loup

discovering nutrition facts
in augmented reality

by SANDRA AFAKORA

LOUP

by

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LOUP

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ABSTRACT

Identifying a condition of nutrition fact fictionalization, my research explores the functioning and malfunctioning of existing interfaces between consumers and food data, proposing an opportunity for design to intervene and provide a path towards a consumer-biased information flow. The potential, limitations, and implications of working in the intersection between data visualization and (industrial) design are exemplified and evaluated, suggesting the urgent possibility of designing an informed call-to-action against nutrition fact opaqueness through engaging, food data defictionalizing consumer experiences, and offering a raison d'être for a methodologically data-driven design practice. Augmented reality technology is investigated and its relevance to the design challenge established, and finally a solution consisting of three parts is proposed; an augmenting device, a graphical user interface, and a holographic display. Together they form 'loup', an augmented reality concept empowering consumers to make fact-based decisions when shopping for groceries.

01

THE OPENING ACT

A CHAPTER ON
THE WHAT AND WHY OF MY THESIS TOPIC

How I landed on nutrition labeling as a sutiable design challenge, why it's important - to me personally, and in the broader context of society. Also what data visualization has to do with design and cereal.

INTRODUCTION

Interpellated in the cereal aisle

◀ FIG. 1.1
Saturated hues in high contrast combinations dominate the cereal aisle, here at Trade Fair, Jackson Heights.

Unfamiliarity is one way of explaining the discomfort and frustrations I experienced during my first and ultimately unsuccessful American cereal shopping experience. It was unfamiliar packaging and branding visuals that forced me, unguided by routine or habit, to systematically evaluate first color schemes, then nutrition labels (assuming a positive correlation between hue brightness and sugar content stirred me away from neon packaging) in my quest for a breakfast product not too nutritionally reminiscent of a Snicker's bar. It was the experience of foreignness with US ounces, cups, and serving size notations that lead me to pick up the same cereal box over and over in an attempt to compare 15g of sugar pr 2/3 cup to 18g of sugar pr 3/4 cup, while simultaneously balancing price per ounce, raisin-free-ness, and linguistic as well as pictorial indicators of crunchiness in a search for the most desirable option. And it was the stark contrast between my own disorientation and the impressive precision with which my fellow grocery shoppers navigated the shelves, that brought sweat to my palms, adrenaline to my heart, and conscious attention to the ideology at play.

Althusser states that "ideology represents the imaginary relationship of people to their real conditions" (101). Rather than being mere consequences of unfamiliarity, aren't the elements of unexpected alienation and discomfort that characterized my grocery shopping experience, usually (if at all) perceived as insignificant and ordinary, then examples of how "ideology interpellates individuals as subjects?" (Althusser 106). Somehow, by capacity of being a freshly transplanted foreigner in an American supermarket, I became aware of the "real conditions" of grocery shopping; the utterly unmanageable overload of information that one cannot hope to navigate based on rational decision-making in situ, but for which one must rely on some sort of prerequisite skill.

If the Barthesian myth is "a second-order semiological system" (Barthes 113), this implicit relying on familiarity is the indication of a sign (the cereal box) turned signifier, transcending its physical presence to manifest a cereal myth of wholesomeness, nutrition density, energy, and health. And when in myth "meaning is already complete" because "it postulates a kind of knowledge, a past, a memory" (Barthes 116), will it not per definition compromise any search and desire for factual information? In other words, is the cereal myth leading us astray with a narrative so strong that it is in fact rendering us incapable of seeing the nutritional reality of our breakfast products?

The potential implications of information narrativization depend largely on the creation of the 'myth' and the intentions behind it, but when based on the assumption that what is conveyed through advertising and branding is not actually the truth, they quickly become immense and thus highly problematic. If we could trust food producing and distributing corporations to strive for accuracy in their representation of information about the products they sell (which would arguable always be in the best interest of the consumer), so that 'healthy-looking', 'healthy-sounding' products such as 'Nature's Path Organic Gluten Free Selections Honey Almond Granola with Chia' were actually healthy, the issue of relying on ideologically founded familiarity and myth-driven recognizability in nutrition acquisitions would be less urgent. However, when this is not the case (I will argue that no definition of healthy applauds a breakfast food consisting of roughly 23% sugar), it is worrisome to realize that the nutrition label, supposedly the security system against information fictionalization, can be so difficult to decipher that it needs to be accompanied by an infographic and a glossary to make itself fully understood (See "Appendix I").

The extent to which my first American cereal purchase was misinformed and resultantly dissatisfying, ultimately lead to 95% of the indiscernible mixture leaving my household in a trash bag. But the problem reaches far beyond my own personal shopping failures. Obesity-related healthcare expenditure1 and carbon dioxide emission numbers2 are testaments to human and ecological crises of colossal proportions, and a need which must not be underestimated; a need for the food system to be first understood, then made understandable - all the way down to the details of the ingredient and nutritional compositions of the products we consume daily. And even statistics aside, does food not occupy such a central position in human life, in how we feel, look, celebrate, organize, and orient ourselves, that we should never settle for food interactions that camouflage reality by encouraging disconnect and disengagement?

Through my research I will argue that relying on brand perception and routine in food-related decision-making are results of myth-discourse, which should not be accepted the primary operator in a flow

of information, especially one where the stakes in personal as well as planetary well-being are extremely high. Instead, the interface between food data and consumers should be designed as a call-to-action, encouraging and assisting information-engagement. (It was arguably my effort to engage that fostered my discomfort in the cereal aisle; a random selection would have wildly accelerated the experience and hence put an end to my misery before it was made perceptible). Perceiving the nutrition label as exactly this, as an interface intersecting data with human experience, provides an entry point for design in an otherwise predominantly political problem arena. It also points to the label as an example of data visualization.

Data designed

In Forbes Magazine "Data visualization is the future […]" (Clark); on WIRED "The next generation of designers will use data as their medium" (Rolston); on FastCoDesign the "Most important design jobs of the future" include "Machine-learning Designer" whose job will be "to construct data models and algorithms that allow companies to create artificially intelligent products", while "The Embodied Interactions Designer must be comfortable wading neck-deep through datasets to mine value while protecting privacy" (Lebarre). But it is not the media-professed promise of data visualization as the new frontier for design that first draws my attention to the discipline. Rather, it's the visual intrigue that originates from an unspoken order, perceivable, yet evasive as in pieces by Laurie Frick, "data artist exploring the bumpy future of data gathered about you". It's the allure of the sense that an underlying logic will provide a path to clarity, as displayed in the work of Jer Thorp, former Data Artist in Residence at the New York Times R&D Group. "In a time of universal deceit — telling the truth is a revolutionary act" as attributed to Orwell perhaps finds application here; at least, it is the expectation that data visualization practices can bring a combination of aesthetic stimulation, objectivity and comprehensibility to the representation of nutrition data that brings relevance to the exploration of this scientifically grounded discipline as part of my design research and thesis. The task ahead of me is to investigate whether these expectations are more than desperate hopes representing a utopian idea of a truth that, if it exists, cannot be captured; to explore the extent to which data visualization escapes information mythification and provides more than just a sense of clarity, and finally whether these scientific practices are in any way compatible with the discipline we call "Industrial Design".

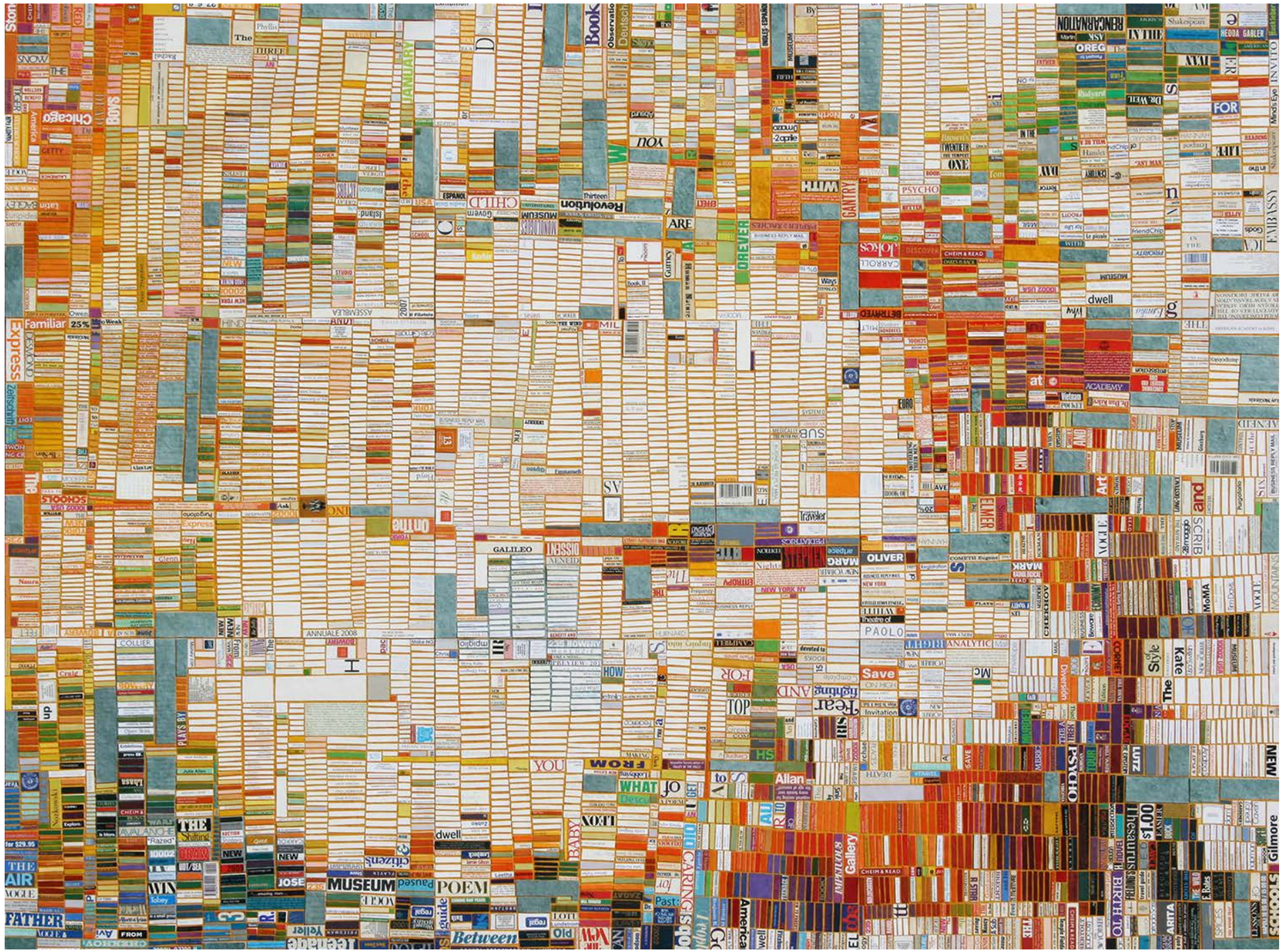


FIG. 1.2
Laurie Frick makes an art of analog data visualization, here in an imagined representation of how the brain perceives time.

Source: lauriefrick.com

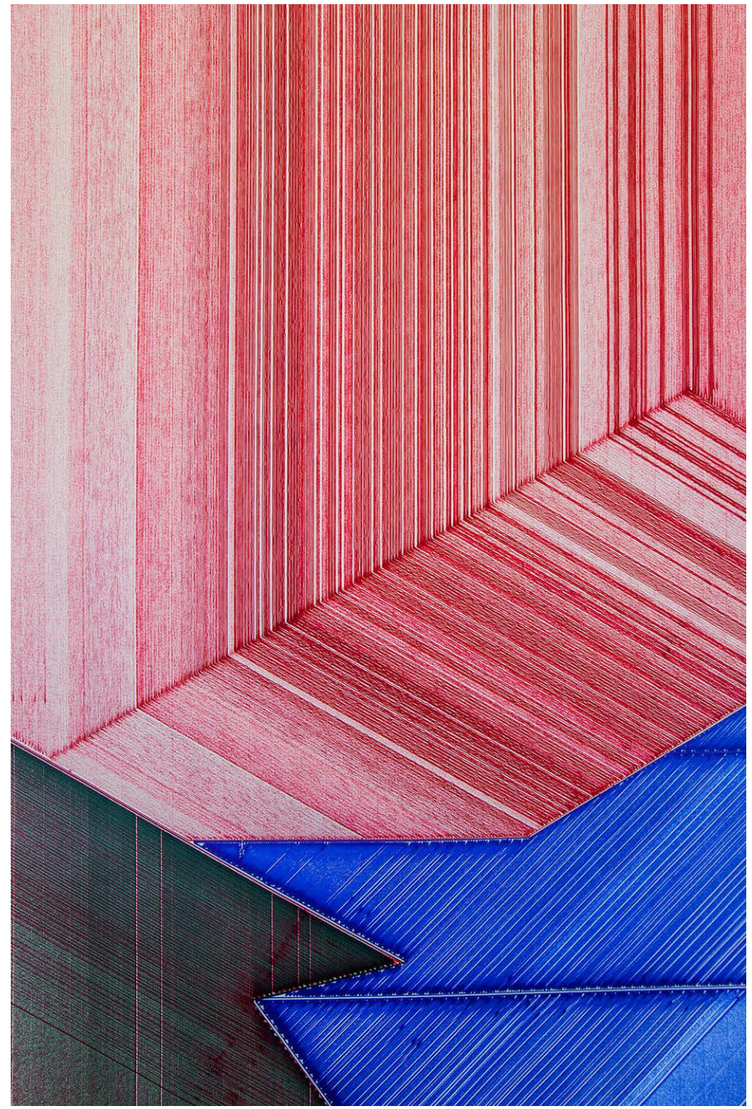


FIG. 1.3
Miguel Nobrega uses code as a medium for expression when creating generative plotter prints. Displayed here is Drawing #2 from his Plausible Spaces Series.

