FUN MILLS:

The Interactive Adaptation of a Post-Industrial Economy

by

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A thesis submitted to the Faculty of Graduate and Postdoctoral Affairs in partial fulfillment of the requirements for the degree of

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FUN MILLS

The Interactive Adaptation of a Post-Industrial Economy

M.ARCH. THESIS // BY COURTNEY KLEIN

“Creativity is generated and sustained through a delight in the unknown”

- Cedric Price

ABSTRACT

Fun Mills intends to revive the economy of the declining post-industrial town, Burnley in Lancashire, UK. Taking influence from Cedric Price's proposed Fun Palace, this thesis explores how architecture might continue to flourish through society's dependence on digital technology. Burnley was once England's centre of cotton and wool production yet is now comprised of numerous vacant cotton mills that line the Leeds & Liverpool Canal. While the majority of prosperous cities in the UK have shifted their economies to high-tech knowledge industries, the predominant population of Burnley is trained in the manufacturing sector, lacking the education to move into a knowledge economy. This project proposes the transformation of unused cotton mills into a network of interactive textile labs, in order to bridge a sharing economy between manufacturing, knowledge, and service industries. Similar to notions of the Fun Palace, the buildings acknowledge indeterminacy by allowing reconfiguring forms to adapt to the continuous progression of science and technology.

Figure 01 //
SELF-PORTRAIT: Cedric Price
Signature Sketch (Page Left)

Price preferred to sign his work with a self-portrait caricature, rather than a conventional signature. He often depicted himself smoking a cigar.

ACKNOWLEDGMENTS

I would firstly like to acknowledge my advisor, Johan Voordouw, for his exceptional guidance, support, and confidence in my work throughout my thesis and final years at Carleton. Thank you for teaching me the fun side of architecture, and for empowering me to develop my own style. You have never failed to provide me with motivation, great ideas, and inspiration when I am stuck, and I am extremely grateful to have had you as a teacher.

Thank you to my incredible parents and siblings, without whom I would never have survived seven years of architecture school. Your constant love and support has kept me going throughout the most stressful times, and I owe all my success to your endless encouragement.

Finally, I extend my appreciation to my architecture family. I feel especially fortunate to have attended the Azrieli School of Architecture, and to have met so many amazing people throughout my graduate and undergraduate degrees. The architecture building feels like my second home, and I will greatly miss working alongside my friends everyday.

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Introduction

QUESTION

How can architecture address the social, cultural and economic issues that arise from digitalization in physical space?

REASON FOR INTEREST

I was interested in the topic of architecture's dependence on **technology** after having worked in architecture firms, which specialize in institutional design. Through my project assignments and experiences there, it became apparent that the future of school and workplace infrastructure might eventually exist **online**. As a student of architecture who plans to continue in the profession, the foreseeable lack of demand for **physical** buildings is worrisome. Civic building construction and use is currently in decline,[1] and investment in industrial building construction has dropped 22% in Canada, over the last four years.[2] Physical architecture, which once provided a communal sense of identity, is currently dwindling at a continually

DEFINE // Digital

Designating a virtual, computer-mediated counterpart of an object that exists in the physical world.
(*Oxford English Dictionary*, 2016)

DEFINE // Digitalization

The adoption or increase in use of digital or computer technology by an organization, industry, country, etc.
(Oxford English Dictionary, 2016)

DEFINE // Technology

An assemblage of heterogeneous components, human and non-human, in disorderly connections.
(Picon, 2016)

DEFINE // Online

Designating or relating to a service, resource, etc., available on or performed using a computer network (esp. the Internet), or a person or organization that can operate or accesses this.
(Oxford English Dictionary, 2016)

decreasing rate.[3] Through my thesis, I hope to explore how the built environment can progress in tandem with the technological advancement of digitalization and the resulting knowledge-based economy, in order to create inherently expressive architecture.

DEFINE // Physical

Of or relating to things perceived through the senses as opposed to the mind; tangible or concrete.
(Oxford English Dictionary, 2016)

DEFINE // Sharing Economy

An economic model based on sharing underutilized assets for monetary or non-monetary benefits.
(Botsman, 2013)

OBJECTIVE

This thesis seeks to create a "**sharing economy**" which will link the manufacturing, service, and knowledge economies to improve the social and economic condition of a small post-industrial town in the UK. The final design will exemplify how the digital world can be paired harmoniously with the analog in order to keep both architecture and long-established industries lastingly relevant.

SCOPE

Read through the work of Bernard Tschumi, Cedric Price, and Karl Marx, this thesis seeks to understand why digitalization is the first era of technology that architecture is unable to address. The project is a speculative research by design thesis. The text of Tschumi is discussed

in order to understand the current disjunction between buildings and their programs, as a result of technology. He agrees with the opinion of Price, who believed that sociality should motivate architectural decisions, in accordance with current technology. Price's work is reviewed as a precedent study for the compelling integration of technology and architecture with social purpose. Finally, Marx's views on work explain how technological advancements, which once alienated workers of the Industrial Revolution era, are able to liberate future work environments. The design proposal presents a network of interactive **textile** labs, in the post-industrial town of Burnley, UK. Utilizing empty cotton mills, which once drove the country's economy at the height of the industrial revolution, the project seeks to improve the town's employment opportunities through **interactive architecture**. The labs facilitate the collaboration of manufacturing, service, and **knowledge industries** in the production of **advanced textiles**, and are designed to function dynamically to grow with the ever-changing technology required for innovative production. The labs function as both a work and education environment, allowing workers to learn from workers in other fields, for the possible development of new skills and training. The thesis limits the scope of the project to solve an important part of Burnley's current economic problem through architecture. While the project program might aid in alleviating issues of un/under employment and education issues in Burnley, this project is not a total solution and sees policy/legislative actions outside the scope of the project.

DEFINE // Textile

That has been or may be woven. Also, of or pertaining to a man-made fibre or filament, not necessarily woven. (Oxford English Dictionary, 2016)

ETYMOLOGY // Textilis (Latin)

Woven.

DEFINE // Interactive Architecture

The art of building relationships involving bi-directional communication between two active parties, which can be either people and/or built components.
(Oosterhuis, 2016)

DEFINE // Knowledge Industry

A term, which encompasses industries, which value the production of the idea over the production of the physical good. These professional industries are increasingly developing due to the heightened presence of ubiquitous information, and usually concern information technology, digital media, and creative activities.
(Swinney and Thomas, 2015: 1)

SIGNIFICANCE

The prevailing solution to designing institutions for a digital age has been creating spaces that utilize modular mobile furniture, able to adapt to a variety of programmatic needs. Due to mobile work tools, such as laptops and smartphones, many offices no longer have set workspaces for employees, a concept referred to as “hot desking” or “hoteling”.[4] Consequently, the prevalent architectural resolution (conveyed in the following images) is bringing about empty and generic spaces, waiting to be filled with furnishings in order to become distinctive. Bernard Tschumi, in his book, *Architecture and Disjunction*, speaks about this trend as “empty” form,[5] an issue this thesis solves through interactive, reconfigurable architecture. Instead of being defined by furnishings, the inherent adaptability of Fun Mills sustains architectural character while accommodating current productivity methods.

DEFINE // Advanced Textile / Digital Textile

Advanced computational and fabrication technologies combine to create textiles capable of both reacting to their surrounding environs and responding to their inhabitants. (Schneiderman and Winton, 2016: 10)

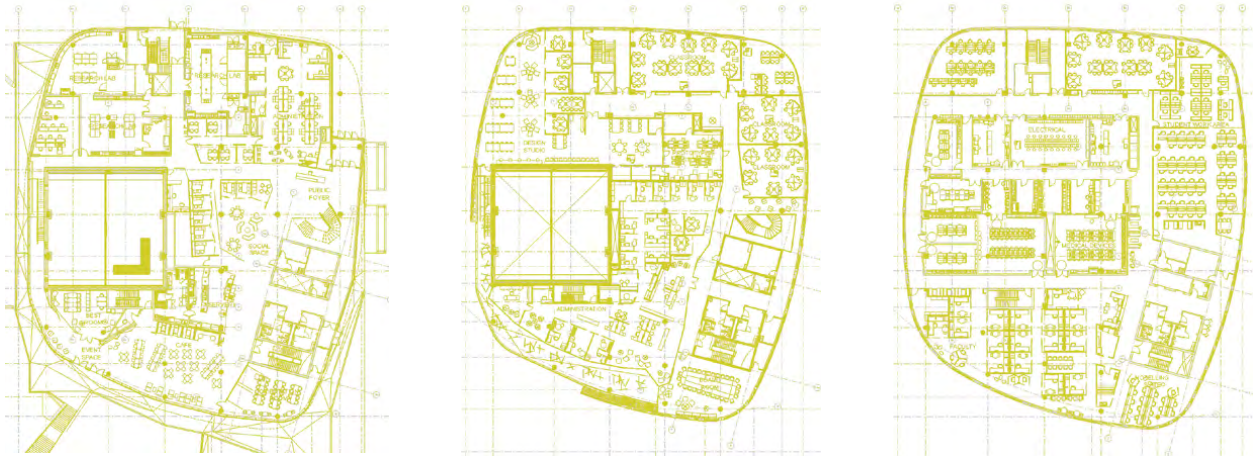
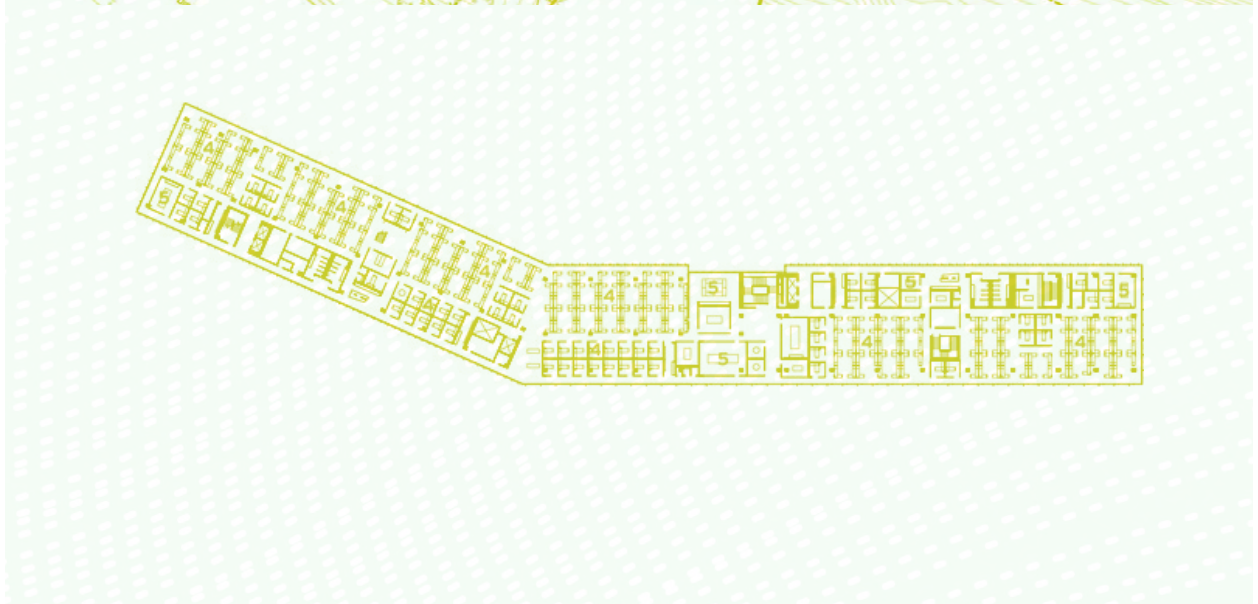


Figure 02 // PLANS: Bergeron Centre for Engineering Excellence by ZAS Architects - Toronto, 2015

The building does not feature any lecture halls, only “active learning classrooms.” While these configurations are intended to promote a sense of socialization amongst students, the architecture does not explicitly distinguish this.



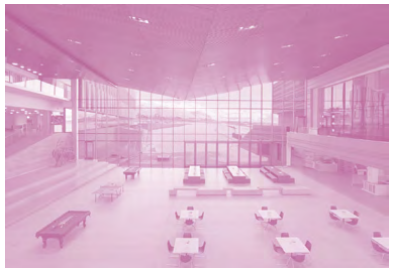


Figure 03 //
PLANS & PHOTOS: Adobe Systems Utah Campus by WRNS Studio - Lehi, UT, 2012

The Adobe building is an example of current office design which relies on interior finishes in order to complete its aesthetic. The building's form is composed of three angled rectangular forms, clad in full-height transparent glazing, so that its colourful furnishings can be lit and publicly displayed at night. The building is not easily decipherable from other similar scale office campuses.

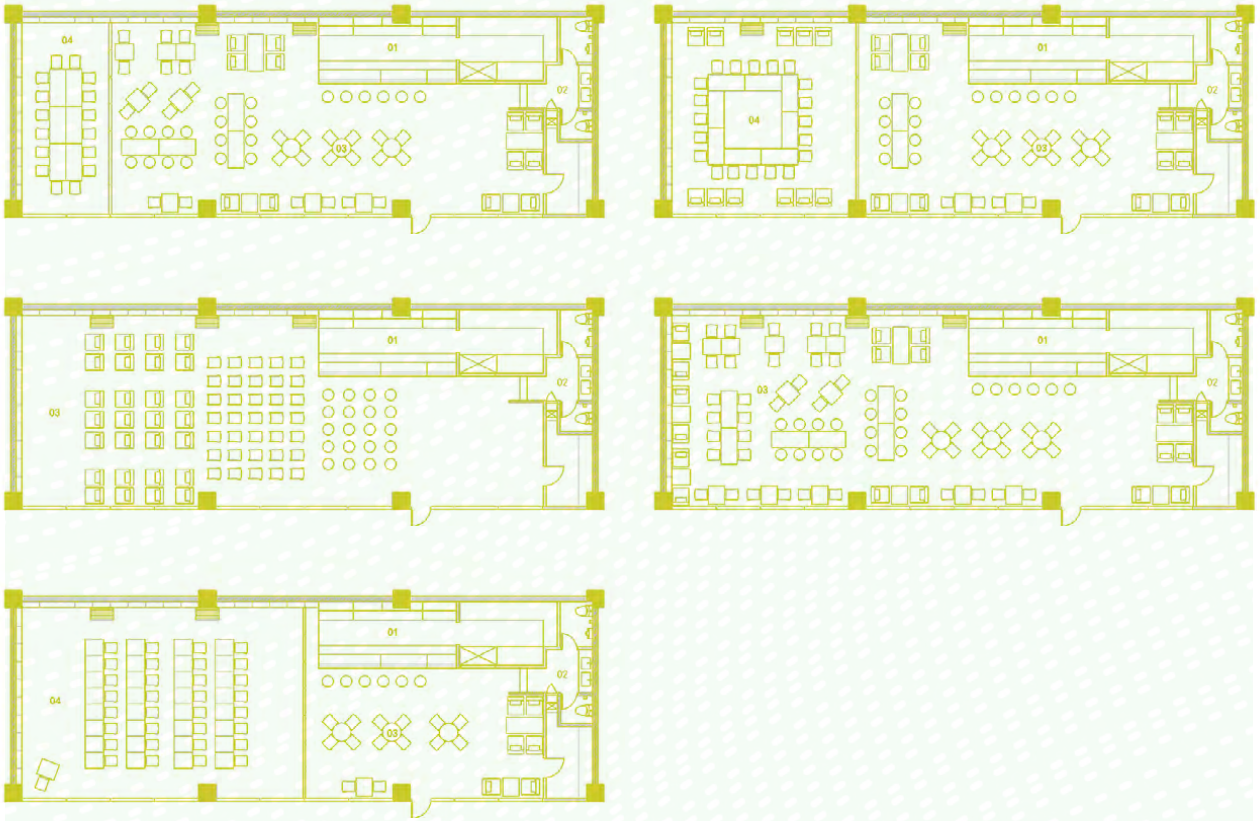


Figure 04 //
PLANS & PHOTOS: Underline Café by LYCS Architecture - Hangzhou, 2015

The Underline Café was designed to act as a multifunctional work and meeting space in the midst of a dense office park. The project proposes an empty shell that can be "transformed" to suit a variety of functional requirements with the reorganization of typical furniture and sliding partitions.

Figure 05 //
DIAGRAM: Preliminary Research & Literature Review Map

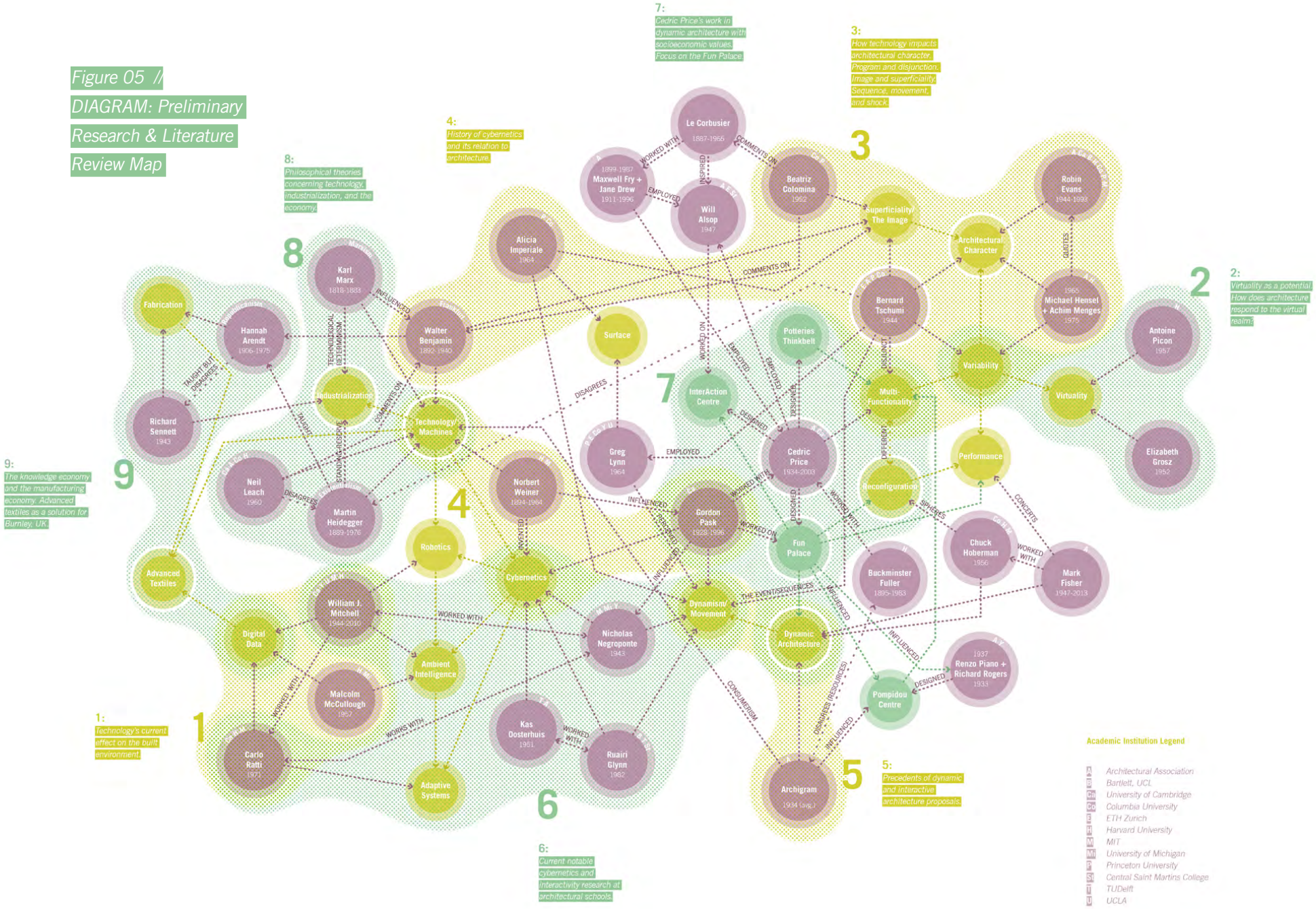
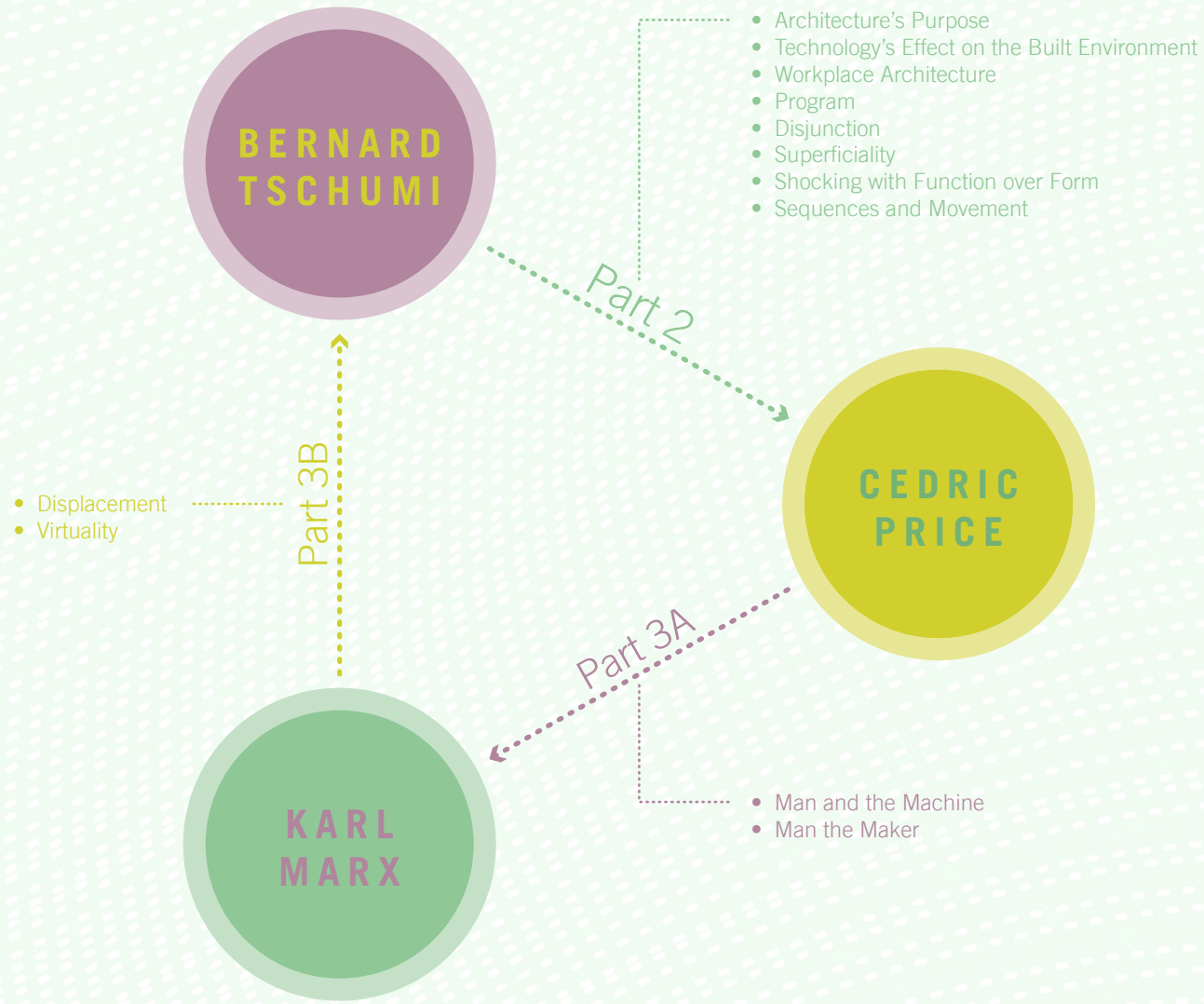


Figure 06 //
DIAGRAM: Thesis Structure



1

Design

SITE

Fifteen cotton mills in Burnley, UK have been selected to be adapted as the Fun Mills, collaborative work environments designed in accordance with Cedric Price's Fun Palace principles. They each function as interactive textile labs that introduce a sharing economy to the post-industrial town. While Burnley once functioned as the center of UK textile production, it is currently facing the worst unemployment rates in the country, and most heavily reliant upon the manufacturing industry.

Although all fifteen mills are proposed to be transformed as part of the project, Trafalgar Mill has been selected as a prototype for the interactive building design concept.

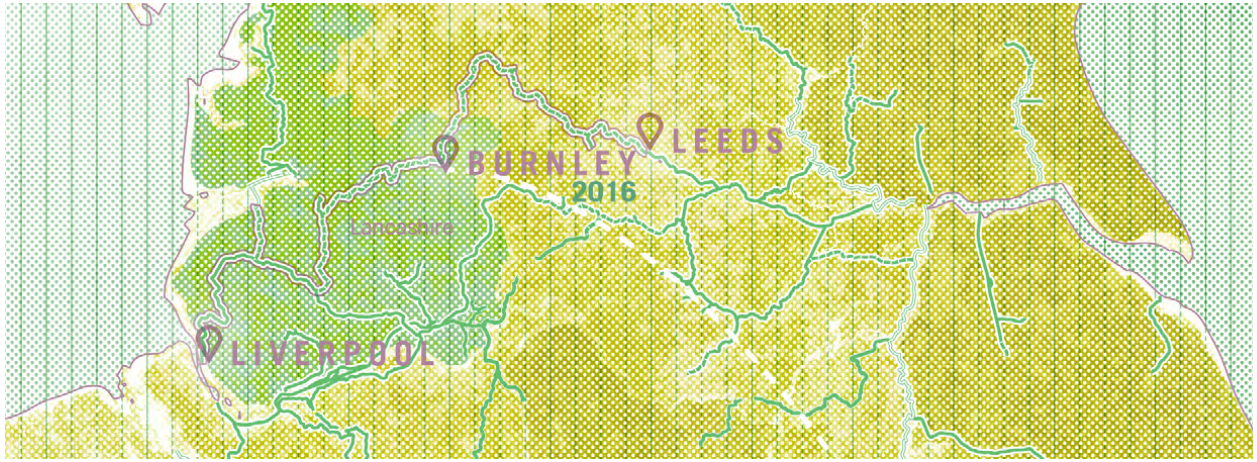
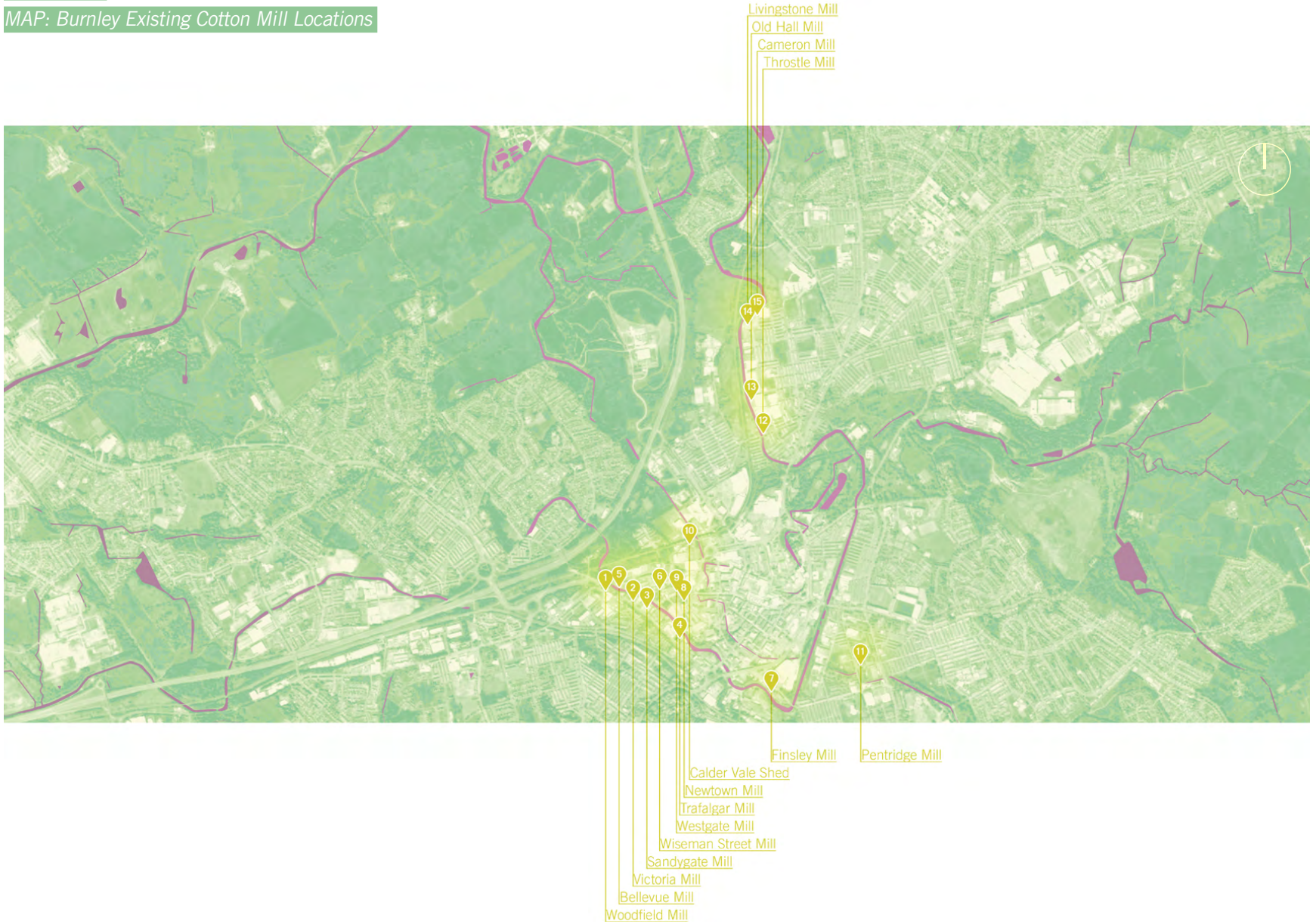


Figure 07 //
MAP: Lancashire County

Highlighting Burnley and the Leeds & Liverpool Canal.

Figure 08 //

MAP: Burnley Existing Cotton Mill Locations



01 Woodfield

02 Victoria

03 Sandygate

04 Trafalgar

05 Bellevue

06 Wiseman Street

07 Finsley

08 Newtown

09 Westgate

10 Calder Vale

11 Pentridge

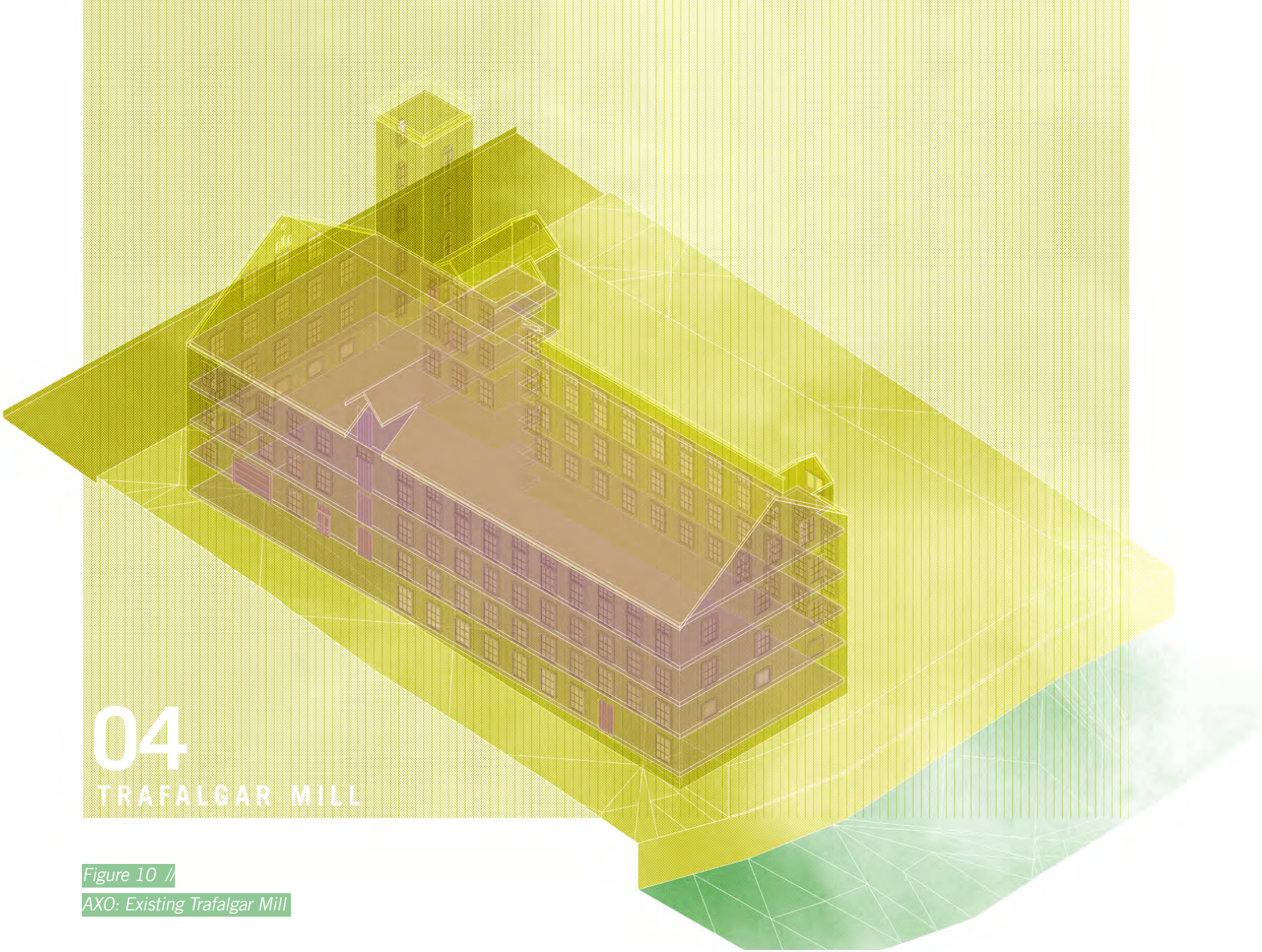
12 Throstle

13 Old Hall

14 Livingstone

15 Cameron

Figure 09 //
PHOTOS: Burnley Existing Cotton Mills



04
TRAFALGAR MILL

Figure 10 //
AXO: Existing Trafalgar Mill

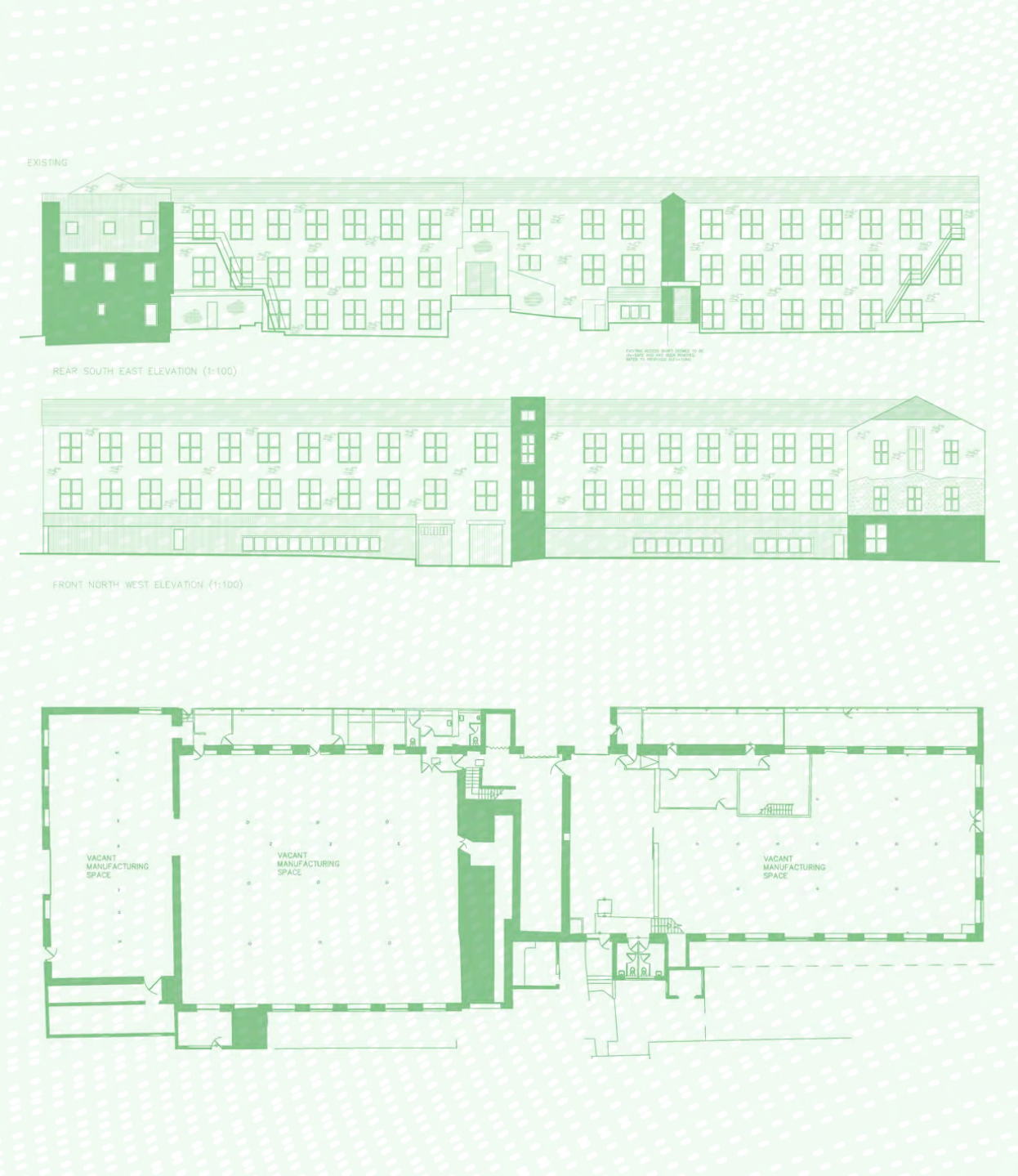


Figure 11 //
ELEVATIONS & PLAN: Oak Mill

Drawings of Burnley mill, not to be transformed as one of fifteen Fun Mills, but referenced in order to create Trafalgar Mill drawings.

