimodal research methodologies inspired by a range of ethnographic and art practices that provide guidance for the VR project's development. The goal of our research methods is to unleash creativity in critical inquiry, support active interdisciplinary collaboration, and break away from standard research formats of academic publication and discussion by mobilizing multimodal strategies of investigation and public engagement. Beyond our own fields of anthropology and media arts, we believe our experimental methods with multimedia in fieldwork can be adapted by other humanistic and social science projects and by other interdisciplinary teams to develop immersive experiences of research findings.

In developing the research and design of this project, we asked: how might the multimodal aspects of logistics be harnessed or reverse-engineered for participant-observation and other ethnographic forms of data collection and analysis? How can we creatively incorporate the kinds of technologies already embedded in logistical worlds – for instance, scanners, GPS visualizations, smart phone recordings, 360 simulations, and digital interactivity – into this project's core strategies of investigation and representation?

Ethnographic "Hacking" and Sousveillance

Our approach was inspired by the "When-in-Rome" principle of the anthropological fieldwork tradition through which researchers have long tried to grasp not only the insider's point of view but also, the technical inner workings or ethnomethods that keep these social worlds running. Just as anthropologists studying navigation across Oceania [9], the Aboriginal desert [10] or the Arctic ice [11] learned to operate the technologies they found in the field in order to understand the practical logics of these mobile worlds, this project aimed to incorporate – as well as ethnographically "hack" -- the kinds of multimedia tools used to negotiate logistical relations in contemporary life.

Another inspiration for our multimodal strategies comes from academic and artistic projects centered on "sousveillance" that take up the grassroot practice for reversing the gaze of surveillance regimes, This approach is exemplified by Simone Browne's *Dark Matters* [12], the "paralogistics" of the performance collective *geheimagentur* [3], and the photographic interventions of Trevor Paglen [13] and Taryn Simon [14]. Resonant with the "culture jamming" strategies of the activist pranksters, the Yes Men [15], as well as the "aggressive compliance" tactics of artist Hasan Elahi [16], we developed a performative method of mimesis and countersurveillance

as a means of tracking the logistical trackers. In the process, we hope to expose some of the hidden seams, frictions and holes that logistical monitoring systems generate in the movement of goods, people, data and capital across the globe [17].

The Experimental Field School

To investigate various forms of computation and algorithmic management currently governing the dynamics of logistical worlds, we organized a "Logistics of Information" Field School and asked participants to engage information creatively as some kind of ingredient (input) or product (output) of a recipe (a stepwise procedure prefiguring the algorithm). With the goal of reverse engineering the logistical mediation of information, our team engaged in brainstorming exercises for identifying starting "ingredients" we could collectively look for during our on-site investigation of logistics in Seoul and the DMZ in South Korea. We then mobilize the "ingredients" we collected in our site visits to build recipes-cum-algorithms as one way to simulate the IT-driven logics of logistical movements. Each participant also wrote a short 300-word reflection about their "ingredient" with an image, video, or audio responding to this recipe-building challenge.

For another "Logistics of Commerce" Field School, we invited participants to play conceptually and materially with the ubiquity of "the box" as a design principle and everyday mediator of logistical worlds. Through methodological prompts for "Working Through the Box," Field School participants generated a collection of various theoretical, practical and conceptual perspectives by brainstorming both the concept and pragmatic operations of the box [18].

Each Experimental Field School workshop was held in person in a location ripe for empirical experiments in investigating logistics: Chicago (USA), Paris (France), and Seoul (South Korea). Each workshop invited local faculty and students from undergraduate and graduate programs who contributed to discussions and provided local guidance for collaborative field work. Along with the team research we conducted across intermodal hubs in the American Midwest, the inspirations and concepts emerging from these Field School gatherings were then mobilized to build the design themes and sketch the storyboard for this VR project.
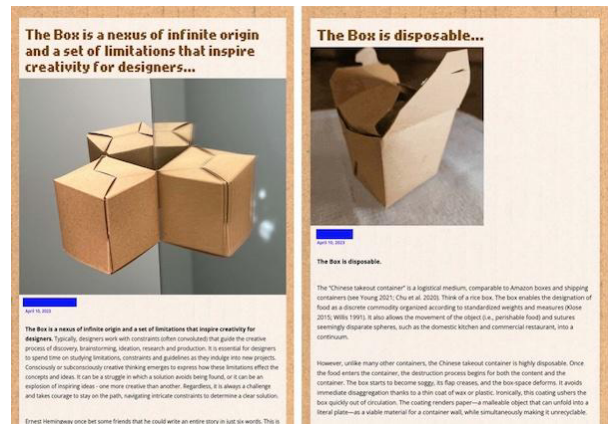

Figure 1. "Working Through the Box" concept examples.