Source: superficie.ink

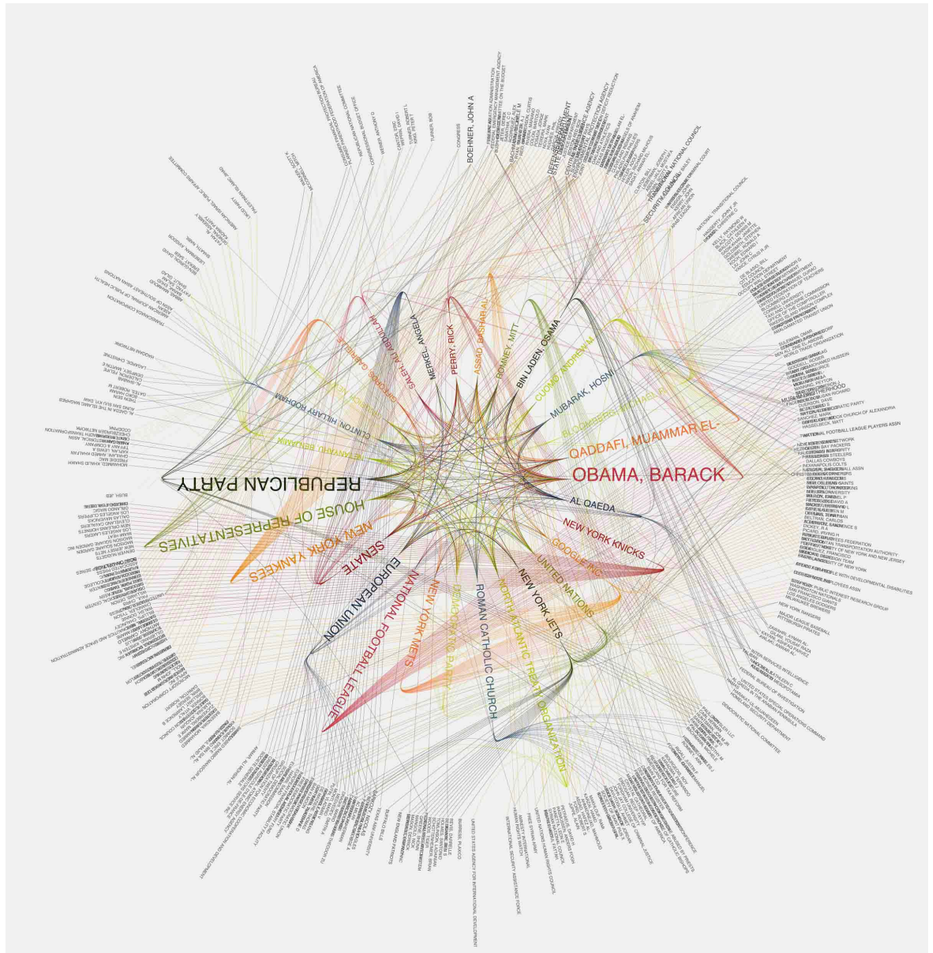


FIG. 1.4
Jer Thorp visualizes a New York Times year of news, blurring the lines between artistic expression and data visualization.

Source: blog.blprnt.com

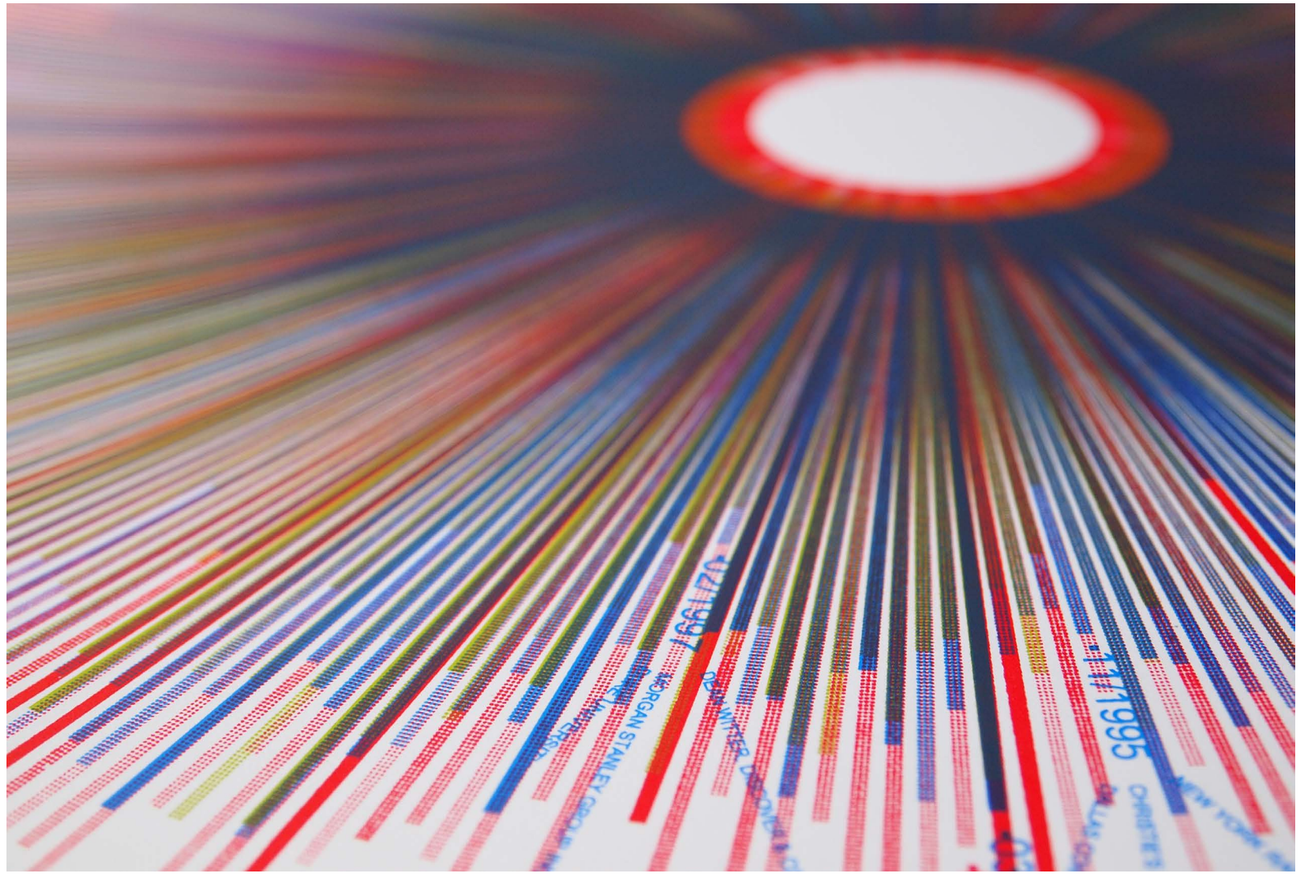


FIG. 1.5
Data visualizations of word usage in the New York Times are abstracted and screen-printed for aesthetic purposes. Created by Jer Thorp for Random Number Multiples.

Source: blog.blprnt.com

In terms of facilitating clarity through human engagement with data, one can raise the question of whether the aforementioned artists aren't simply "exploiting" the connotations of data-driven work to create interest through visual complexity without ever reaching the benefits of "objective" insights that the practice elsewise is expected to provide. But even if this is the case, the art work of Thorp, Frick and Nobrega exemplifies the strong connection that can exist between data and aesthetics, which, to me, is an indication that design too could have something to gain from engaging with data visualization practices. And perhaps the point of reducing the value of data to nothing but a medium for aesthetic expression is exactly where the liberties of the artist exceed those of the designer, and where the exploration of a data-driven design practice can have its subtractive beginning.

RESEARCH OBJECTIVES

Designing with data

The goals I define for my research serve to guide the thesis process by suggesting the type of academic objectives I hope to fulfill. I will define two overall objectives; one methodological and one design-oriented.

Methodological goal

The thesis should aim to bring data visualization out of the domain of information science (dealing primarily with questions in academia and cultural preservation, e.g. museums) and exploring what it can be for industrial design (dealing with the everyday life of people), including exploring possibilities for bringing data visualization into the physical space. The exploration of this disciplinary overlap should be done with methodological awareness and reflectiveness. In the following chapter, disciplinary definitions will help serving this purpose.

Design goal

The designed experience should be one of learning, delight, reflection and wonder in regards to personal food consumption habits and related topics. It should also be holistic in terms of presentation and

processing of information, as well as beautiful and engaging in terms of aesthetics.

Throughout the research, methodological investigations will be exemplified by examination of current and potential solutions; designed means affording guidance and misguidance in the relationship between consumers and data will be analyzed for resulting insights to be incorporated in the final design. The research question summarizes the overall goal and will serve to navigate the process.

RESEARCH QUESTION

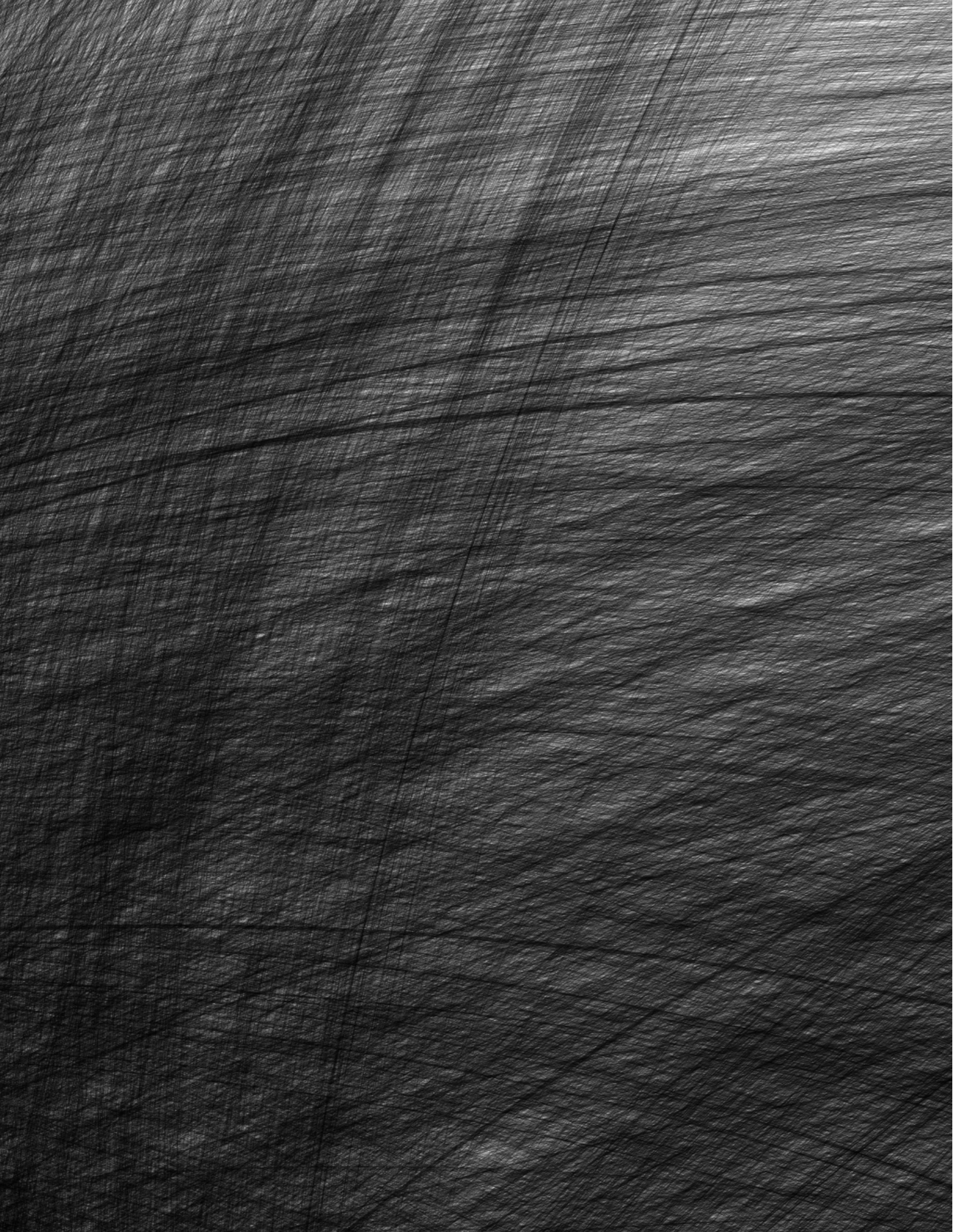
How can design engage data visualization methodologies in the creation of interfaces that communicate food data to activate deliberate and informed consumer behavior?

02

METHODOLOGY

A CHAPTER ON
WORKING WITH DATA IN A DESIGN FRAMEWORK

Characterizing the disciplines of design and data visualization respectively, ultimately suggesting a raison d'être for and path towards a data-driven design process. Defining critical terminology.