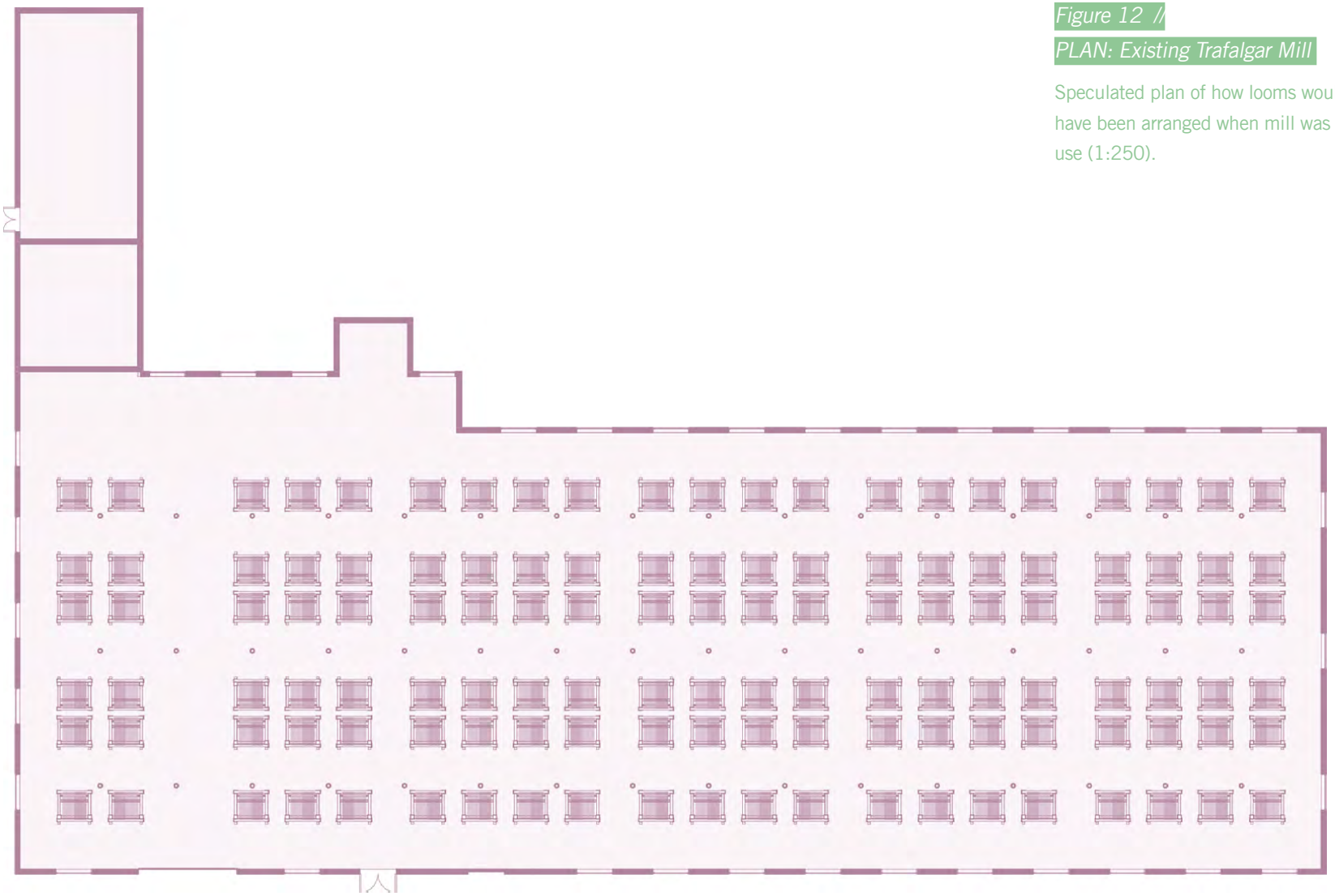


Figure 12 //
PLAN: Existing Trafalgar Mill

Speculated plan of how looms would have been arranged when mill was in use (1:250).

PROPOSAL

The design entails the adaptation of vacant cotton mills to become interactive textile labs, for the establishment of a Burnley knowledge economy. The labs facilitate the collaboration of manufacturing, service, and knowledge workers in the production of advanced textiles. The environment is designed as interactive and dynamic, as a means to grow with the ever-changing technology required for innovative production. The labs function as both a work and education environment, allowing workers to learn from workers in other fields, for the possible development of new skills and training. Similar to Price's Fun Palace concept, time is a key element of the design, creating an inter-accessibility between the constantly shifting program juxtaposition.

While similar to the Fun Palace, the proposed intervention is not an "incomplete building," but instead retains architectural character in each reconfigured position. The project re-assembles itself, not assembling and dismantling by use of cranes, as imagined by Price. Instead of predominantly acting as a leisurely escape from everyday life, the Fun Mills each act as a collaborative workplace, education centre, and recreational destination. The building does not use an **adaptive cybernetic** system in order to be **responsive**, but adheres to users who are constantly in control of spatial reconfigurations.

DEFINE // Adaptive Systems

Organisms or mechanisms capable of optimizing their operations by adjusting to changing conditions through feedback.
(Yiannoudes, 2016: 5)

DEFINE // Cybernetics

Science of control and communication in the animal and machine, organisms and mechanisms.
(Wiener, 1948)

DEFINE // Responsive Architecture

The natural product of the integration of computing power into built spaces and structures, and that better performing, more rational buildings are the result.
(Negroponte, 2016)

The Leeds and Liverpool Canal and River Calder are leveraged to create a local marketplace that situates on the water. The market provides opportunity for Burnley citizens to gather the textiles being produced within the mills. The floating marketplace proceeds down the waterways to neighbouring towns, to extend the textile product reach and economic gain.

Fifteen existing mills, all located either along the river or canal, are each transformed into a different type of textile lab. Each lab specializes in a unique phase of the production process, so that they all work in collaboration, generating a knowledge network across the city. This concept was present in Burnley during the height of cotton manufacturing in the nineteenth century, and is replicated for advanced textile production utilizing both physical infrastructure and **virtual** connections.

DEFINE // Virtual

Used to describe a concept with no physicality. A potential awaiting its full actualization.
(Picon, 2003: 295)

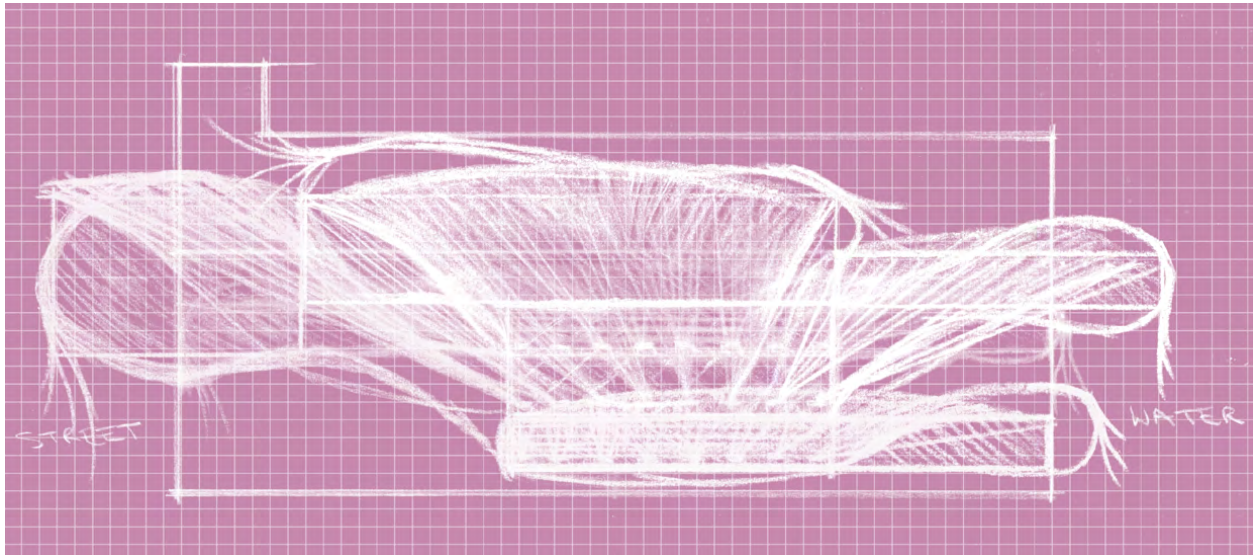


Figure 13 // SECTION: Trafalgar Fun Mill Sketch

Preliminary sketch exploring textiles as kinetic environmental enclosures.

ADVANCED TEXTILES

In order to reinvent Burnley's economy, new industries need to evolve out of industries that already have a local presence. A city where the cotton industry has long prevailed cannot make a sudden switch to biomechanical engineering in favour of entering the knowledge economy.[6] It is for this reason that improving the existing skills of the workforce is crucial, enticing companies to locate where high-skilled workers in that industry are already present.[7] Because the production of textiles has been Burnley's primary industry since the early eighteenth century, the development of advanced textiles is a logical entry point for the town into the knowledge industry. The practice combines the town's deep-rooted manufacturing skills along with the creativity and digital expertise of knowledge workers in order to establish the base of Burnley's sharing economy.

Textile production was greatly affected by the 1801 invention of the jacquard loom. Invented by Joseph Maria Jacquard, it was the first mechanical instrument capable of producing a seemingly endless array of patterns in a type of algorithmic design.[8] Today, computational technologies allow generative algorithms to merge with traditional design methods, inventing new forms and uses for a once-passive material.[9] Advanced textiles have developed new ways of responding to the human body, from the scale of nano-objects to the urban environment. This discipline is continually developing new means of connecting humans to the built environment, and questioning the traditional relation of interior and exterior. Textiles

Figure 14 // PHOTOS: Slow Furl by Mette Ramsgard Thomsen - Brighton, 2008

Example of advanced textile responsive environment.

have the ability to fuse interior space and tectonic structure together, making conventional forms of structure redundant.[10] The interactivity that advanced textiles bring to architectural environments promotes the occupant from simple user to participant.[11] Textiles provide a sense of tactility when clothing the body both at the human and architectural scale.

Currently advanced textiles have experimented with many practical uses, including garments to protect wearers from hazard, or to keep warm or cool.[12] Others are used in the transportation industry as acoustic and vibration control inside cars, or as lightweight, fuel-efficient material in aircraft wings or propellers. Architecturally, designers have used advanced textiles as building cladding for insulation purposes.[13]

Many advances in technology have resulted in innovative uses for textiles, such as those that are photosensitive, fibre optic, conductive, chemically or thermally sensitive, shape memory, or drug releasing. It is possible for textiles to function as interfaces, sensors, energy producers, or displays, by combining traditional techniques with new materials or vice versa.[14] Self-actuated textiles are distinguished by their ability to change properties according to changes in their surrounding environment. Changes in properties can involve the textile's colour or shape, as well as the emission of light, sound, or heat. While designers have traditionally understood textiles as passive components, self-actuated textiles introduce time and movement as design features.[15] Both Price and Tschumi's concept of architecture as events in time, opposed to objects in space,[16] are fulfilled by the application of advanced textiles as part of the Fun Mills' architectural environment. These types of materials function both technically and aesthetically that resolve superficiality in architecture, on display rather than hidden within walls.[17]

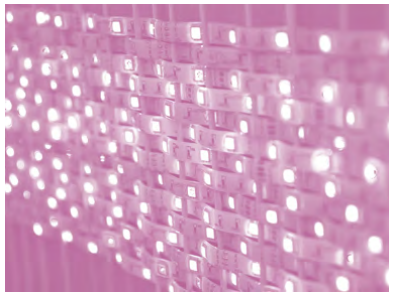


Figure 15 //
PHOTOS: VelO2 by Loop.pH - Taipei, 2016

Example of advanced textile responsive environment.

// Design Precedents

As advanced textiles are increasingly gaining application in architectural environments, they have become the focus of research for both practicing designers and academic scholars. Architect and computer scientist, Mette Ramsgard Thomsen, directs the Center for Information Technology and Architecture (CITA) at the Royal Danish School of Architecture, in Copenhagen. She calls her work "digital crafting," and describes it as repeated weaving and knitting patterns to create architectonic structures. By utilizing interactive sensor technologies, she designs new spatial experiences which engage with time, motion, and the potential of instability, and challenge the standard use of textiles.[18]

Do Ho Suh is a Korean artist who works with passive textiles to construct spatial installations. His most current work at the Victoria Miro Gallery in London, England is entitled *Passage/s*, and focuses on the sequencing of architectural environments as a single passageway. The project uses colourful, translucent **fabric** as an enclosure material, enabling each part of the passageway visibility from inside the structure. The artist selected textiles for the installation to communicate the migration, transience, and weightless feeling of crossing both physical and psychological boundaries.[19]

Another project, which uses textiles as environmental enclosure is the Technicolour Pavilion, designed by DP Architects, as part of Singapore's 2016 Archifest. The designers utilized colourful passive textiles in the project to invite users to interact with the material, emphasizing

DEFINE // Fabric

Any system or structure of matter; any body formed by the conjunction of dissimilar parts. A building or edifice. (Schneiderman and Winton, 2016: 1)

ETYMOLOGY // Faber (Latin)

Artisan who works in hard materials.

ETYMOLOGY // Fabrica (Latin)

1- Workshop.
2- An art, trade; a skillful production, structure, fabric.

ETYMOLOGY // Fabriquer (French)

To make, construct, fashion, build.

ETYMOLOGY // Fabrick (Old English)

To build; to form; to construct.

the nuance of space and saturation as one moves around the pavilion. Light and colours shift from different viewpoints of the structure, modifying one's experience with the progression of time, emphasizing the ephemerality of the textile-based environment.[20]

Fun Mills' use of textiles is distinguished from the previous two examples in that it utilizes advanced textiles, not simply as an art installation, but as an interactive mediator of space. It carefully specifies textiles which enhance the spatial characteristics of the mill through improved acoustics, physical transformation, and thermal variation. The design of Fun Mills uses advanced textiles also to create a sense of weightlessness, responding to the transient state of the knowledge industry's modes of production. Upon the building's reconfiguration process and shifting of program, the textiles create new types of space, which respond to users and current environmental factors within the mill.

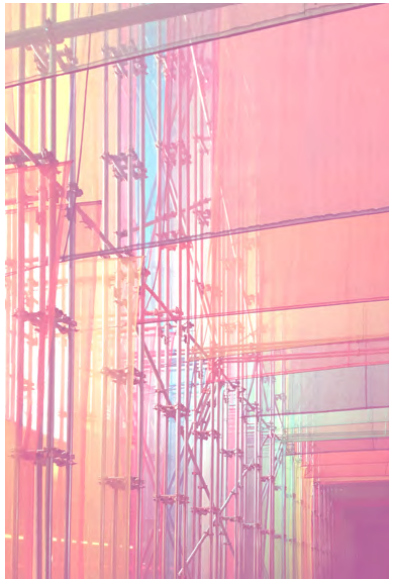


Figure 16 //
PHOTOS: Technicolour Pavilion by DP Architects - Singapore, 2016

Example of textile-based environment.

Figure 17 //
PHOTO: Passage/s by Do-ho Suh - London, 2017

Example of textile-based environment.

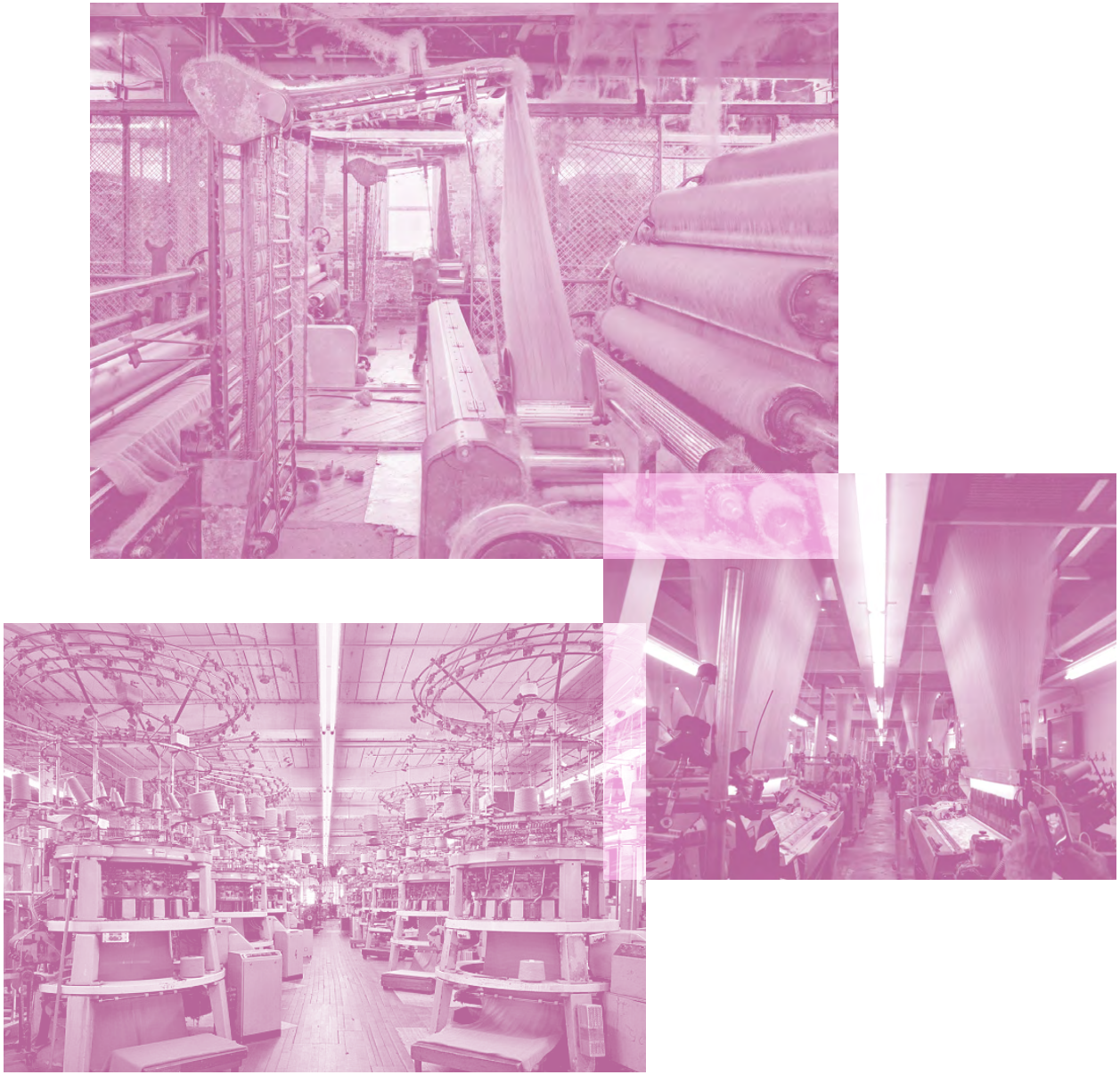


Figure 18 //
PHOTOS: Various Examples of Current Textile Mills

Images conveying how textiles act as spatial environments.

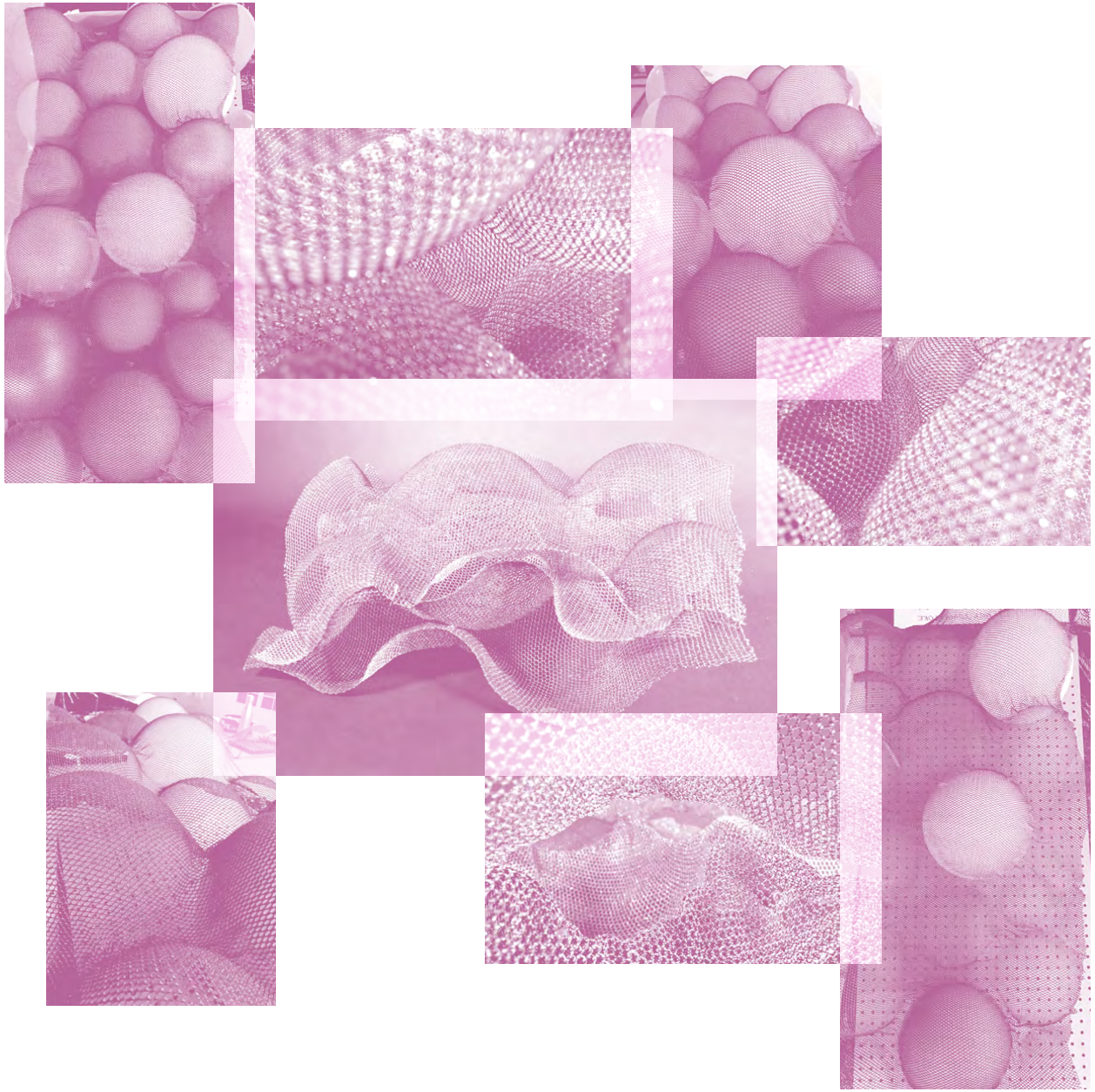


Figure 19 //
PHOTOS: Hardening Textiles with Balloon Framework

The photos show preliminary spatial experiments with textiles. While the generated forms were not carried through to the final design, the process enabled a greater understanding of textile materiality.

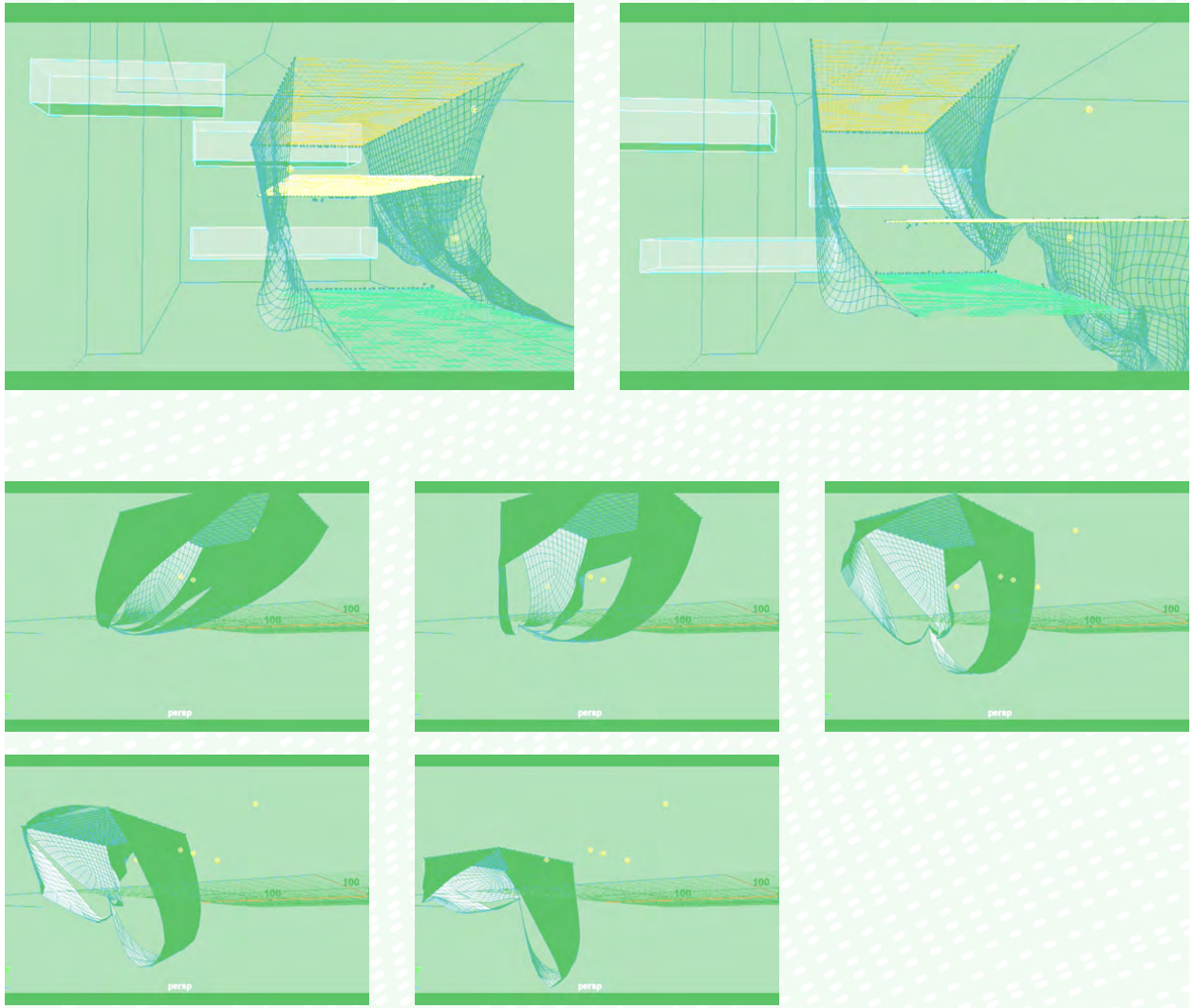


Figure 20 //
STILLS: Trafalgar Mill Conceptual Prototype in Motion

Animation software was utilized to understand the spatial properties of textiles in motion. The stills show key frames of reconfiguring floorplates and the responding forms of textile enclosures.

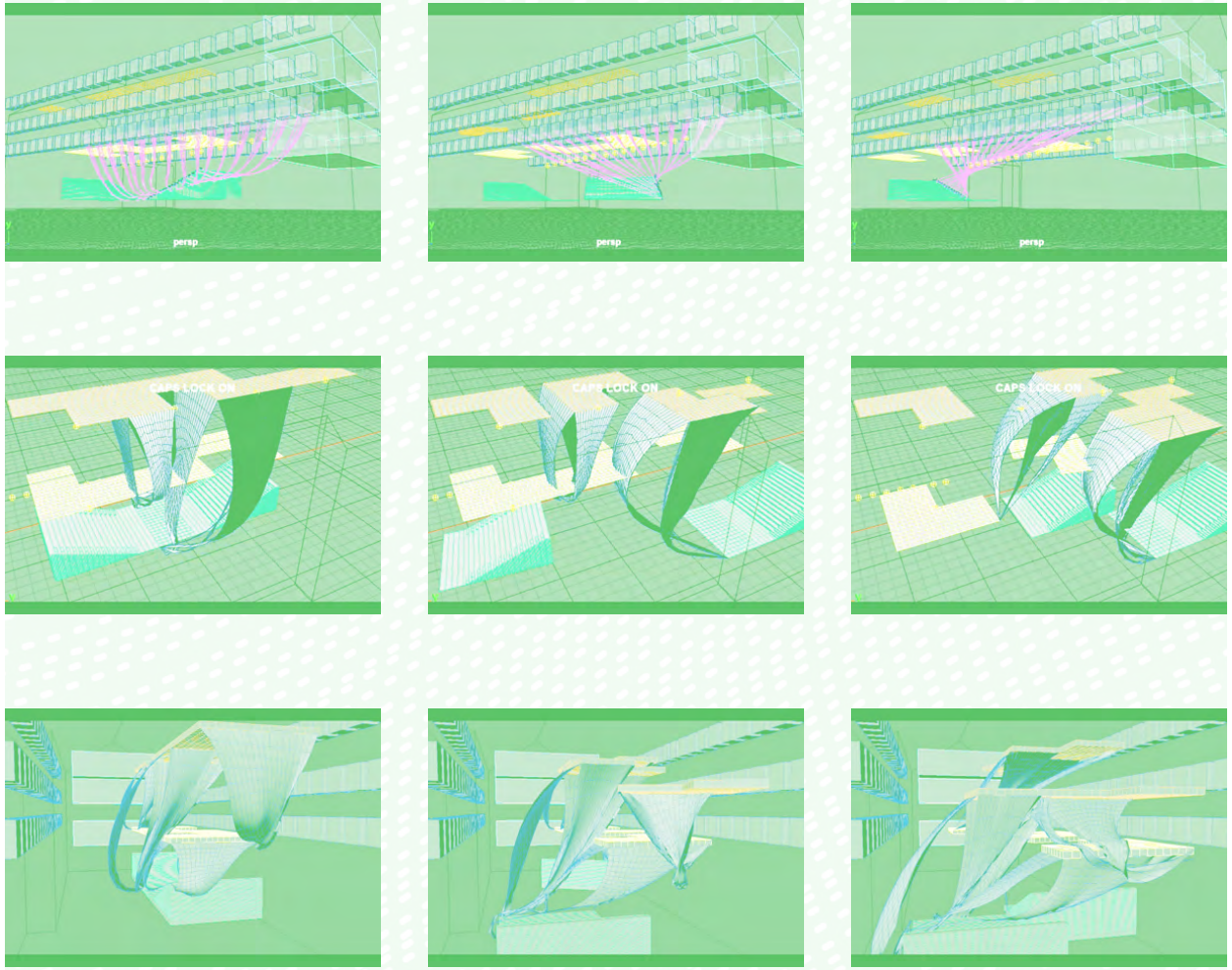
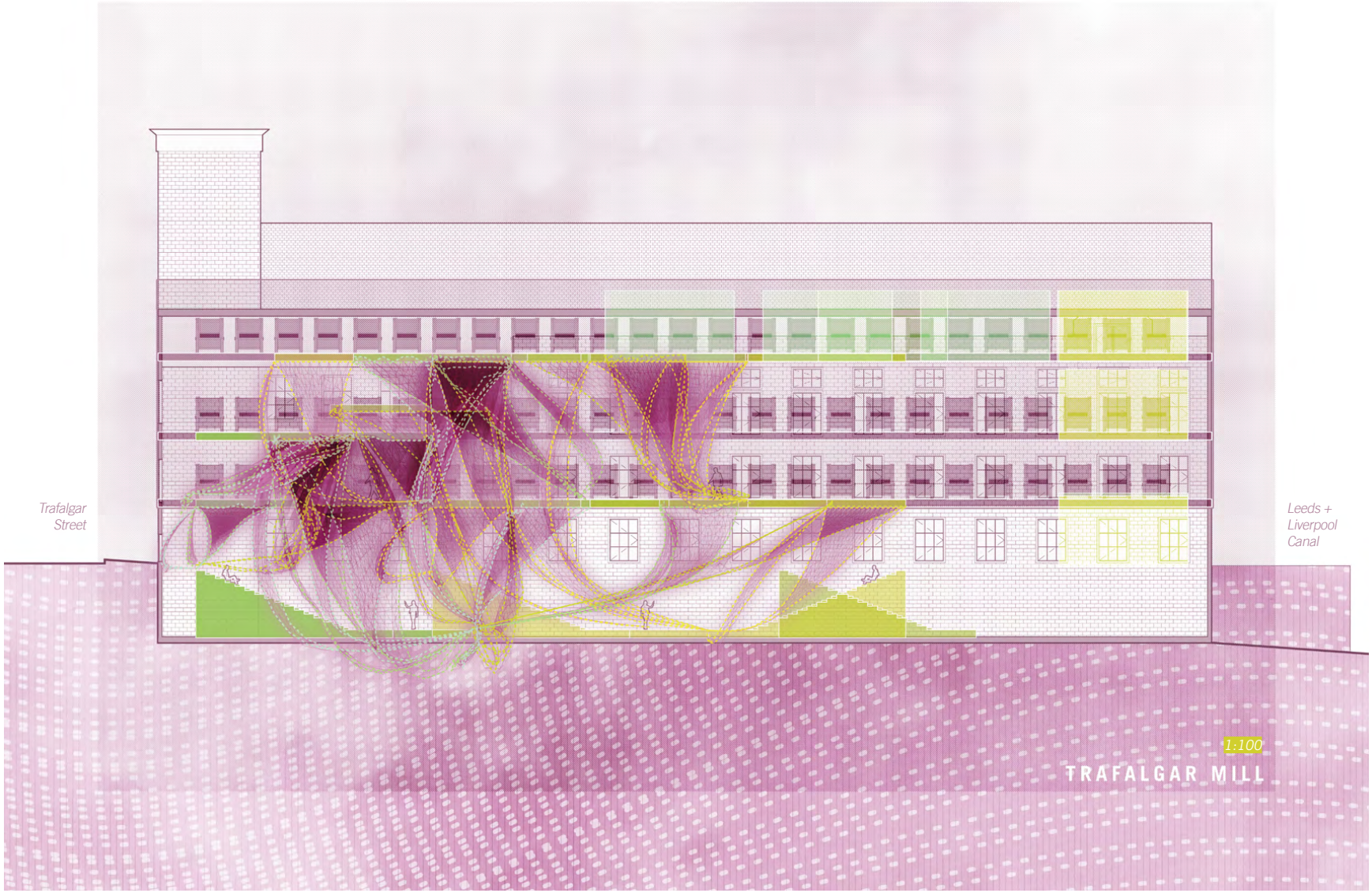


Figure 21 //
STILLS: Trafalgar Mill Conceptual Prototype in Motion (Left)

Animation software was utilized to understand the spatial properties of textiles in motion. The stills show key frames of reconfiguring floorplates.

Figure 22 //
SECTION: Trafalgar Mill Conceptual Prototype in Motion (Page Right)

The section shows four stages of the mill reconfiguring, creating movement amongst the textile enclosures.


Trafalgar Street
Leeds + Liverpool Canal
1:100
TRAFALGAR MILL

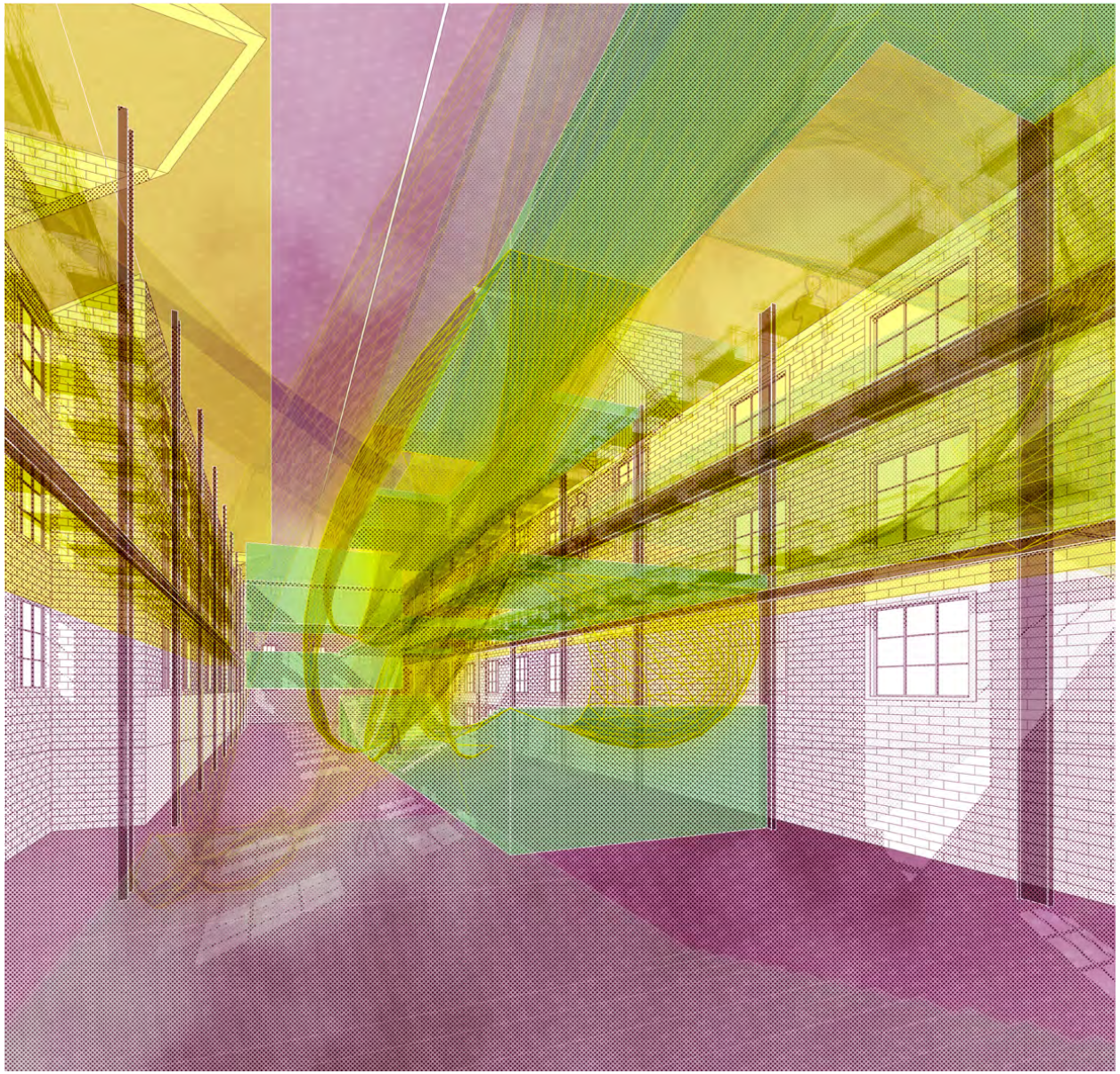


Figure 23 //
PERSPECTIVE: Trafalgar Mill Conceptual Prototype in Motion - Stage 1

The first of four stages of reconfiguration. Textiles are not yet in full dynamism.