Design, VR Development and Interaction

Our designers created graphical materials to enable and support local research such as identity systems, packaging, note planners, game cards, boxes, and posters to help the research team organize and execute their onsite investigations. A website with multiple webpages was also produced to organize research concepts, showcase different research team members' contributions and experiment with multimedia forms for representing findings.

As part of our research process, we also proposed and designed a prototype of the mobile app "Collectiva."

Figure 2. Mobile app prototype enabling field researchers to collect and share data in real time.

The "Collectiva" app is an interactive show-and-tell application that allows researchers to upload an image, sound or other media artifact and then annotate that artifact with notes pinned to specific parts in the image (or sound)

being described. The app aims to empower research communities with field research-centered tools for uploading and gathering materials - and the notes related to each item - in one place and in turn, to facilitate exchange within a community of like-minded researchers. App users can collect and upload notes in real time while working on site locations and then explore the collection of uploaded images and read all the annotations attached to each image.

Scenarios and Scripted Interactions

The VR project consists of 10 different interconnected scenes as listed below:

- cityscape,
- data center,
- warehouse exterior parking lot,
- modern cemetery,
- prairieland,
- wasteland,
- army ruins,
- warehouse inbound handling,
- warehouse outbound handling,
- warehouse picking mod.

The participant navigates and interacts with the VR environment and 3D objects across these scenes and from the perspective of a data-tracked user or "algorithmic" subject. Each scene is conceptually and interactively connected to other scenes and unveils various behind-the-scenes workings of product delivery. Each scene also represents various ecological, socioeconomic, and historic entanglements shaping the logistics of fulfillment.

VR Walk-Through

Our virtual tour aims to trouble shallow contemporary sensibilities of "fulfillment" – an industry term often celebrated by logistics giants like Amazon as a matter of delivering "seamless" flows of one-click, on-demand satisfaction to consumers everywhere and every*when*. Unraveling the novelty and technophilia conventionally attached to the digital "magic" of logistics, our project mobilizes the distinct multisensory registers afforded by interactive 360 media to immerse the user in the dark "hauntological" side of supply chain capitalism [19].

The audience enters into a dark space with an interface menu, which prompts them to "Choose Your Fulfillment" by clicking on one of the items displayed for possible "purchase." There is a data-inspired binary transition, and the audience finds themselves looking over a Cityscape, as the consumer core of "last-mile" logistics; Army Ruins presenting the military-industrial base of logistics infrastructure; or Prairieland, representing the settler-colonial hauntings shaping contemporary logistics.

Each scene contains artifacts from other scenes that index the space-time foldings and interconnections of zones conventionally held apart. These out-of-place artifacts also serve as teleporting triggers to transport the participant as a flowing data stream into those other scenes.

Beyond the historic layers invoked by the Prairieland and the Army Ruins, the player can connect via teleporting artifacts to two other scenes to get a sense of the multiscalar spacetime of logistics:

- Warehouse exterior in which the participant explores the "mega" scale of land used for materials handling. Here the player navigates the vast expanse of the warehouse parking lot and its surrounding loading docks for linking inbound and outbound flows of goods, labor and trucking.
- Data center interior in which the participant immerses in the "nano" scale of data flows powering the online interface and its related digital infrastructures in the logistics industry. Here the player engages the otherwise imperceptible microprocessing materials and speed of data anchoring logistical worlds.

The core of the VR experience centers on two scenes of recursive player interaction:

Warehouse - This scene animates the heart of logistical labor. It introduces the participant to a form of gamified Taylorism via the algorithmic management of worker performance. In this scene, the participant must navigate ever-intensifying competition for completing certain repetitive logistical tasks. Their performance is "scored" according to benchmarks of speed and efficiency along two distinct points in the logistical process of materials handling:

- Picking mod - The participant's mission is to gather items for online orders from rows of storage shelves into a bin for further packaging into deliverable boxes and pouches.
- Outbound handling - The participant is tasked with ensuring the smooth processing of packages along a conveyor belt by moving them from a vertical chute onto a conveyor belt in precise alignment with a scanner aiming to register the barcode labels on the packages from above the moving conveyor belt.