METHODOLOGICAL OPPORTUNITY

Design undefined

◀ FIG. 2.1
Data visualization of cereal ingredients form a rhizomatic network

Industrial design is dissolving. Such is my experience as the discipline, increasingly widespread yet difficult to discern, leaves methodological residue across campuses and consultancies as its seeming professional and academic dilution continues. In 2015, Californian design agency Lunar was acquired by consulting giant McKinsey; two years earlier, Fjord merged with Accenture. Designit has a studio in New York City, but it has no product design practice. Frog design's first listed service offering online is 'Growth Strategy' and they are looking to hire 'Visual Designers', 'Interaction Designers', and 'Experience Designer', but no Industrial Designers. This Fall, Pratt launched a Master's of Science in Information Experience Design, not as part of the School of Design, but the School of Information. The idea of design thinking and a "design-driven culture" is today so central to successful business practices that it should presumably be considered by any organization wishing to maintain or improve their competitive advantage (Kilian). Thus it seems that while the presence of industrial design is fading, the concept of design is approaching omnipresence; that the concern of industrial design with mass-producible objects, from inception of idea to ergonomic dimensioning and aesthetic

refinement, its disciplinary conception inextricably tied to the 20th century rise of the assembly line (Heskett 10), has transformed into a concern with the process of designing, which doesn't discriminate between experiences, products, and services as results. An example commonly encountered in design schools (I recall it from my time at Aalborg University, Royal College of Art, and Keio Media Design) uses a brief, historical evaluation of music players to justify this transformation by illustrating that designing products cannot be separated from the design of experiences and, ultimately, human behavior. Not only is the gramophone formally miles and countless cubic inches apart from the iPod (now also on the verge of extinction through the smart phone's far reaching absorption of most daily interactions with technology), bending over to carefully place a needle on a record is performatively entirely different from thumb-swiping across a touch-screen in search of the icon that activates Bluetooth connection with a separate speaker set. When the product changes, inevitably so does the way we interact, behave, move, and think. And with the exponential digitalization of products and services over past decades, consequentially challenging of the scope of industrial design by inspiring the rise of the User Experience, User Interface, and Service Designer (Di Russo) (and many more, as previously exemplified in the job listings of design consultancies), it seems that the ability to condition behavior remains the common denominator across disciplines denoting themselves "design". My own approach to design reflects exactly this. I identify more as 'designer' than strictly 'industrial designer', and a characterization of the methodologies that guide my research and thesis development will consequently consist in outlining the processes that guide the design of behavior and human experience, rather than products specifically. Instead of resorting to definition through delimitation, I will argue that the design process is in fact characterized by its boundlessness; that inasmuch as academic disciplines define themselves by their rules and limits, design is the anti-discipline; a transboundary multi-discipline with the ability to span approaches, techniques and inspiration sources infinitely. I thus ascribe to myself as a designer the terrifying and liberating privilege of limitless input, and deem my foremost responsibility the transformation of resulting chaos into subjectively meaningful (often equating delightful and/or functionally problem-solving) experiences for stakeholders, the process to be guided by an ability to simultaneously sense and make sense.

Data in the design-rhizome

In 'A Thousand Plateaus – Capitalism and Schizophrenia', Deleuze and Guattari present the rhizome as a "mode of assemblage", an epistemological framework in which "the multiple must be made […] with the number of dimensions already available –always n – 1"(6). While their explorations explicitly challenge the genealogical, binary tree-logic of written word, their suggestion that a book might be "all the more total for being fragmented" can be applied to design as a method as well. Characterized by principles of connection, heterogeneity, and multiplicity (Deleuze 7,8), the design process is rhizomatic in that it has no beginning or end; even as we might consider briefs the formal outset and manufacturing the conclusion, I see no reason why these conventional delineations of the design practice should not be regarded as trajectories rather than dots, connected backwards with existing conditions and reaching forward, up, and sideways towards new ones. "There are no points or positions in a rhizome, such as those found in a tree, structure, root. There are only lines." (Deleuze 8). The same applies to the design process that isn't deluded, pretending it exists in a vacuum. When allowing itself to be informed by all that informs,

be it science and art, engineering and marketing models, history and literature; when deliberately replacing either/or with both/and, design becomes an exercise in the rhizomatic principle of cartography, where the generative forces of mapping and exploring replace the duplicating act of tracing. As Deleuze and Guattari define the map, I will describe the design process, in that it "does not reproduce an unconscious closed in upon itself; it constructs the unconscious"(12). The job of the designer is then to subtract from the limitlessness of 'n' all that instructs and advances, only to reassemble, rethink and refine the detracted to create what produces a desired behavior.

In terms of being regarded as results of processes within the scope of the design (anti)discipline, there is in the design-rhizome no need to make distinctions between a MacBook Pro with "Multi-Touch enabled strip of glass built into the keyboard for instant access to the tools you want"-Touch Bar (Apple), the endeavor of familiarizing consumers with nutrition facts, and an animated graph on 'How the U.S. and OPEC Drive Oil Prices' from the online New York Times 'Interactive' section. But while the first is widely accepted as exactly that, the second is so entangled in politics and obscured by the ordinariness of everyday life that it requires a closer look (and in my case, interpellation through defamiliarization caused by moving abroad) for it to explicitly reveal itself as such. The latter can likely (by virtue of the apparent diligence in the choice of sunrise-inspired dark-purple-fades-to-bright-orange-to-denote-the-passing-of-time color gradient and shifting transparencies guiding the attention of the viewer), more immediately be accepted as design-related; it does, however, also raise the question of the relationship between design and data. While this overlap is usually expressed in the epistemologically scientific discipline of data visualization, the rhizomatic approach renders adoption and adaptation of its methodologies by a designer not only unproblematic, but in some cases even desired. I will propose that the design of interfaces between food data and consumers is such a case. I will even hypothesize that data visualization practices could prove to be important parts of the methodological rhizome-assembly mobilized to resolve any design objective in which large data quantities present themselves as part of the problem arena. Specifying what these practices entail and examining the context in which they operate will explain, and hopefully justify this proposition.

Paradigmatic paradox

In data visualization, "decision-making is the ultimate goal". That is the statement by Kasik et. al. in "Attention and Visual Memory in Visualization and Computer Graphics" (282), a scientific paper accounting for the cognitive science behind visual information processes, and an attempt to transform these into useable guidelines for designers working with information visualization. A more elaborate explanation states that "the overall goal of creating visual representations is to use cognitive and perceptual principles that increase the communication impact of the results of the data transformation process to enable visual analysis and knowledge synthesis." (Kasik, 282)

The article summarizes a variety of related theories, following the best practices of scientific publication, both in form and content; there is the abstract providing a quick overview of covered topics and research findings, the factual objectivity of language, the criteria of reproducibility of results; all indications of how the paper is written within a scientific reference frame, therewith also obliged to comply with the prescribed rules and protocols. With such predefined standards follows an equally defined set of values, a premise existing

at the foundation of all scientific research, which demonstrates the belief that objectivity is the key to knowledge and understanding; that logical thinking is more valuable than sensitivity of the senses; that measurability and accuracy are desirable, while subjectivity and emotion are not. The paradox arises when data scientists in seeming acknowledgement of the undeniable connection between data visualization and visual aesthetics, attempt to define the value of the latter inherently subjective concept by inspection through a methodologically scientific lens. So while it is somewhat reassuring (medically connoted syringe-terminology aside) to know that "ongoing research in visualization has shown that injecting aesthetics may engage viewers […]"(Healey, 1185), the utilitarianism demonstrated in the subsequent "although it is still not known whether this leads to a better memory for detail" hints at a missed opportunity in the approach data scientists employ to engage and evaluate that which activates not just sense-making, but the senses. Rather than pursuing the endeavor of "injecting" design sensitivity into the scientific paradigm, reversing the methodological outreach and embracing the flexibility of the design process-rhizome by inviting scientific data practices into the design repertoire, resolves the paradox of inflicting objective measurability to subjective qualities. The task for me as a designer is then to identify and include the practices that find relevance in my chosen method-assemblage, and to employ the rhizome's principle of cartography to conduct the experimental map-exploration necessary to know whether the attempt is indeed fruitful.

Practices of data visualization

Associate Editor of the Journal of Computational and Graphical Statistics, Michael Friendly's now ten year old account of the origin of data visualization establishes (and, indeed, partially visualizes ("Appendix II" on page 198) how the field has historical ties in map-making and the creation of tables diagrammatically representing the positions of stars, some of which date back as far as the 10th century, with an ancient Egyptian idea of coordinates even identified as having been used in the laying out of towns as early as 200 BC (Friendly 3). Separated by millennia and technological quantum leaps, these practices are dramatically different from the software-based, large scale-statistical techniques of today (Few 2, 6, 11). Computer-aided data visualization offers a multiplicity of practices, including statistical analyses such as time-series, distribution, and correlation, as well as mapping and network analysis (Few 141). Some manifest themselves visually in the form of graphs, mapping analyses are, not surprisingly, represented as maps, and network analyses have the ability to take on various formats, always based in the connective relationship between data entries (an example of which was encountered earlier in Thorp's work for the New York Times, "Fig. 1.4" on page 28)(Heer 17).
When exploring the inclusion of data-driven methods in my design research of the realities of nutrition and ingredient data, I will refer to best practices for selecting and applying techniques for analysis and visualization of the specific data types.

The cognition-enhancing promise of visualizing data is enticing; in Few, visual representations "not only make the patterns, trends, and exceptions in numbers visible and understandable, they also extend the capacity of our memory, making available in front of our eyes what we couldn't otherwise hold all at once in our minds. […] Infor-

mation visualization helps us think."(6); in Heer, visualizations "can improve comprehension, memory, and decision-making" and might even "help engage a more diverse audience in exploration and analysis"(1). There are, however, dangers to be aware of in working with data, the most prominent one being (deliberate or incidental) manipulation of results; "If you torture data long enough, it will confess to anything" as attributed to Darrell Huff, author of 'How to Lie With Statistics', demonstrates the essence of the issue and the importance of understanding motivation and approach behind any data representation. For this reason, uncovering incentives and reassessing data sources and visualization techniques in the existing consumer/food data intersection will be integral to my research.

In "The Visual Display of Quantitative Information", Edward Tufte provides what might be the most widely acknowledged set of guidelines for the design of statistical graphics (10). His leading principle is that of 'data-ink-maximization' which devises that "a large share of ink on graphic should present data-information" so that "nothing can be erased without losing information" (Tufte 93,123). Visual elements that do not meet this criterion are by Tufte deemed redundant "chartjunk" (108). Bateman et. al. counter Tufte's methodology with a study that demonstrates how embellishment in data visualizations can improve long-term recall of information as well as make the experience of chart-reading more enjoyable (2579). These cognitive studies and considerations of best practices will serve as references in my analysis of existing food data representations (particularly in a case study of online nutrition data platform, the Sage Project, in Chapter 5). Likewise, disciplinary standards will provide the starting point for my own research practice of exploratory data visualization; however, my approach being that of the designer rather than the statistician, only to the extent to which they aide and inform rather than limit and control.

Methodology of multiplicity

The tension between the strictly scientific paradigm of data visualization practices and the subjective relativity of the sensitivity-driven design process presents itself to me full of potential. Let data inform both input and output. Apply methodologies that benefit the process, but realize that outcomes are not predicted only experienced. Seek inspiration in science and the senses. Replace disciplinary boundaries with self-discipline. Include data in the design rhizome; embrace and protect the privilege of designers to never limit what informs, always subtracting meaning from the multiplicity.

Such is the approach I take in mapping and uncovering how data visualization methodology can aide the design of informed consumer behavior, that is, of engaging, explicitly deliberate consumer interactions with nutrition and ingredient information.

GLOSSARY

Definitions of critical terminology

Actionable, adj.

That which can be transformed into action, in my research often referring to information which leads to decision-making and action.

Aesthetic, n.

Aesthetic is often defined as that which is concerned with beauty (Oxford Living Dictionaries). I will return to the etymological origin of the word and the Greek 'aistetha' meaning 'perceptible things' and define aesthetic as all which is perceptible to the senses, with no concern for whether it is perceived as beautiful. When wanting to emphasize the relation of the concept to all senses, not just the visual, which seems to dominate current connotations, I will use the (somewhat redundant, but for the sake of clarity still necessary) 'sensory-aesthetic'.

Affordance, n.

I will adopt Norman's definition of affordance as "the relationship between a physical object and a person" (11). In my definition, physical objects include data visualizations and other two-dimensional representations. Affordances, and the idea of affording, will provide the theoretical starting point for analyses of existing as well as possible interactions with and between mediators.

Consumer, n.

While design is usually concerned with the 'user', I will use the term 'consumer' in its stead, as my research deals with exactly consumption (of information and/or/with/on/in food).

Consumer-bias, n.

The concept of consumer-bias is based in the idea that there is no true objectivity in the visual representation of data; that the aesthetics will always carry meaning, which in relation to data can be regarded as bias. Rather than striving for unbiased visualizations, I will advocate for an attempt at consumer-bias, where all implicitly embedded meaning serves the best interest of the consumer.

Data, n.

Data comes from the Latin word 'datum' meaning 'something given', which might be closer related to our understanding of 'fact' today. I will define a data point as a value measured according to a given parameter, and a dataset as an assemblage of such values. In using the term 'data' (unless otherwise specified always referring to one or multiple datasets), I am thus referring to that which is quantifiable (though not necessarily numeric or existing across a continuous spectrum), and most often available in large quantities. 'Data' doesn't inform decisions, but merely exists as a collection of measurements or nominative entries forming a basis for interpretation.

Data-driven, adj.

That which actively bases its practice (or parts of it) on data, in my

research mostly referring to (design) processes; the process of using data to move forward a process. That which is directly based on insights derived from data.

Data visualization, n.