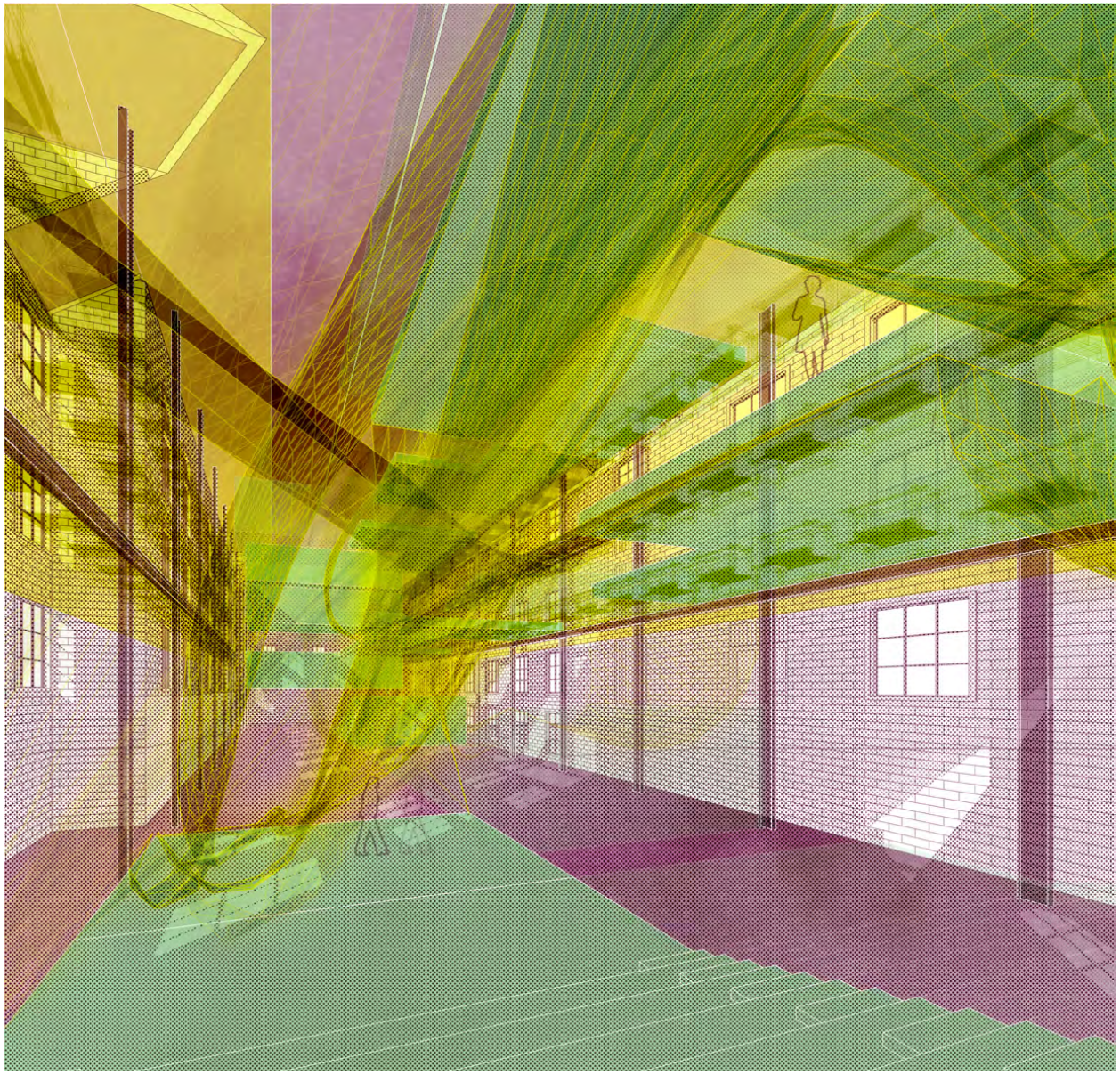


Figure 24 //
PERSPECTIVE: Trafalgar Mill Conceptual Prototype in Motion - Stage 2

The second of four stages of reconfiguration. Textiles are starting to lift, creating new spatial forms.

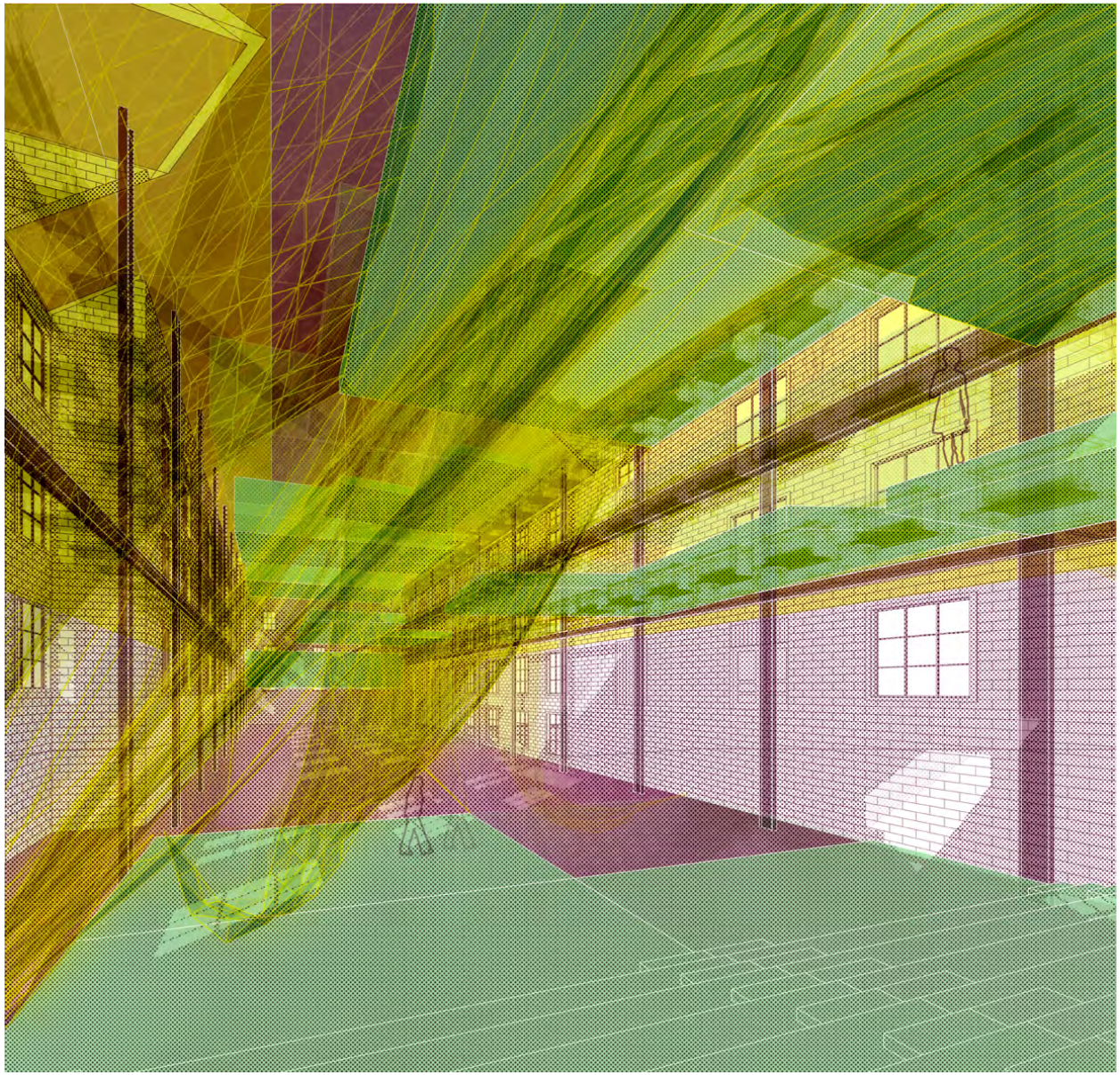


Figure 25 //
PERSPECTIVE: Trafalgar Mill Conceptual Prototype in Motion - Stage 3

The third of four stages of reconfiguration. Textiles are still in motion and starting to settle into a new position.

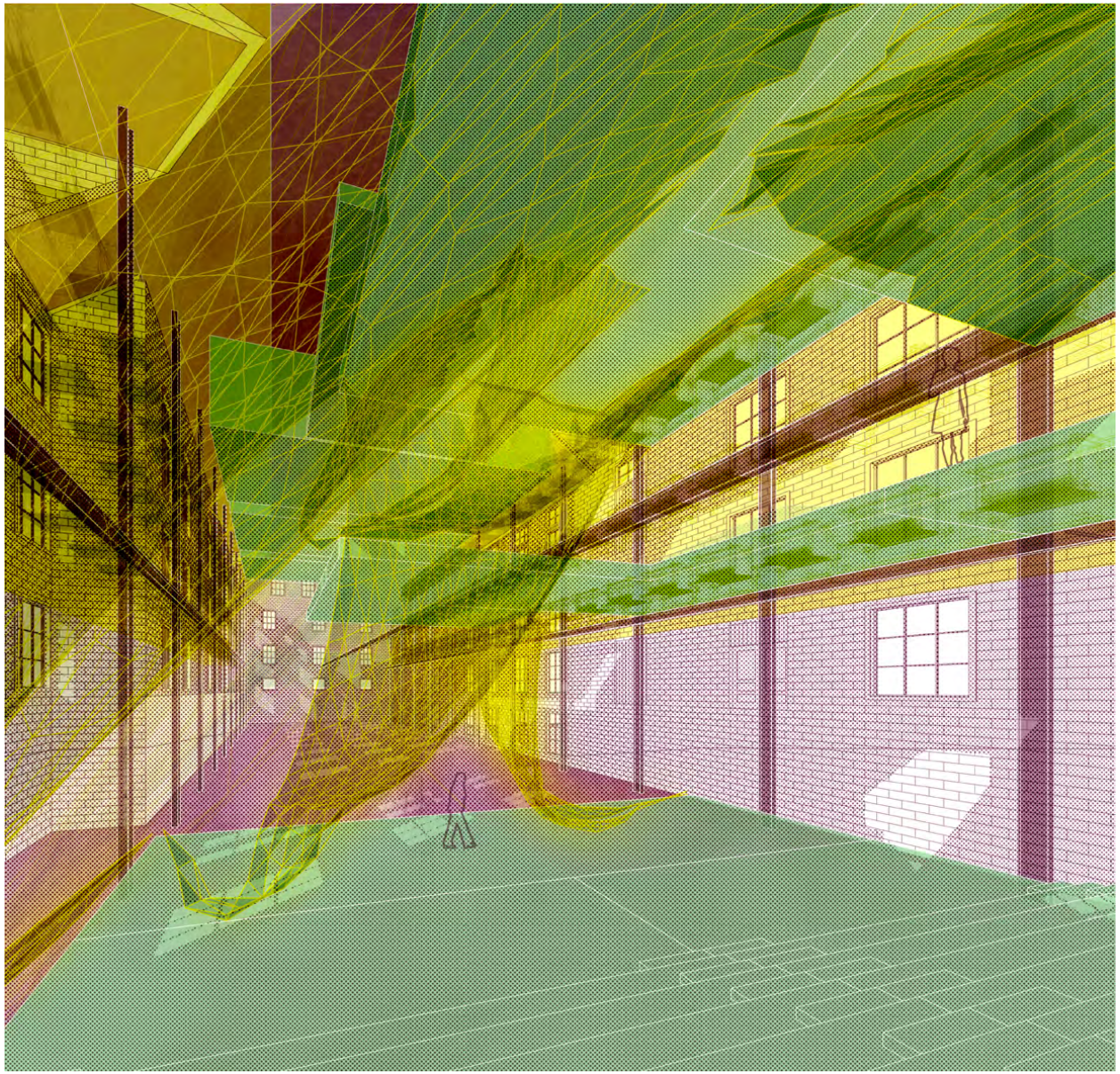


Figure 26 //
PERSPECTIVE: Trafalgar Mill Conceptual Prototype in Motion - Stage 4

The last of four stages of reconfiguration. Textiles have settled into the final placement.

INTERACTIVE TEXTILE LABS

Each of the fifteen selected Burnley mills specializes in a different stage of the advanced textile production process, working together to form a shared network across the city. The following describes the seven different types of interactive textile labs proposed, in addition to mill location. All textile lab equipment requirements have been referenced from the University of Borås Swedish School of Textiles, which is currently a world leader in advanced textile design and research.[21]

Fibre Lab

Bellevue Mill, Old Hall Mill

- Machines for staple fibres that card, stretch, and ringspin
- Needle-punching machine for nonwoven materials
- Thermoplastic development through compounding, extrusion, and melt-spinning of fully drawn fibres
- Development of yarns used in composites
- Spinning of recycled fibres

Weaving Lab

Trafalgar Mill, Westgate Mill, Cameron Mill

- Testing of new construction ideas using computer-guided and manual looms, as well as other weaving machines
- Mechanical and electronic jacquard loom and dobby machines
- Carries types of yarn, from cotton to optical fibres

Printing Lab

Victoria Mill, Finsley Mill

- Screen printing, transfer printing, and digital printing
- Long tables for planographic printing of textiles
- Ausbrenner, reservage, and etch printing
- Pleating cabinet that can be heated up to 140°C
- Large oven to fix prints by hanging on rack or inside steam tube dryer

Sewing Lab

Wiseman Street Mill, Throstle Mill

- Machines for all kinds of seams and materials
- Taping and sewing machines for lock stitching, overlocking, cover stitching, shuttle stitching, buttonholes, slip-stitching, flatlock stitching and double lock stitching
- Ultrasonic welder to join materials by melting layers

Media Lab

Sandygate Mill, Pentridge Mill

- Body scanner and 3D printer to construct and print finished models
- Laser cutters to cut exact patterns and details, also used for engraving
- InkJet printers which use dispersion inks and pigments
- Carbon dioxide technologies which allow dry dyeing without water
- Heat presses for curing prints, thermal fixation, pleating, vacuum forming, and lamination

Knitting Lab

Newtown Mill, Livingstone Mill

- Development of elastic materials on both circular and flat knitting machines
- Development of double interlocking and single Jersey materials of varying thicknesses
- Machine for knitting stiff materials
- Development of sweaters, gloves, and synthetic blood vessel prototypes

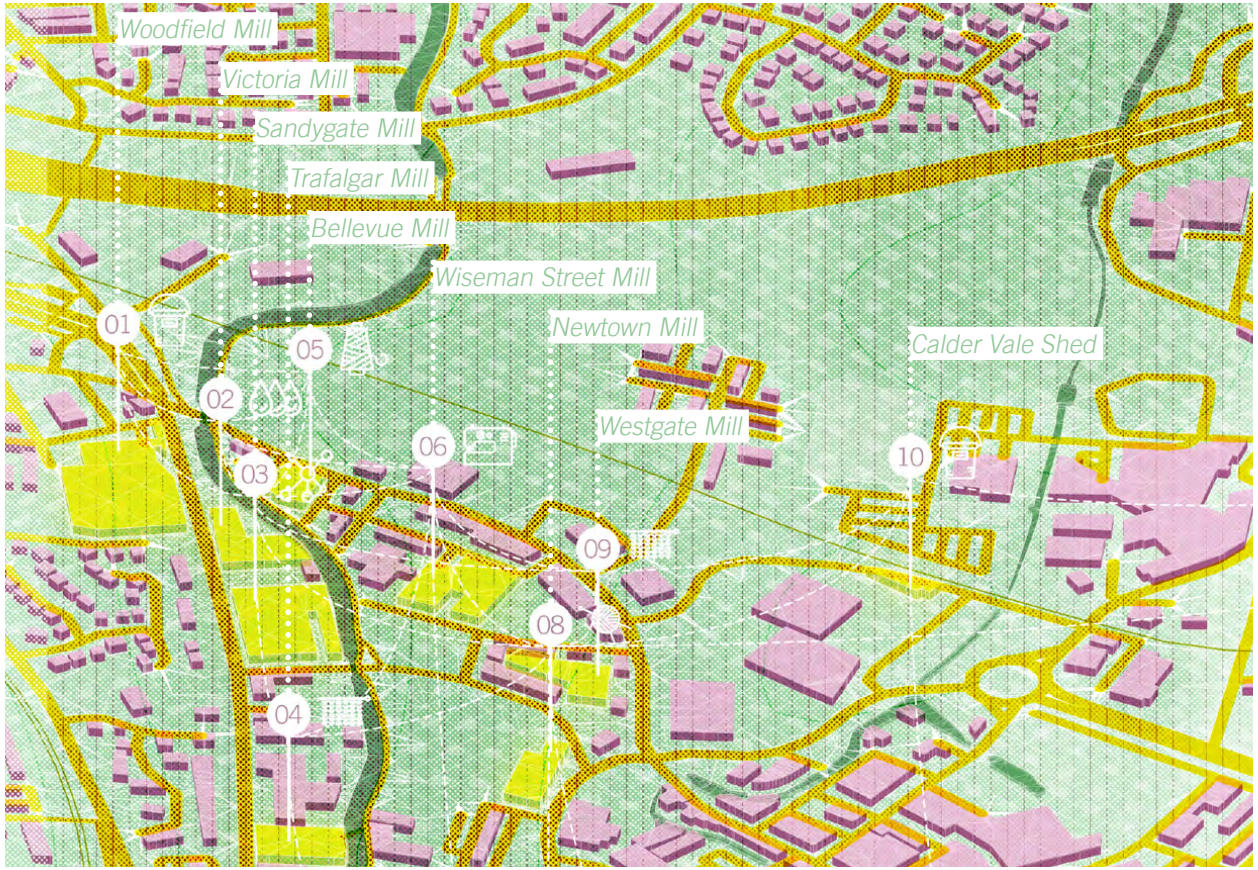
Finishing Lab

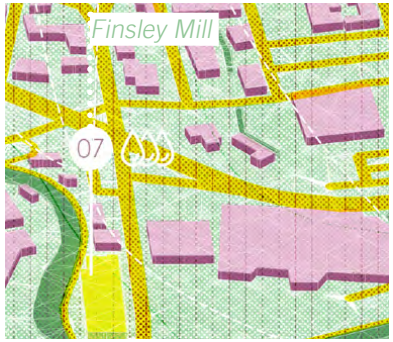
Woodfield Mill, Calder Vale Shed

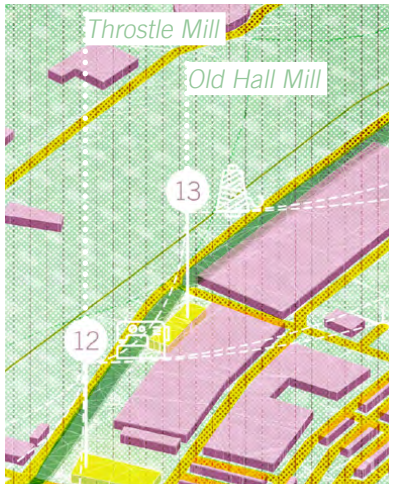
- Stenter equipped to coat materials using different techniques
- Rotary screen printing
- Foulard used to water-proof textiles
- Dyeing machine for dyeing, pre-treatment and finishing of fabrics
- Analysis of colour through digital colourimetry

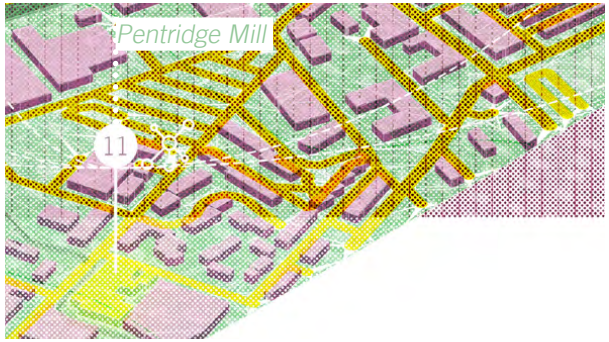
Figure 27 //

AXO: Network of Burnley Fun Mills









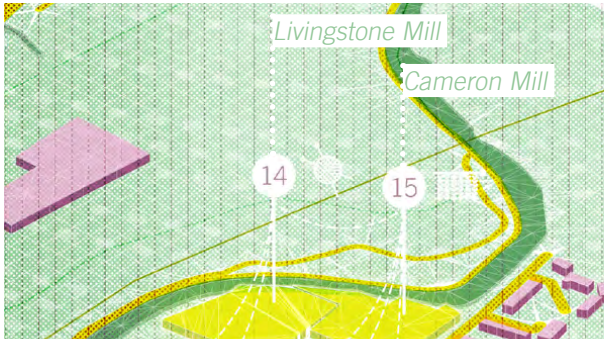
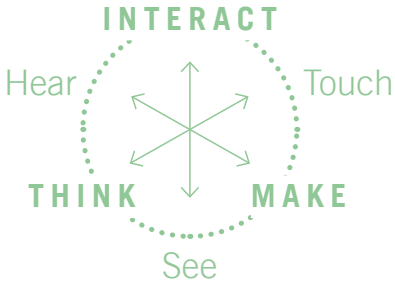


Figure 28 //
AXO: Network of Burnley Fun Mills (Enlarged Views)

TEXTILE PROPERTIES



The architecture of each mill utilizes the advanced textiles it produces as a material to create a dynamic environment. In opposition to contemporary architecture generally dominated by the visual sense, the mills allow participants to experience the environment through a multitude of senses. This integration of technology within materials generates new opportunities of interaction between users and the building.[22] The three types of workers in each mill, manufacturing, service, and knowledge, are representative each of a particular sense, and are actualized through the following advanced textile technology.

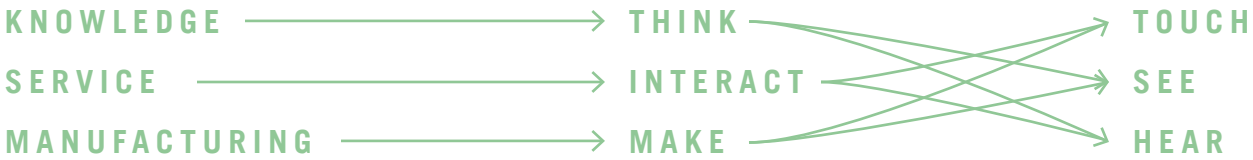


Figure 29 //
PHOTOS: Fun Mills' Enclosure Advanced Textiles

From left to right: Phase Change Material, Gorscuba Print, Acoustic Wool.

Touch: Phase Change Material

Using microencapsulation chemical embedding technologies, these textiles change state depending on the temperature. The embedded chemical goes from a liquid to a solid, or vice versa, in order to protect the inhabitant from extreme temperatures.[23]

See: Gorscuba Print

This textile is printed with a reflective ink so that its pattern does not appear until caught by the light and illuminated.[24]

Hear: Acoustic Wool

This material adjusts its sound insulation properties by responding to the current environmental sound level. Nano-scale microphones are embedded into the textile, which pick up sound at a certain level. Integrated shape memory metal wires are activated to reform through the application of electricity channeled through conductive yarns. The textile will then change its own shape to more effectively absorb sound.[25]

While the above three types of advanced textiles have been selected for the initial phase of the Trafalgar Mill prototype, it is intended that the fabrics will change with the evolution of the building. The Fun Mills are designed as interactive textile laboratories, and therefore new fabrications can be tested as enclosure materials within the building. The physical properties of the textile enclosure define each space, and can be replaced at any time to re-establish the space's activity function.

PROGRAM RELATIONSHIPS

To design Fun Mills with constantly shifting **reconfigurable** program, a scale of program relationships was referenced from architect Tim Ireland's article, *The Spatiality of Being*. He echoes the beliefs of Cedric Price when stating that programmatic activity is imbued with inherent social properties, which create new associative properties when situated in proximity to one another. Similar to Bernard Tschumi, Ireland writes that programs' associative properties generate either positive, negative, or indifferent reactions. Sociable encounters cause a combination/fusion reaction, hostile encounters cause a repulsion reaction, and nonchalant encounters cause a deformation reaction. The relation-potentials can be measured on a fluctuating scale, which factor in current physiological and social needs. Once a program has settled into a new location, the program relationship scale shows the potential for a space to become unsettled, based on the shift of another program.[26] The dynamism of programmatic space allows for different relationships to occur between activities at desired time intervals, in the same way Price envisioned the Fun Palace. Spaces become specific to the immediate activity needs, and not perpetually fixed in irrelevant spatial relationships. The possibility of environmental transformation, and the reactive properties between programs enables choice in one's daily workflow, unattainable in the original cotton mill setting.

DEFINE // Reconfigurable [Space]

Opposed to "multifunctional", describes a space intended to function for an anticipated variety of uses through an option-oriented design.

Figure 30 // TEXTUAL RECORD: Program Compatibility Chart by Cedric Price - London, 1977

Price created this chart when studying spatial reconfiguration for a project entitled "Generator," in order to organize which programs would and would not be compatible.

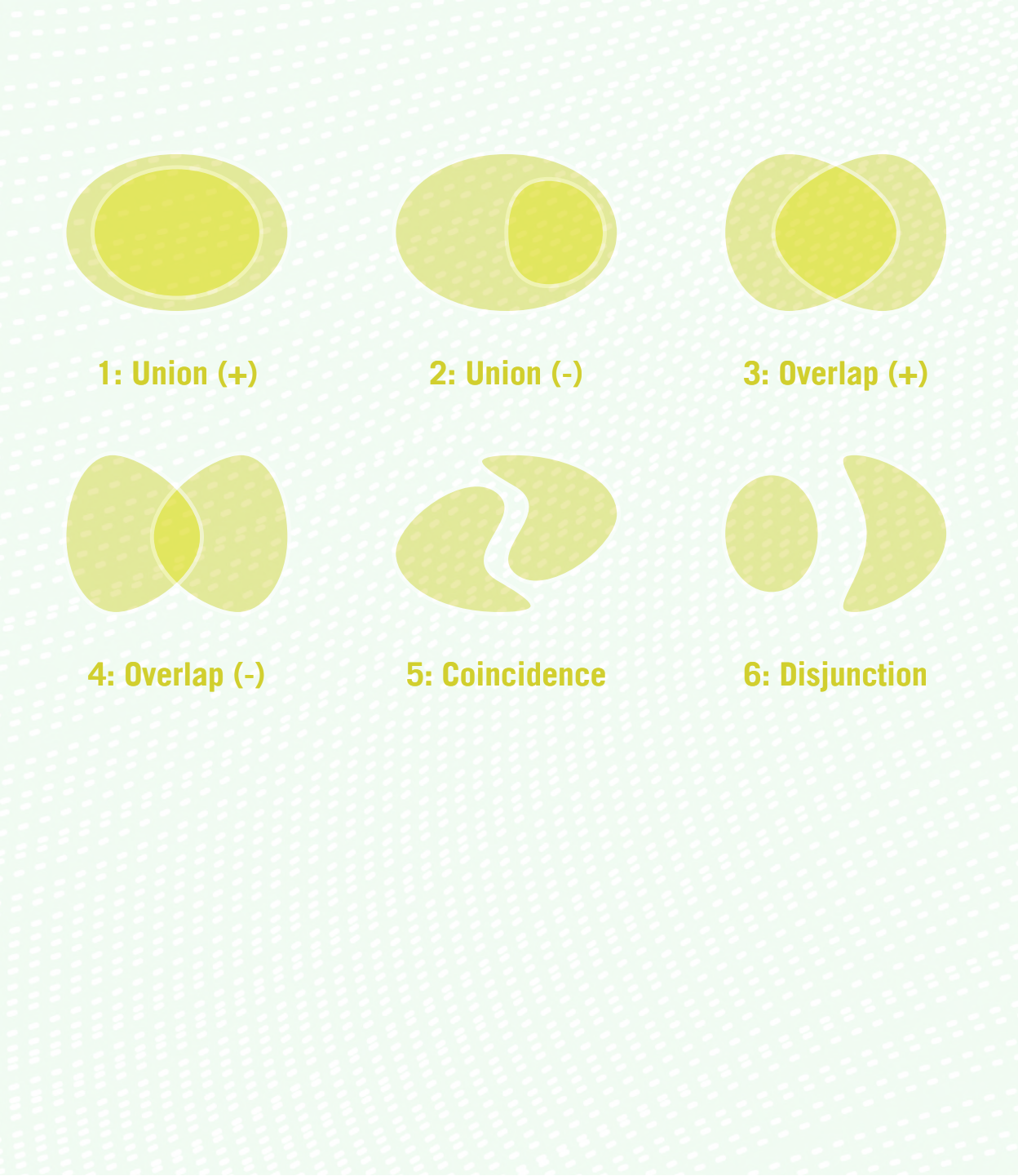


Figure 31 //
DIAGRAM: Activity Relation Potentials

Referenced from *Spatiality of Being* by Tim Ireland, this scale of activity relations was used to create a consistent standard for reconfiguring program within the Fun Mills.

Figure 32 //
DIAGRAM: Fun Mills 2D Program Relationships

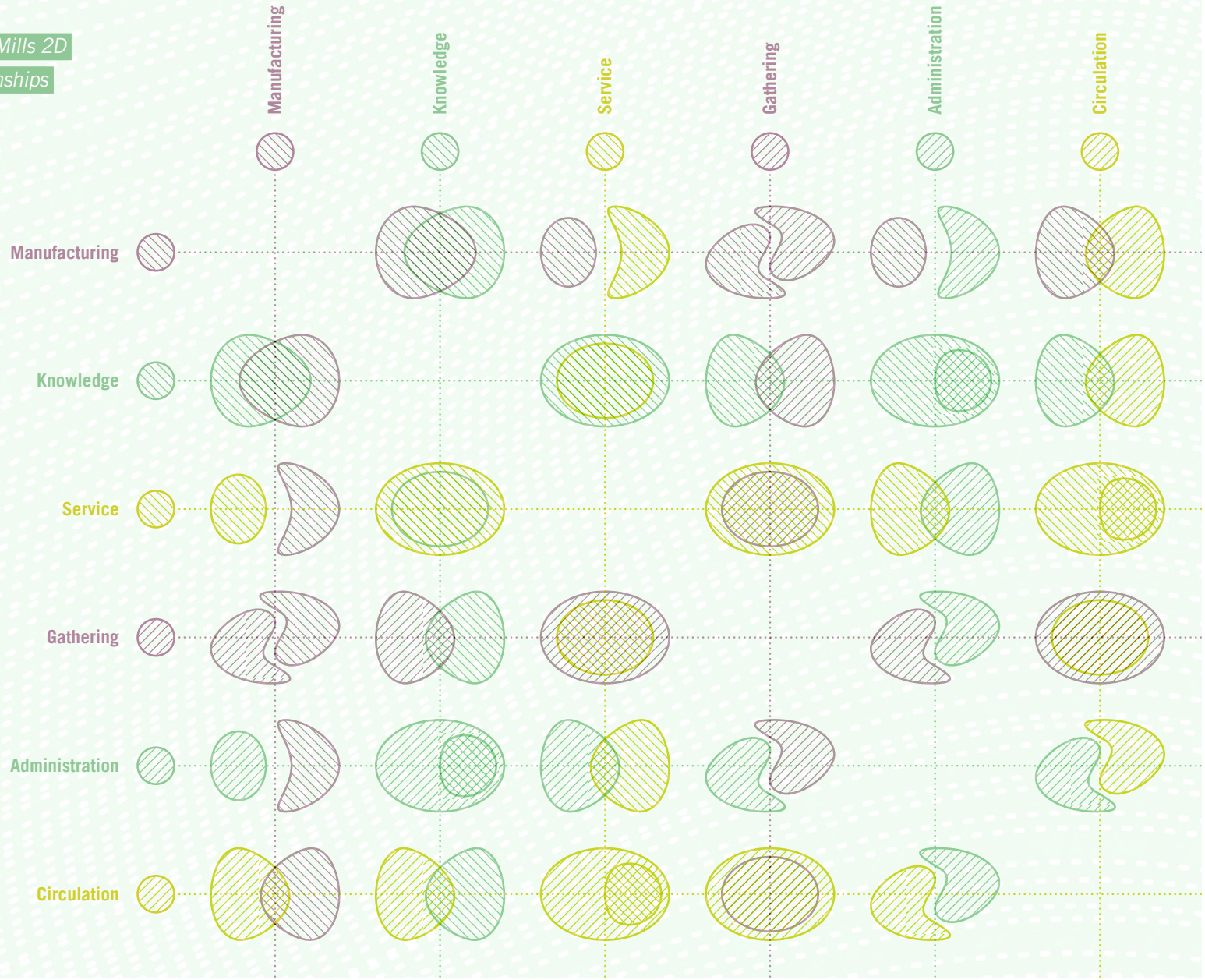
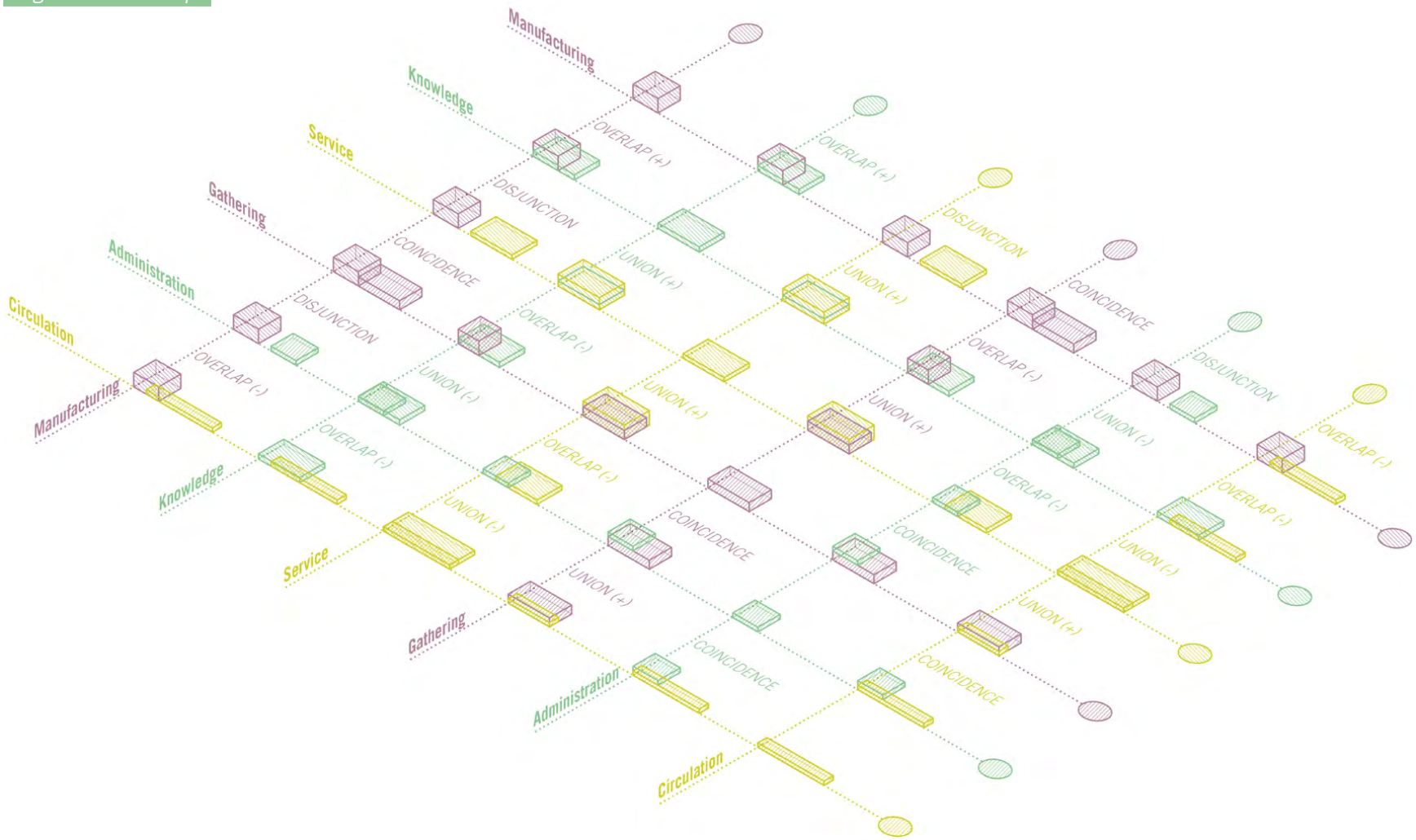


Figure 33 //
DIAGRAM: Fun Mills 3D
Program Relationships



Each Fun Mill will contain the following six reconfigurable program:

A: Circulation Space

B: Administration Space

C: Gathering Space

D: Service Space

E: Knowledge Space

F: Manufacturing Space

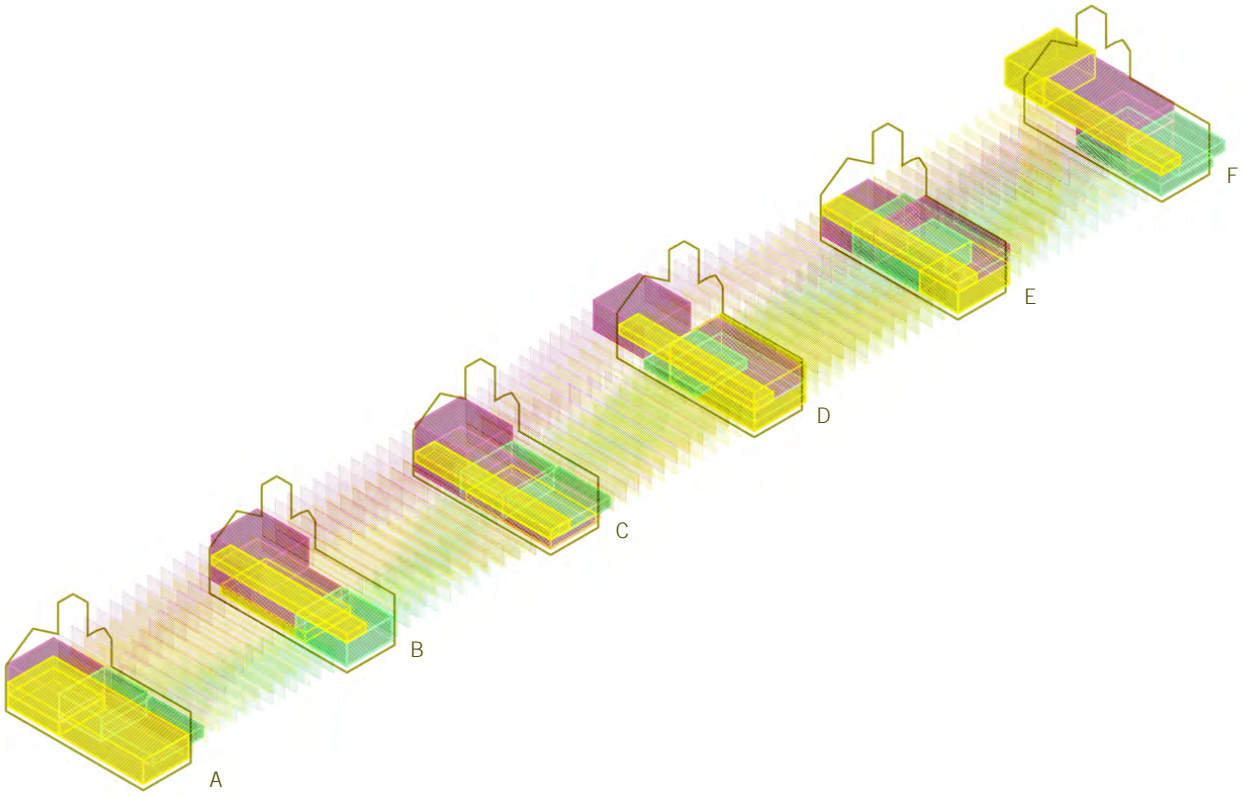
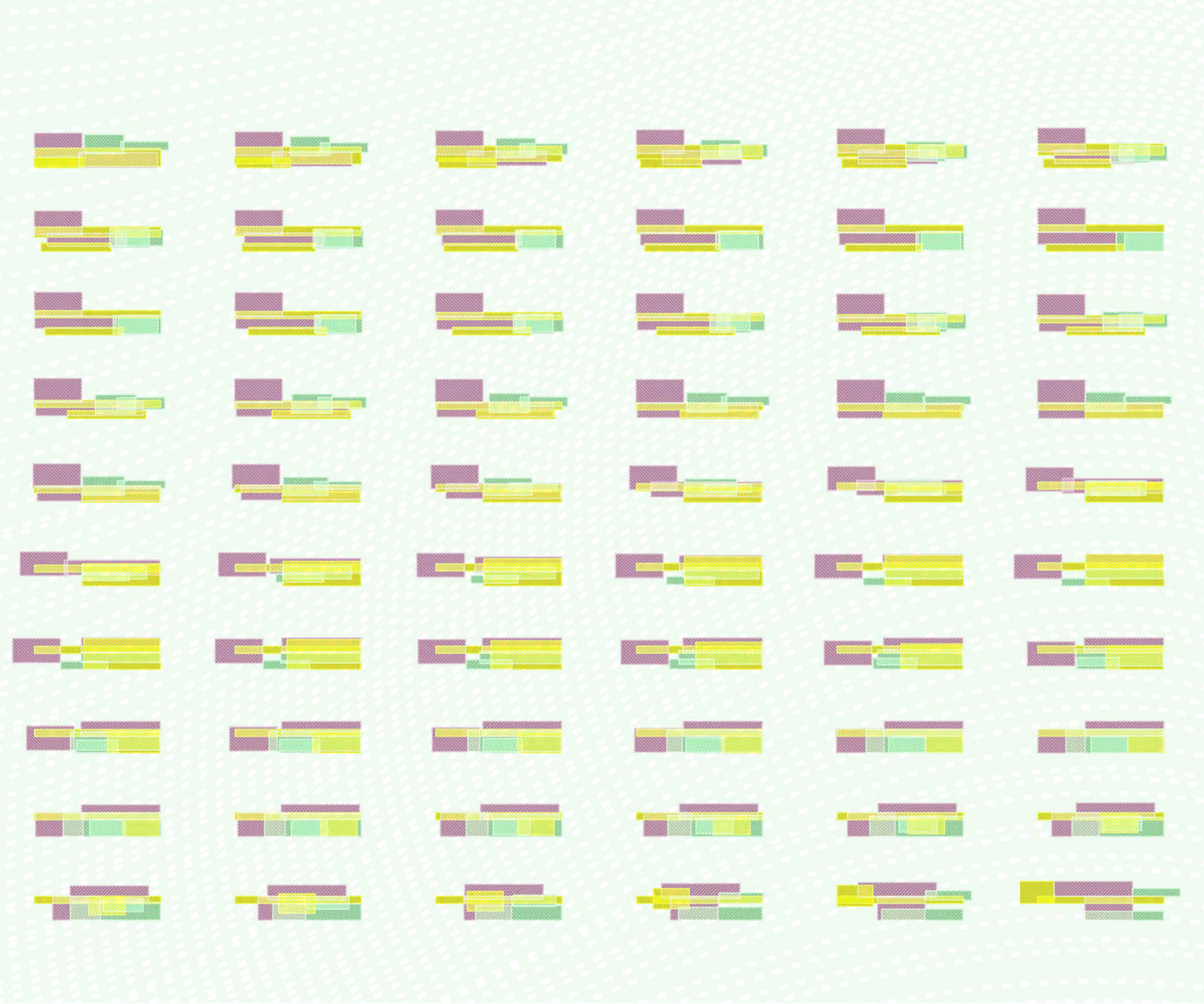


Figure 34 //
DIAGRAM: Fun Mills
Reconfiguration Process (Right)

This sectional diagram captures each step of the kinetic reconfiguring process between the six proposed configurations.