For both of these scripted interactions, there are punitive repercussions for participants who fail to meet the performance benchmarks for speed and efficiency. The

benchmarks themselves continually escalate with each successful completed task so that the goals become ever more difficult and out of reach. In this way, we aim to immerse the participant in the well-documented intensities and precarities of warehouse labor, where workers are often hired through temp agencies and subjected to seasonal cycles of underemployment and layoffs [20].

Wasteland - This final scene brings the participant to the peripheral zones where disposable labor and exhausted commodities end up. This is the site where the participant is teleported after they fail repeatedly to meet performance benchmarks in the warehouse scene. While appearing initially as a wild and desolate landscape, this scene offers the participant an interactive opportunity to manage the afterlives of on-demand consumption towards different ends: (1) by adding to the trash already strewn about the setting or (2) repurposing the surplus into renewable matter and creative rebuilds through a sifting exercise for separating toxic waste from reusable "treasures" in the landscape.

Ultimately, while the warehouse represents the peak of a "systems" perspective in logistics, the wasteland offers an interactive space for the system's unwinding into other possible forms of relating, living and becoming that gesture to the environmental promises of sustainability. In this way, the VR experience provides an opportunity for turning the logistical sense of consumer "fulfillment" sideways or on its head.
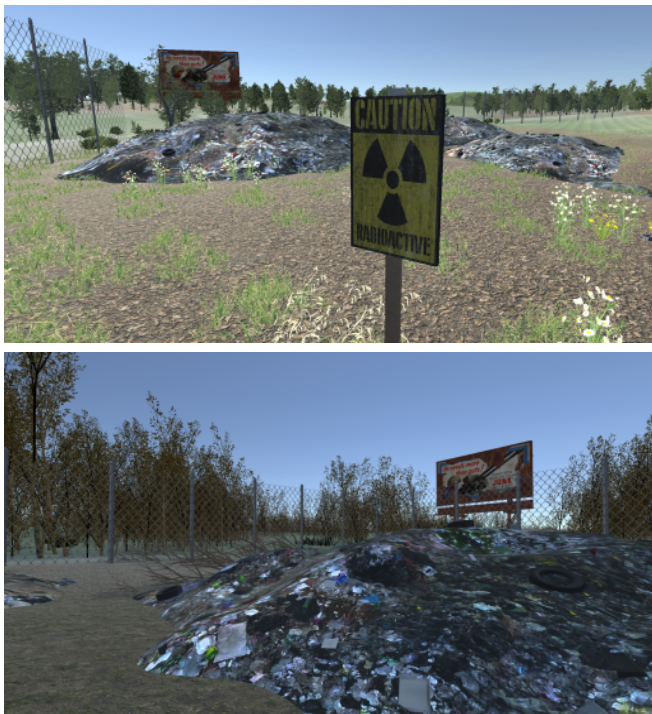