Visuals with a direct relation to one or multiple datasets; the visual result of a data visualization process. Usually existing two-dimensionally, a data visualization can be analog or digital; it can be static, dynamic, or interactive. This definition aligns with what Few calls "visual representation of quantitative information" and his referral to data visualization as "an umbrella term to cover all types of visual representation that support the exploration, examination, and communication of data" (2,12).

Data visualization, vb.

Data-driven formation of visuals, that is, the transformation of a data set (most likely through algorithmic or statistical manipulation) into a visual representation that provides added insights and understanding of the data. In my own practice, I will distinguish between exploratory data visualization, where the goal is for the visualizer to learn about the data, often by testing hypotheses and different visualization techniques, and communicative data visualization where the goal is to communicate findings to an audience not actively involved in the visualization process.

Fictionalization, n./vb.

See 'narrativization', n./vb.

Infographic, n.

A graphic representation (relying on visual tools such as color, shapes, iconography, two-dimensional composition, and type) of information. In my definition, the starting point for an infographic is not a large data set, but rather information (quantifiable or qualitative) that has already been derived elsewhere. This means that the layout and logic of the infographic is primarily determined by its human creator rather than being data- and/or algorithm-driven. While my research is not concerned with infographics, it is a term often used interchangeably with data visualization; as I don't agree with this synonymization, it is useful to make the distinction explicit.

Information, n.

In the Oxford Living Dictionary, a definition of information is 'Facts provided or learned about something or someone'; I will define information as that which informs. Being able to facilitate learning, understanding and decision-making are thus the main characteristics of information. As the distinction between data and information is crucial, I will define the relationship between the two as one of refinement, be it through visualization, filtering, selection, overview, or other means; in other words, any successful refinement of data will produce information. Note that the relationship is directed; information cannot necessarily be reverse-processed into data.

Informationalization, n.

Any transformation of non-information, usually data, into information, and not restricted to visuals.

Interface, n.

I define interface as a point of interaction, something that connects a system with humans and allows them to interact. An interface thus represents a meeting and the potential for communication between otherwise separate entities.

Mediator, n.

In 'Reassembling the Social', Latour introduces the concept of mediator (37). Mediators, as opposed to intermediaries, are transformative carriers of meaning, whose impact on a system, situation, or social 'assemblages' must be evaluated on a case-by-case basis (Latour 39, 77); "No matter how apparently simple a mediator may look, it may become complex; it may lead in multiple directions which will modify all the contradictory accounts attributed to its role." (Latour 39). I will activate this definition of mediator, which does not discriminate between object and non-object, human and non-human, as a means of analyzing, understanding, and preventing underestimation of the actors in my problem arena.

Narrativization, n.

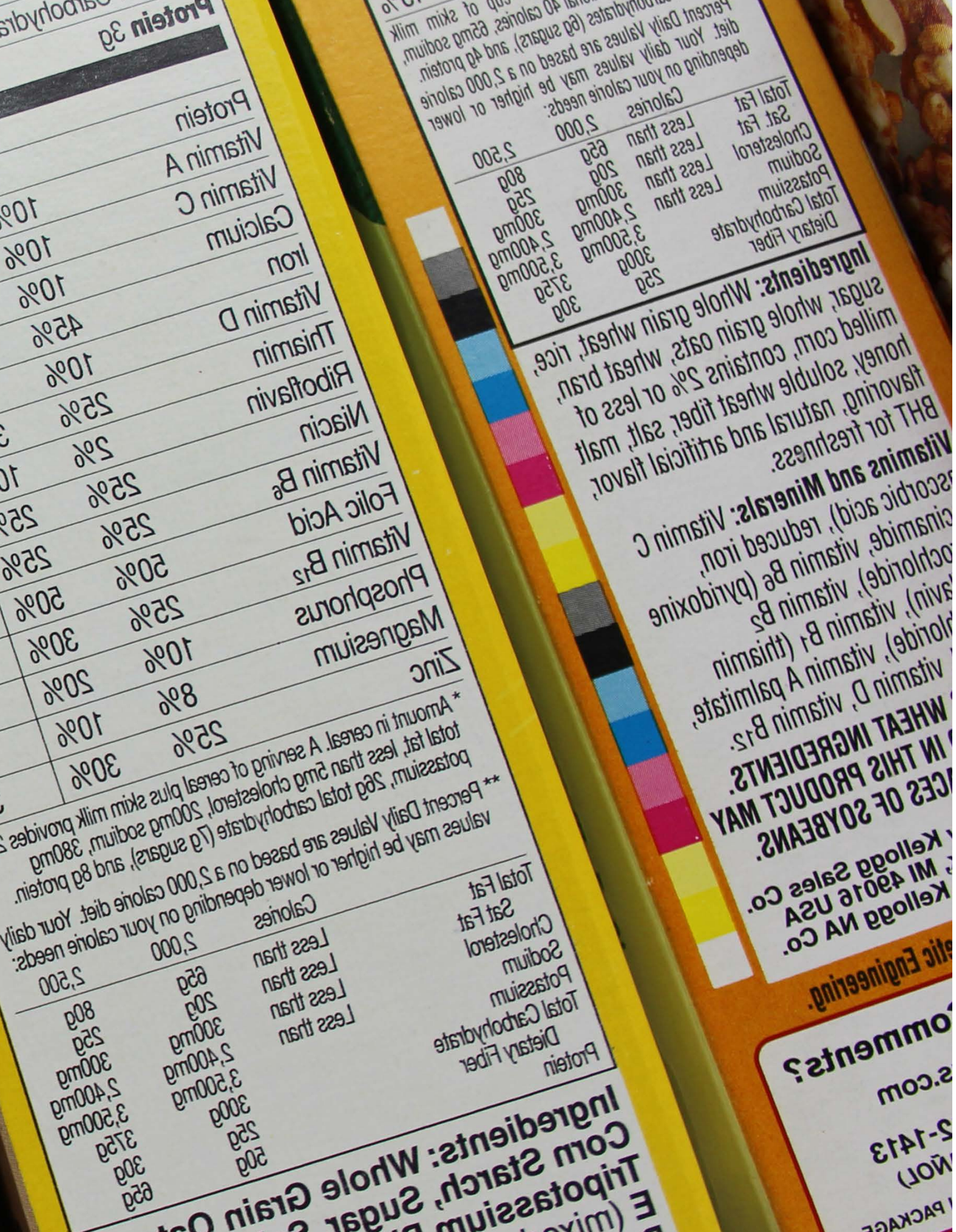
I will define narrativization, or fictionalization, as the process or the means by which information is presented ways that contradicts or obscures its meaning. Narrativization will inevitably result in information opaqueness, and often consists in the fabrication of fictional alternatives to that which represents reality.

03

DESIGN ARENA

A CHAPTER ON
NUTRTITION LABEL STAKEHOLDERS

Finding an entry point for design in a highly politicized design arena. Framing the problem and narrowing the scope by zooming in on cereal.



◀ **FIG. 3.1**
On cereal boxes the nutrition label lives on the egde, resulting in visual uniformity.

PROBLEM FRAMING

Label politics and depoliticization

From a design perspective and an experience of often struggling to convince non-design professionals of the importance of visual structure and hierarchy, it is fascinating to discover how much commotion can be caused by a change in typographical emphasis through bolding and font size, the addition of a single line of text, and the reshuffling of two others. Nonetheless, the FDA's decision to change the layout of nutrition labels, named by the Wall Street Journal the "most radical nutrition overhaul in decades" (Gasparro), has given rise to a more than 300,000 word long legal report, preceded by "vicious dissent from several major food associations" in the years leading up to the Federal Register's final rule of May 27, 2016 (associations which include the American Bakers Association, American Beverage Association, American Frozen Foods Institute, Corn Refiners Association, International Dairy Foods Association and National Confectioners Association) (Ferdman, 2016). Rather than demonstrate a sudden rise of interest in graphic design practices across food industry board rooms, these circumstances seem to attest to exactly how central associations perceive the nutrition label to be in defining consumption patterns and, consequentially, bottom lines on their members' quarter-

ly reports. If transparency is not on the marketing agenda for major food corporations, it is because they benefit from the ficitionalization of information that exists in its stead. I will suggest that what constitutes these benefits is not just the potential of 'tricking' consumers into buying certain foods, but even more so the depoliticization that follows mythification.

According to Barthes, "myth is a system of communication", "a discourse" that distorts reality by merely postulating knowledge, the relationship between myth and political action being that one excludes the other (107, 116, 120, 146, 147). Understanding 'political' "as describing the whole of human relations in their real, social structure, in their power of making the world" (Barthes 142), underlines the extensive consequences of the myth-discourse and the caution with which it and its depoliticizing effects should be treated. This understanding also suggests that discrepancies between perception and reality of food facts are indeed cause for concern beyond immediate health impacts. When granola is considered healthy by 80% of the American population, but only deemed so by 47% of nutritionists (Quealy); when associations in the food industry fight hard against the addition of information to the nutrition label (Ferdman); these are indications that food fact myths exist and are deliberately kept in existence. In order to overcome the resulting depoliticization, which pacifies through normalization and simplification of (political) conditions into natural statements of fact, understanding the first the actors, then the mechanisms that produce the myth is essential (Barthes 143, 146). In the case of consumer-food data interactions, the passivity is exemplified by the nutrition fact disengagement that usually characterizes the grocery shopping experience, and the implicit acceptance of nutrition labels as not providing information in an easily accessible manner. Latour offers an approach that identifies the nutrition label as just one of many mediators in the complex network that constitutes the problem arena of food fact fictionalization.

An assembly of mediators

Mediators as defined in 'Reassembling the Social' are in essence rhizomatic. As Deleuze and Guattari attribute to the rhizome principles of multiplicity and connection, so Latour describes the character of mediators as multi-directional and transformative, making both terms concepts from which meaning is to be derived through assembly and reassembly (Deleuze 7; Latour 39, 50). The task of identifying mediators in the problem arena of food data narrativization thus becomes a task of assembling the collective of actors that shape and transform it. The list of mediators already (if implicitly) established includes the nutrition label, policy makers, food industry and association representatives, and consumers. To this I can add journalists, who communicate about food and nutrition; packaging designers, who create the surroundings in which nutrition labels exists, and supermarkets, as the place where the food data-consumer interaction is most likely to occur. Packaging and brand visuals stand out as particularly impactful mediators. Web platforms and apps such as EWG's Healthy Living, foodfacts.com, and the Sage Project are other examples of mediators in the flow of information; the latter's use of data visualization techniques to represent information renders it of particular interest and makes an ideal candidate for the detailed case study analyses provided in Chapter 5. While some mediators are beyond the realm of what design can directly transform, others are well within it. And to realize that the mediators are interconnected, that they all have agency in the problem arena, and that if one changes, so will the entire assembly in

which it takes part, is also to realize the impact that design can have in the highly political, complex problem arena of food data transparency.

DEFINING THE SCOPE

Consumer-centric design

How does one define the user of the nutrition label? Those who grocery shop? Those who eat packaged food? While the identification of stakeholders as mediators is useful in establishing the critical arena that a design proposal will populate, delving deeper into the definition of the 'end-user' is an essential design methodological step towards providing the best possible solution in terms of interaction, affordances, and aesthetics. However, in the case of the nutrition label, and therefore also other food information interfaces, the user group is extremely broad, potentially making it difficult to extract concrete insights to be transformed into design criteria. But rather than narrowing the scope by focusing specifically on a certain user group (for example defined by their nutritional needs, which could be defined by anything from allergies to heart disease), I choose to define the target audience for my design proposal generally as the consumer. The consumer-centric design solution will then be that which best serves the interest of this consumer; that which empowers and facilitates fact-based decision-making, which exposes advertisement fictionalization, and allows shopping choices to be guided by deliberate consumer intentions rather than marketing strategies. This provides an entry

point for design into the complex stakeholder arena at the scale of the individual, suggesting that a design solution could benefit from existing on a personal rather than systemic level, since this will ensure that no other interests than those of the consumer will drive the proposal.

The cereal problem

While the consumer-centric approach ensures wide application for a design proposal, maintaining the generality of the nutrition label, it also leaves the scope of the design challenge almost impossibly broad. So rather than narrowing the scope by user group, I will do so by product. Since the cereal aisle was where I was first confronted with my inability to make a fact-based choice, cereals became the obvious food category to focus on. Even my own experience aside, cereals and granolas are notorious for their hidden sugar content, as suggested in New York Times' "Why Your Granola is Really a Dessert", making them the perfect subject for new, fact-based evaluations. Finally, cereal boxes have a relatively standardized appearance, making them more susceptible to design changes. Thus, cereal becomes the starting point for the food fact defictionalizing goals of the design process – though always keeping in mind, that the scope should maintain the ability to be widened to include other product categories.

Identifying precedents

Case studies of precedents serve to inform the design process, setting examples to follow or areas upon which to improve. The nutrition label presents itself as the primary case, lending itself to both data-driven and design-centric analysis. This is the focus of Chapter 4. Other precedents include online services dealing with food data communication, as well as immersive, interactive experiences encouraging users to food-data engagement. These tangential cases are the subject of Chapter 5.