Figure 35 //
DIAGRAM: Fun Mills
Reconfiguration Stages (Left)

Using the program relationship charts, six different spatial configurations were proposed, each one concerned with an individual program. The motion of shifting forms was mapped out between the configurations.



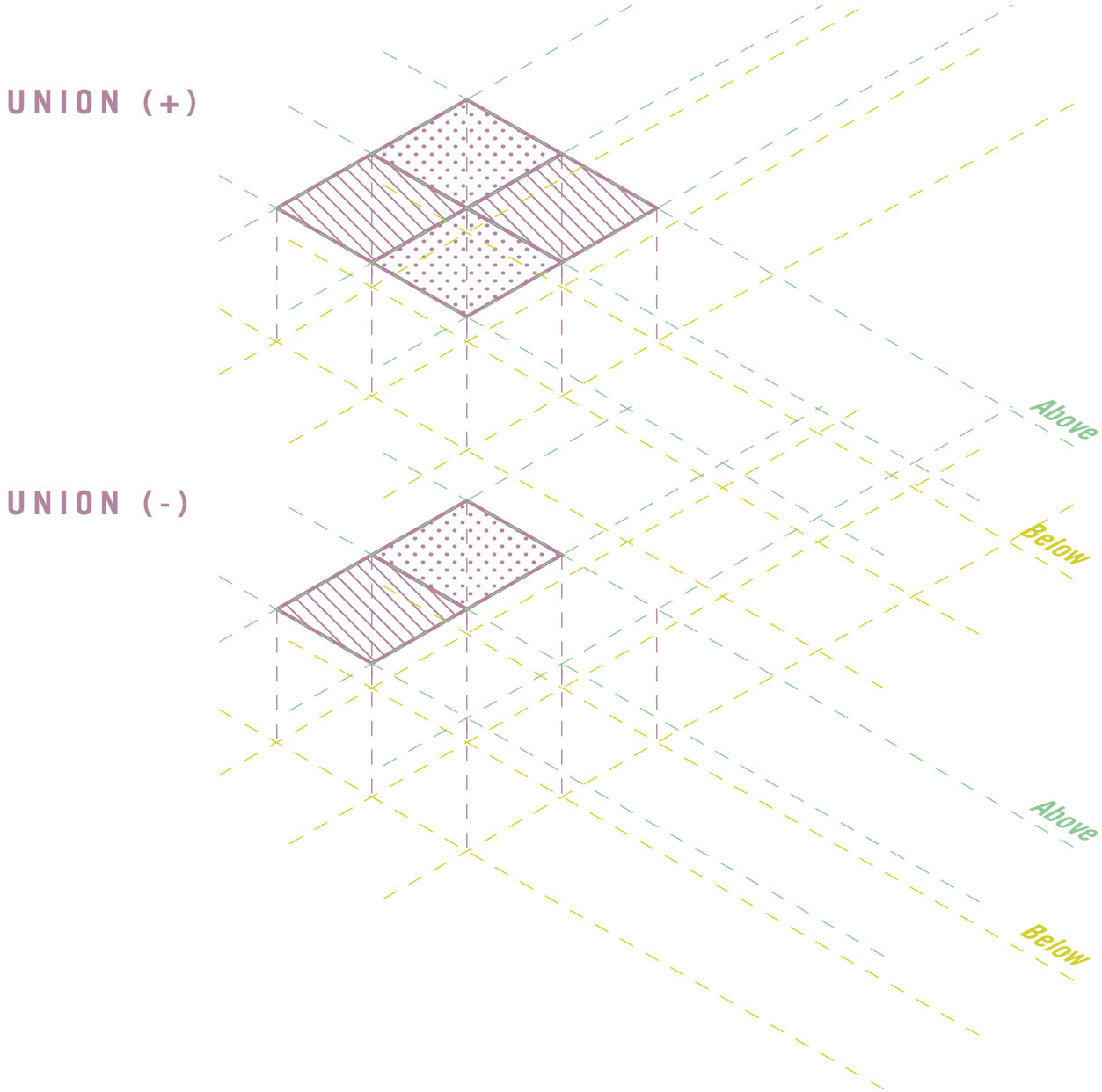


Figure 36 //
DIAGRAM: Fun Mills Program Relationship Final Configurations

Explaining how floorplates will interact to create both Union (+) and Union (-) relationships between programmatic activity.

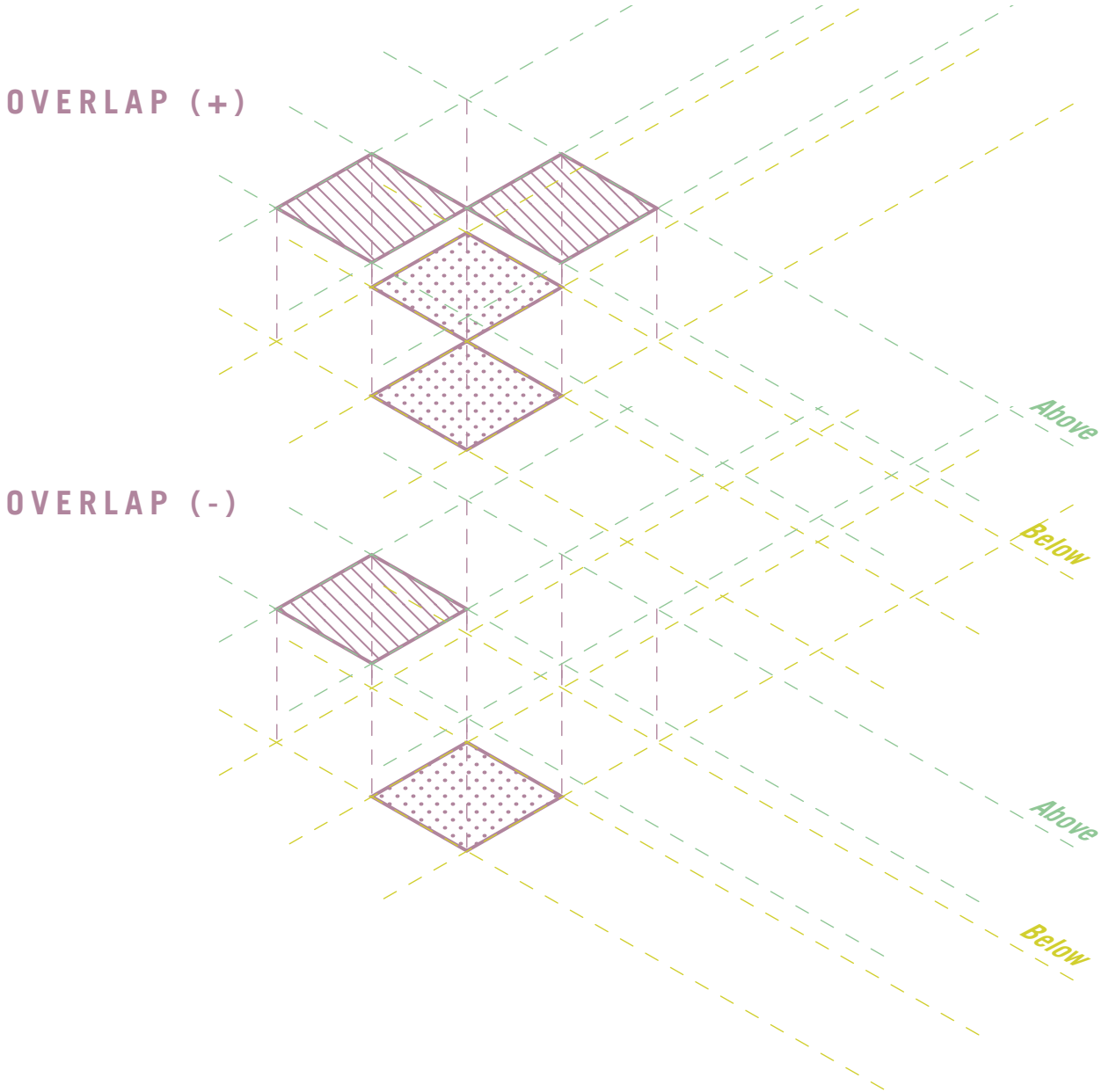


Figure 37 //
DIAGRAM: Fun Mills Program Relationship Final Configurations

Explaining how floorplates will interact to create both Overlap (+) and Overlap (-) relationships between programmatic activity.

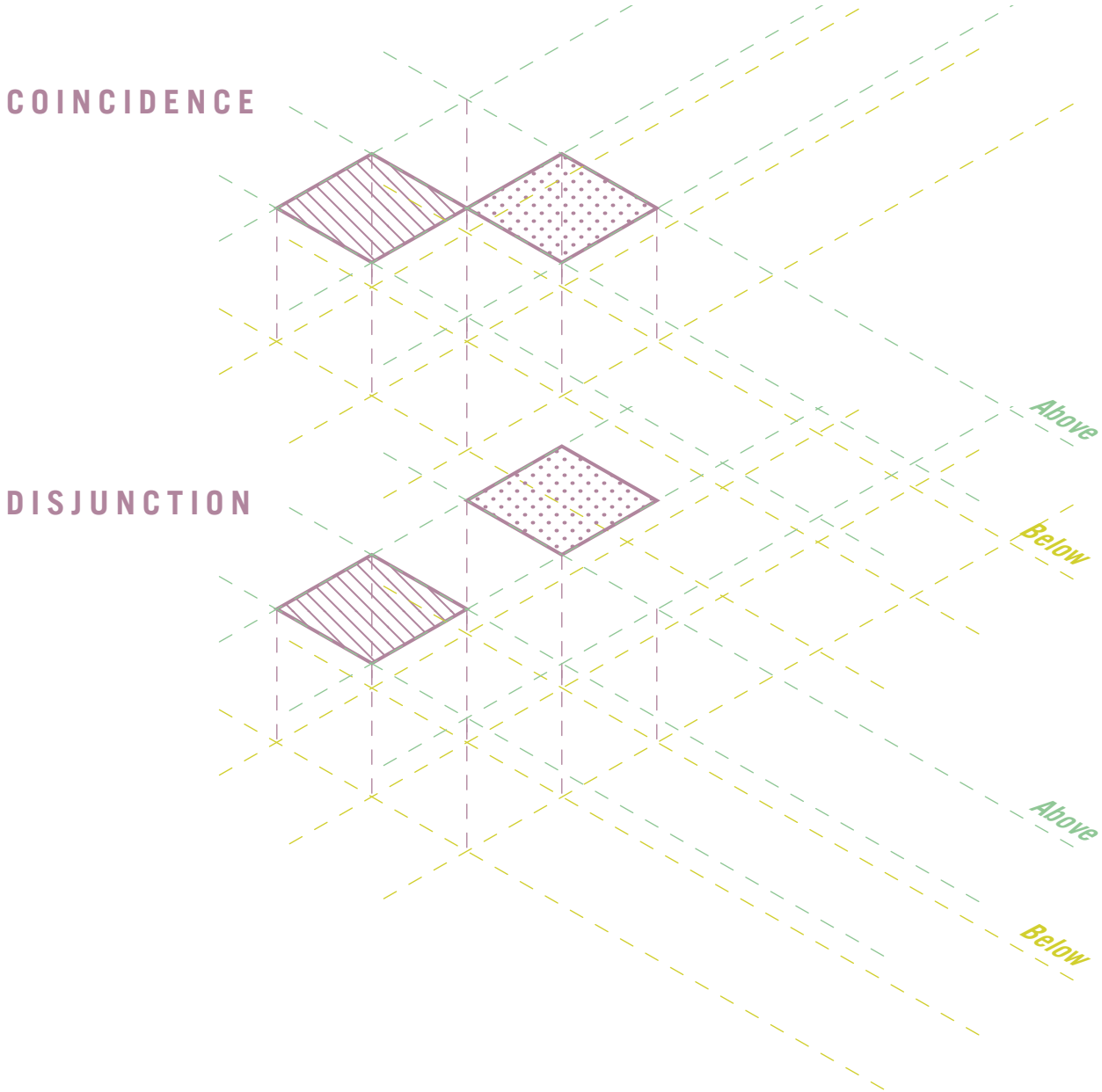
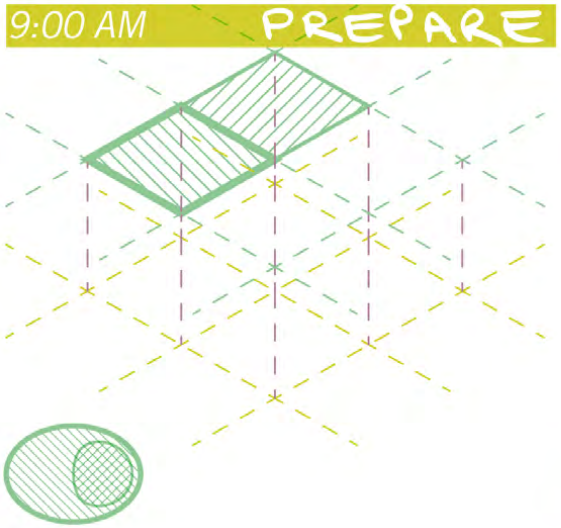


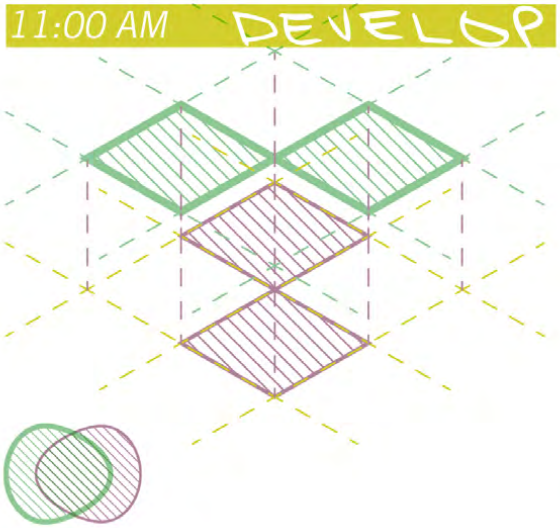
Figure 38 //
DIAGRAM: Fun Mills Program Relationship Final Configurations (Left)

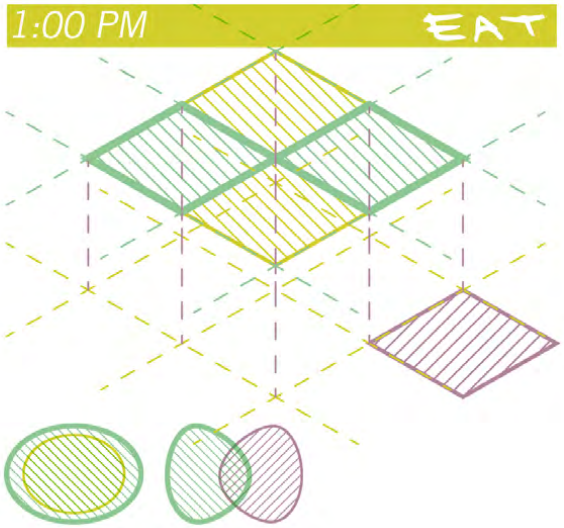
Explaining how floorplates will interact to create both Coincidence and Disjunction relationships between programmatic activity.

Figure 39 //
DIAGRAM: Possible Workday Activity Timeline on the Knowledge Module (Page Right)

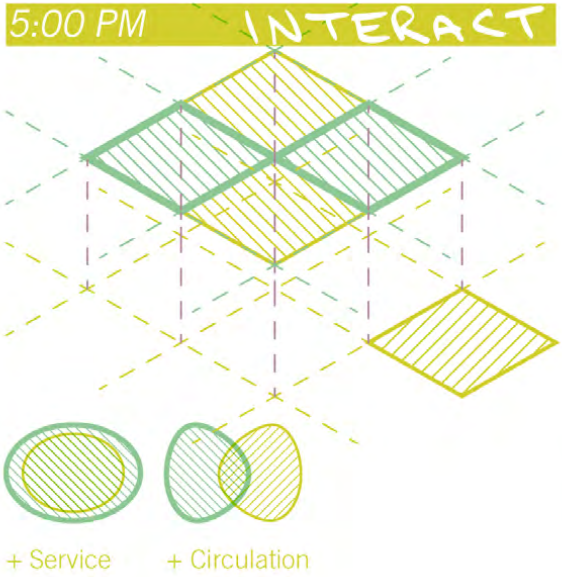
Using the previously illustrated program relationships, the diagram shows how program modules interact in order to create spaces for various workday activities in the Fun Mills.


9:00 AM
PREPARE
+ Administration

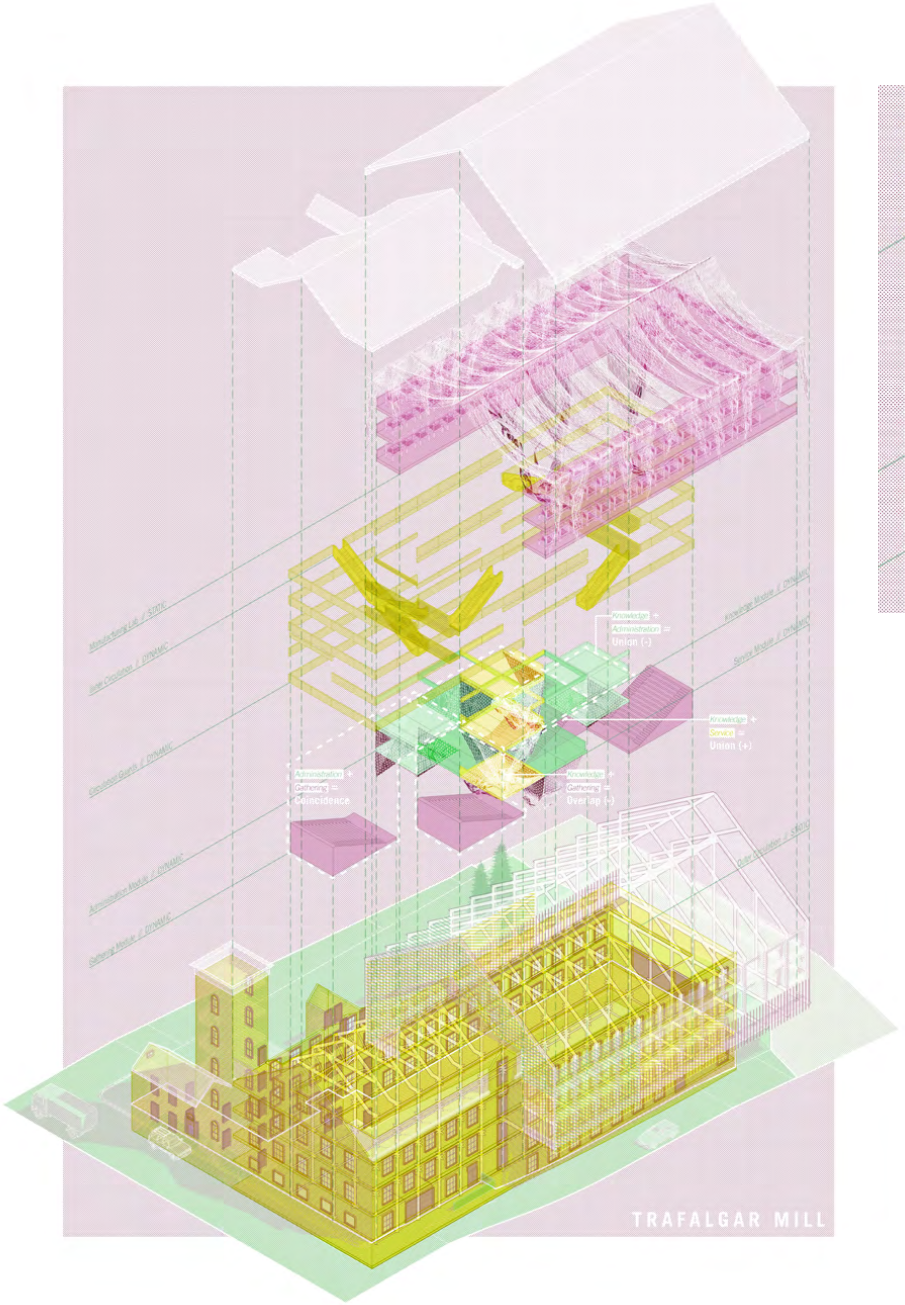

11:00 AM
DEVELOP
+ Manufacturing


1:00 PM
EAT
+ Service
+ Gathering


3:00 PM
LECTURE
+ Gathering


5:00 PM
INTERACT
+ Service
+ Circulation


7:00 PM
MARKET
+ Circulation



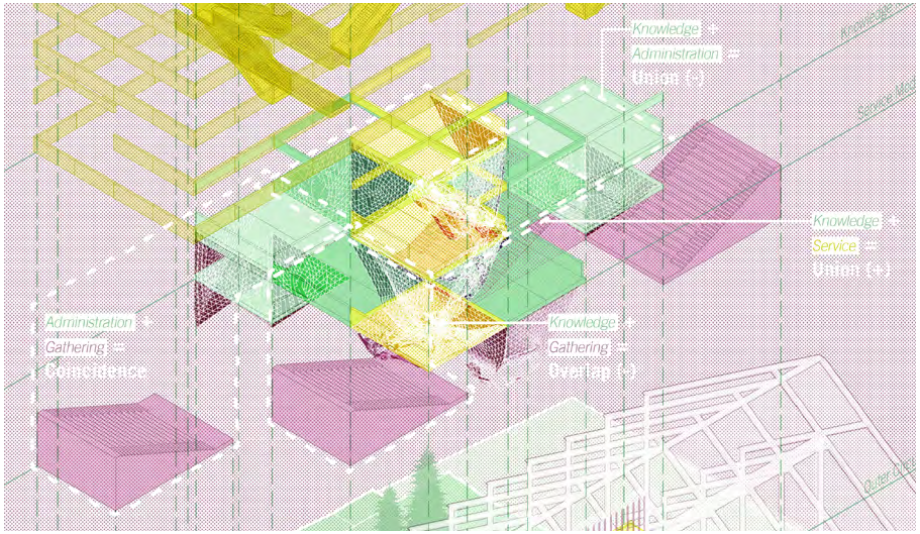
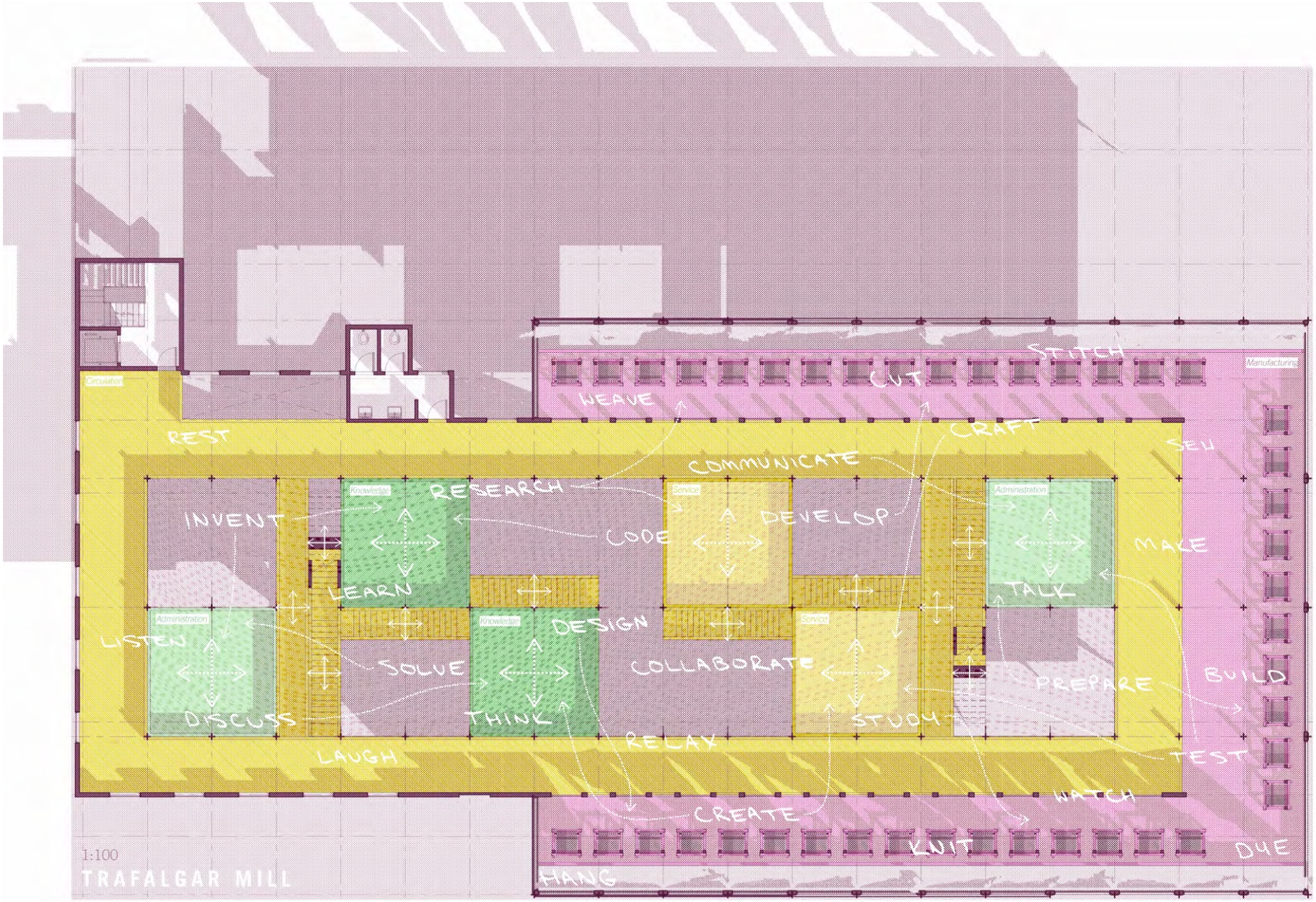


Figure 40 //
AXO: Trafalgar Fun Mill Prototype
Exploded Axonometric (Left)

Drawing differentiates between dynamic and static program components, and highlights program relationships in current configuration.

Figure 41 //
PLAN: Trafalgar Fun Mill Prototype
Annotated Plan (Page Right)

Annotated similarly to Price's drawings, the plan describes programmatic activity possible upon reconfiguration.


Circulation
Manufacturing
Knowledge
Service
Administration
Knowledge
Service
Administration
STITCH
CUT
WEAVE
REST
CRAFT
SEW
COMMUNICATE
RESEARCH
INVENT
DEVELOP
CODE
MAKE
LEARN
TALK
DESIGN
LISTEN
SOLVE
COLLABORATE
PREPARE
BUILD
DISCUSS
THINK
STUDY
RELAX
LAUGH
TEST
WATCH
CREATE
KNIT
DYE
HANG
1:100
TRAFALGAR MILL

STATIC PROGRAM

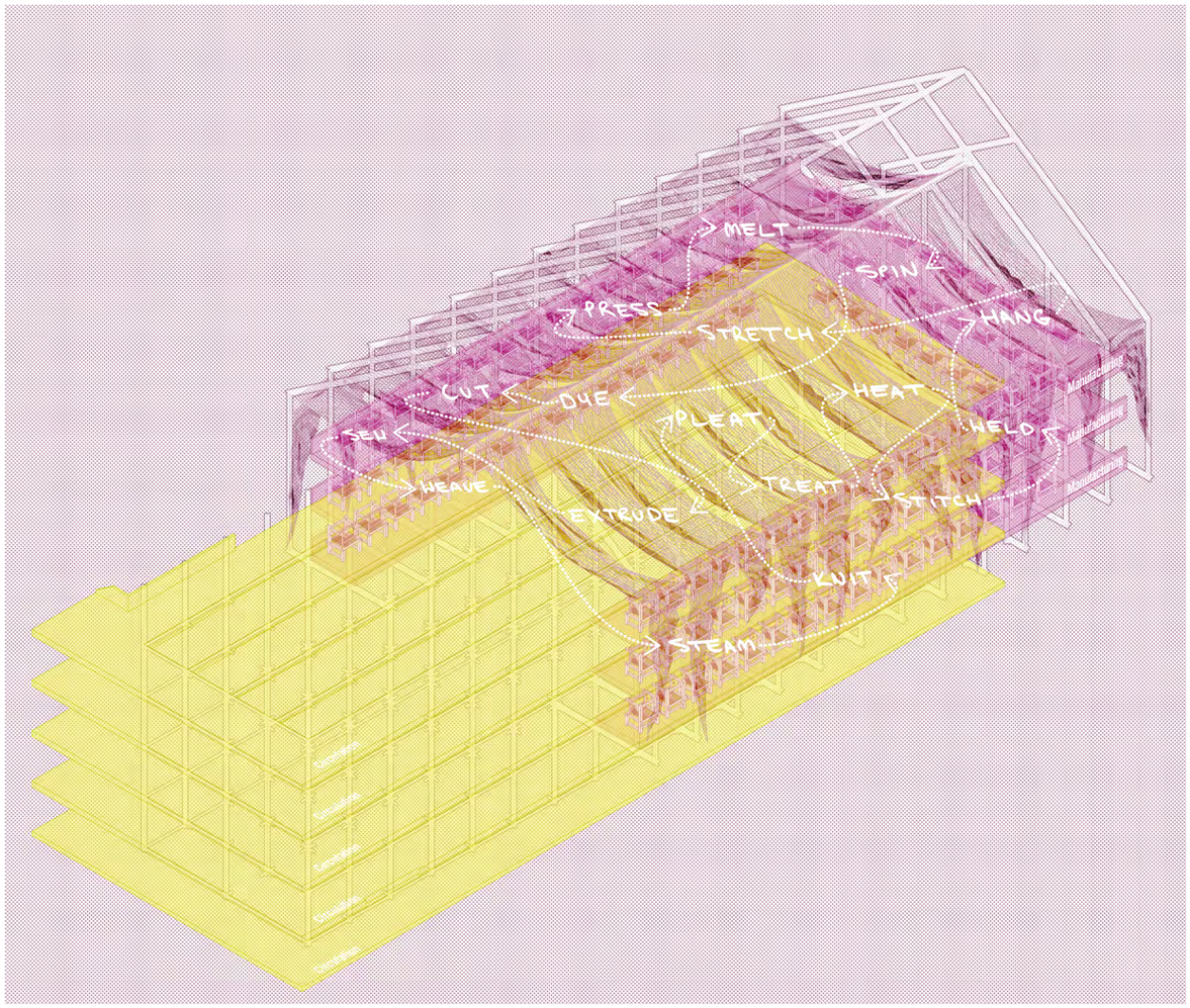


Figure 42 //
AXO: Trafalgar Fun Mill Prototype
Static Program

Annotated with possible activity to occur in the static manufacturing space.

DYNAMIC PROGRAM // STAGE 1

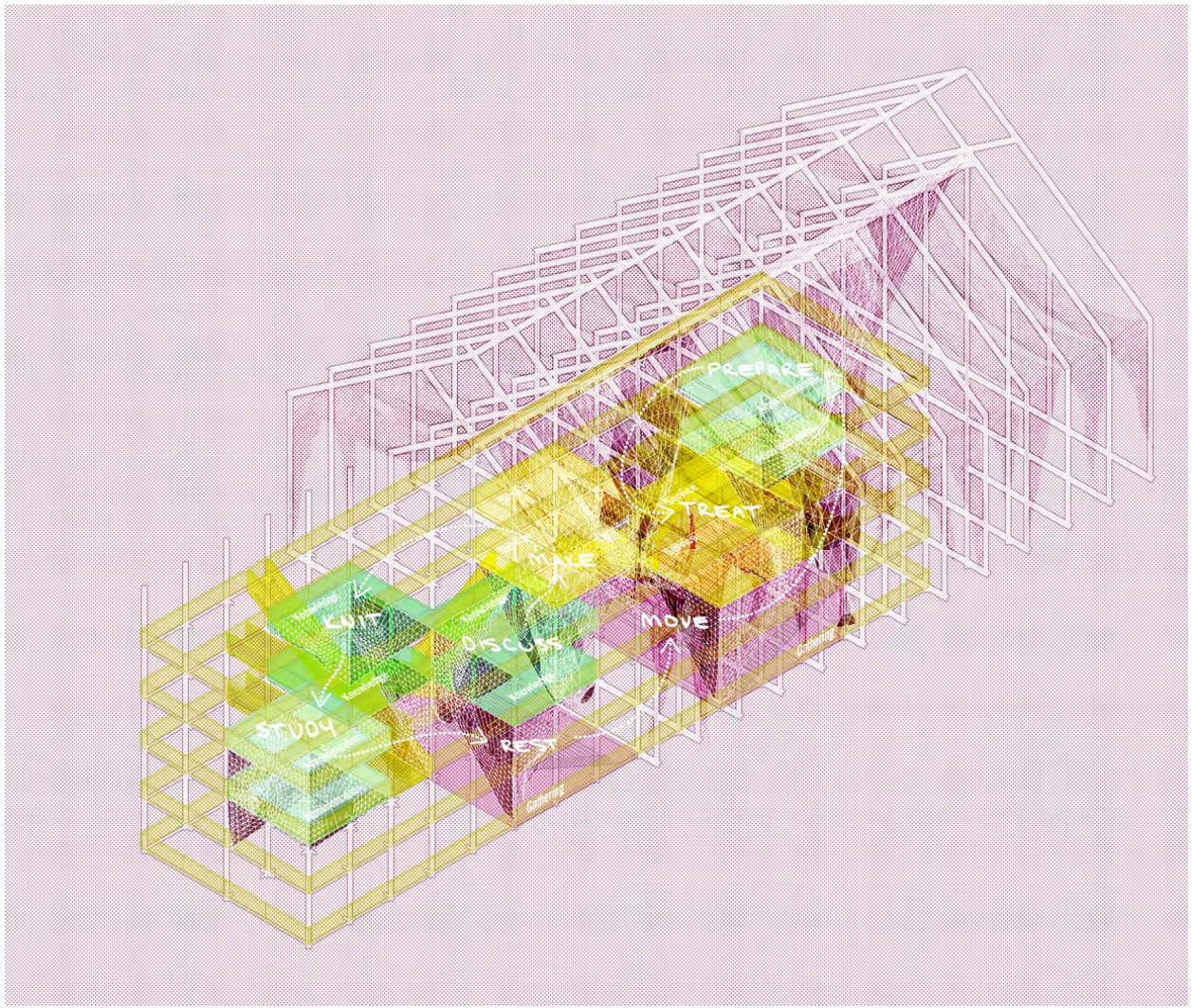


Figure 43 //
AXO: Trafalgar Fun Mill Prototype
Dynamic Program - Stage 1

Annotated with possible activity to occur in the first stage of one imagined reconfiguration sequence.