Figure 4. Warehouse exterior parking lot VR scene.
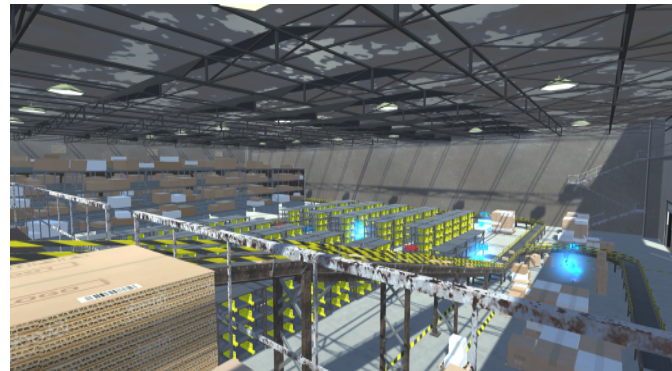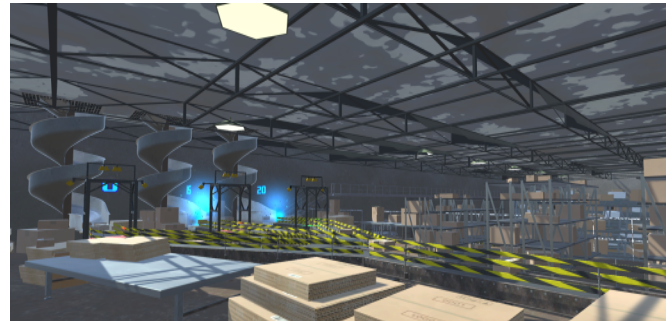
Figure 5. Warehouse VR scenes. Gathering items for online orders for packaging.
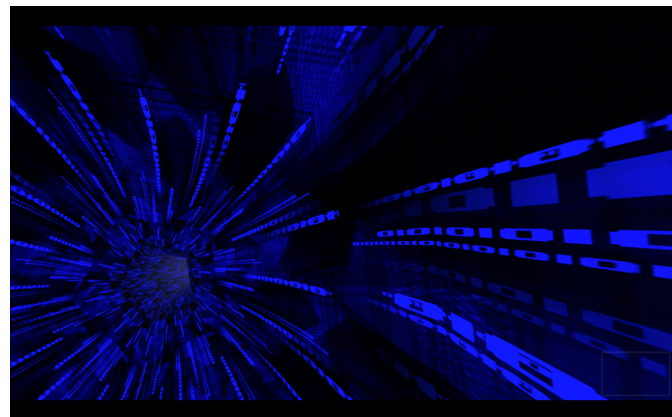

Figure 3. Toxic wasteland VR scene.

Figure 6. Binary transition between VR scenes immerses participants in the digital tunnel of data streams.

Sound Design

During the field research trips for this project, our team recorded ambient sounds from various sites of warehousing, trucking, data processing and other adjacent sites of prairieland, army ruins, wilderness and wasteland. These sounds serve as atmospheric references for each scene as well as audio sources for designing the soundscape in the VR scenes.

Through a robust sound composition, our aim is to further immerse the participants in their interactive 360 experience. In addition to an ambient soundtrack, we will collaborate with a professional music composer to write theme musical compositions for each scene. We also plan to create voice-over narration in the "systems" style of Amazon's digital assistant, Alexa, to further engage and motivate participants as part of our VR storytelling.

Conclusion

While growing numbers of anthropologists and other researchers now take advantage of online platforms such as websites and social media to share their findings, this project aims to explore the distinct forms and design possibilities of digital media for capturing and conveying ethnographic knowledge in new sensory and interactive registers.

This project hopes to enrich anthropological knowledge and broader academic and public discussions of (1) the changing material culture and embodied experience of e-commerce-driven mobility, consumption, labor, and the environment in contemporary life and (2) the impact of logistics as a distinct industry and social form for knowing and relating to Others – for example, via algorithmic models of supply-and-fulfillment or as data profiles of labor or consumer power – as an increasingly on-demand global economy sustains the flows of travel, trade, and information across the vicissitudes of space and time.

As a virtual tour animating the interpenetrations of logistical spacetimes across digital, military-industrial, and settler-colonial infrastructures, this project also draws previously disparate and siloed domains of research on the global flows of people, things, and data into a more rigorously comparative and integrative field of understanding; it does this by enabling participants to interact virtually with the hidden pragmatic designs and coordinating agencies of logistical flows.

Fulfillment also aims to bring the traditional social sciences into fruitful conversation and synergies with the computational sciences and interactive digital arts. A third and final goal of this project is methodological: (3) to enrich emerging research interests in multimodal forms of anthropological fieldwork, collaboration, and publication, especially by exploring emerging interactive digital media through the development of the VR project. In turn, this project contributes to a growing scholarly conversation about the promises and challenges of investigating and writing about complex multiscalar phenomena by exploring the possibilities offered by multimedia technologies for conducting field research and for representing anthropological insights in more creative and sensorially rich modes.

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Author Biographies

Julie Y. Chu and Daria Tsoupikova's collaborative research practice, which began in 2018, encompasses multimodal research, digital design and pedagogical initiatives. Harini Kumar and Kenzell Huggins joined the *Fulfillment* project shortly after it was initiated and have worked closely with Julie Chu on gathering research materials via multimodal ethnography across various intermodal hubs across the American Midwest, Asia and Europe. All four authors have worked collaboratively on the storyboard and design concepts for the project while Daria Tsoupikova is the creative director on the project and has led the design team throughout the VR research, development and production process.

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Acknowledgements