04

DISSECTING THE LABEL

A CHAPTER ON THE STANDARDIZED NUTRITION LABEL

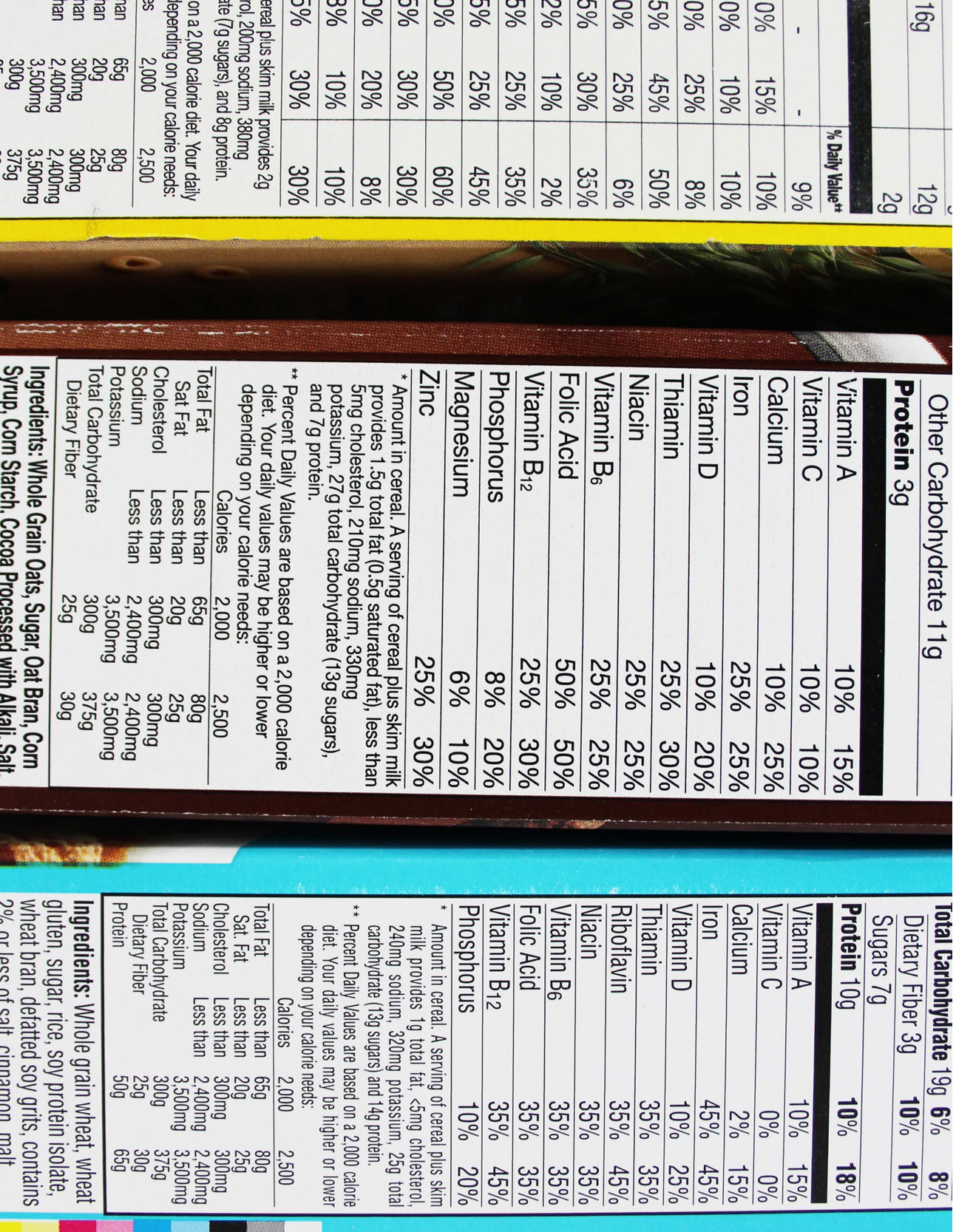
Investigating the nutrition label as an interface between consumers and data; first with a data-driven approach, then through user research strategies.

LABEL ANALYSIS

Overview

The nutrition label is an elaborate, standardized infographic provided by the FDA. It is also an iconic design that we interact with daily, whether actively or passively. It is easily recognizable, yet readily unnoticeable. Understanding the contained information begins with understanding the components and their hierarchy. On their website, the FDA provides a (for the purpose of clarity notably color coded) explanation of exactly this (Fig. 4.1). In addition to this quantifiable information is the required ingredient list, providing a ranked list of product constituents.

The complexity of not just the contained information, but also the connotations and qualitatively embedded values (from politics to design language), makes the nutrition label a candidate for endless analysis. This chapter takes a pragmatic approach, zooming in on that which is most likely to inform the design of a new food-data/consumer interface; firstly, using a data-driven approach to understand the factual content of a large number of labels; secondly, a design-driven path, where user interviews, surveys and observations lead to identification of existing consumer/label interactions and possible points for improvement.



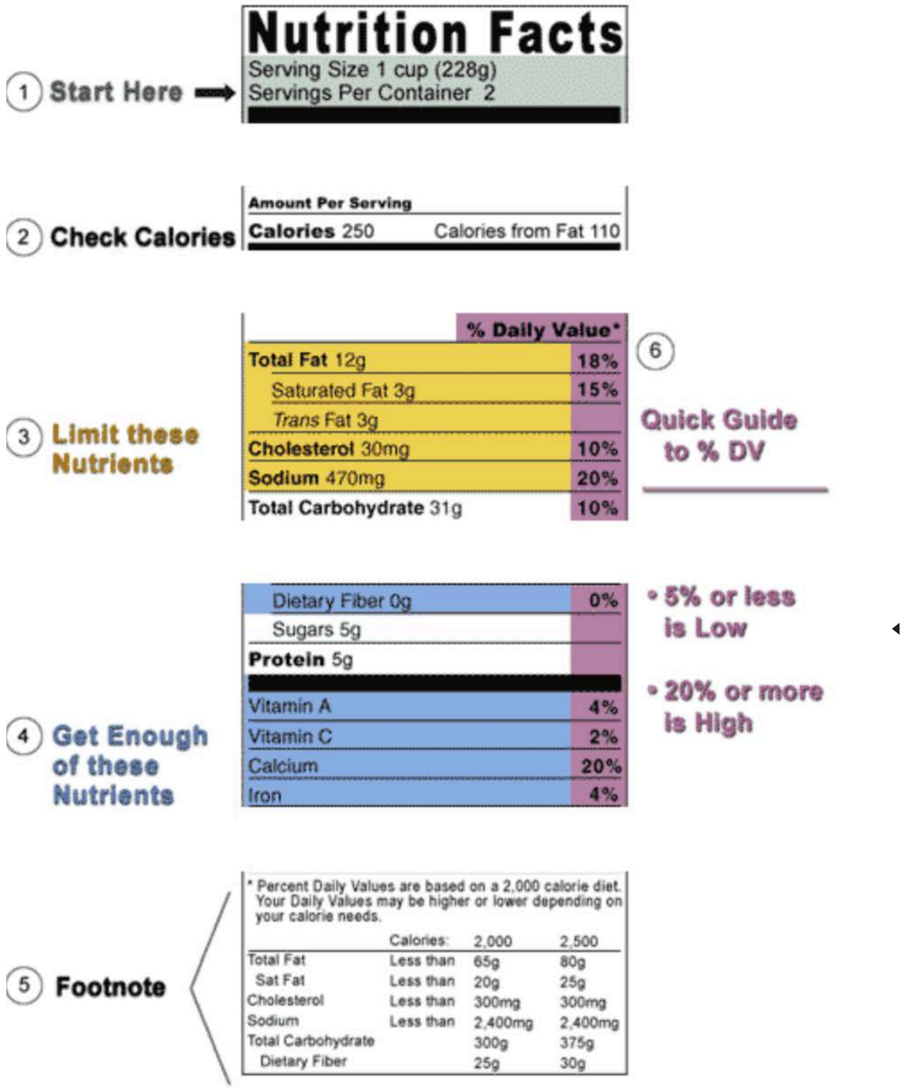


FIG. 4.1
Nutrition label overview.

Source: FDA.

SIDE-BY-SIDE COMPARISON

Original Label

Nutrition Facts
Serving Size 2/3 cup (55g)
Servings Per Container About 8

Amount Per Serving
Calories 230 Calories from Fat 72

	% Daily Value*
Total Fat 8g	**12**%
Saturated Fat 1g	**5**%
Trans Fat 0g	
Cholesterol 0mg	**0**%
Sodium 160mg	**7**%
Total Carbohydrate 37g	**12**%
Dietary Fiber 4g	**16**%
Sugars 1g	
Protein 3g	
Vitamin A	10%
Vitamin C	8%
Calcium	20%
Iron	45%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily value may be higher or lower depending on your calorie needs.

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

New Label

Nutrition Facts
8 servings per container
Serving size **2/3 cup (55g)**

Amount per serving
Calories **230**

	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Note: The images above are meant for illustrative purposes to show how the new Nutrition Facts label might look compared to the old label. Both labels represent fictional products. When the original hypothetical label was developed in 2014 (the image on the left-hand side), added sugars was not yet proposed so the "original" label shows 1g of sugar as an example. The image created for the "new" label (shown on the right-hand side) lists 12g total sugar and 10g added sugar to give an example of how added sugars would be broken out with a % Daily Value.

FIG. 4.2
The new FDA nutrition label of May 2016.

Source: FDA

A data visualization approach

Uncovering trends that are not discoverable by looking at nutrition labels individually, this analysis serves as my first exemplification of how data methodology can inform a rhizomatically assembled design process. Through an exploratory data visualization approach, I analyze nutrition and ingredient data of more than 6,000 breakfast products from foodfacts.com to gain insights about their general composition and nutrition values. What I present here are results and insights gained from analyses and visualizations.

Insights from messy data

The concept of 'clean' or 'tidy' as opposed to 'messy' data differentiates datasets that have been prepared for analysis from those that have not (Wickham). While the idea of tidying makes perfect sense to the data scientist whose main interest is statistically accurate insights, my design approach and concern with investigating of the communicative quality of nutrition labels offer a different take, where there might be value in understanding the extent of data messiness inasmuch as it represents the reality that meets the consumer. The following summary presents essential findings.

Ingredient complexity

The amount of ingredients with names completely foreign tow me in my day-to-day interaction with food, such as 'mixed tocopherols', 'niacin', 'sodium acid pyrophosphate', and 'thiamin mononitrate' present themselves with overwhelming quantity and frequency, much less noticeable when presented on individual nutrition labels. In 6,000+ products, the total count of "different" ingredient surmounts to more than 5,000; this however, represents difference in notation rather than content, but suggests that considerations of how inconsistency in representation affects consumers should be made.

Serving size units

The difference in notation of serving size, and the difficulty of comparing nutrient data across units of volume, weight, and entity, that follows, becomes even more evident with data visualization, where uniformity across data entries is essential for sense-making.

The issue of 'serving size' lends itself to qualitative evaluations as well, such as whether they should represent recommendations or realities, and how the connotations of 'serving' affect consumer-data relations. In the FDAs new regulations on nutrition labeling, serving sizes are increased to reflect better how much people eat (Federal Register); I am wondering how this will affect the quantities that consumers consider appropriate.

Averages and distributions

Distribution analysis reveals how servings per container greatly favors even numbers, particularly the number eight. I suspect that this can be attributed to its divisibility by both 2 or 4, and what might even be defined as the number's 'friendly' connotations. A quote by Samuel Johnson suggesting that "Round numbers are always false" at least inspires the idea that coincidence alone did not cause behind these statistical results.

FIG. 4.3
Network visualization of ingredient pairs for 6,000+ breakfast items displays composition complexity.

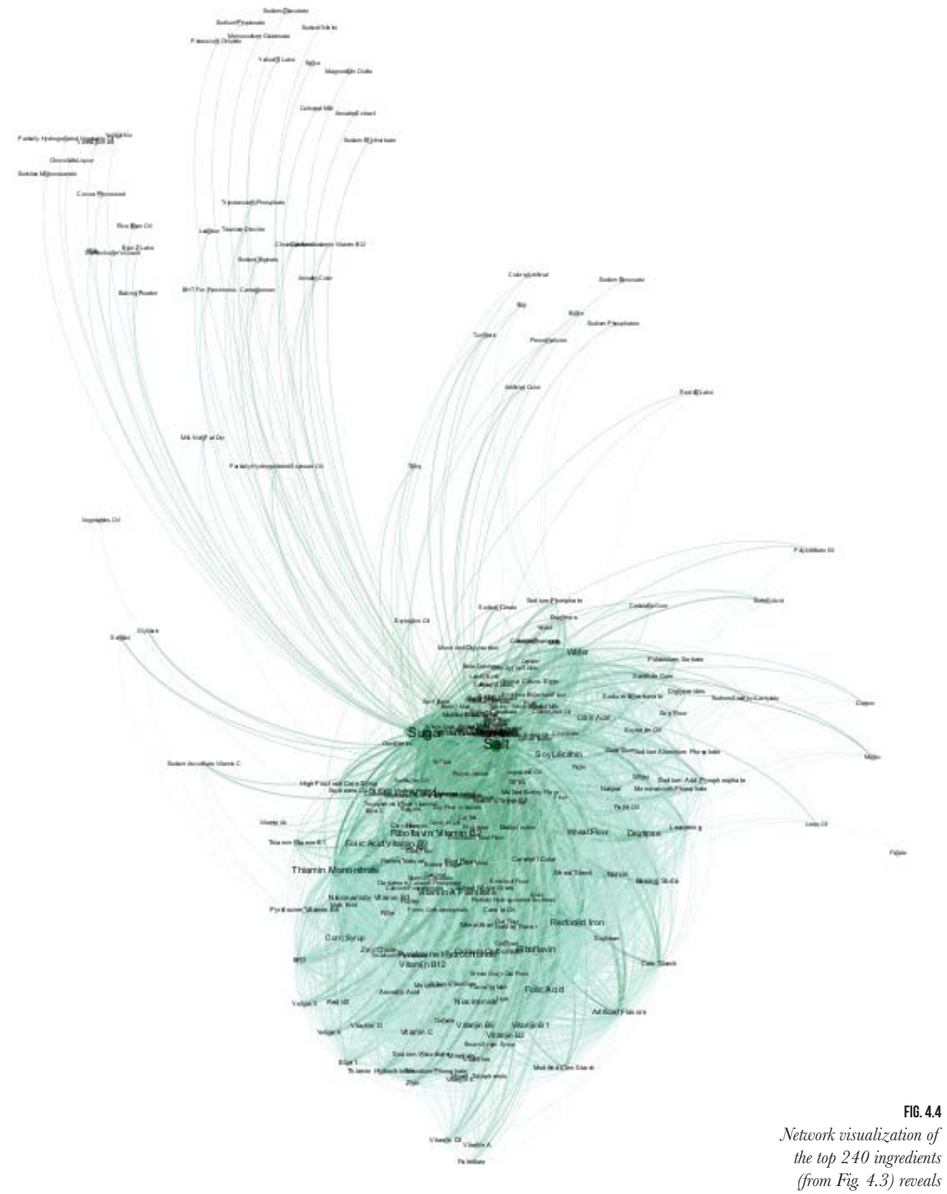


FIG. 4.4
Network visualization of the top 240 ingredients (from Fig. 4.3) reveals ingredient complexity.