DYNAMIC PROGRAM // STAGE 2

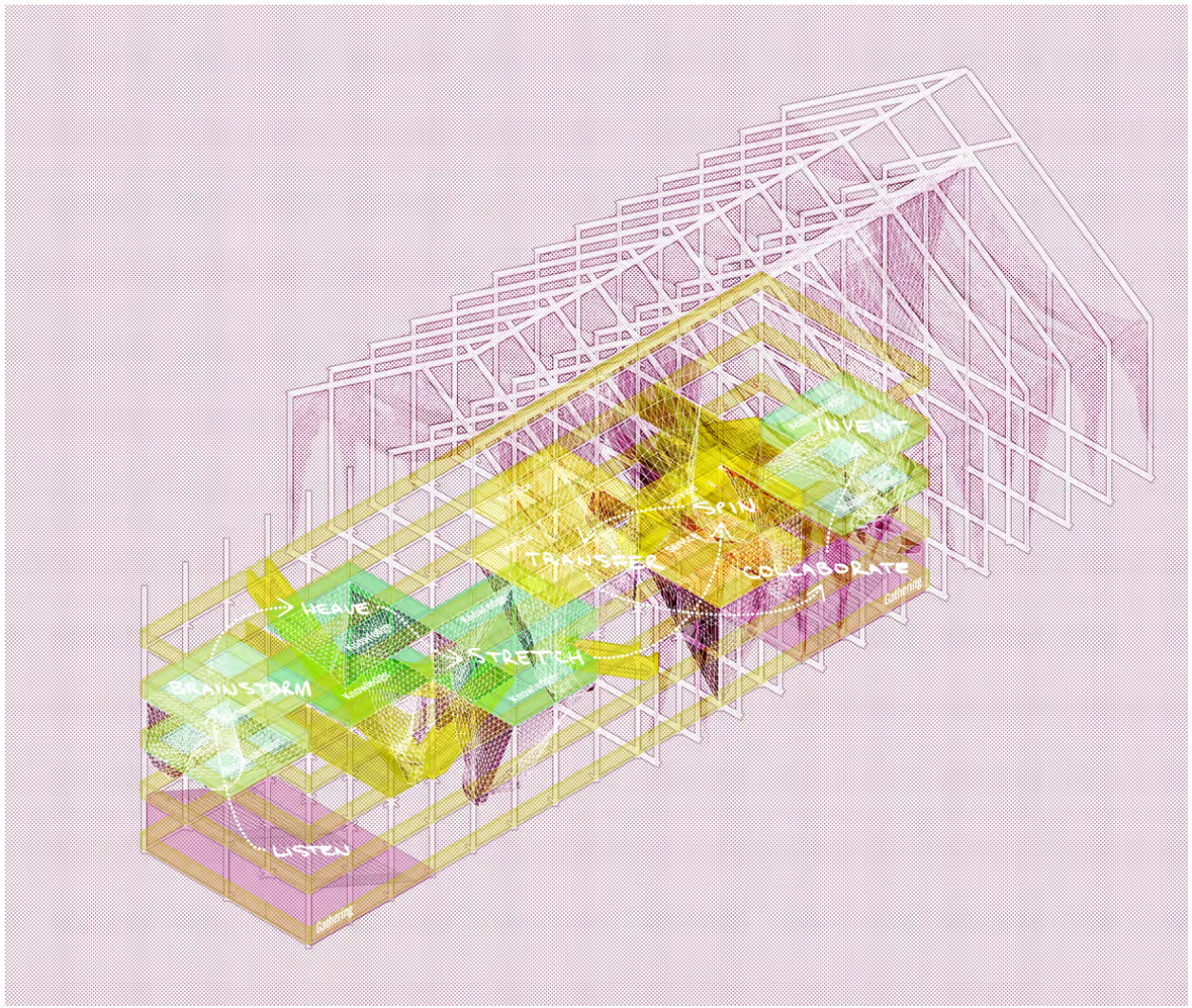


Figure 44 //
AXO: Trafalgar Fun Mill Prototype
Dynamic Program - Stage 2

Annotated with possible activity to occur in the second stage of one imagined reconfiguration sequence.

DYNAMIC PROGRAM // STAGE 3

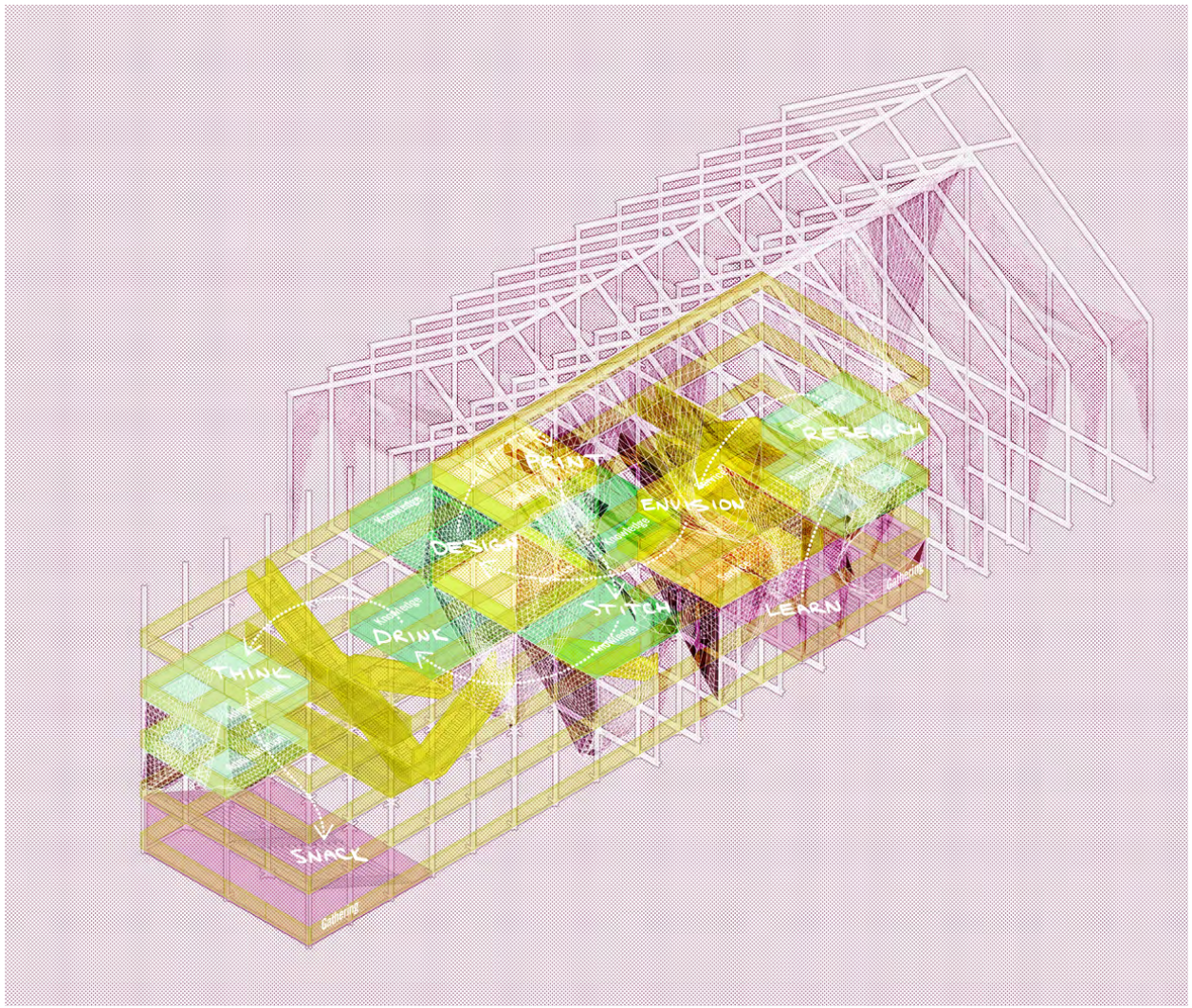


Figure 45 //
AXO: Trafalgar Fun Mill Prototype
Dynamic Program - Stage 3

Annotated with possible activity to occur in the third stage of one imagined reconfiguration sequence.

DYNAMIC PROGRAM // STAGE 4

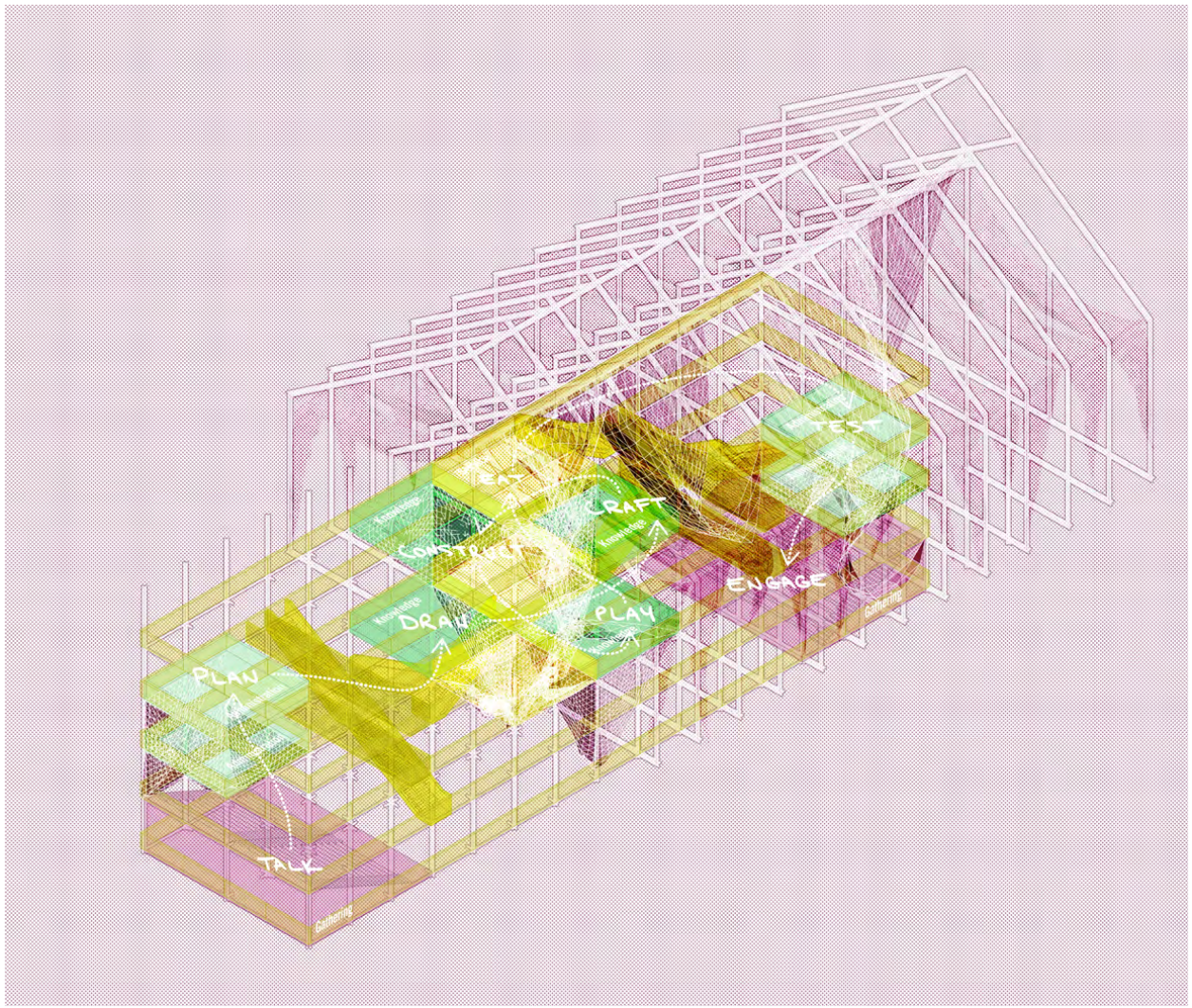


Figure 46 //
AXO: Trafalgar Fun Mill Prototype
Dynamic Program - Stage 4

Annotated with possible activity to occur in the fourth stage of one imagined reconfiguration sequence.

DYNAMIC PROGRAM // STAGE 5

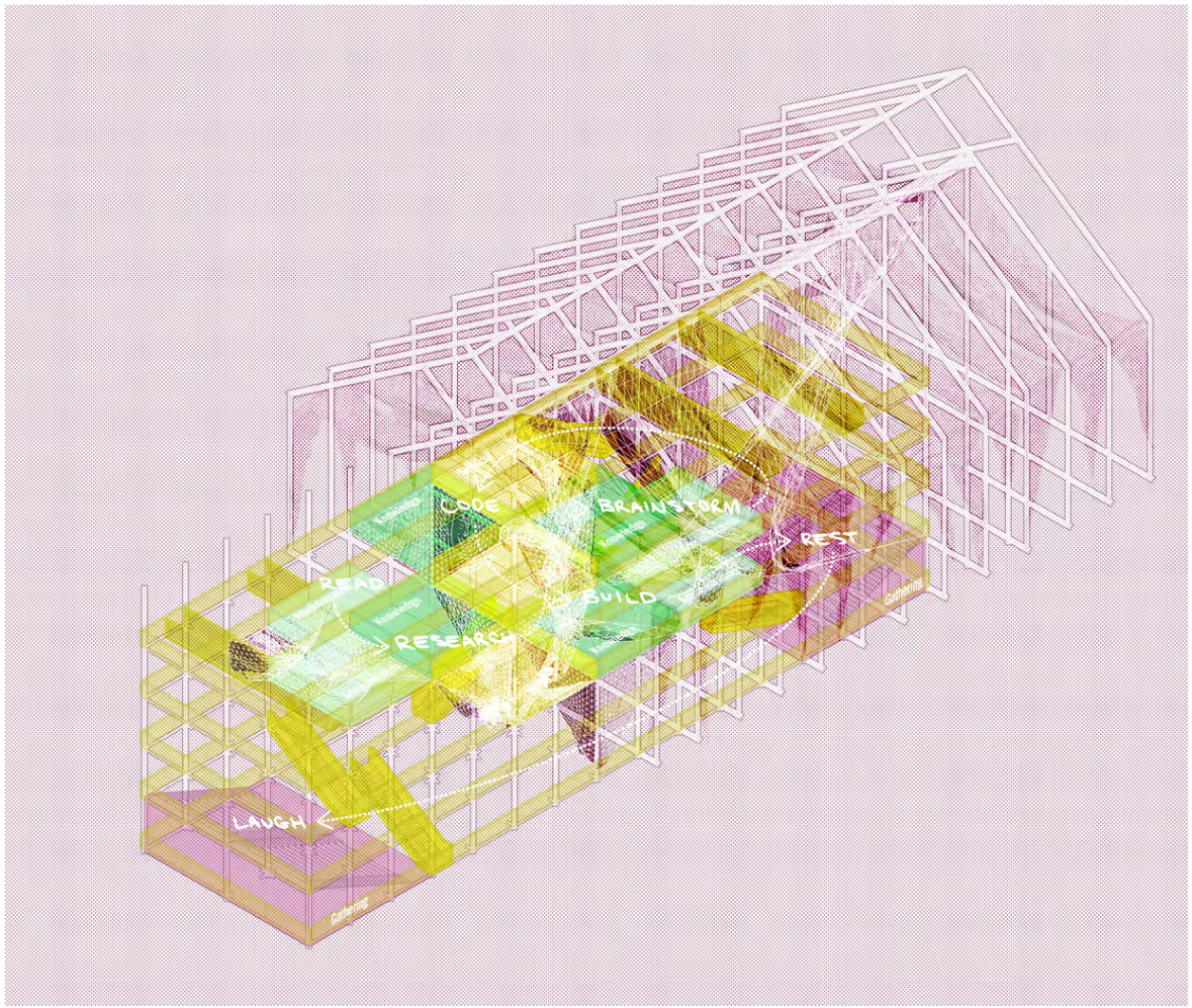


Figure 47 //
AXO: Trafalgar Fun Mill Prototype
Dynamic Program - Stage 5

Annotated with possible activity to occur in the fifth stage of one imagined reconfiguration sequence.

DYNAMIC PROGRAM // STAGE 6

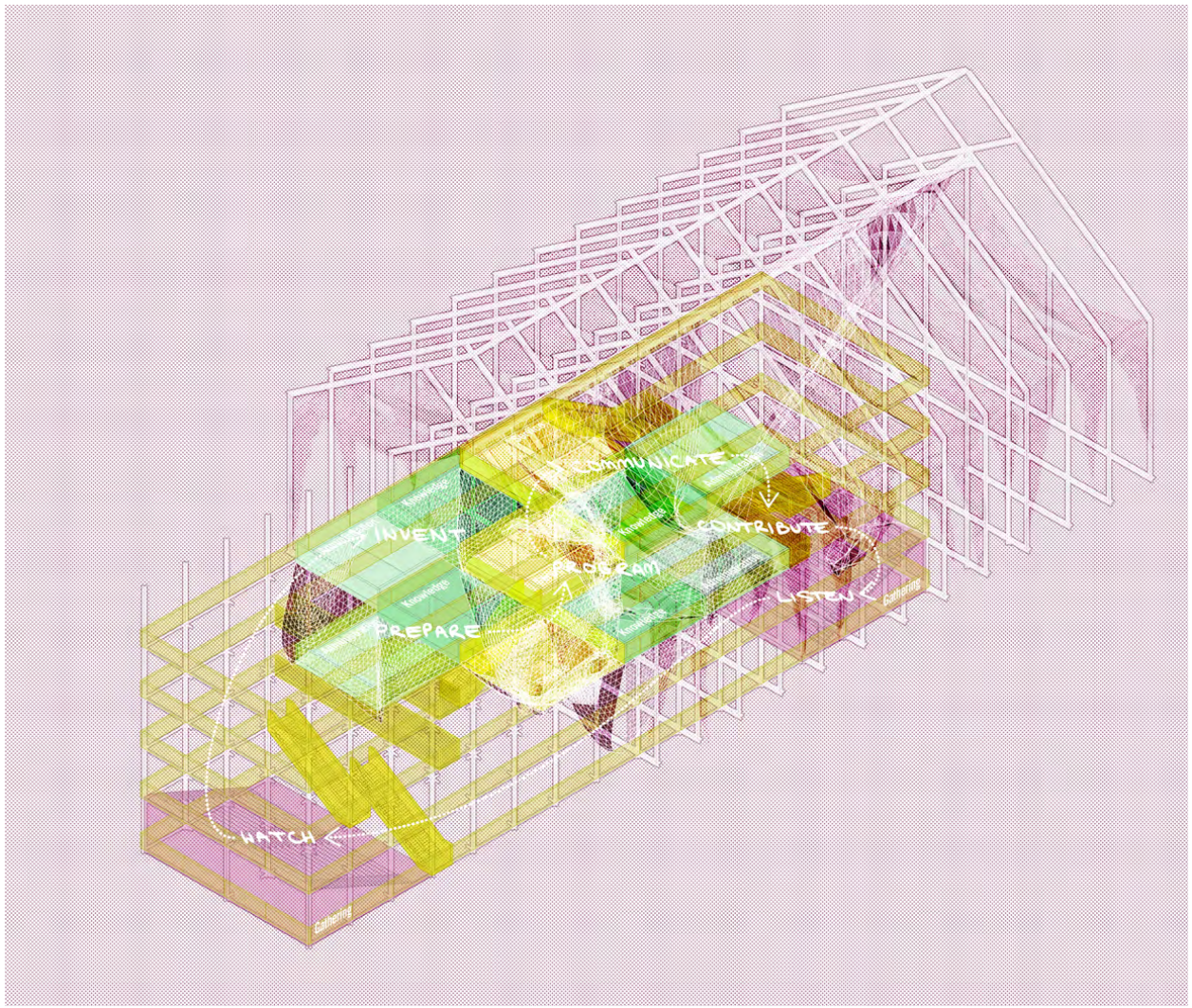


Figure 48 //
AXO: Trafalgar Fun Mill Prototype
Dynamic Program - Stage 6

Annotated with possible activity to occur in the sixth stage of one imagined reconfiguration sequence.

DYNAMIC PROGRAM // STAGE 7

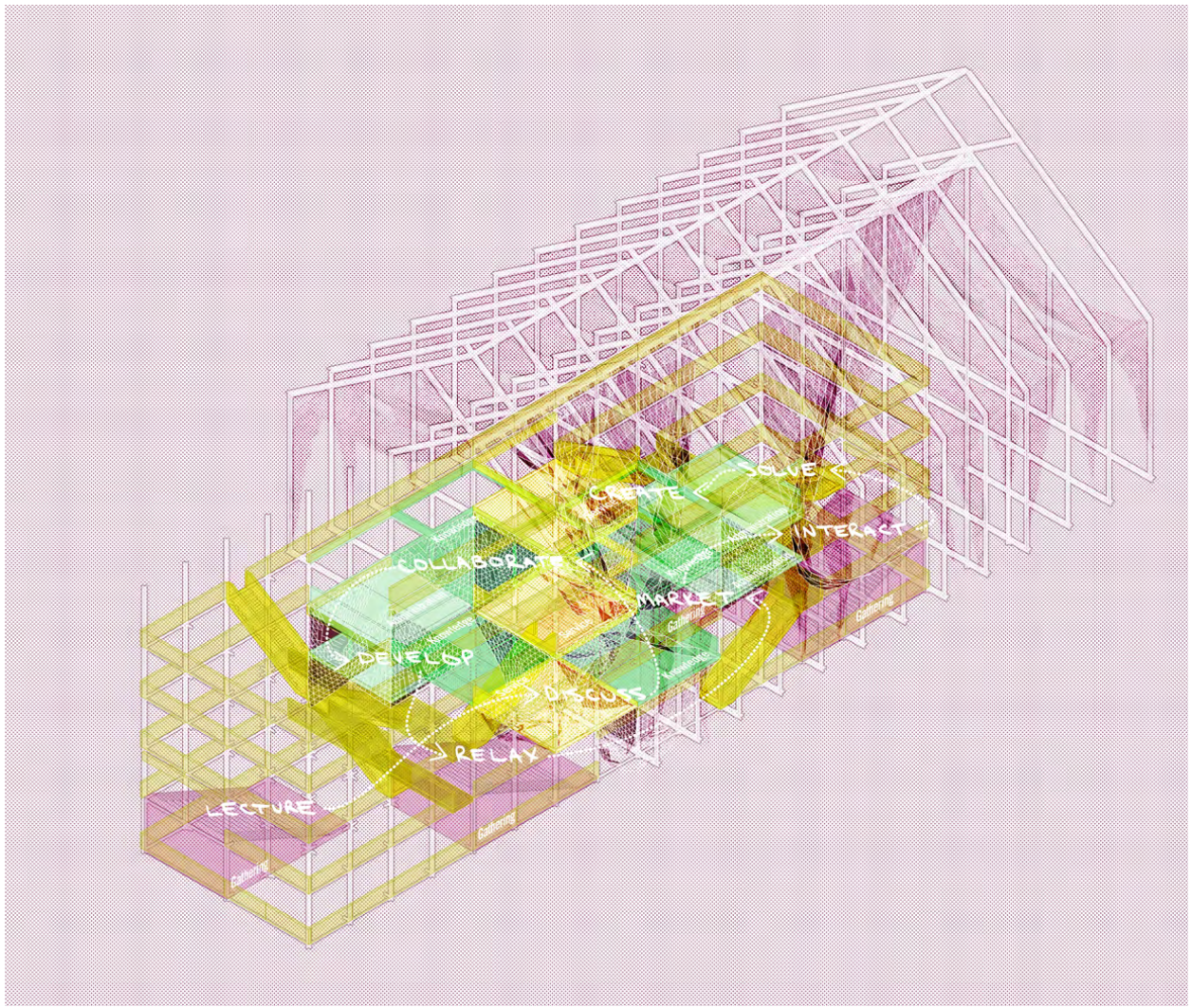


Figure 49 //
AXO: Trafalgar Fun Mill Prototype
Dynamic Program - Stage 7

Annotated with possible activity to occur in the seventh stage of one imagined reconfiguration sequence.

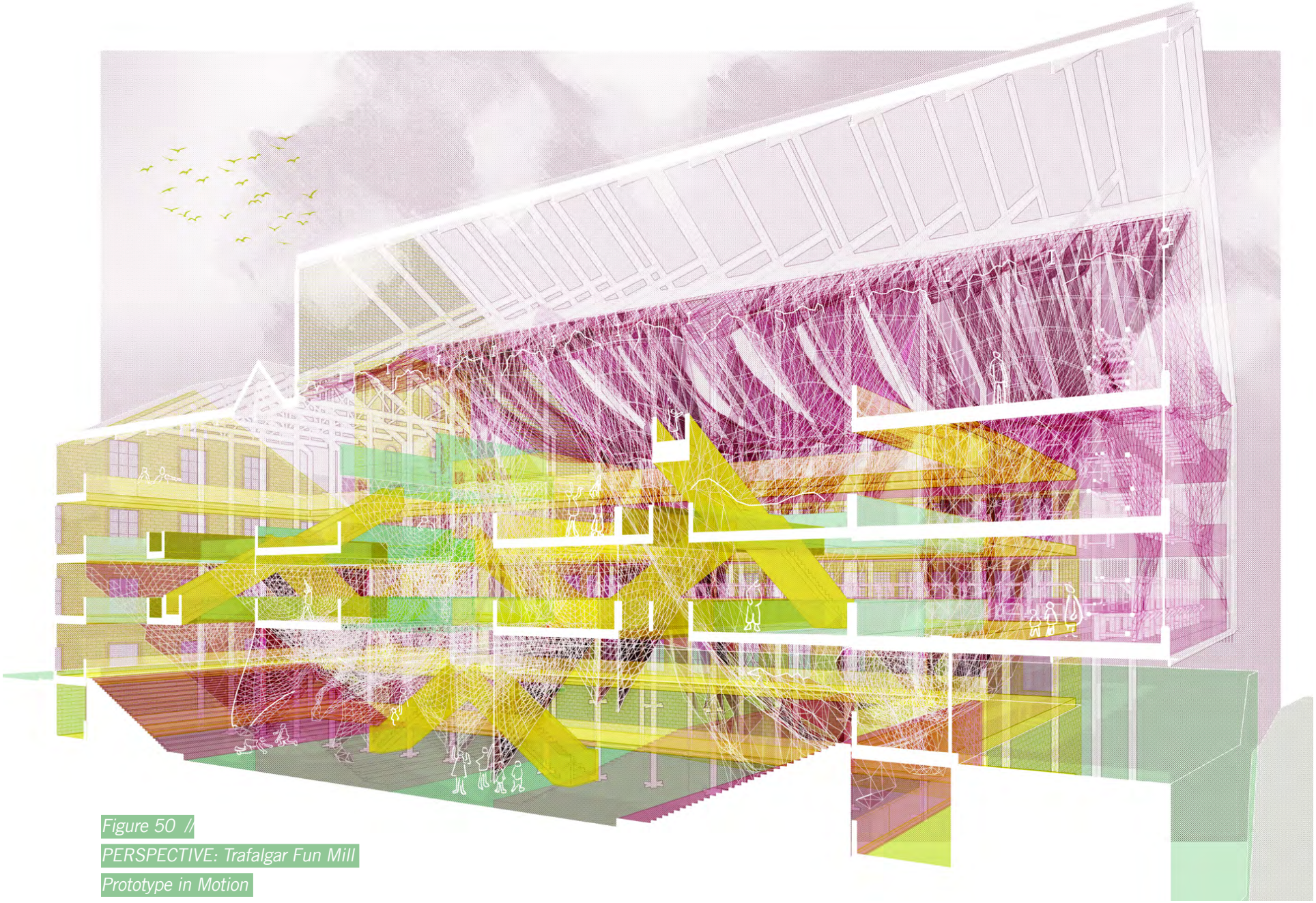


Figure 50 //
PERSPECTIVE: Trafalgar Fun Mill Prototype in Motion

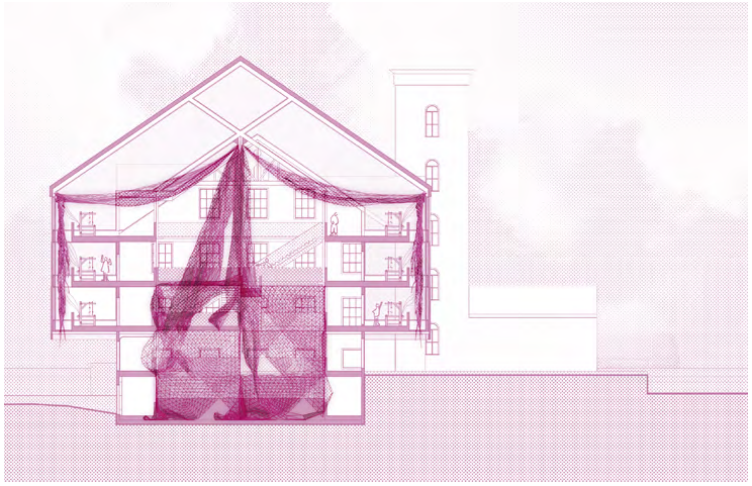


Figure 51 //
SECTION: Trafalgar Fun Mill Prototype - Spatial Textiles (Right)

Textiles are manufactured in the Fun Mill's outer static space, and secured onto central reconfiguring floorplates to generate dynamic space.

Figure 52 //
PERSPECTIVE: Burnley Fun Mills from Above (Left)

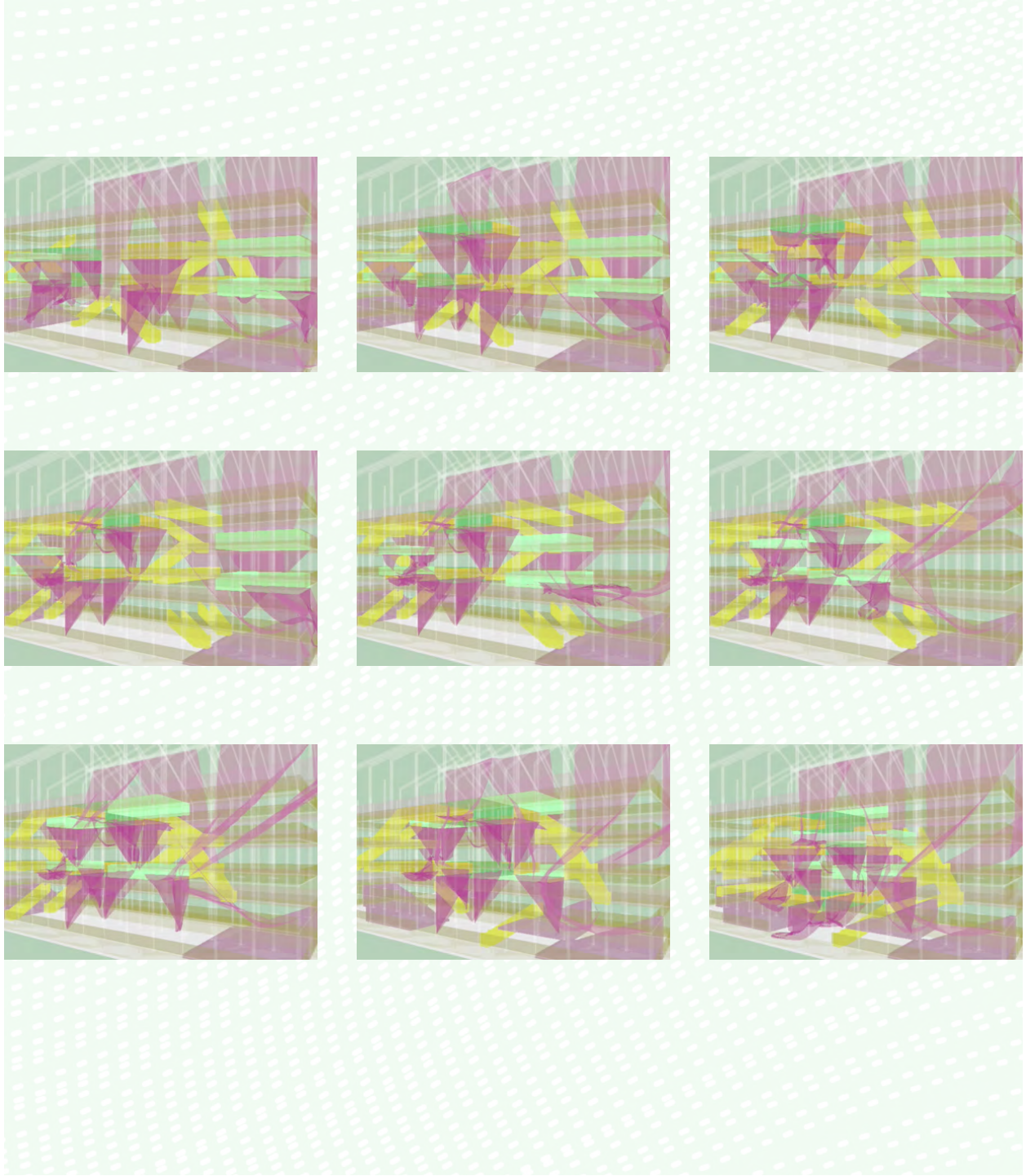


Figure 53 //
STILLS: Trafalgar Fun Mill
Prototype in Motion - Side View

Using animation software, the same reconfiguration sequence illustrated in the drawings was conveyed in a short video. The stills show key frames of movement, from a side view of the building.

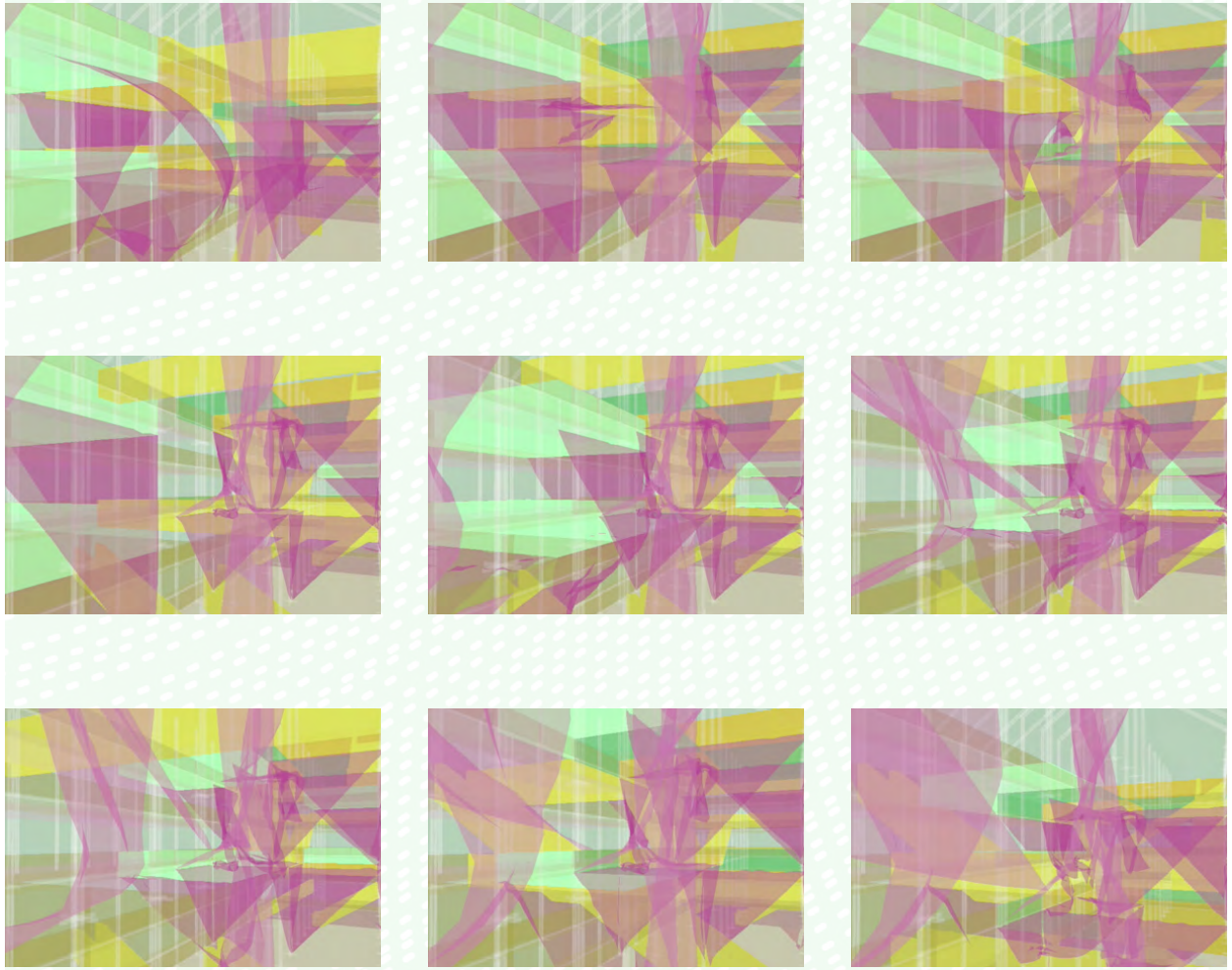


Figure 54 //
STILLS: Trafalgar Fun Mill
Prototype in Motion - Interior View

Using animation software, the same reconfiguration sequence illustrated in the drawings was conveyed in a short video. The stills show key frames of movement, from an interior view of the building.

PART 1 CONCLUSION

Fun Mills proposes the adaptation of vacant cotton mills, in the post-industrial town of Burnley, UK, to be transformed into a network of interactive textile labs. Fifteen sites, along the town's canal and river, function as collaborative work environments, which combine manufacturing, service, and knowledge industries to produce advanced textiles. The textile product will also be employed as a design material, working with reconfigurable floor plates, in order to create flexible, shifting work environments that foster twenty-first century productivity. By exercising principles set forth by Cedric Price's Fun Palace design, Fun Mills takes the fluctuating nature of program relationships into consideration through anticipated indeterminacy.

2

The Fun Solution to Empty Architecture

INTERACTIVITY

The implementation of buildings that are spatially responsive is an architectural retort to the continually updating stream of information that defines much of our daily lives. Interactivity is also a means of characterizing present-day architectural vacancy, caused by ubiquitous digitalization. Through the application of **cybernetic technology**, buildings are able to reconfigure to facilitate various uses for inhabitants, and therefore adapt to a variety of activity. As mobile devices allow innumerable resources to be taken anywhere, any activity can, in principle, be carried out in any place. Consequently, this thesis maintains that all places should be equipped for a variety of programmatic function. Rather than continue a passive architectural language to respond new technological tools, this thesis proposes architecture that employs kinetic and responsive building technology to adapt to intensifying digitalization. The final design of Fun Mills enables digital technology to act as a supplementary layer to the physical, in place of its current role diminishing architectural character.

DEFINE // Cybernetic Technology

A field of study developed by Norbert Wiener at MIT in the 1940's, designed to bridge the gap between the organic and the inorganic. The technology produces environmentally responsive machines, which are capable of learning and self-regulating. (Yiannoudes, 2016: 10-13)

QUOTE // "Architectural and planning attention should primarily increase the range of choice of activities and not merely increase the amenity value of existing situations."

(Price, 1964: 61)

QUOTE // "Architecture must concern itself continually with the socially beneficial distortion of the environment."

(Price, 2003: 92)

CEDRIC PRICE

In the 1960's the development of Cedric Price's improvisational architecture, defined as technological interchangeability with social participation, was seen as a revolutionary concept. More recognizable in his earlier work, he responded to the uncertain state of British society, which, at the time, was struggling to invest in new technologies.[27] Price intended for his architecture to react to the shifting needs of citizens, inciting social transformation and creating a new "educational industry" in the UK. He attempted to reestablish the country as a leader in emerging technologies, a position it once held during the Industrial Revolution.[28] In order to achieve this, he opposed conventional planning practices, believing that they were over-determined and placed too much power in the hands of the designer. Rather, he stated "creativity is generated and sustained through a delight in the unknown" and acknowledged that change and indeterminacy was inevitable.[29] The design of the Fun Palace in London manifested these values in a "virtual architecture" with no singular program, but could reconfigure itself to house a variety of program, and emulate a variety of buildings.[30] Emphasis was placed on human participation and impermanence, educating users on technological innovation, rather than on more familiar monumental symbolism.[31]

Price believed that to improve the quality of life through design architects should involve themselves in **anticipatory design**, as recommended by Buckminster Fuller.[32] Design should work preventatively, rather than curatively, on social ills. Although buildings cannot control

DEFINE // Anticipatory Design

"…Try[ing] to anticipate the needs of humanity, anticipate the needs of nature in general, try[ing] to anticipate the accommodation of the total intercomplementarity, using these principles then to actually begin to participate in the evolutionary formulations of nature, so we don't just have to wait and take it for granted that someone else is going to provide this thing for us, that some one else is going to invent."
(Fuller, 1975)

social behaviour,[33] sociality should be a driving force in all aesthetic decisions.[34] Similar to Tschumi's theories, Price was also against ancient forms pushed onto irrelevant programs, stating that it disrupted the relationship of form and function. Price preferred to create quasi-temporal structures, as the lifespan of programs began to decrease from their traditional predecessors. He claimed there was an increasing tendency in the UK to prolong the structure too far beyond its usefulness. "The built environment is becoming a generous repository of buildings for nervous minds rather than a three-dimensional manifestation of a current optimistic civilization…" said Price in 1981, implying that society dwelled too much on conservation as opposed to innovation.[35] The design of the Fun Mills reinforces this view, emphasizing progression with current technology, rather than enshrining the past. Price discouraged designers from needing to "get it right the first time," as this logic brought about the safe solution. In this regard, the Fun Mills is similarly designed to change over time, constantly adapting to the most current modes of work. As the lab creates the advanced textiles, which act as interior environmental enclosures, workers have control over which textiles they prefer to inhabit. Future technological advances may allow a new type of textile to replace the currently proposed set, providing new spatial characteristics as the Fun Mills evolves.