Information design strategy

Any kind of design solution dealing with the data complexity described in the above must be acutely aware that an interface is something dynamic, allowing for equally successful accommodations of greatly variable data compositions. Data analysis findings inform this process, as it defines the spectrum within which a solution must be able to operate. In Chapter 6, these insights are defined as design criteria to further guide the development of a solution.

LABEL INTERACTIONS

A design approach

Complementary to the data-driven approach to the nutrition label, a qualitative design approach is employed to gain insights of behavioral consumer habits and preferred label interactions. Interviews and conversations, as well as an online questionnaire (Appendix III), provide the methodological framework for this approach. One thing became immediately evident during this investigation; absolutely everyone has an opinion about the nutrition label. Whether it is their daily companion, a symbol of health-obsessed nitpicking, or a political battleground, the nutrition label means something to almost everybody, suggesting that the topic is just as much a highly relevant, potent driver for change, as it is controversial and an unavoidably subject to lively discussion and disagreement. This leads to the first of the three primary insights derived from this study; the need for customization.

Even though there are some overall tendencies, such as increased attention to sugar content and calories per serving as opposed to other nutritional aspects, the general picture painted by interviews and surveys is a strong desire to for customization. Everybody has different bodies, values and consumption habits, and to the extent possible, a consumer/food-data interface should reflect this.

Another finding deals with location; out of 61 subjects, only one reads nutrition labels exclusively at home (Appendix III). The remaining 60 people answer that their engagement with the label takes place either solely or primarily at the supermarket. This indicates that a new interface would have the greatest impact if located at the point of purchase.

Finally, one aspect of the nutrition label is identified as being particularly problematic to a majority of respondents; serving size. Visualizing the indicated amount is a great concern to many, and is complicated further by variations in unit denotations. A new interface should identify potential solution to this.

In Chapter 6, these findings an insights are evaluated and transformed into concrete design objectives. But first, Chapter 5 will explore tangential case studies already existing in the nutrition fact problem arena.

05

PRECEDENTS

A CHAPTER ON
EXISTING SERVICES PROVIDING NUTRITION INFORMATION

Critical analysis of web platform 'The Sage Project' provides insights alongside studies of tangential precedents.

THE SAGE PROJECT

Good intentions and broken promises

◀ FIG. 5.1
The Sage Project landing page.

Source: sageproject.com

"New App Will Provide All of the Food Nutrition Data You Will Ever Need" declares the Time Inc. media platform Food and Wine (Pomranz). InStyle magazine duplicates the praise with their headline that introduces the Sage Project as the site that "breaks down everything you've ever wanted to know about food" (Adamiyatt). A still overall positive New York Times WELL article stays more practical when stating that "Sage goes beyond the food label to give customers additional information about additives and preservatives, how much sugar has been adding during processing or how far a food has traveled" (Strom).

In many ways, the team behind the Sage Project, lead by co-founder and chief executive Sam Slover, and I share a mission of mobilizing design and data visualization principles to improve food data transparency. The values on their landing page, carrying promises of actionable transparency and visual simplicity, are examples of this; Slover's comment to the Times that "food labels are a data visualization that we see every day, but we don't get a lot from them" further emphasizes the alignment in our perception of the problem (Strom). However,

I find the extent to which the Sage Project addresses these issues underwhelming and in some cases even counter-productive. Instead of seizing the opportunity to demonstrate data visualization best practices, counteracting opaqueness, and challenging corporation-biased mediators in their fictionalization of information, the platform masks logically incoherent graphs with visually cohesive aesthetics and animated distractions, all affording a consumer-data relationship based on entertainment and perceived accuracy rather than learning, investigation and statistical integrity.

In his account of affordances, Norman defines signifier as the "signaling component", meaning that which encourages and guides the user to a certain (type of) interaction with a product (13). I will use this definition to analyze the perceptible consumer-data affordances5 on the Sage Project by examining the aesthetics of visual signifiers on the platform interface, before mobilizing the framework of Tufte to examine the designs of the site's nutrition data visualizations.

Advertising aesthetics

The landing page welcomes its audience with soft blues, greens, and pinks, strategically chosen as backgrounds for food icons with similar color schemes, keeping the expression subtle, yet not too washed out, the latter ensured by activation of toned, darker hue highlights. Balancing aesthetics of fun and professionalism perfectly, the spinning animation of featured food items seems to signify that this is an environment in which to be entertained rather than informed; the 3D-modeled, rotating strawberry's bright red hue looks cute and friendly against a soft pink background, yet the call-out bubbles, springing from the center of the berry as basting pins from a pincushion with alternately enlarging heads, containing information such as "142% Vitamin C" (of what is not specified here) or "Good Nutrient Density", express a highly analytical approach and exude an air of (enjoyable) accuracy and precision.

A side effect of the consistently used tone-on-tone aesthetic is a style that is uncannily reminiscent of certain advertising visuals; it seems that along with Slover and his team, visual designers at Apple, Casper, and SnapChat have also discovered the soothing effects of contrast-neutralization through single-hue illustration (Fig. 02-07). Whether there is some underlying marketing strategy declaring this the aesthetic of millennials (I suspect a shared target audience to somehow be responsible for the aesthetic alignment) will remain unascertained. What is left is to assess if there is appropriateness in a platform whose "goal is to provide honest, accurate information in an easy-to-understand way"(Sage Project) sharing such striking similarities with ad campaigns.

On product pages, the aesthetics of tonality are replaced with a different version of colorful minimalism. Food items are shot from a straight-on top-view and neatly cropped to eliminate shadows, then presented on a white background, artificially enhancing the two-dimensionality in the representation. You almost get the sense that Slover's design team only out of absolute necessity agreed to include actual product images on the platform, and that they would have been happier had they been granted permission to create animated product icons for every single item, allowing them to keep aesthetic coherency complete without having to deal with the lack of color-coordination caused by the diverse and heavily branded reality of the food items they represent. Even manufacturer's names are not shown in logos or

FIG. 5.2
Landing page at the Sage Project.

Source: sageproject.com

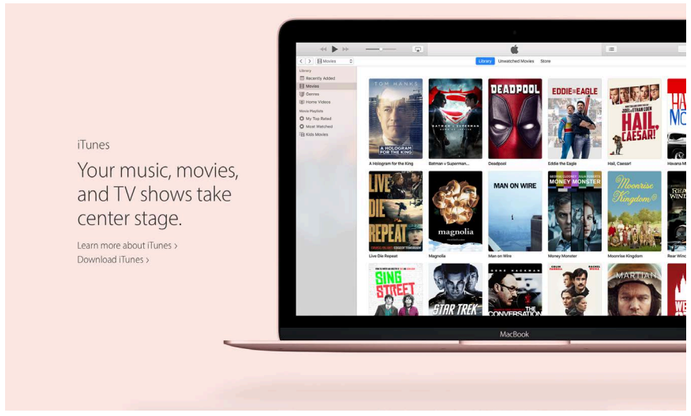


FIG. 5.3
Apple's rosegold MacBook

Source: apple.com

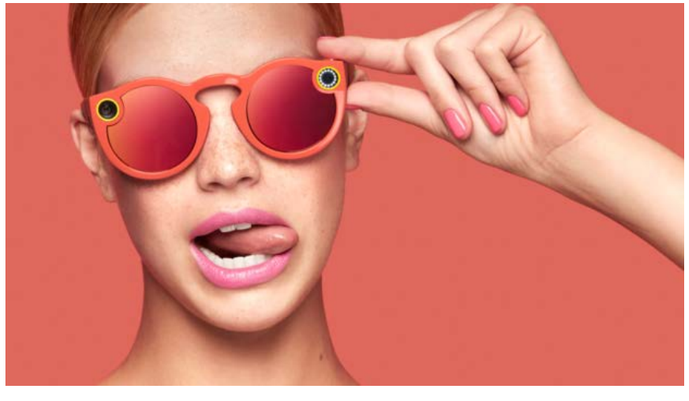


FIG. 5.4
Snapchat glasses

Source: snapchat.com

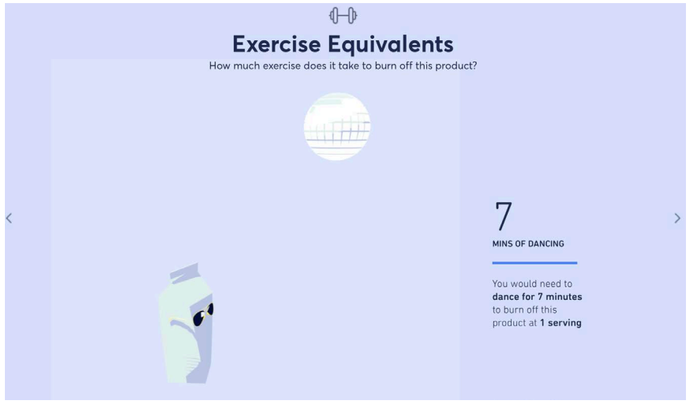


FIG. 5.5
The Sage Project visualizes exercise.

Source: sageproject.com

FIG. 5.6
Casper advertizes mattresses

Source: casper.com

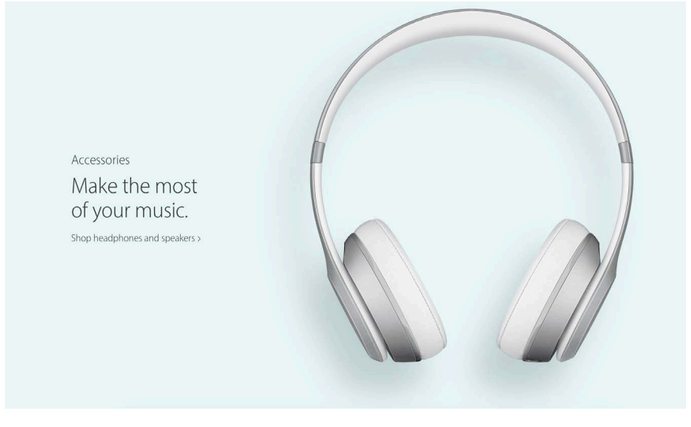


FIG. 5.7
Apple advertizes accessories

Source: apple.com

original type, but standardized to all be represented in a neutral gray, upper case version of the platform's sans serif type. To their credit, Slover and his team did through these means succeed in creating a nutrition data web platform that doesn't feel cluttered and overwhelming, which is indeed an accomplishment, and has, I believe, great part in the reason behind the praising reviews. It is in fact not the aesthetic choices themselves that overthrow the value of this achievement (given different criterion for evaluation, the application of visuals might be considered more successful; for example in their ability to facilitate an experience of brand identity neutralization); more readily, it is the contradictive relationship the website visuals hold to their written supposed complements, promising above all transparency, that create a paradox impossibly justified as part of the fulfilling said commitment. While my analysis so far has been concerned only with the aesthetics of non-data representations, surveying the actual nutrition data visualizations reveals that here, too, the Sage Project is failing to align visuals with visions. Seemingly counterbalancing, yet in reality grossly understating, or in some cases even misrepresenting, dry facts with juicy visuals –or, in Tufte's terms, "chartjunk", the nutrition fact representations are more informal than informing.

Disregarding data discipline

To be in compliance with the guiding principle of data-ink-maximization from Tufte's minimalist approach is to recognize that the placement and coloration of the few pixels then selected for activation must be considered carefully; that the number of colors should be kept to a minimum; that once a hue is assigned to a data category (let's say Carbohydrates), it should not be reassigned or reused to represent other parameters. Adherence to this rule is of course increasingly complicated when parameters multiply, and compromises are inevitable. This however, doesn't justify why the Sage interface represents "Total fat" in a circular bar graph with "Quick Facts" in bright purple, the same parameter which is then in the "Caloric Breakdown" horseshoe graph, suddenly depicted in a cool blue tone (all within the product page of one food item). Neither is it clear whether the gradual shift in hue and value, from bright red over pale orange to a warm yellow, in the concentric circles of the "Avoid Too Much" graph represents a hierarchy of importance for the nutrients in the category, something which the simultaneous decrease in circle sizes seems to support, even though it more likely is the result of purely visual design decisions.

From the inability to display values above 100%, to the comparison-compromising consequences of circle concentricity (forcing a condition of mutually independent proportions relative only to their respective circles, thus making the line segment of 5% 'Sat Fat' longer than that of 5% 'Sodium', contradicting the fact that the value they represent to the consumer is so to speak 'the same'), the data visualization practices of the Sage Project are as counter-effective to their transparency-pledging mission statement as their advertising aesthetics. Disciplinary guidelines for increasing the cognitive and perceptual impact of visual communication are repeatedly violated or ignored. This is not an example of designers taking the methodological liberties I previously advocated in reference of Deleuze and Guattari's rhizome as a framework for thought, and, as I suggest, design processes. It is rather a lesson in what happens, when aesthetic considerations get ahead of more practical ones –not an uncommon downfall for designers, but all the more detrimental when the design objective is the act of informing, of making "complex data easy to digest and accessible to all" (Sage Project). Not even Bateman's finding

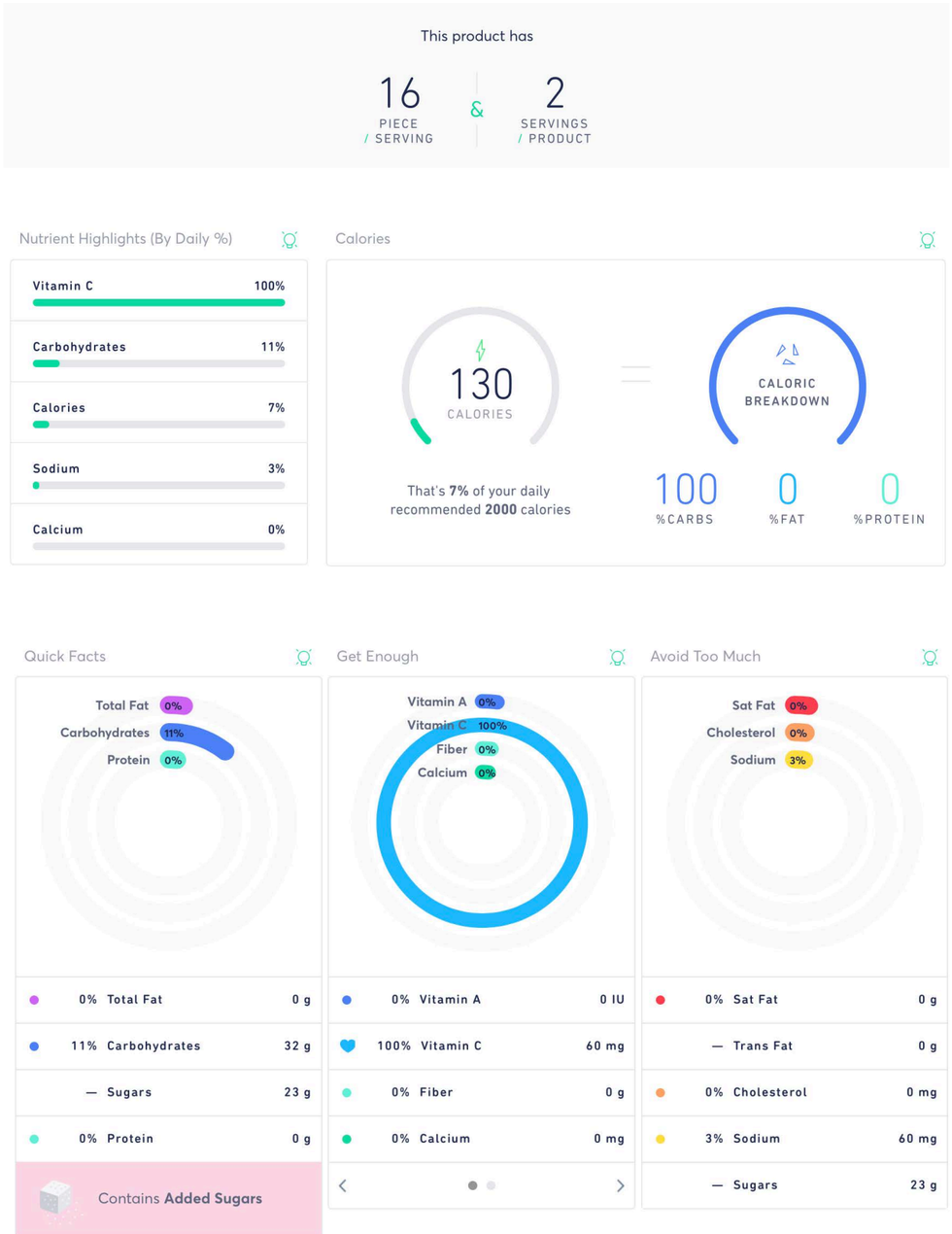


FIG. 5.8
Nutrition data visualization for "Organic Fruity Gummy Candy" by Surf Sweets.

Source: sageproject

that data visualization embellishment increases memorability can justify the design decisions (2579); the charts studied by Bateman all integrate embellishments in representation of the data (e.g. a graph imprinted on the leg of a showgirl, denoting the prices of diamonds over time and titled "Diamonds Were a Girl's Best Friend")(2576); on the Sage Project, while the graphs remain fairly "clean" (though not nearly clean enough to meet Tufte's standards), the "embellishing", and certainly memorable, disco-dancing milk carton and yoga-posing pear exist as separate entities with no direct visual relationship to the nutrition data.

I don't necessarily believe that Slover and his team are driven by ill intentions. But when applying "badges" that "help visualize the data" by "highlighting data points we know you (the consumer) are interested in" classifies "Surf Sweets Gummy Bears" as a product with "Good nutrition density" (to the questionable delight of the Times reporter) and "Good nutrition for price", it inevitably raises questions about the underlying values and potential biases in the data display (Sage Project; Strom); of whether the addition of Vitamin C (in this case in the form of ascorbic acid) to candy bears should be promoted as being "good" and how this serves the needs of consumers and corporations respectively. Recognizing that pressure from the food industry to maintain transparency at an absolute minimum is immense, also comes with the realization that the list of corporate collaborators, currently counting 50+ partners (in addition to Surf Sweets, including brands such as Nature's Path Organic, Whole Foods, and Applegate) probably would not be as long, had Slover insisted on (and followed through with) increasing the level of information accessibility provided by standardized labels.

To be fair, the Sage Project does in some cases offer insights that add

to the legal minimum that is provided on food packaging; prompting consumers to specify details about their height, weight, age, and activity levels allows a personal calorie quota to be calculated, and nutritional values are thence displayed as a percentage of this estimate. Yet with units reflecting only item-inherent relativity, meaningful comparison between food products becomes virtually impossible, or at least unreasonably labor intensive for the consumer. Imagine deciding on which laptop, camera, or car to buy without a sensibly formatted option of side-by-side spec comparison. Such is the daily serving-size-centric reality of nutrition labeling, and another missed opportunity for the Sage Project.

LOOKING AT TANGENTS

Online precedents

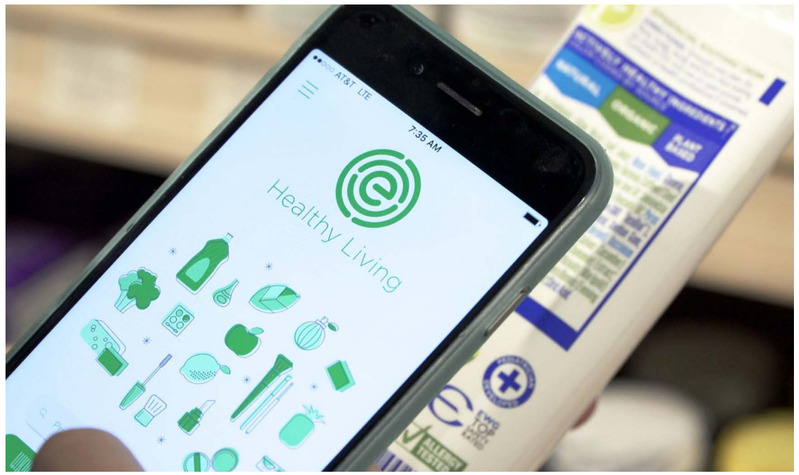
While the Sage Project (the nutrition label itself aside), with its almost fully aligned value and mission statement, is the most dominant current player in the problem arena in which my thesis project aims to exist, other applications with similar objectives are worth considering as well. MyFitnessPal, EWG Healthy Living and FoodFacts.com are all services for online use, be it mobile or desktop-based, aiming to help consumers make more informed decisions. However, I find that none of them manage to address the issue of on-site, customizable information delivery in a fully satisfactory way; EWG with its bar-code scanning functionality definitely promotes on-site interaction, but the process feels tedious and offers no element of customization. It also uses a rating system for products (1-10, one being the best), which helps consumers quickly compare products on their path towards decision-making. Any rating system will however raise the question of the basis of the rating, something which may also vary from person to person, or even from product to product. With MyFitnessPal, the focus is primarily on weight-loss, thus potentially losing a user group with interest in fact-based food-decisions without the simultaneous goal of slimming down. FoodFacts.com exists both as a smartphone appli-

cation and as a desktop version, and provides extensive information which is indeed customizable. Thus, in functionality this comes closest to the experience I am aiming to create with my thesis project. But as was the case with the EWG app, the interface feels crowded, it is not making use of data visualization principles to ease access to information, and in the case of the mobile applications, it seems (perhaps only naturally) to be struggling to manage the limited real-estate available on-screen.

I believe the main conclusion to be drawn from these precedents is, that even with multiple offerings on the market, there is still a lot of room for improvement in terms of user experience design.

Large-scale inspiration

Looking beyond the solely digital, a concept such as Future Food District of EXPO 2015 offers a large-scale solution to the problem of on-site food data communication. Taking up more than 75,000 sq. ft., Future Food District is a digitally driven grocery store exploring "how data could change the way that we interact with the food that we eat, informing us about its origins and characteristics and promoting more informed consumption habits." (Ratti). The concept achieves a lot of what I am defining as my thesis objectives; it provides an on-site experience that empowers consumers to make fact-based decisions, and even goes beyond nutrition facts to provide extensive information about each product, including aspects regarding environmental impact and manufacturing. In many ways (and only based on promotional video documentation), FFD actually seems like an ideal solution; however, the scale of it makes it difficult to implement widely, and requires an immense level of cooperation, not to mention investment, from retailers. I will take inspiration from FFD and explore the opportunity of bringing its large-scale benefits into a solution existing on the scale of the individual.



◀ **FIG. 5.9 (TOP)**
EWG Healthy Living

Source: ewg.org

◀ **FIG. 5. 10 (BOTTOM)**
MyFitnessPal offers a path to weight loss.

Source: myfitnesspal.com

FIG. 5.11
Future Food District is a large-scale concept implementing food fact interfaces in a supermarket setting.

Source: carloratti.com

06

DESIGN OBJECTIVES

A CHAPTER
DEFINING GOALS AND DESIGN PRINCIPLES

Drawing on conclusions from case studies, a set of guiding design principles are defined. The mission and vision for the project are established.

DESIGN PRINCIPLES

Case study conclusions and evaluations

◀ FIG. 6.1
Cereal

To transform the insights gained from case studies and precedent analysis into something which can guide my research and thesis development as I move forward, I establish a set of design principles. Dynamic and transformable, they will steer but never limit the design process; they will call awareness to the shortcomings, contradictions, and myth-discourse of existing solutions and begin to provide a path towards the design of food data defictionalizing consumer experiences.

01: The value of comparison

Size and quantity are only understood relatively; whether something is big or small, a lot or a little, can only be answered if a context is established; when there is something to compare to. Nutrition data is no different in this regard. However, mediators in the current food-data information flow afford only item-inherent comparison, encouraging consumers to evaluate whether a given 'serving' is appropriate, never if it is more or less appropriate than a serving of a different quality. I believe accurate understanding of different foods in relation to each other to be crucial in fighting fact fictionalization, and facilitating item-to-item comparison will thus be a guiding principle in my thesis development.

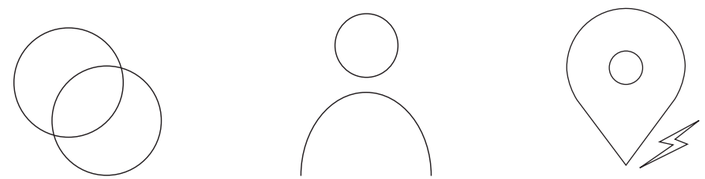
02: Customization

With nutrition label values noted as 'percentage of daily value', it only makes sense that this 'daily value' corresponds to personal needs rather than a standardized average. An element of customization will also allow for much more accessible information displays, as unnecessary information can be hidden. Already part of most of the studied precedents, and repeatedly requested by interviewees, customization is an inevitable feature for a food-data/consumer interface. With this, consumers should be able to define their own goals and criteria by which their food information is displayed.

03: On-site access

To accommodate established user patterns and provide the best conditions for fact-based decision-making, the designed interface should be on-site implementable. It should be an integrated part of the grocery shopping experience rather than a separate research tool or an afterthought.

The establishment of the three design principles inevitably begins to point towards a technology-driven solution; even just the notion of working with data suggests this, and adding a layer of customizability makes it difficult to envision an analog approach. However, I believe that applying new technologies should not be a goal in itself; rather, I'm a proponent of using technology in thoughtful ways, as a tool to reach other defined goals, in this case the goal of achieving seamlessly integrated nutrition data user experiences.



01
Comparability

02
Customization

03
On-site

FIG. 6.2
Desing Principles

MISSION

The goal of the design is to empower consumers to make fact-based decisions when shopping for food.

VISION

My ideal world is one where the food industry has no incentive to hide information from consumers; where concerns for human and planetary well-being are not compromised by the quest for profit-optimization; and where it is not a struggle to evaluate cereal nutrition information in the attempt to make a well-informed purchasing decision. By systematically addressing the latter through design and data visualization methodologies, I attempt to shift the information-bias towards benefitting consumers rather than corporations, with the hope and belief that engaging, food data defictionalizing consumer experiences can be a call-to-action against nutrition fact opaqueness, which will begin to bring about the first and the second.