Figure 55 //
SELF-PORTRAIT: Cedric Price - Year Unknown

The cartoon-like annotation Price applied to his own self-portrait is particularly reflective of his animated style of drawing, as well as his tendency to poke fun at himself.

// Fun Palace

When beginning to design the Fun Palace in 1964, Price considered most institutions to be in an increasingly rapid state of change, yet their activities were constrained by a lack of dynamism in their enclosures. For his project, Price wanted his design to reinforce the activities housed within it, to be seen as a "people's workshop" or a "university of the streets". For this reason he collaborated with cyberneticist Gordon Pask in order to factor time into the design, in relation to the activities that would transpire within the Fun Palace. The surroundings of the site were industrial in nature, producing noise, dust, and toxic fumes. However, Price scaled the building to control these detriments and to exploit them for their beauty. The building contained two types of enclosures, the smaller requiring more servicing (such as kitchens, restaurants, workshops, and lavatories), and the larger require less servicing (such as auditoria, cinema, and meeting halls). Although most of the activities provided were already publicly available in London, there was an inter-accessibility created by their juxtaposition, which enhanced freedom of choice and resulted in hybrid activities. All the circulation routes above the ground level were adjustable by the users, with radial, base-fixed escalators and portable walkways. Price thought of the building as a "short-term toy to enable people to use a building with the same degree of meaningful personal immediacy that they are normally forced to reserve for a limited range of traditional pleasures."[36]

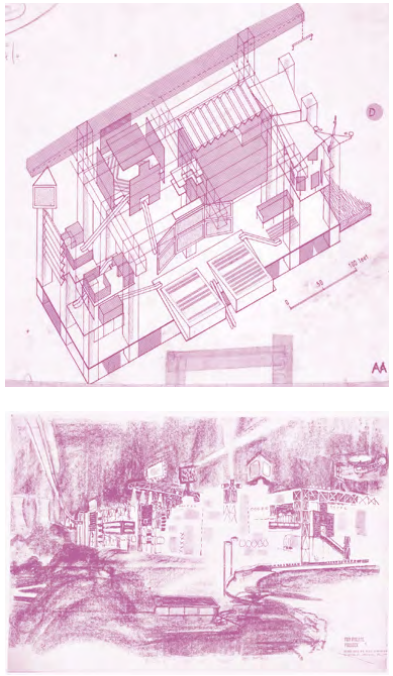
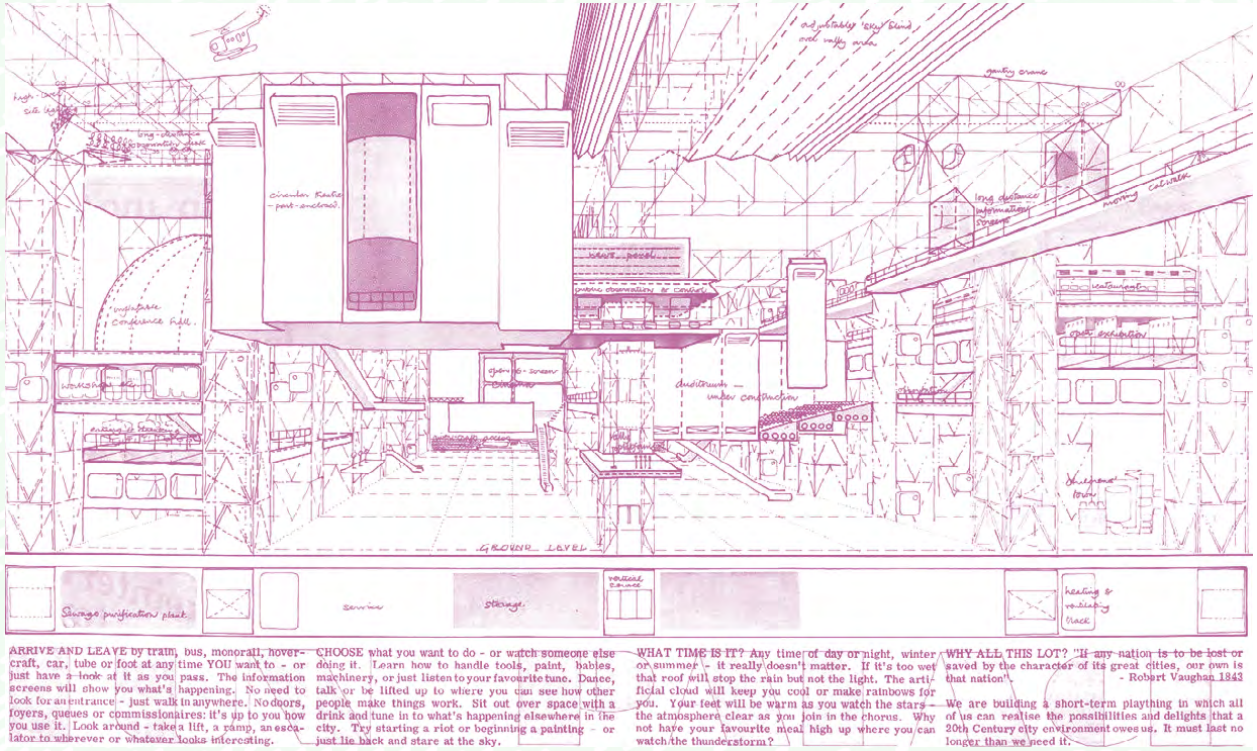
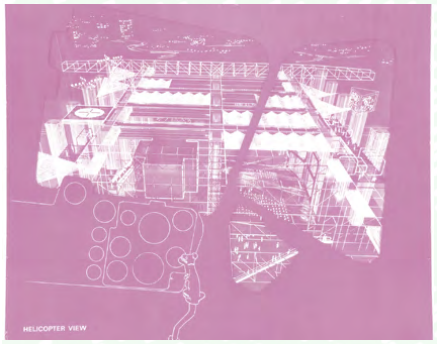


Figure 56 //
AXO & PERSPECTIVE: Fun Palace by Cedric Price - London, 1966

“Creativity is generated and sustained through a delight in the unknown”

- Cedric Price





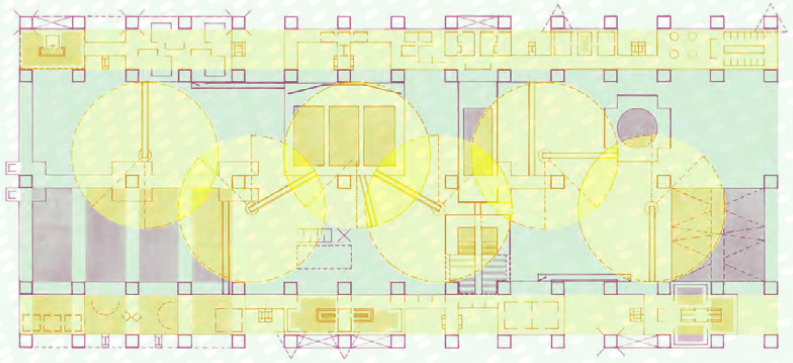
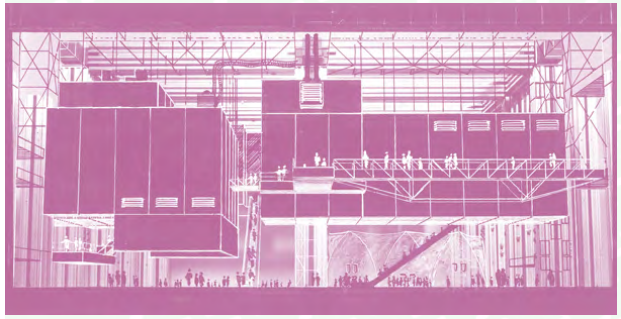


Figure 57 // PERSPECTIVES & PLAN: Fun Palace by Cedric Price - London, 1966



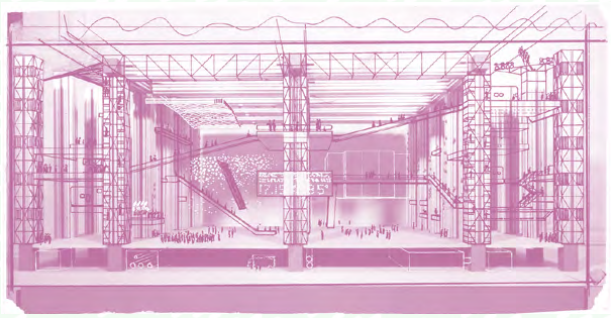
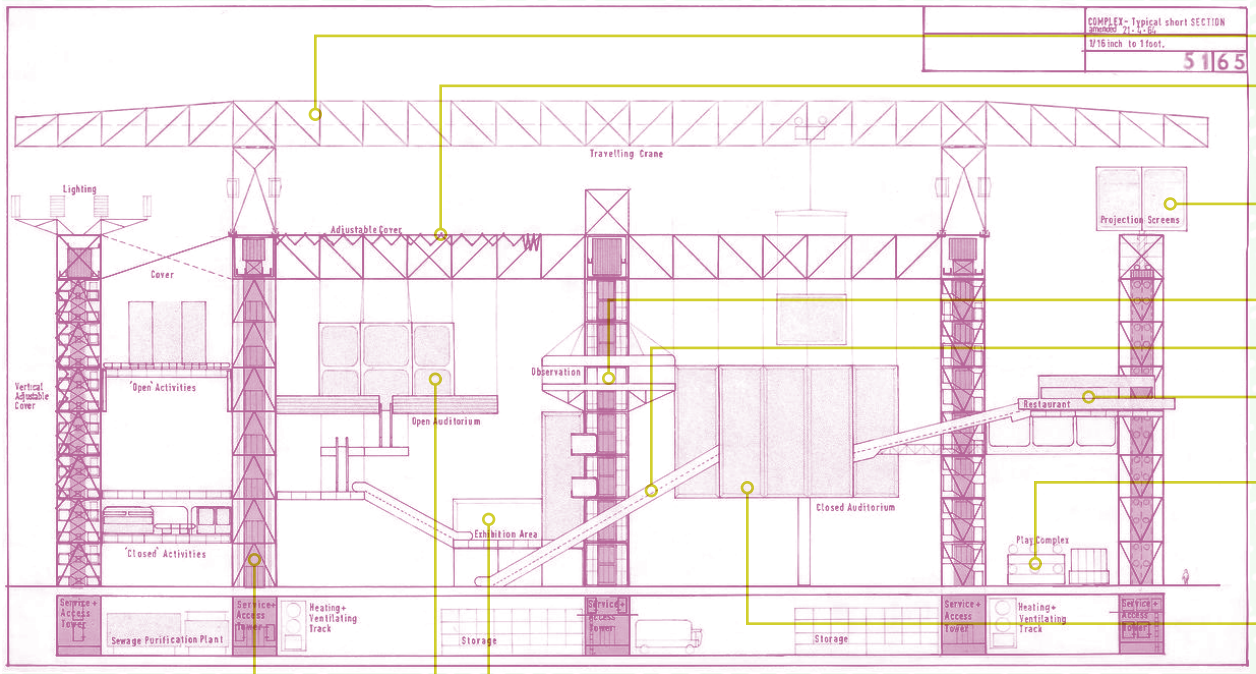


Figure 58 //
PERSPECTIVES & SECTION: Fun Palace by Cedric Price - London, 1966



Travelling Crane
Adjustable Cover
Projection Screen
Observation
Escalators
Restaurant
Play Complex
Closed Auditorium
Exhibition Area
Open Auditorium
Service Towers

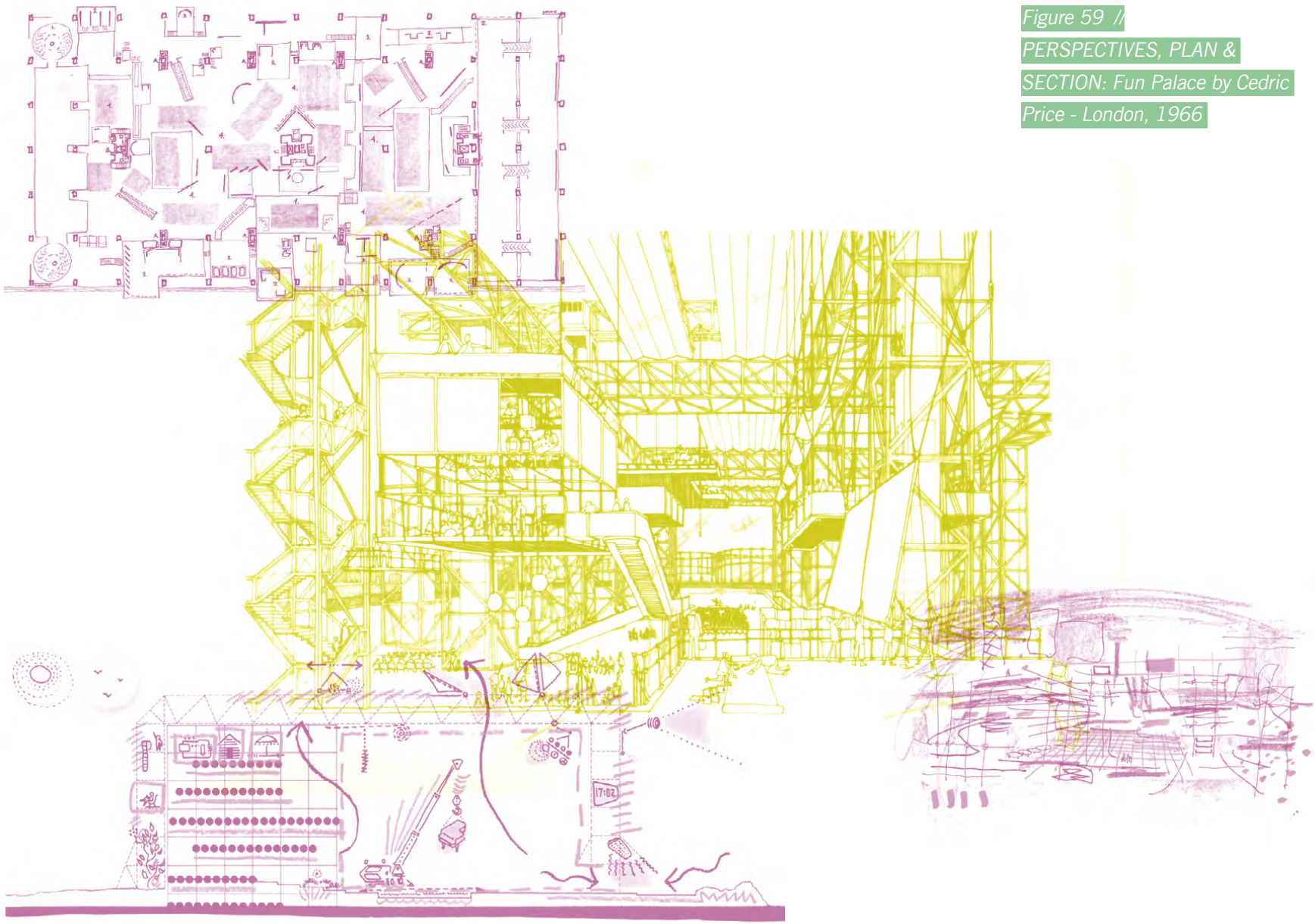


Figure 59 // PERSPECTIVES, PLAN & SECTION: Fun Palace by Cedric Price - London, 1966

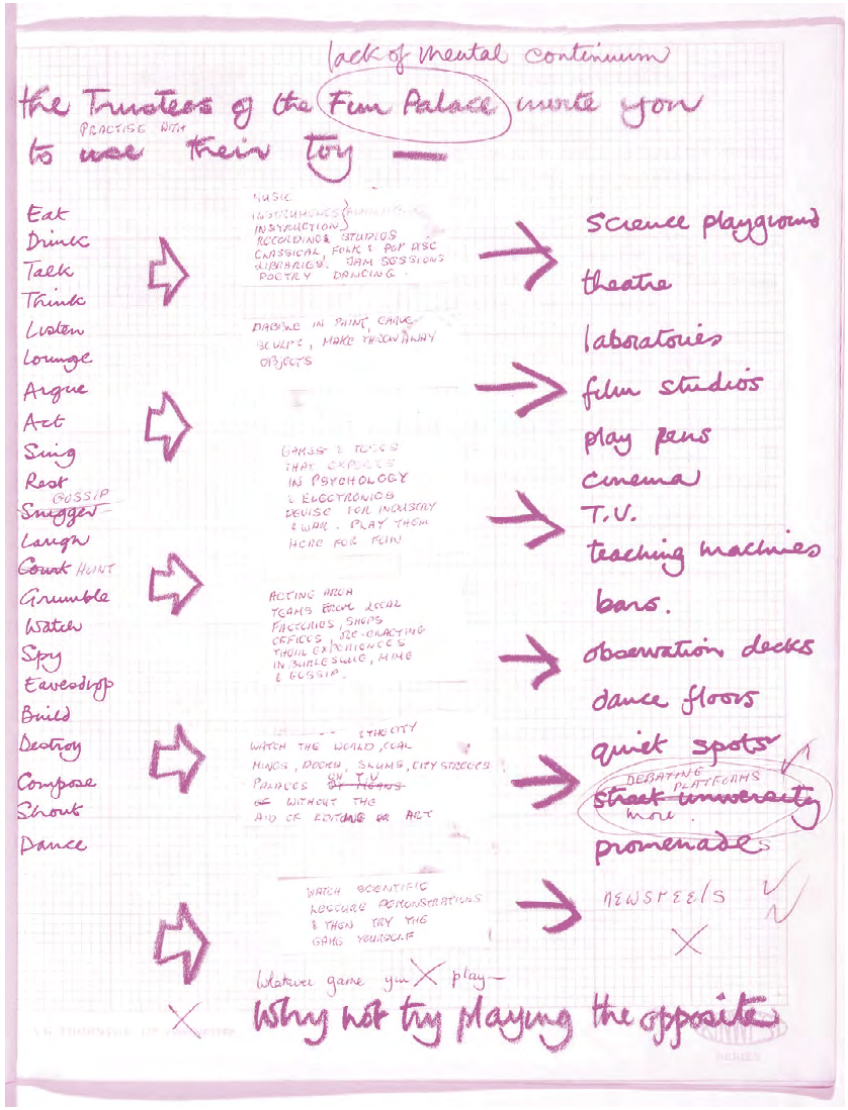
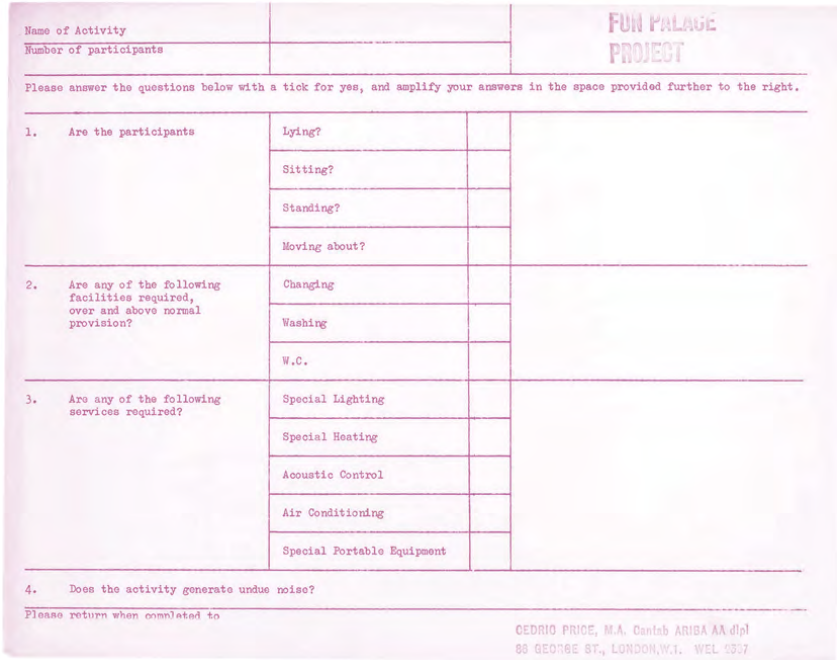


Figure 60 //
TEXTUAL RECORDS: Fun Palace by Cedric Price - London, 1966

Both these documents were created by Price in order to understand the juxtaposing program and reconfigurable spaces in the Fun Palace.



FUN PALACE PROJECT

Name of Activity
Number of participants

Please answer the questions below with a tick for yes, and amplify your answers in the space provided further to the right.

1. Are the participants	Lying?		
	Sitting?		
	Standing?		
	Moving about?		
2. Are any of the following facilities required, over and above normal provision?	Changing		
	Washing		
	W.C.		
3. Are any of the following services required?	Special Lighting		
	Special Heating		
	Acoustic Control		
	Air Conditioning		
	Special Portable Equipment		

4. Does the activity generate undue noise?

Please return when completed to

CEDRIC PRICE, M.A. Cantab ARIBA AA dipl
88 GEORGE ST., LONDON, W.1. WEL 4957

// Potteries Thinkbelt

The British education system was of particular interest to Price during the 1960's, as he was displeased that learning was something that occurred over a fixed period of time. Additionally, the amount and what was learned was predetermined by an elite few, and only pursued in order to achieve a sort of status, rather than for one's own personal growth. As more training became required for different types of positions, it became increasingly compartmentalized and time-framed, as well as more controlled by social and economic conditions.[37] Price disagreed with the prevalent learning infrastructure, and in 1966 proposed an educational institution, which ran along a derelict train line within the North Staffordshire Potteries. The area was once a thriving industrial district, specializing in ceramic production, yet was suffering economically. Price stated his proposal, entitled the Potteries Thinkbelt, would "take advantage of local unemployment, a stagnant local housing program, a redundant rail network, vast areas of unused, unstable land, consisting mainly of old coal-working and clay pits, and a national need for scientists and engineers." While there was interest from the UK Administration due to the immediate societal dilemma, other architects found the proposal ridiculous.[38] Price wanted to increase the availability of education on a national scale, as opposed to the elitist universities which dominated the industry, and designed the Thinkbelt as a small-scale prototype. As education should prepare one for daily life, Price believed it should be accessible everywhere and to everyone. He designed the Thinkbelt to be mobile so that a center of scientific education could be transferred to anywhere.[39] The project housed teaching and working areas, as well as student accommodation.[40] Similar to the Potteries Thinkbelt in its adaptation of unused

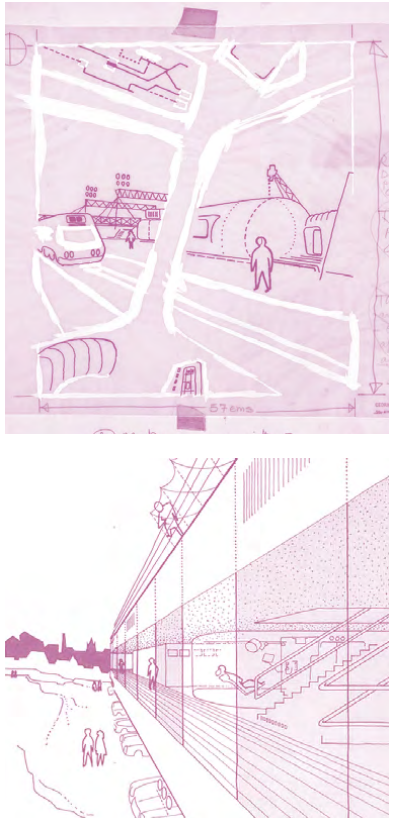
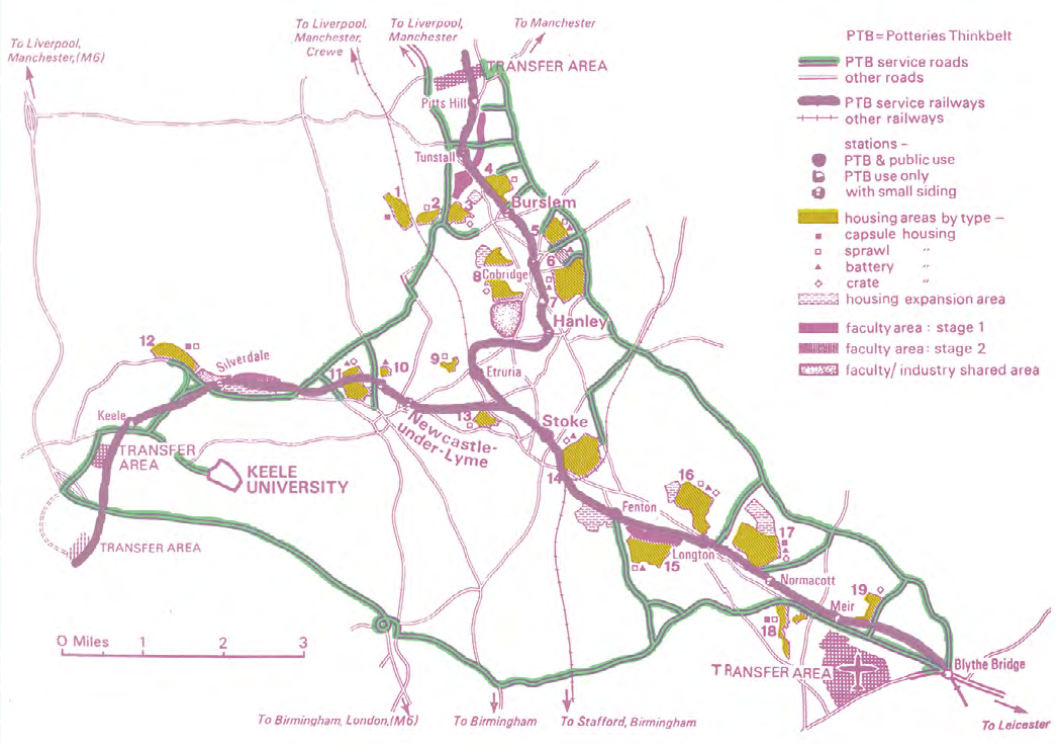


Figure 61 // PERSPECTIVES: Potteries Thinkbelt by Cedric Price - North Staffordshire Potteries, 1966



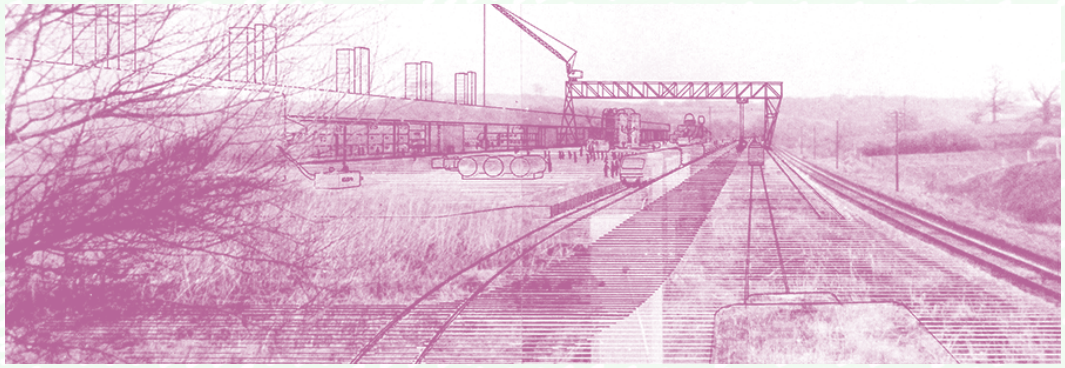


Figure 62 //
MAP & PERSPECTIVE: Potteries Thinkbelt by Cedric Price - North Staffordshire Potteries, 1966

infrastructure, local unemployment, and need for knowledge innovation, the Burnley Fun Mills seeks to make education and quality job opportunities available to those who could most benefit.

// Inter-Action Centre

In 1976, Price had the opportunity to construct a scaled-down version of the Fun Palace, called the Inter-Action Centre, in Kentish Town, a northwest neighbourhood of London. Price described the project as "a multipurpose community resources centre providing, in its first stage, workshops, rehearsal rooms, studios, assembly hall, classrooms, eating facilities and administrative office for the Inter-Action trust." While not as radical as the Fun Palace, the project used shipping containers as enclosures to slide in and out, and removed when necessary. The Inter-Action Centre was similar in its aesthetic to the Pompidou Centre, in Paris, France, although the materiality was less refined, as Price did not think of architecture as art, but something value-free. Befitting his beliefs on building conservation, the project was demolished in 2003.[41]

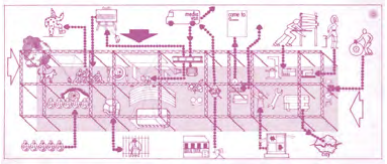


Figure 63 // PHOTOS & PLAN: Inter-Action Centre by Cedric Price - London, 1976

ARCHITECTURE'S PURPOSE

Cedric Price's beliefs on the importance of interactivity in architecture became influential throughout the 1970's, and continued to make an impact on the work of architects, writers, and teachers. In his 2005 book, *Placing Words*, architect and professor William J. Mitchell similarly states that the purpose of architecture is to produce communal experiences, specifically those of human interaction.[42] Consequently, any architectural plan should imply how human relations and activity occur within the space through its divisions and unions.[43] As illustrated in previous images, the recent response to digitalization and mobile devices has left architecture empty, waiting to be furnished in order to understand its programmatic function. Historically, architecture was meant to establish the presence of institutional permanence,[44] reflecting the current economic and political status of a society in built form, or rather molding the society to come.[45] While Price disagreed that architecture should be permanent, he did believe that buildings should reflect societal progress by acting as an instrument to incite innovation.

Architectural professor Malcolm McCullough agrees with Price on the subject of behaviourism, believing that spatial structure subconsciously affects human action, creating opportunities for participation.[46] This idea is opposed by Bernard Tschumi, who agrees with Price on designing for human activity, yet believes it is indeterminable whether behaviour can be influenced by the organization of space.[47] This project maintains that architecture contextualizes

interactions through physical sensing and gesturing, adding a layer of meaning absent from online interaction.

Price's thoughts on the disconnect between architectural space and its program are reflected in architect Tim Ireland's 2015 article, *The Spatiality of Being*,[48] which reiterates how human activity should inform spatial configuration. Just as the Fun Palace was intended to bring 1960's London to the forefront of technological advancement, Ireland believes technological changes influence present-day activity. These shifting patterns of activity eventually result in new forms of built space. Ireland argues that space is viewed as an abstract concept, and not something shaped by human behaviour.[49] While architects of the Renaissance designed space in ratio to the human body, in pursuit of harmony,[50] today's architects assume that human behaviour will follow in accordance with unreasoned designs.[51]

TECHNOLOGY'S EFFECT ON THE BUILT ENVIRONMENT

According to Picon, human behaviour is now affected by the dominance of the digital realm, and therefore, current architectural design should respond accordingly.[52] Digital devices and mobile communication are increasingly used to mask one's immediate environment, allowing

the exploration of media to be displaced from its original context. The city, which was once experienced as a composed sequence, is now experienced discontinuously, like a film with a series of jumps and flashbacks.[53] While the historic city was walled and gated, the city of the present is limitless.[54] Digital information is now overlaid onto physical spaces, constantly fleeting, yet intricately woven into the urban fabric.[55] These ephemeral moments are competing with the permanence of the built environment, which exceedingly causes architecture to lose permanent meaning.[56] By emulating the continually shifting dynamism of the Fun Palace in the adaptation of the Burnley mills, the ephemerality of the knowledge economy is no longer competing with the built environment, but rather aligning with it. The Fun Mills allow the transience of current technology to expand the depth of one's immediate environment, instead of serving as a mask to it.

WORKPLACE ARCHITECTURE

Price was torn between the view of the office as a "communications matrix and information node," saying it was too generalized to be useful, and its definition as "a mind-oriented living space", saying it was too ambiguous. During the late 1960's, many office tasks were beginning to become automated, and he thought of them as conducted in an entirely separate dimension. He was hesitant to believe that office space, in the form of an enclosure for human activity, was still a necessity for professional work. Rather, he proposed that office activities,

which still required physical space, be amalgamated with other activities.[57] His position on workplace automation is still applicable today, even more so due to advancing digitalization.

The formal qualities of architecture must now accommodate not only physical human presence, but also the ubiquitous flow of digital text, sound, and graphics.[58] In the workplace specifically, digitalization reduces the necessity for face-to-face interaction between workers on a shared site. Rather, documents and databases can be accessed and distributed to any place at any time, eliminating necessity for a centralized headquarters. Businesses now value their presence digitally, through web pages and advertising, rather than in built form, as the former can reach a larger radius of potential clientele.[59]

While architects have been designing in the presence of computers for a few decades now, the conventionalization of mobile computing drastically alters the norms of spatial organization. The need for computer labs was more critical ten years ago than it is today. At that time, they became places of discussion, teaching and learning, and places where one relied on interacting with peers. With the heightening of mobile devices, computers no longer establish fixed sites of meeting, but instead allow access to virtual communities of interest. People are less motivated to work in public spaces when they can access the same information from their home or personal office. Architecturally, there is now a demand for flexibility, and the ability to appropriate spaces for whatever activity should take place. Spaces are no longer designated with program, but intended to provide options of spatial character.[60]

The Fun Mills project overlays new models of workspace onto the space of textile production. The ephemerality of current digital work tools, required to sustain a knowledge industry in Burnley, are reflected in the building's kinetic potential. The dynamism introduces interactivity into the production process of advanced textiles, both for the workers and patrons, allowing both groups an intimate understanding of the mill's methods and product. While the ability for long-distance interaction may be technologically possible, the Fun Mills interactive environment is more conducive to productive meetings and workflow. The digital automation of tasks not only enables the amalgamation of human activity, but also of the spaces designed for those activities when necessary.

PROGRAM

Fifteen of Burnley's vacant cotton mills are adapted as interactive textile labs. To establish Burnley's sharing economy, each mill specializes in a distinct stage of advanced textile production, yet contains a similar framework of reconfigurable program. Defined space for each industry is provided with the capacity to overlap and fuse with one another. Spatial movement within the mill occurs by choice of the users, in the interest of expediting collaboration between industries when necessary. Each mill also includes a collective gathering space, private offices and meeting spaces, which similarly have the ability to relocate and transform

within the building. The spatial configuration of each textile lab is indeterminable, stimulating new events and social participation.

It is crucial to note that the term "event" shares its etymological roots with the term "invention", indicating that the event or program of a building should be what invents the architecture.[61] Through a continued reading of Tschumi's *Architecture and Disjunction*, it can be inferred that architecture cannot exist without program, without action, or without event.[62] While Tschumi's book was written in 1996, at the commencement of mainstream personal computers, the program disjunction he speaks about has progressed in tandem with advancing mobile technology. Today, however, there seems to be a detachment between building and program in many "**multifunctional**" spaces designed to respond to digitalized mobility. Rather than designing the multiple functions of the space, emphasis is increasingly placed on architecture's image, which fails to correlate to the building's function. When designing the Fun Palace, Price never dwelled on the aesthetic of the project, but rather focused on the building as an event of inciting program, sociality, and an understanding of emerging technology.[63]

Tim Ireland agrees with Tschumi that contemporary architecture no longer responds to daily human activity,[64] as many architects disregard the immanently reflexive properties of space. Space is both capable of producing and being produced,[65] and is constantly manipulating and being manipulated by human interaction. Both physical and mental interaction affects the formation of spatial environments, which consequently are social products of those that created it.[66] In recent architecture, idealized building typology that was originally designed out of functionality has been allocated to entirely irrelevant programs.[67] The practice is superficial,

DEFINE // Multifunctional [Space]

Opposed to "reconfigurable", describes a space intended to function for any possible use by its lack of design.

QUOTE // "Anyone [can] observe how much more easily… architecture can be grasped in photographs than in reality."

- Walter Benjamin
(Colomina, 1994: 47)

QUOTE // "The real world, finally, will become a fiction."

- Friedrich Nietzsche
(Tschumi, 1994: 236)

as architecture in its objective should formally anticipate, and be directed by, the events that will take place within it.[68] The program should act as the **shock factor** within architectural design, rather than be elicited from an arbitrary form.[69]

DEFINE // Shock Factor

The surprise or defamiliarization caused by architecture in order to communicate.
(Tschumi, 1996: 149)

DISJUNCTION

According to Michael Hensel and Achim Menges, the spatial arrangements of most contemporary architecture lack substance in comparison to historical precedents.[70] Rather than to similarly respond to digitalization with empty space, Fun Mills proposes a dynamically reconfiguring architecture. Robin Evans goes further to argue that the last two centuries of architecture have rid spaces of social experience,[71] as architectural drawings are currently failing to signify how they will be inhabited.[72] By beginning with a thorough understanding of program relationships, the continuously shifting plans and sections of Fun Mills consistently maintain conscious spatial functionality. The ephemerality of contemporary life has destabilized the definition of program, which in turn destabilizes the relationship of program and space. While Tschumi takes advantage of this dissociation in his landscape design for Parc de la Villette,[73] this thesis seeks to resolve disjunction by employing the technology that prompted it. Today's architects offer differing opinions of what a school building or a library should entail, and to what level digitalization is applied. It can be seen that programs are indeterminate due to the development of technology and the practices they drive.[74] The focus on solidity,

firmness, and structure in architecture is disappearing, as function has become transient, and the fleeting image is favoured over the stable one.[75] Disorder, collision, and unpredictability are becoming common attributes of spatial design.[76] In the same way that Price wanted to move architecture away from "monumental symbolism", the Burnley mills promote these values of the digital age by favouring anticipated indeterminacy. The manufactured advanced textiles act as the architecture, reshaping environments as program shifts and transforms. Spatial properties of the textiles are dependent upon both human and technological interaction, and therefore provide a sense of predictable unpredictability. While the architect predefines the options in reconfiguration, they fascinate users who are unknown to the interactivity.

As Tschumi writes, the excess of style frivolously applied to arbitrary buildings exemplifies the disjunction of current program and space. "Gothic condos, Doric supermarkets, and Bauhaus bars," expel meaning from historical architectural language.[77] Michael Hensel and Achim Menges continue this thought by explaining how two distinct organizations prevail in plans today: the corridor and cellular room arrangement, and the open plan. The former involves the incessant partitioning of space, which eliminates the possibility for face-to-face social interaction, and rather responds to privacy and security.[78] Spaces were attached to the corridor like apples on a tree, reducing the facilitation of unnecessary communication.[79] Accidental encounters would disrupt the running of the architectural **machine**, meant to hide people from other people.[80] In opposition, the open plan has a preference for transparency,[81] and historically was devised to allow all members of a household to serendipitously interact.[82] The Modernists thought of homogenous universal space as a democratic solution, enabling equal opportunities for inhabitation. It was believed that an open environment minimized

DEFINE // Machine

A mechanism that, after being set in motion, performs with its tools the same operations as the worker formerly did with similar tools. (Marx, 1887: 495)

visual, aural, and tactile distractions, and was applied to many building types as standards were established.[83] While an open plan might be preferable for certain people in certain programs, others may find it stifling and intrusive. The reconfiguration ability of the Fun Palace, to be applied to the Burnley cotton mills, allows for its architecture to be neither closed nor open, but rather able to experience all stages of a gradient in between. By cycling through acceptable program relationships, selected when desired by the user, both privacy and collective collaboration can occur in the same space.

According to Evans, since the mid-nineteenth century, no substantive changes in institutional planning have occurred, merely accentuations and modifications.[84] It should be of great concern why the corridor model still prevails when the social constraints that devised it are no longer relevant.[85] Architecture should not be preventing sociality, in the same way rows of looms isolated workers at the height of industrialization, but allowing more options for sociality to occur. Lately, more focus is given to the fabrication of architecture over its inhabitation,[86] and the standardization of building systems has contributed to this. This standardization becomes reminiscent of the original cotton mill layouts, which were designed to inhibit sociality and collaboration. Today, the practice produces generic social environments, surrounded by generic shells that are eventually customized to suit the specific inhabitants.[87]

Figure 64 // PHOTO & PLAN: Bürolandschaft Office Landscape Approach by Quickborner Team for Planning and Organization - Hamburg, 1950's

Example of open plan.

Figure 65 //
PLAN: Bearwood Country Residence by Robert Kerr - Berkshire, 1864

Example of nineteenth century corridor plan which separates servants.

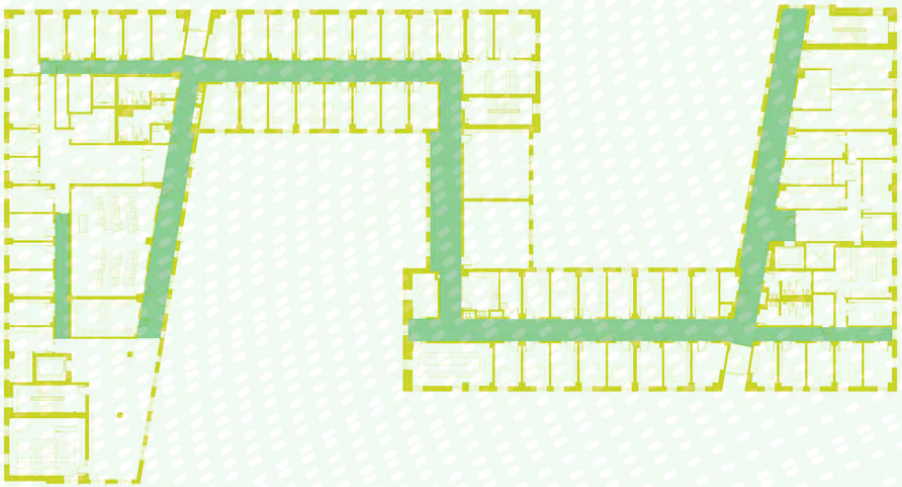


Figure 66 //
PLAN: University of Connecticut Social Sciences Building by Leers Weinzapfel Associates - Storrs, CT, 2012

Example of twenty-first century corridor plan.

SUPERFICIALITY

Bernard Tschumi, Beatriz Colomina, and Alicia Imperiale all speak about superficiality as a marker of both postmodern and contemporary architecture, each providing their own term for parallel issues. While Tschumi identifies the issue as "empty form," Colomina sees it as a fetish of representation, and Imperiale discusses the matter of flatness and depthlessness. Price's work challenges the issue of superficial architecture as he never emphasizes a project's appearance or representational imagery. Instead, he focused on the functionality of the plan and section, never dwelling on issues of façade or finalization. Similarly, the basis of Fun Mills' design lies in its programmatically adaptable work environment, relying on the physical qualities of advanced textiles and dynamic reconfiguration. The project emulates Price's ideology in that it is purely a programmatic and spatial exploration, with appearance of least importance. The existing facades of the cotton mills are not substantially transformed.

The introduction of photographic reproduction in architecture, along with the circulation of mass media, flattened the meaning of architecture into a flat, passive image, rather than a place designed for functional use.[88] In her book, *Privacy and Publicity*, Colomina argues that the invention of photography transformed architecture into a consumer commodity, specifically during Modernism. This architectural era began the experience of buildings through photographic evidence rather than first-hand, or through conventional drawings or books.[89] Notions of superficiality were also reinforced by new construction techniques developed in the

Figure 67 //
PHOTOS & PLAN: Eberswalde Technical School Library by Herzog & de Meuron - Eberswalde, 1999

Example of superficial architecture.

Modern era, which allowed walls not to be used structurally, and rather seen as ornamental.[90] This led to a standardization of structural patterns, repetitive grids of steel, wood, or concrete, to satisfy a preference for building efficiency. The method drives an interchangeability of buildings that enables reinvention through the shedding and replacement of the skin.[91]

While Price was never interested in a building's imagery or materiality, Postmodern architects and critics had a tendency to discuss architecture in terms of what was conveyed by the façade. The concern for architecture's appearance as a surface, and not as structural space, was reinforced by the progression of image-based media.[92] When attempting to market the Fun Palace to developers, images of the building's appearance were not released, as it was unpredictable what the building would look like at all times. The appearance would shift with the current activity, by virtue of the building's undetermined development.[93] He maintained that the building's value lay in its opportunities for social participation, and the means resulted in a perceived mechanical aesthetic.[94] Other architecture around this time ignored the inner workings of buildings, indicating Postmodernism by literal superficiality and flatness, writes Imperiale. In her book, *New Flatness*, she says the façades of this time acted as a mask for the rest of the building, simply decorated with patterns and colours. This allowed the overall appearance of the building to be easily differentiated without any reorganization of the building. Surfaces were used as a form of media, rather than the geometry of the plans and sections.[95]

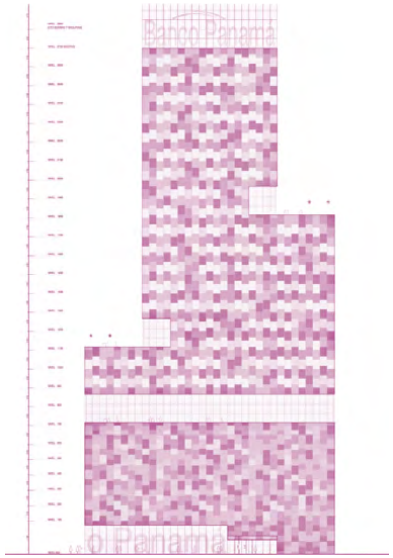


Figure 68 // ELEVATION: Bank of Panamá Tower by Estudio Herreros - Panamá City, 2012

Example of superficial architecture.

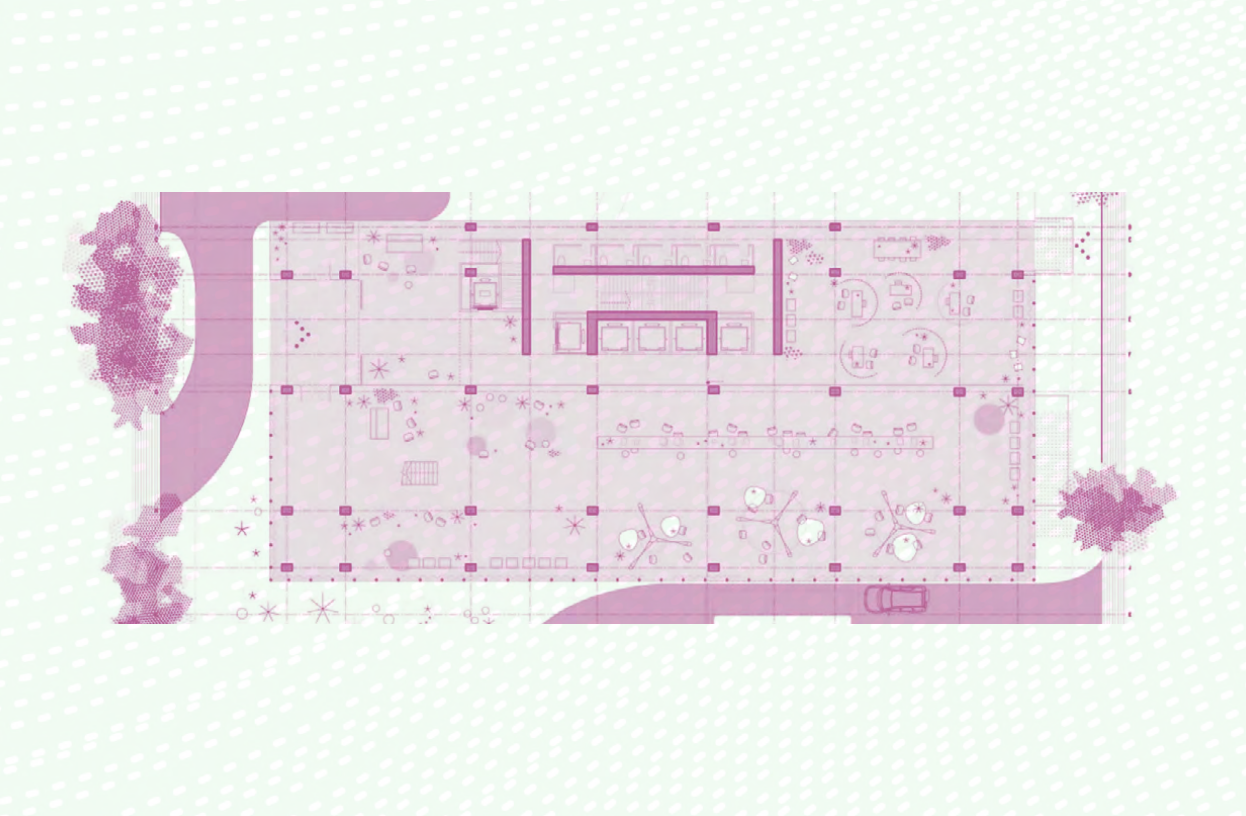


Figure 69 //
PLAN: Bank of Panamá Tower by Estudio Herreros - Panamá City, 2012

Example of superficial architecture.

The ubiquity of image-based media continues to reinforce superficiality as the signifier of the contemporary era. Architectural history is more often studied through reproducible images than first-hand, encouraging building interchangeability.[96] By concentrating the design's objective on interactivity between industries and building materials to facilitate this, Fun Mills places its value in functionality over aesthetic.

// Shocking with Function over Form

The relationship of form and function has become interchangeable, a complete contrast to the traditional notion, whereas one would follow the other. Today, architects create a "shock factor" by juxtaposing programs with unconventional respective forms.[97] This method of shock can prove to be ineffective when preventing program from functioning efficiently. It can be discerned that architects are fascinated by the dramatic, and that if architecture is to communicate, there must be some sort of shock factor.[98] Shock may act as the only method of communication in a time when all information is easily accessible.

However, historicists, contextualists, and postmodernists may argue that architecture should not be defamiliarizing in the same manner that fine art aims to be. These people see architecture as a means to comfort users, and to provide a sense of familiarity. The general public will usually take the side of these traditionalists, seeing architecture as shelter, defined by bricks and mortar. In opposition, those who see architecture as places of experience and a representation of societal innovation are the ones who wish to advance society. Price upheld this point of view, asserting that architecture had the potential to incite an educational industry by introducing interactive user participation. For the innovators, shock is something to be employed in architectural design, yet not necessarily through the separation of form and function.[99] The interactivity and dynamism of Fun Mills' function elicits a sense of shock in its users, as its reconfigurability continually enables the production of new spaces.

SEQUENCES AND MOVEMENT

This thesis seeks to address how architecture can address the issues digitalization presents in physical space by attaining a balance between determinacy and indeterminacy. Humans will always operate through a body in physical space. This requires some sort of determinacy in order to be productive in their environment. However, digital mobility enables activity to be carried out anywhere, introducing the movement of indeterminacy into one's environment. The nuance of the two opposing qualities of space produces Fun Mills, which houses and contextualizes the digital through Price's framework of reconfigurable flexibility.

Without the movement and action of everyday life, architecture could not exist.[100] It is the movement of bodies which produces spaces.[101] Therefore, buildings should be designed to accommodate the constant production and change of the contemporary era, and promote the programmatic indeterminacy caused by digital mobility.[102] The architect's task is to organize events in a strategic way, which should not imply locating them in a fixed place. Cedric Price acknowledged the inevitability of collision amongst a building's activities, designing spaces with the ability to reconfigure. Tschumi continues this idea, saying that architects should create opportunities for events to collide throughout spaces, favouring uncertainty over certainty.[103] A building should be experienced through time, frame-by-frame like a film,[104] rather than at a glance like a billboard.[105] As floor planes relocate within the Fun Mills, the building frames a new environment to create diverse user experiences.

The process of architectural design is usually composed of many iterations of the same scheme,[106] especially with the introduction of the computer as a design tool. As computers are machines that produce sequences of events, the final building design is usually an arbitrary stop in an evolving design process based on deadlines. Architects should take advantage of the sequencing made possible by computer modeling,[107] in order to design the process as the final result. The transformation of spaces would rely on a set of rules, such as compression, rotation, insertion, and transference,[108] in the same manner that Price systematized indeterminacy through his drawings of the Fun Palace. Price thought of the project's structure as an "operative space-time matrix of virtual architecture", comparing the variable program to a computer program.[109]

Alicia Imperiale explains that space is not a fixed object, but something malleable and changeable. The consideration of time only adds to the pliability and variability of space,[110] along with the input and output of human activity.[111] Tim Ireland adds that the chain of action created by human movement is most appropriately expressed through **topological surfaces**, such as textiles, as they communicate space as a set of points. The topological properties of textiles portray a sense of motion not possible with the application of rigid forms, responding to the convening and dispersal of points with each gesture.[112]

DEFINE // Topological Surfaces

Defined by its departure from the Euclidean geometry of discrete volumes represented in Cartesian space, and the extensive use of topological, "rubber-sheet" geometry of continuous curves and surfaces. Mathematically described as NURBS (Non-Uniform Rational B-Spline) curves and surfaces. In the topological space, geometry is represented not by implicit equations, but by parametric functions, which describe a range of possibilities.
(Kolarevic, 2000: 99)

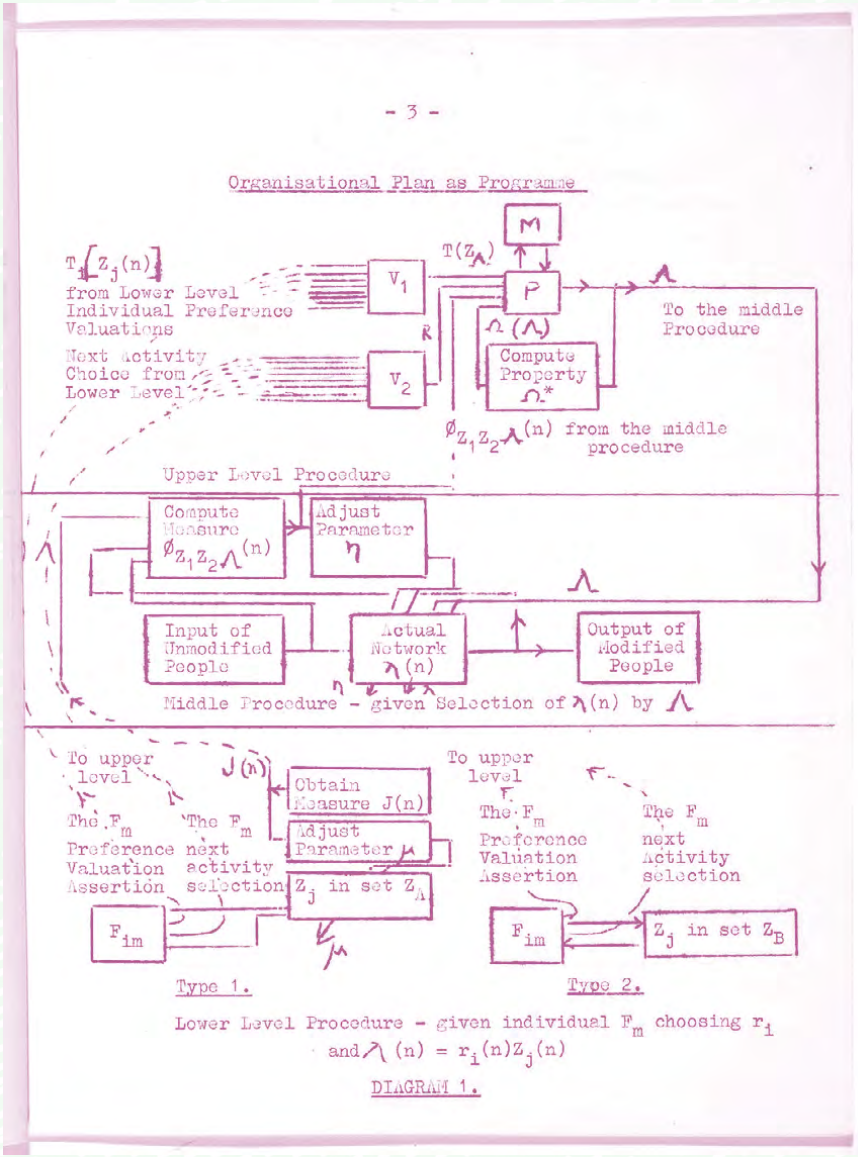


Figure 70 //
TEXTUAL RECORD: Fun Palace by Cedric Price - London, 1966

Document created by Price and his colleagues, showing cybernetic plan of the Fun Palace. The mapping elicits a comparison of the building's programming to a computer's programming.

PART 2 CONCLUSION

By harnessing the principles put forward by Cedric Price in both his Fun Palace and Potteries Thinkbelt, this thesis proposes to transform Burnley's cotton mills into interactive workspaces. Price believed that architecture should reflect the technological progress of society by actively serving as a vessel for innovation. Most current architecture attempts to address the increased mobility caused by digitalization by offering empty, generic spaces, unable to reflect the character of their program. Architecture is then flattened into a representation of its façade, which fails to correlate to the building's function. Rather than responding to technology's indeterminacy with superficial forms, Fun Mills' shock factor and character arises from its attention to program functionality. The reconfigurable architecture spans determinacy and indeterminacy in its spatial qualities, both grounding and accommodating the movement of digitalized mobility.

3

Economy, Technology & Displacement

ECONOMIC HISTORY OF BRITISH TEXTILE MANUFACTURING

Looking at Cedric Price's Fun Palace as a precedent study, this thesis attempts to prepare the current UK economy for the digital age, through the design of technologically enabled work and education environments. In order to predict future economic trends, it is necessary to first examine an abridged history of the UK economy and how it was affected by technological advancement.

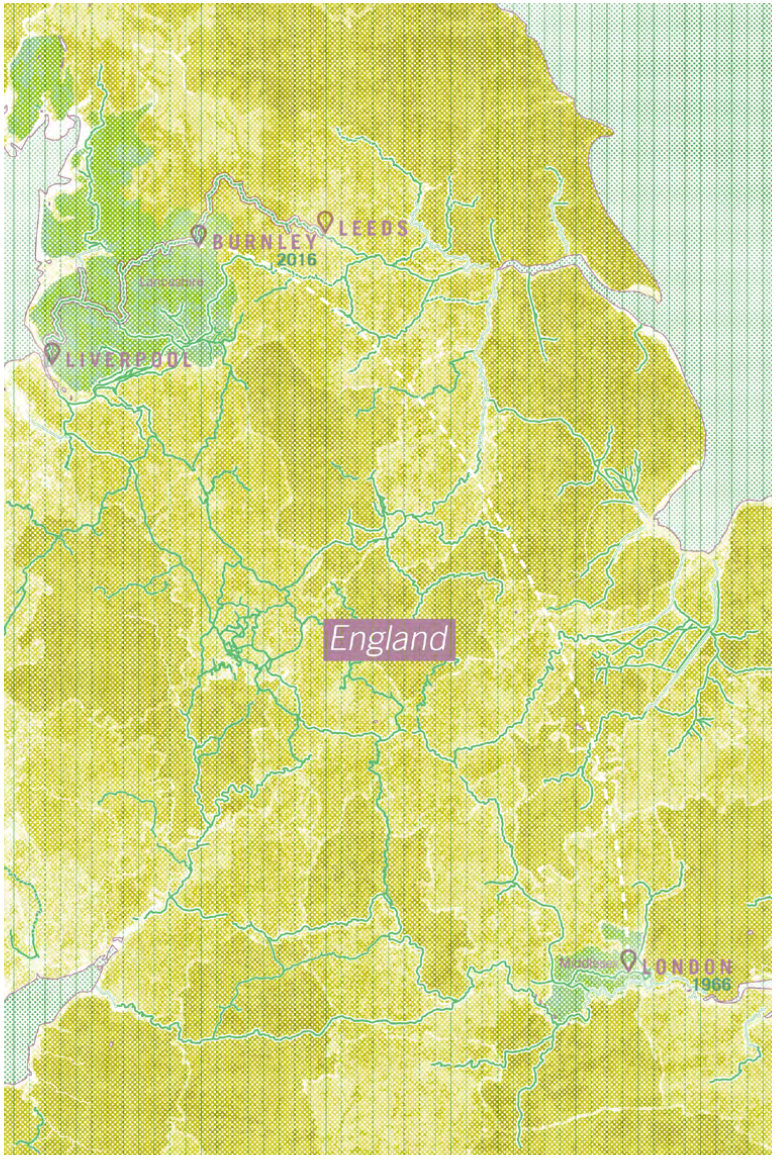
Burnley began its role as the centre of the wool and cotton industry back in the 1730's.[113] The town was chosen for the specialization because of its heavy rainfall and damp climate, as the high humidity prevented fibres from splitting.[114] The town's central transport location on the Leeds and Liverpool Canal, along with the new textile machine, gave rise to a specialization in cotton. Dozens of mills lined the waterway, which functioned as the spine of the town.[115] Within the cotton industry, Burnley concentrated mostly on weaving, having the largest number of looms per establishment in all of Lancashire.[116]

By 1901, the UK was still in relative economic stability, and manufacturing was still the country's dominant industry.[117] Lancashire employed 75.8% of the country's cotton workers, dispersed amongst Manchester, Bolton, Burnley, Blackburn, Oldham, Preston, and Stockport.[118] Even by that time, Burnley was the most economically distressed town.[119] Each town specialized

Figure 71 //
MAP: United Kingdom
(Page Right)

Highlighting London, the city Fun Palace aimed to economically and socially revive in the 1960's, along with Burnley, the city Fun Mills aims to revive today.


LEEDS + LIVERPOOL CANAL
Liverpool
Maghull
Downholland Cross
Halsall
Rufford
Parbold
Wigan
Leigh
Dobbs
Wheelton
Blackburn
Cowdhurst
Carlton-le-Moor
Gannow Tunnel
Burnley
Brierfield
Barrowford
Salterforth
East Marton
Skipton
Silsden
Bingley
Shipley
Calverley
Bramley
Armley Pop.
Leeds
Stanley Dock
Bootle
Aintree
Litherland
Ashton
Lathom
Parbold
Appley Bridge
Johnson's Hillock
Riley Green
Rishton
Church
Barrow
Ightenhill
Reedley
Nelson
Foulridge Tunnel
Barnoldswick
Gargrave
Kildwick
Keighley
Saltaire
Apperley Bridge
Rodley
Kirkstall
Granary Wharf
Scotland
Atlantic Ocean
North Sea
Northern Ireland
Isle of Man
Irish Sea
Ireland
England
Wales
Celtic Sea
UNITED KINGDOM


BURNLEY
2016
LEEDS
LIVERPOOL
England
LONDON
1966

in a particular type of textile production,[120] and each mill specialized in a different stage of the manufacturing process. In order to systematically work together, the mills clustered together geographically. Approximately 2,000 mills in Lancashire worked in spinning and weaving, and the industry continued to grow by multiplying the number of small mills, rather than by increasing the size of existing ones. By 1907, 89% of textiles produced here were internationally exported.[121]

Over the years, competition from overseas began to threaten the success of the UK's cotton industry.[122] There was a decline in imperial trade, and rising competition from Japan,[123] China, and the Middle East. An increase in Indian production along with Indian tariffs preventing import also hindered Lancashire's prosperity.[124] The UK mills continued to use the power loom when other countries, such as the US, began utilizing more efficient ring frame and automatic looms.[125] The two World Wars caused economic and political readjustment, leading to a nationwide decline in employment.[126] There was an especially negative impact to the cotton industry throughout the two wars, as raw material became more difficult to obtain.[127] The industry continued to slowly decline up to the 1970's.[128] The once clever location of cotton mills in proximity to raw materials and waterways became unnecessary, as the cost of transport dropped over the twentieth century. Electric power generation eliminated the need for a continuous coal supply further reduced the importance of Burnley's geographic location.[129]

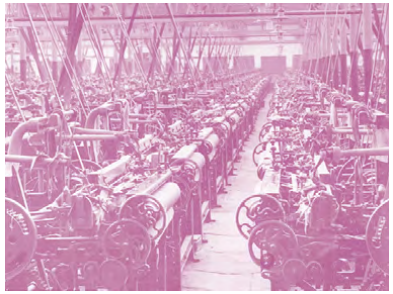


Figure 72 // PHOTOS: Burnley Cotton Mills at Time of Operation

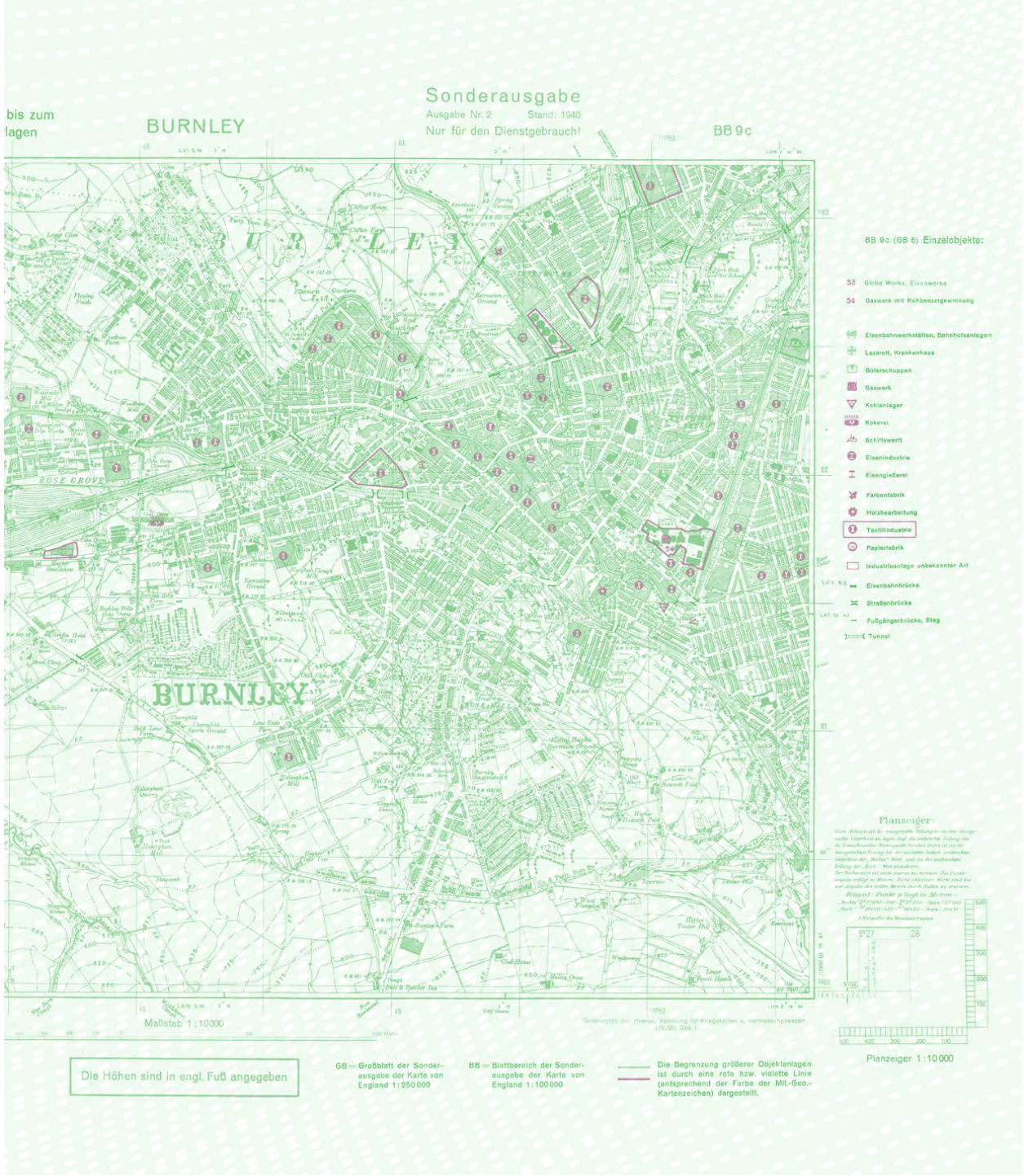


Figure 73 //
MAP: Burnley Map Highlighting Textile Mills - 1941

Textile mills can be located where the "textilindustrie" icons appear.

Figure 74 //
DATA: Burnley vs. London - 1901

(Clayton & Mandair, 2012: 4, 20, 22, 30, 15-16)

// Leeds and Liverpool Canal

During the mid-eighteenth century, transport connections to the west coast of England were limited, with the rivers of Lancashire too rapid for boats to navigate. Traders within the county required the cheap supply of coal in order to maintain industrial businesses, and wool manufacturers around Leeds desired access to Liverpool ports for American trade.[130] In 1770, the first phase of construction on the Leeds and Liverpool Canal began, completing its third and final phase almost fifty years later,[131] stretching 204 km long.[132] The establishment of the canal led to the large import of raw cotton from American plantations through Liverpool, which supported the Lancashire mills in advancing the thriving textile industry.[133] While coal, ironstone, and limestone were the primary cargo to be transported along the waterway, various kinds of merchandise followed due to the route's heavy industry.[134] The newfound availability of different food, alcohol, and domestic products considerably transformed the consumption habits of the cities and towns in canal adjacency.[135] Although damage caused disruption during the Second World War, trade resumed along the canal until the late 1980's.

Figure 75 //
DIAGRAM: Stops on Route Leeds & Liverpool Canal

SHIFT IN CURRENT BRITISH ECONOMY

Today manufacturing makes up a tenth of the UK economy, seeing a decrease in employment by 60%, although there has been an increase in output. While the country continues to manufacture, digitalized automation has reduced the need for large amounts of workers.[136] Currently struggling UK cities have simply continued to replicate their economies, instead of reinventing them. The jobs in these declining industries are being replaced with even lower-skilled, more routinized jobs, such as cotton mills being swapped for call centres. Some cities have even struggled to replace their failing industries at all.[137] By looking at *Figure 76*, there is a clear geographic pattern of declining jobs, focused in and around Lancashire. Whereas the benefit of locating in a city was once waterways for transport, fuel sources, and large numbers of workers, today the benefit is the knowledge exchange. Increasing globalization has allowed businesses to locate their low-skilled, routinized work to offshore sites.[138] Accordingly, the Lancashire area is in decline due to the unavailability of skill development for knowledge industries, not exclusively due to the manufacturing departure.[139]

The UK economy is increasingly specializing in more knowledge-focused industries, such as banking, information technology, digital media, and creative activities, due to the increasing development of ubiquitous information. In these contemporary industries, it is the production of the idea which is valued over the production of the physical good.[140] It is evident that the majority of knowledge jobs are located in the same areas of economic prosperity.[141]

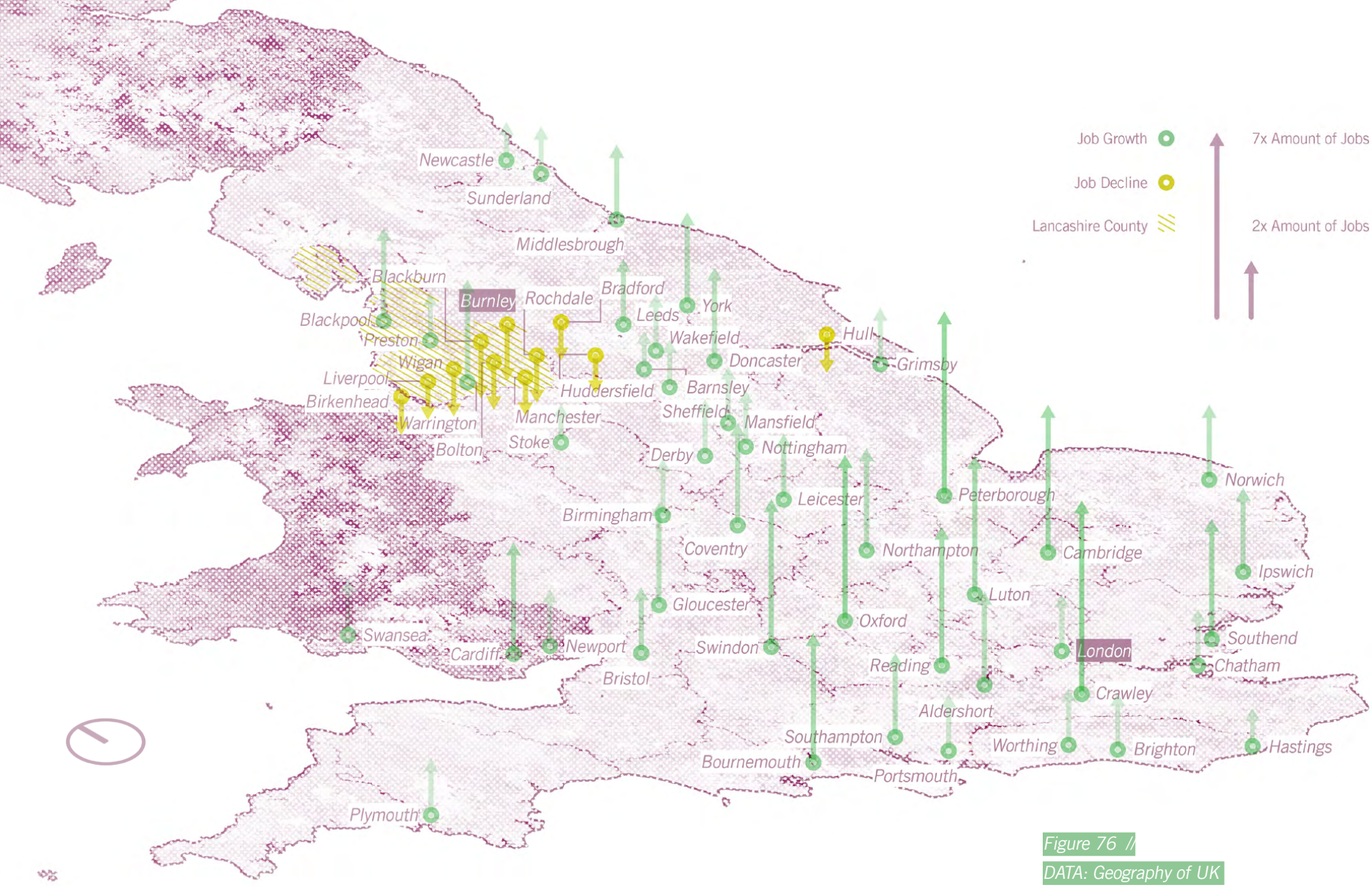


Figure 76 //
DATA: Geography of UK
Employment Growth & Decline

Data from 1911-2013 (Swinney & Thomas, 2015: 6)

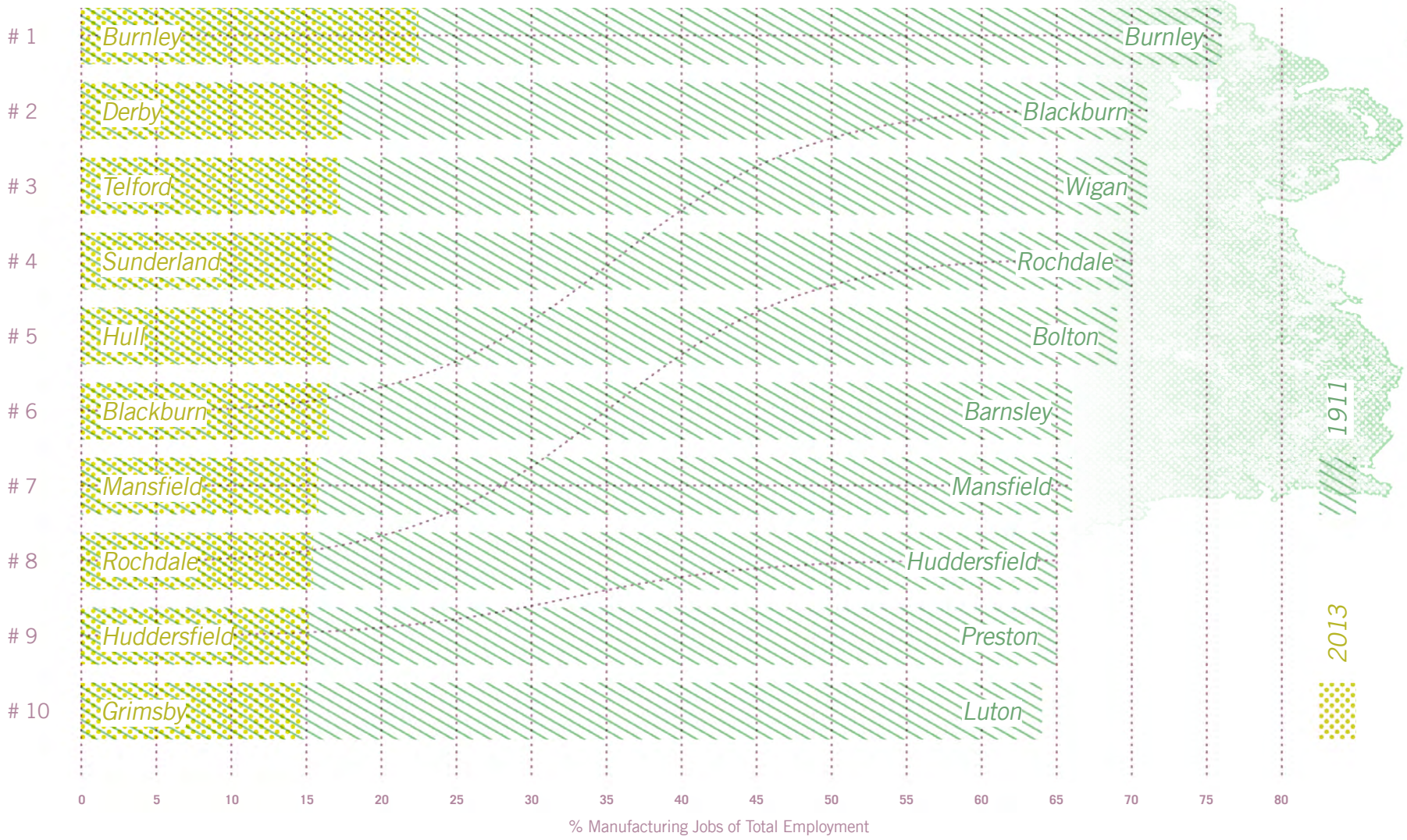


Figure 77 //

DATA: Top UK Manufacturing Cities - 2013/1911

(Elledge & May, 2015), (Swinney, 2015)

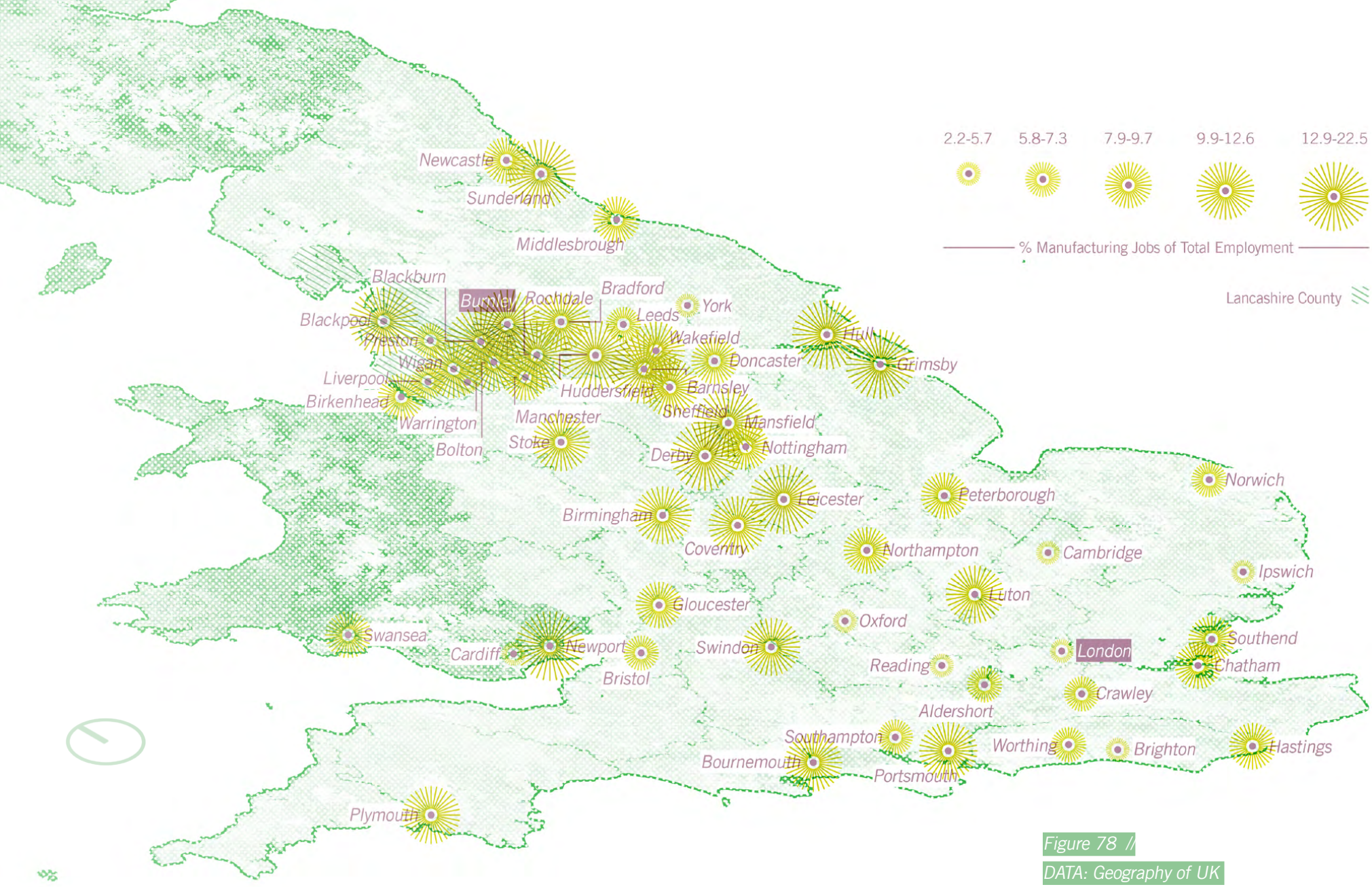


Figure 78 //
DATA: Geography of UK Manufacturing Economy

Data from 2013 ("Outlook Data Tool," 2016)

// Burnley Today

Today, Burnley has half the number of jobs it did a century ago.[142] While it still has the highest percentage of manufacturing jobs of any UK city, the sector now accounts for a quarter of the town's employment, a decline from three quarters in 1911.[143] The town's current economy is a paradox, simultaneously named the most struggling and most enterprising UK borough.[144]

In support of the latter statement, an expansion in employment has recently occurred with the creation of 600 digital sector jobs in the past year. The digital sector includes the manufacturing of communications and computer equipment, IT programming, telecommunication, software publishing, and sound and motion picture production.[145] The town has advertised that it contains a large skills bank to support small and medium-sized businesses, and is an affordable place to establish a company.[146]

The town poses an opportunity for design intervention, in order to properly prepare the manufacturing-reliant workers for the shift to a knowledge-based economy. Its central location on the 204 km long Leeds and Liverpool Canal, connecting to ninety-one locks on the main line, allows for possible connections between the industries of many neighbouring towns. The River Calder passes through the Burnley, linking five more towns, Whalley, Altham, Padiham, Walk Mill, and Holme Chapel. Taking into consideration Lancashire's long history of textile production, the adaptation of existing unused cotton mills into interactive textile labs is an appropriate method for reconciling the town's economy for the knowledge era.

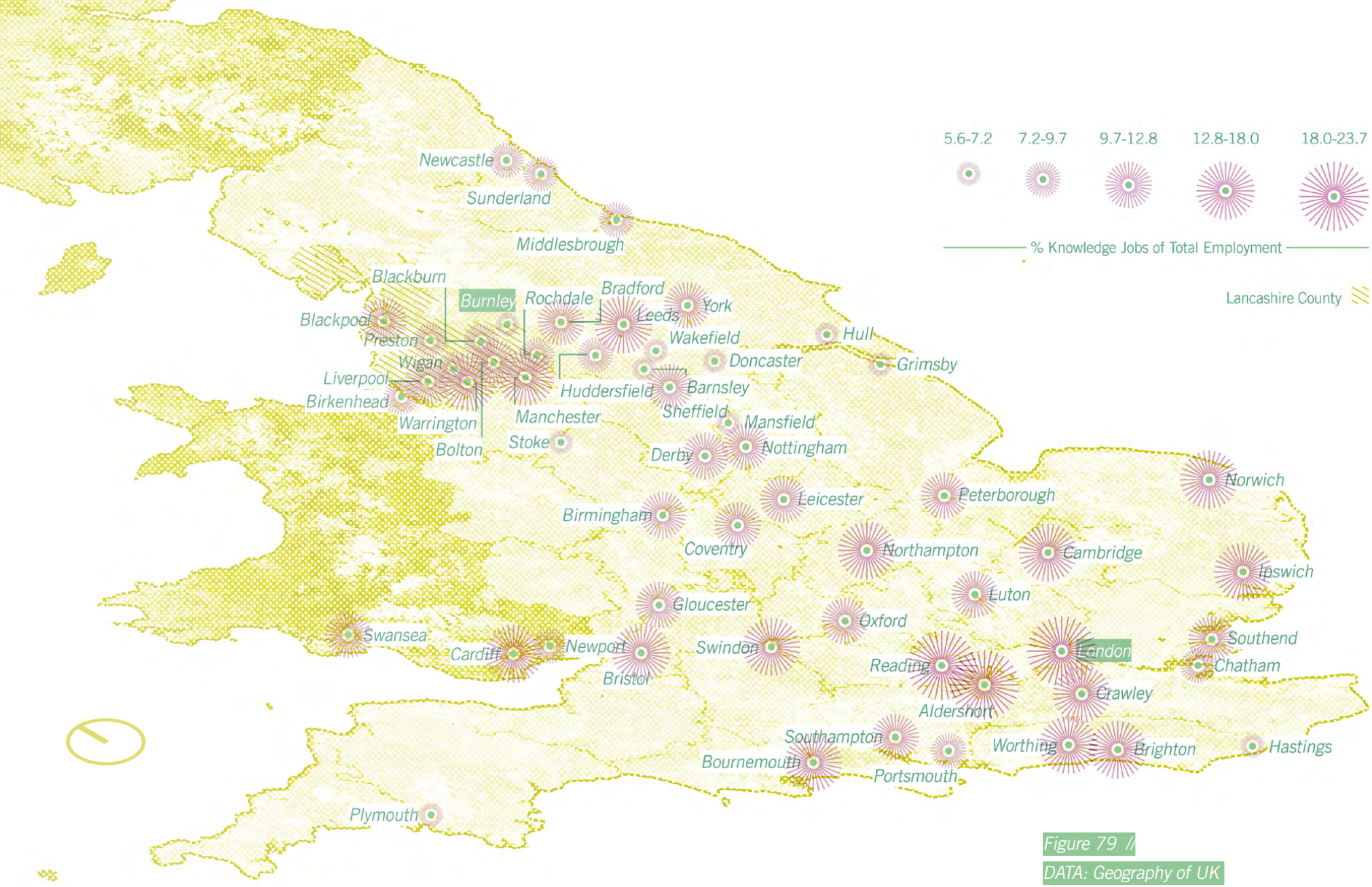


Figure 79 //
DATA: Geography of UK Knowledge Economy

Data from 2013 (Swinney & Thomas, 2015: 12)

Figure 80 //
DATA: Burnley Employment Statistical Breakdown

Data from 2011 ("Neighbourhood Statistics: Burnley," 2016)

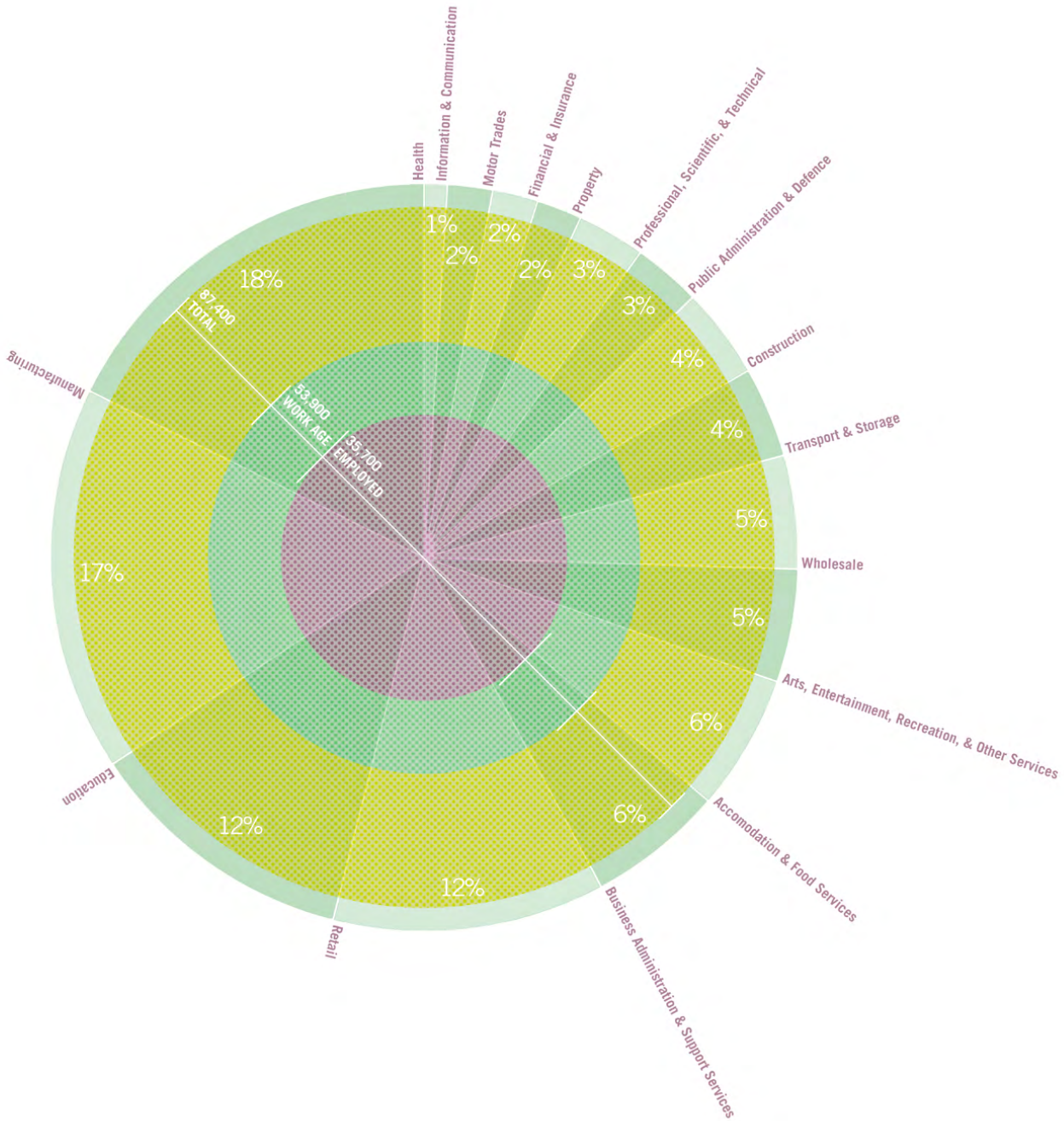
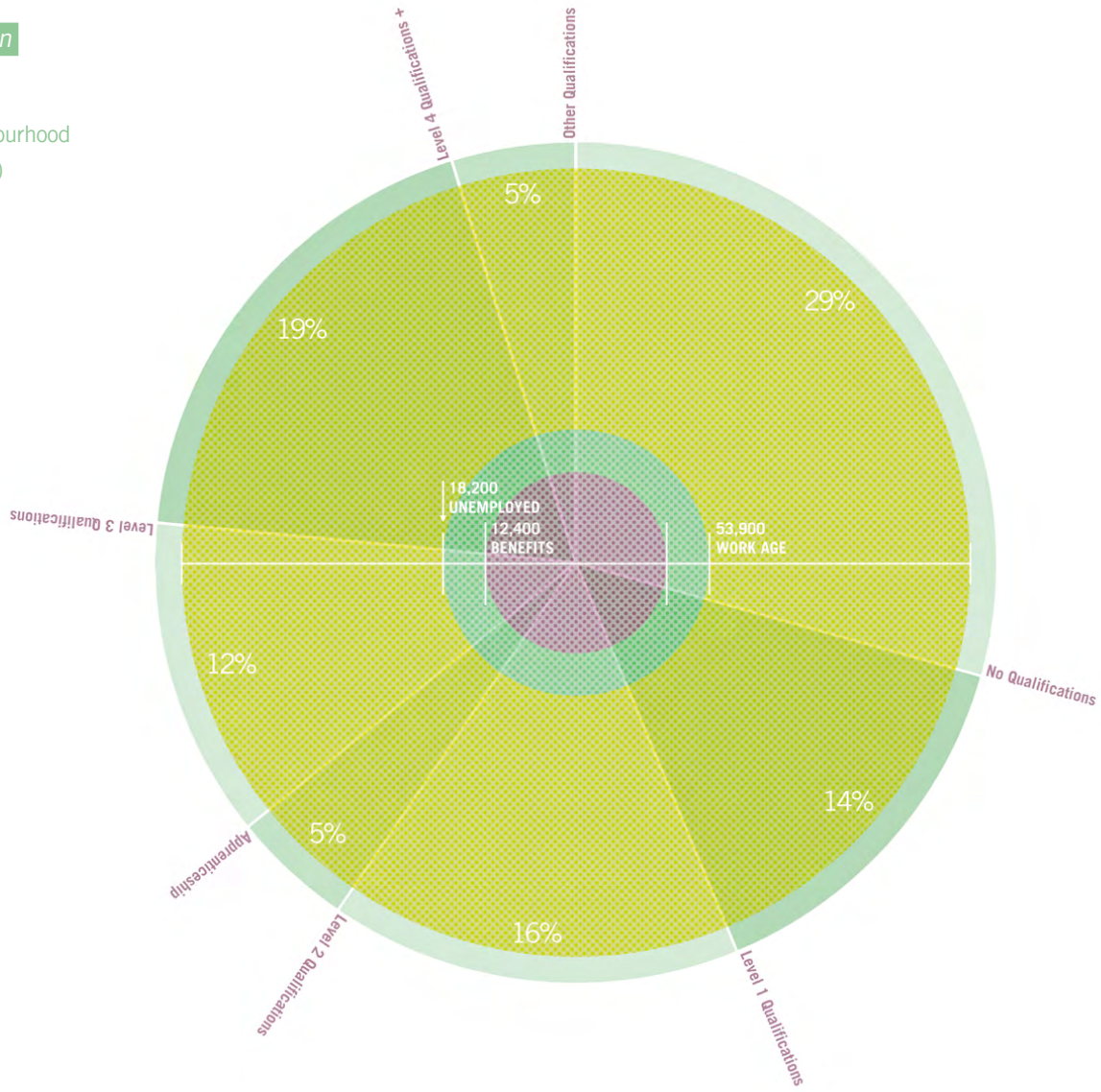


Figure 81 //
DATA: Burnley Education Statistical Breakdown

Data from 2011 ("Neighbourhood Statistics: Burnley," 2016)



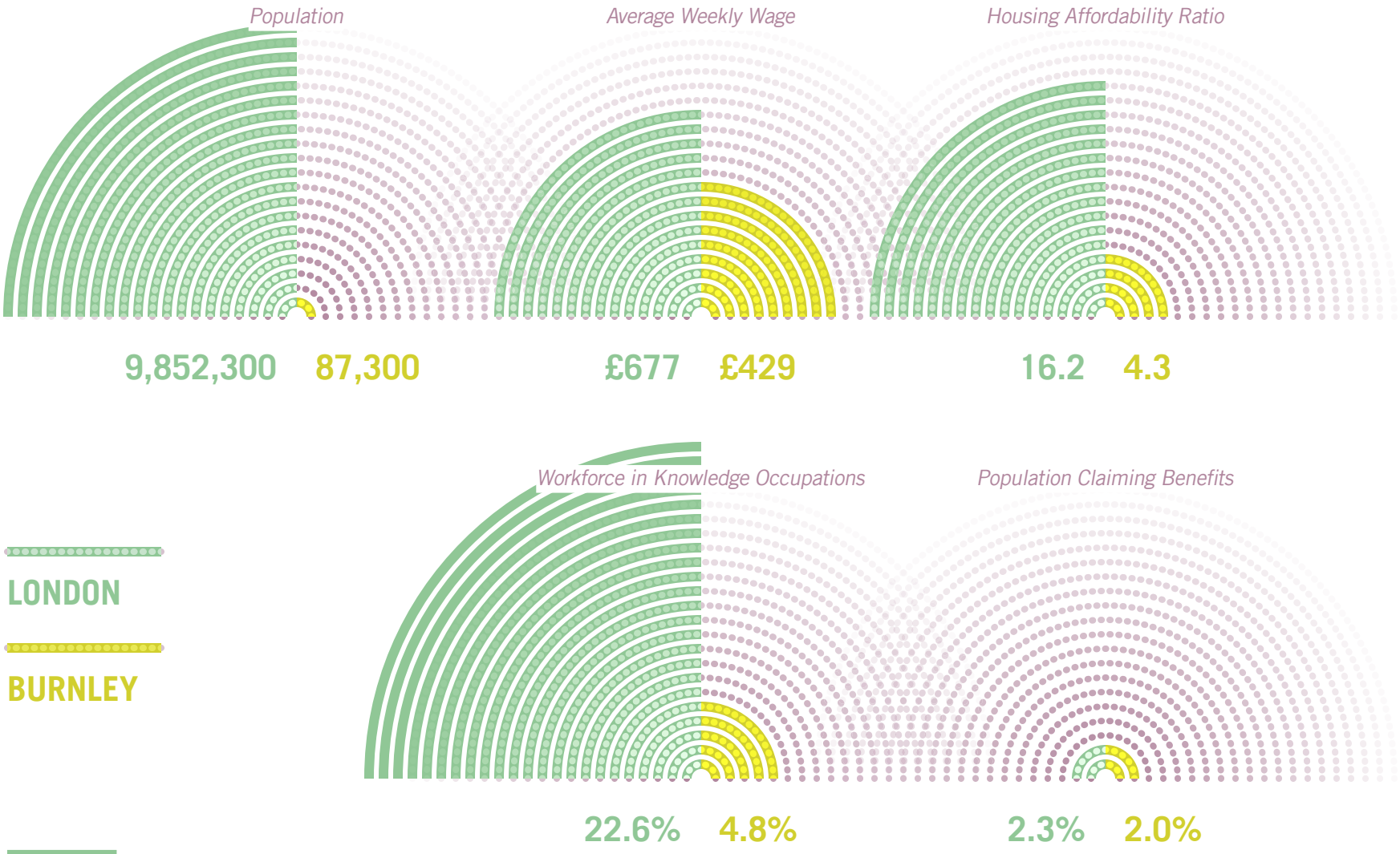


Figure 82 //
DATA: Burnley vs. London - 2014

(*Cities Outlook 2016*, 2016: 28, 48, 54), ("Outlook Data Tool," 2016)

MAN AND THE MACHINE

Philosopher, Karl Marx, wrote heavily on the subject of technology and the economy, and how each historically affected the other's projection. Known as "technological determinism" this thesis seeks to utilize current technology for economically beneficial intentions, in a town that experienced the rise and fall of industrialization. Marx's theories are particularly relevant.

In Marx's 1887 work, *Das Kapital*, he discusses how work is what defines humans, and that the practice "fulfills our species' essence." Work allows humans to be creative and flourish, however, during Europe's Industrial Revolution, work destroyed workers. To mill and factory owners, a worker was an abstract idea that needed to be fed, and the workers' only choice was to work many hours for unfairly low wage. The introduction of mechanization contributed to the decrease in pay, as production became quicker, requiring less training, and making employees easily dispensable. The automation of labour, such as the looms used in Burnley mills, also created the possibility for women and children to take part in the manufacturing industry. Marx stated that this technology alienated workers, alienating them from their labour and the resulting products. The workers carried out the same routinized stage of production all day, for tedious hours, which caused them to become cogs in a giant machine. As well, the workers could not afford the products they created, and were generating wealth for the employer who did not respect them. The few hours at home to eat, sleep, and relax were the only periods of time the workers got to live.

Marx explains that the bourgeoisie (employers) push capitalism onto the proletariat (workers) for personal gain. This results in technology and society constantly spurring one another to keep up with the other one. "The bourgeoisie cannot exist without constantly revolutionizing the instruments of production, and thereby the relations of production, and with them the whole relations of society." While the increase in productivity of machinery signals the increase in worker alienation, Marx believed the process would eventually cause an ultimate downfall. Once work has become completely automated and the worker is eliminated from the process of production, capitalism will come to an end. He says the proletariat will be emancipated, liberating the domination of humans from other humans. A new society will emerge where mechanized production will serve everyone rather than a select few, and the proletariat will finally benefit from technological advancement.[147]

While it may seem that Price intended for the Fun Palace to liberate people from life-encompassing work through automated technology, the current production methods of the knowledge economy contradict this position. The harsh conditions of the Burnley cotton mills and the indeterminacy of the Fun Palace each promoted work through distinct architectural design, which anticipated the prevalent modes of labour and production. The more recent value attributed to education and creativity within the knowledge economy characterizes the power of labour to be the ability to adapt. Spatial relations become transient, complex, and impossible to tie in place when language, exchange, and collaboration become the primary instruments of production. As work no longer requires activity-specific tools to accomplish, it is emptied into generic form through digital devices, and workspaces need to provide flexible, reconfigurable arrangements in order to cater to human subjectivity. Price's emphasis on

social participation opportunities within the Fun Palace, to foster creativity, aligns with the knowledge economy's mode of production, that time dedicated to leisure is now an essential component of work. Digitalized mobility makes work possible wherever and whenever, to the point where life becomes a substrate of production. The architectural principles of flexibility and uncertainty are no longer thought of as liberating values, as the spatial accommodation of indeterminacy becomes twenty-first century capitalist architecture.[148]

Despite this view, it can be argued that the anticipated indeterminacy of the Burnley Fun Mills does not reinforce capitalist work regimes. By merging the principles of the Fun Palace with the proposed sharing economy of Burnley, capital is equally dispersed amongst all workers, and no longer in the hands of the 'bourgeoisie'. The network generated by Fun Mills, and within each individual mill, equivalently values each industry in order to function efficiently. This horizontal network does not marginalize manufacturing workers. The alienation issues associated with capitalism were predominantly caused by worker subordination and disconnect from the final product, both matters the Fun Mills aims to resolve. Therefore, the Fun Mills' sharing economy opposes the criterion of a capitalist work environment, and economically benefits each the manufacturing, service, and knowledge industries.

MAN THE MAKER

As this thesis seeks to introduce knowledge workers into the manufacturing-heavy town of Burnley, by means of advanced textile production, there may be misconceptions about the viewpoint on manufacturing jobs. While the project seeks to amalgamate the knowledge, manufacturing, and service sectors in order to flourish the economy, it does not denounce any of these professions. All three industries are necessary to reestablish Burnley as the center of textile production in Britain. Philosopher, Hannah Arendt, wrote about *Homo Faber*, translating to "man the maker" in contrast to *Animal Laboran*, meaning "animal labourer" as the two different types of fabricators. She stated that Homo Faber understands how his or her products will affect the world, and through them is trying to make the world more useful and beautiful. In opposition to this, Animal Laboran does not understand how his or her fabrications affect the world at a societal extent, and only attempts to make life easier and longer in his or her creations.[149]

Arendt's student, Richard Sennett, expands on her writings by saying that Homo Faber is superior of Animal Laboran. He says Homo Faber is the judge of material labour and practice, asking why, not how. Contrarily, Animal Laboran is a human being condemned by drudge and routine, absorbed in a task that shuts out the world. In the act of making his or her work, nothing else matters, as the work is an end to itself. This person is capable of thinking, although it is constrained to the process of making, only asking how, not why.[150]

It can be inferred from Arendt's writings that Animal Laboran is the same proletariat worker Marx refers to in *Das Kapital*, mindlessly producing objects of which he or she does not understand the significance. As the thesis proposes to introduce knowledge workers in Burnley for the production of advanced textiles, these workers may be seen as superior to the manufacturing workers, similar to Sennett's explanation of Homo Faber. However, this hierarchal relationship is not the project's intention. The design proposal will enable the knowledge and manufacturing workers, along with service workers, to equitably work together, each providing essential contribution to the production process and ultimately the economy. A worker in the nineteenth century might be seen as a drudging animal, unable to understand the product of his or her labour due to the standardized and alienating environment of the cotton mill; factory workers as cogs in a machine. Price intended to remedy this issue in his Fun Palace proposal, so that the building would educate and familiarize people with new technological modes of production. It can be argued that the project's adaptability and space for subjectivity was designed to transform all workers' outlooks from that of Animal Laboran to the more informed position of Homo Faber, enabling a more equalized sharing economy.

DISPLACEMENT

Mitchell states that the digital devices, which provide people with a sense of connection, have become objects of displacement in reality. The range of activities in a given space and time becomes extended and jumbled,[151] as a portal to somewhere else always exists, placing a hold on one's current surroundings.[152] While some forms of technology create a partial displacement from reality, masking only one sense, such as headphones and wearable microphones, new devices are entirely erasing the confinements of place and time.[153] It is no longer assumed that a designed space will be noticed by inhabitants, as the present is an age of continuous distraction.[154]

Through an analysis of both Marx's and Arendt's views on work and technology, it can be inferred that the nineteenth-century technology utilized for cotton production in Burnley also created a sense of displacement amongst workers. Alienated by the standardized routine, which resulted from the automation of their work, cotton mill workers were completely removed from the product of their fabrications. Continuous rows of looms dictated the design of the mills, which consisted of large empty space to accommodate machinery, the technology similarly ridding architecture of character.

Both in the contemporary era and at the height of industrialization, it can be seen that technology causes a sense of displacement amongst people and results in empty architectural

work environments. While Internet and digitalization displaces one's attention to a distant context, industrial machinery also displaced workers from their immediate actions. Current digitalization comparably disconnects workers from their finished product, as direct interaction with customers is replaced by consumer analysis software.[155] Both technologies take over one's predominant focus, eliminating him or her from the current surroundings, and designate the environment as background to the technological activity. Buildings then no longer require specificity to program, and it is only budget that motivates the architectural design. By introducing movement into the design of the Burnley mills, the architecture interacts with and enhances all modes of work. The building's interactivity grounds technological activities in the current setting, rather than becoming disregarded and workers consequently feeling displaced.

VIRTUALITY

While the online world is thought of as "a virtual realm", it should be noted that virtuality existed long before digitalization. The virtual describes a reality, however, it is a potential reality, or a potential option of environment.[156] The concept was understood through text, literature, and art before the advent of the computer age. Virtuality celebrates the mind over the body, yet does not threaten the abandonment of one's actual environment. Humans will always experience the world through a body, and are unable to sustain life permanently disconnected

from the body. Still, virtual infrastructure is now threatening to dismiss spatial relations in favour of solitary sociality.[157] The digital technologies, which are believed to provide a sense of connectivity amongst workers are replicating the solitude amongst mill workers during the Industrial Age.

The virtual, as it has for many centuries, should continue to act as a supplementation to the actual, instilling it with further meaning. This relationship is imbalanced today, as the possession of information has become more important than the possession of physical objects within the knowledge economy.[158] Progressively, the virtual becomes actual to people through constant habituation, clouding the distinction between the two. In order to respond to the current emphasis on virtuality, the social concepts of a building should serve as its focus over its materiality.[159] The ability to design meaning into a structure, and imbue it with potential environments, is what separates architecture from pure engineering.[160] To characterize the intangibility of the knowledge economy, an industry which relies upon virtual product, Fun Mills proposes an architecture which harnesses ephemerality. A space which can be mobilized at any moment can best accommodate the production of information and ideas, not requiring the specificity of tools for the production of physical goods.

PART 3 CONCLUSION

The town of Burnley was once at the centre of textile manufacturing during the height of the Industrial Revolution. However, in recent decades, the town's role in this industry has diminished due to inexpensive production overseas. Along with foreign competition, many manufacturing jobs have disappeared due to digitalized automation, reducing the demand for manual labour. Lancashire has struggled to shift their workforce to more knowledge-driven occupations, leaving Burnley still heavily reliant on manufacturing and remaining the most highly unemployed of all UK cities. The reconfiguring architecture of Fun Mills takes cues from Cedric Price, catering to the virtual production methods of this century's knowledge economy. While the environment opposes the rigid standardization features which signified Burnley's capitalist era, it promotes the knowledge industry's production methods, suggesting that work occurs at all times and places of life. The technology of today displaces workers in the same way the looms of the cotton mills did, as they both distract workers from the immediate environment, rendering it ancillary. The interactivity of Fun Mills' architecture does not fall into the background, but grounds the production of the virtual by responding to the unpredictable mobility it dictates.

Conclusion

CONCLUSION

This thesis asks 'how architecture can address the social, cultural and economic issues that arise from digitalization in physical space'?

The thesis combined the work of three main authors to contextualize the programmatic, economic and spatial issues and configurations of the Fun Mills.

Cedric Price allusively predicted the production methods of the prevailing knowledge economy, and accordingly designed a conducive space which amalgamated work and leisure. Price believed that "creativity is generated and sustained through a delight in the unknown," and emphasized the value of human participation and indeterminacy in his projects. The Fun Palace provided a framework onto which users could project their desired activities, reconfiguring spaces in order to conceive new program. His work reinforced the functionality of architecture over its visual representation, focusing his design on the temporal properties space, and how it would incite continuous events.

Bernard Tschumi, along with other architectural authors, contributes to the understanding of how technology affects contemporary architecture. While architecture aims to promote sociality and human interaction, current digital infrastructure is masking and competing with the immediate environment. Rather than designing buildings which actively consider the

virtual as an architectural layer, architects respond to the mobilization and consequential indeterminacy of work with empty architecture. Current buildings are rid of character by ignoring programmatic function, relying on superficial facades and furnishing as a means of distinguishability. The thesis maintains the view of Price, that while mobile work methods cannot be spatially predicted, architecture requires some extent of specificity in order to contextualize activity.

Karl Marx's theories of technological determinism were examined in order to compare Burnley's former work environments to those of the proposed Fun Mills. The project proposes a "sharing economy" network, dependent upon the collaboration between manufacturing, service, and knowledge industries to develop advanced textiles. Contrary to worker alienation caused by bourgeoisie control in the Industrial era, each of Fun Mills' workers are participating in all steps of production. At the same time, the flexibility presented in Fun Mills' architecture promotes the production methods of the knowledge industry, which rely on human mobility and indeterminacy to produce at all times. Although the adaptability of reconfiguring forms initially appears as a leisurely environment, leisure itself becomes a form a work, as work encompasses all aspects of life.

By connecting the writing of all three authors, it is evident why current architects have difficulty designing spaces which expressively address digitalization. Human activity, especially that of work, has been comparatively easy to predict before mobile technology. Architects had little hesitation as to how spatial form would house an activity. However, digitalization has moved the predominant production of work from the physical to the virtual, making it possible to

carry out work in any place, at any time. The shift in production mode makes less predictable for architects to design how program will be implemented by the end user and subsequently they provide "multifunctional" empty space. Price makes the point that although work becomes virtual, humans still approach life through a physical body, and therefore require contextualization. It is the nuancing of indeterminacy, caused by mobile work methods, and determinacy, caused by the body, which Fun Mills seeks to achieve in its architecture.

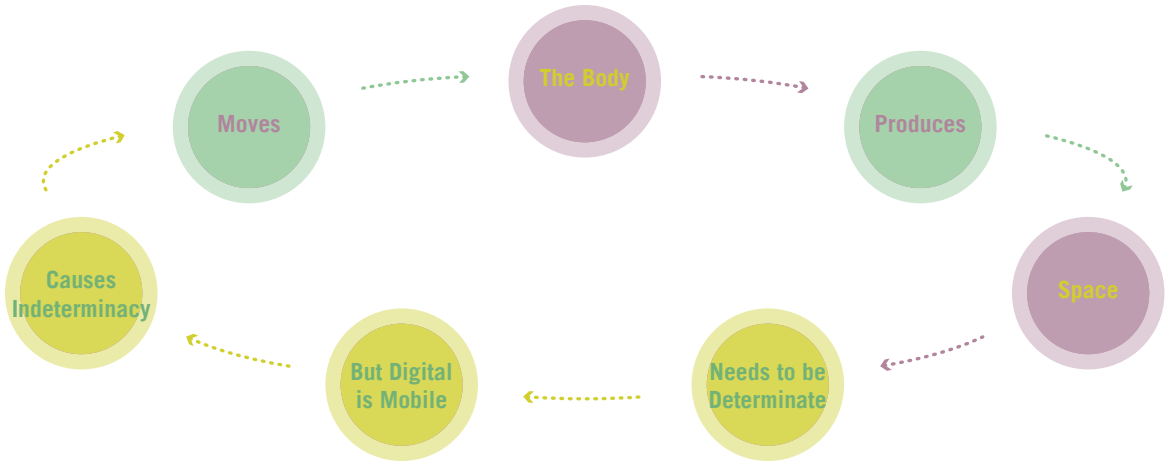


Figure 83 // DIAGRAM: The Nuancing of Spatial Determinacy / Indeterminacy

Diagrammatically explains why there is difficulty balancing spatial determinacy & indeterminacy in the digital age.

The timeline of the thesis work has limited the extent to which Price's theories could be applied, and Fun Mills is accordingly designed as a prototype. While the architecture of an interactive work environment was only conveyed through Trafalgar Mill, the project intends that each of the fifteen vacant cotton mills would be correspondingly transformed. Additionally, the labs would build connections with neighbouring towns via the Leeds and Liverpool Canal, and disseminate the sharing economy network throughout comparably struggling UK cities. Similar to how Price's Potteries Thinkbelt utilized a neglected railway to circulate his proposed

knowledge industry, the Fun Mills could also expand onto the canal to widen the extent of a sharing economy. Conceivably, the reconfigurability properties of space, which are initially constrained to the boundaries of each mill, could be realized instead from mill to mill, utilizing the waterway as the flexibility framework.

The application of Price's design principles to Fun Mills reveals that his theories are more relevant today than at the time of their origination. His concept of "anticipated indeterminacy" solves architecture's current affliction of emptiness and superficiality by enclosing virtual production with the flexibility it requires. Fun Mills defines spaces through its inherent spatial character, generated through the physical properties of advanced textile enclosures, and the movement they capture upon reconfiguration. The user can manipulate the textiles' properties and kinetic floorplates, catering to different desires and unpredictability. The opportunity for workers to experiment with new textile technologies as forms of enclosures emphasizes the mill's role as an interactive laboratory. The possibility for juxtaposition, fusion, and separation of program enables workers to conduct all modes of production at any time, facilitating the collaboration of industries to boost Burnley's economy. The creation of advanced textiles capitalizes on the town's manufacturing past, yet allows them to compete with foreign production by incorporating advanced technologies.

While it was not feasible to actualize the Fun Palace during the 1960's, the concept is now technologically conceivable. Fun Mills is the natural progression of Price's ideas for the twenty-first century, as the social and economic issues he aimed to prevent are now exceedingly prevalent.

Appendix

DECLINE OF BRITISH TEXTILE MANUFACTURING

Even with an abundance of weavers, Burnley's workers earnings were still relatively high during the eighteenth century.[161] Yet mill working conditions were not ideal, as machines were crowded together illuminated by flickering candlelight. The hours were often twelve to eighteen hours per day, and child labour was not unheard of.[162]

In 1811, the Burnley textile industry was at the height of its economic success, with around 99,000 power looms in operation. The population increased to 100,000 people, from just 4,000 people ten years earlier.[163] Economic prosperity continued for Burnley until 1901, when 13% of the population was documented claiming benefits.[164] Burnley was still primarily a weaving town at this time, with the industry five times more concentrated in here than the national average.[165] The town began to shrink in population over the twentieth century, and between 1998 and 2008, private sector employment fell by 14.3%.[166]

It was the highly specialized economies, such as those in Lancashire, which were more vulnerable to market fluctuation. As the UK lost its competitive edge in textile production, the cities and towns with more diverse ranges of industries were less susceptible to economic decline. It was these towns that substituted their textile jobs with other flourishing sectors. Additionally, the cities with generally higher income levels were more likely to economically

Figure 84 //
PHOTOS: Present-Day Burnley

succeed, as the demand for services and consumer goods was more consistent.[167] Contradictory to this, Lancashire's manufacturing towns were characterized by low-skill employment, and unable to adapt their skills to emerging markets.[168] Between 1971 and 1981, all British manufacturing jobs declined by 1.7 million, creating economic uncertainty amongst UK mill towns.[169] By examining this history, a correlation between a town's average skill level and its economic performance is evident,[170] reinforcing that investment in skills is economically crucial.[171]

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