07

CONCEPT DEVELOPMENT

A CHAPTER ON MOVING TOWARDS AN AR CONCEPT

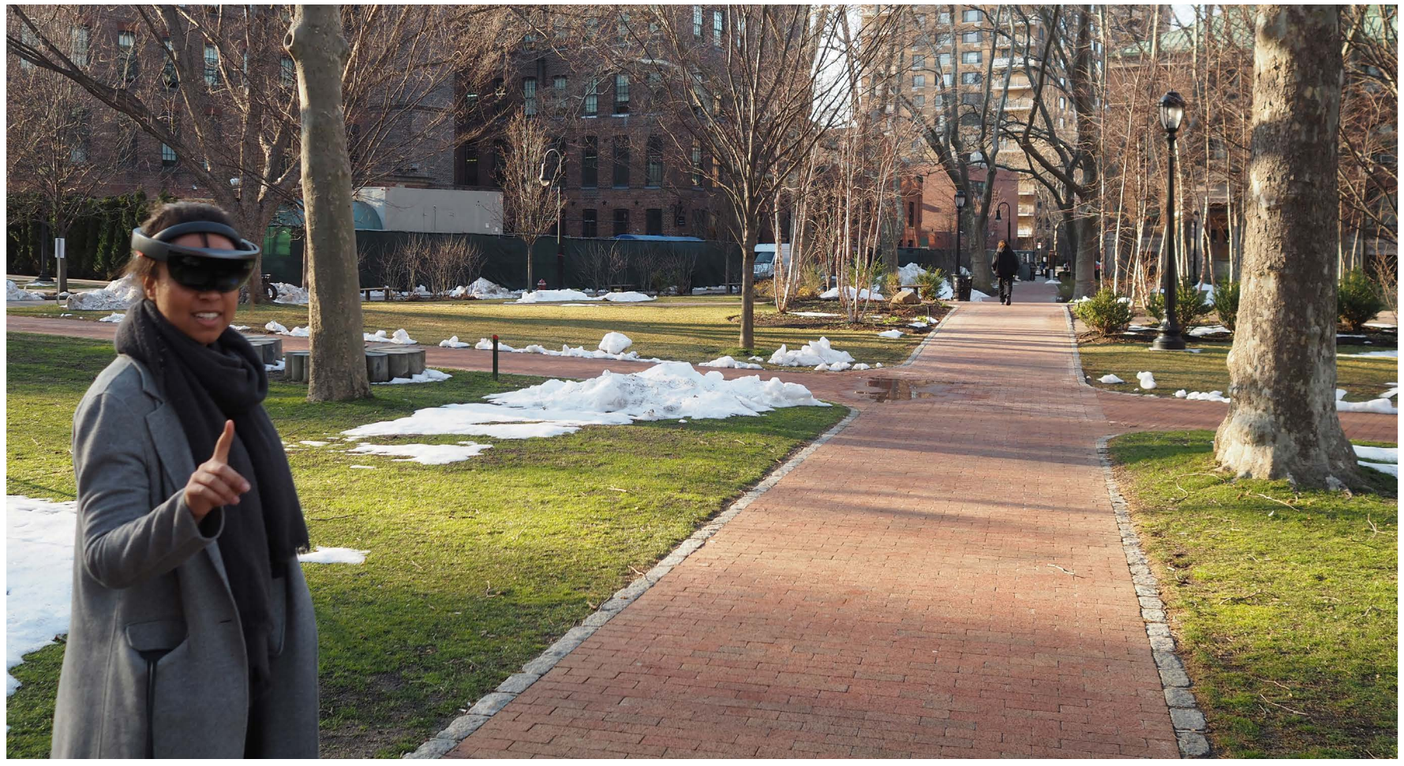
Developing the design DNA; Discovering augmented reality while concretizing concept interactions and intent.

FIG. 7.1
Close-up of a Microsoft Hololens augmented reality headset.

WORKING WITH TECHNOLOGY

Discovering augmented reality

Before I had tried the Microsoft HoloLens augmented reality headset, AR was just a concept for me – not something I actively considered designing with. But after my first encounter with "real" AR, seeing digitally projected holograms appear on top of a real-world scene (as opposed to mixed reality applications/phone-based AR, where holograms appear on an image reproduction of the real environment), I immediately recognized the immense potential and possibilities that this technology presents. And even more so, I found that this technology had the opportunity to solve many of the issues I have discovered during my thesis research. Before AR, a packaging front as displayed on Fig. 7.4 was nothing but wishful thinking; an imagined ideal scenario, where manufacturers and packaging designers prioritize information communication over marketing strategies; with AR, however, it needn't be just a dream. In fact, with image recognition-based AR, three major benefits to the food information experience emerge. These benefits were enough to convince me that an AR solution would be a fruitful direction for the development of the final design.

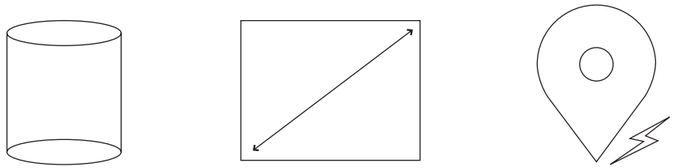


▲ FIG. 7.2
Testing the Microsoft HoleLens provides insight into the AR user experience.

▲ FIG. 7.3-7.4
Augmented reality in its most basic form; an overlay of information on a real-life scene.

Augmenter *Augmentation + Augmentee*

FIG. 7.5
The concept of AR



01
Volumetric display

02
Bigger canvas

03
Instant access on-site

FIG. 7.6
The benefits of AR

01 Volumetric display

With AR, interfaces are no longer limited by the two dimensions of a screen. Three-dimensional holograms provide the opportunity to display volumes to scale, a particularly great advantage when it comes to solving the issue of serving size and unit visualization.

02 Bigger canvas

Using an augmented reality device (other than a phone), comes with the privilege of being able to use the entire surrounding environment as a canvas for information display. With data as comprehensive as nutrition facts can be, every inch of interface real-estate counts.

03 Instant access on-site

Image recognition AR is ideal for the supermarket scenario; an augmenting device can detect the front of packaged foods and display the appropriate nutrition information hologram on top. This provides instant access on-site; no scanning, scrolling, or searching necessary. When looking through the augmenter, food packaging fronts can indeed be made to look like data visualization displays.

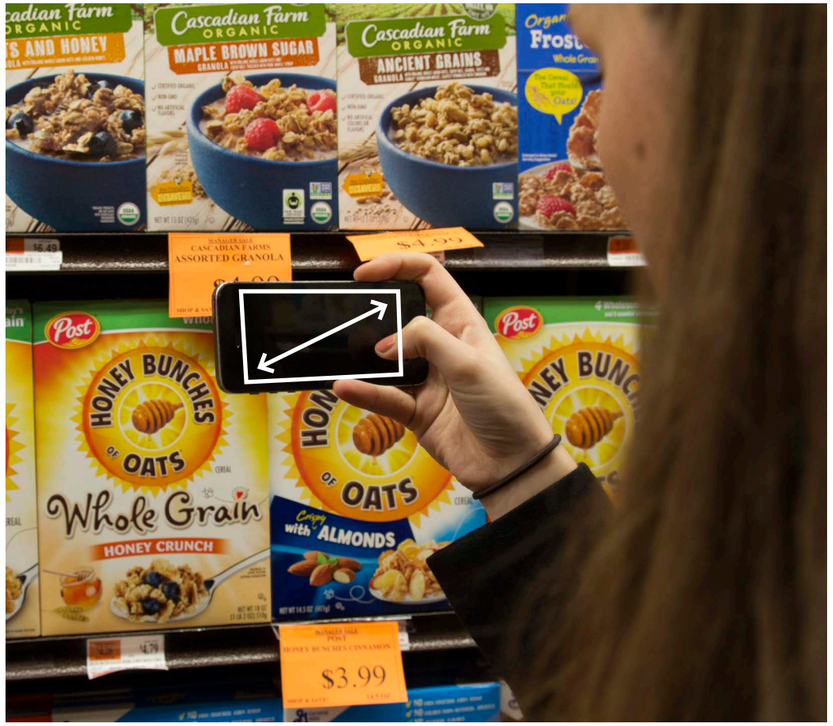


FIG. 7.7
With phone-based applications, the display size allows only limited amounts of information to be visibile at a time.

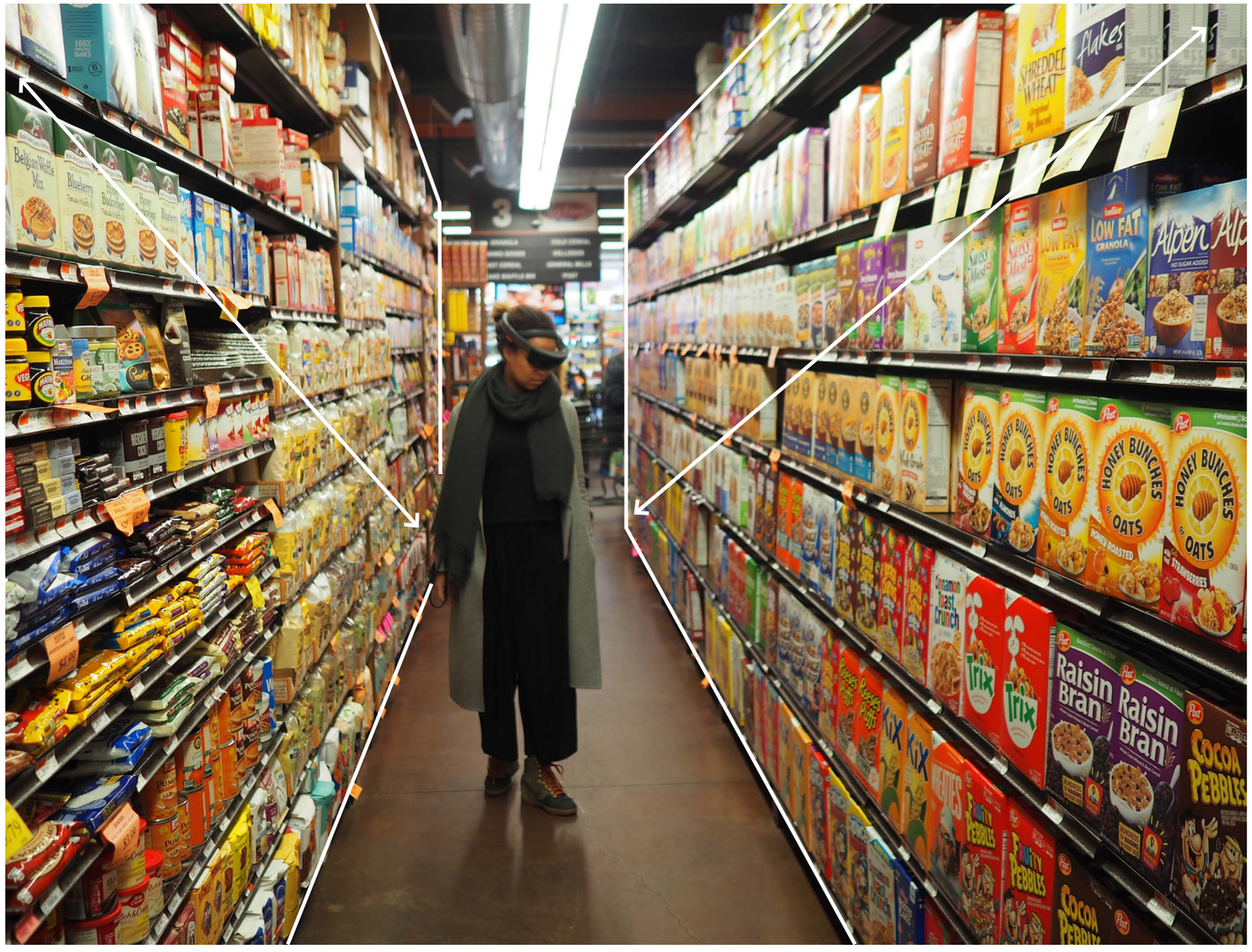


FIG. 7.8
With augmented reality and image recognition, the entire supermarket becomes a canvas with the potential for display of information.

Prototyping in AR

Designing in AR of course requires involvement with some technical tools and software. I am working with game development platform, Unity, as the central program for prototyping and developing AR apps, using the Vuforia plug-in add the functionality that allows for image-prompted, image-tracking holograms. The apps can be deployed for testing on smartphone as well as the Microsoft HoloLens. With the software workflow set up, testing and evaluating different holographic solutions becomes possible. However, as AR technology is rapidly developing, I am attempting not to let my design explorations be limited by what's possible with the current set-up, neither by my own technical capabilities and skills using the AR-related software (for example coding in C#). My workflow is thus one of familiarizing myself with the technology to the extent to which it informs the design process, and allows for concept testing; whenever a "works-like" prototype is not achievable, a "looks-like" version is developed using other visualization techniques.

Implications of AR

Most new technologies face some resistance towards their implementation into our daily lives, and I believe that AR is no different. Even I have my doubts about whether I wish to further add to the comprehensive digital landscape that already surrounds us. This is why I find it important to explore not only the benefits of AR, but also the implications that follow. In doing so, I will aim to design my way out of dystopia, to use my agency as a designer to push towards desirable scenarios where technology is a helper of humanity rather than an all-encompassing distraction, or even worse, a main component of a

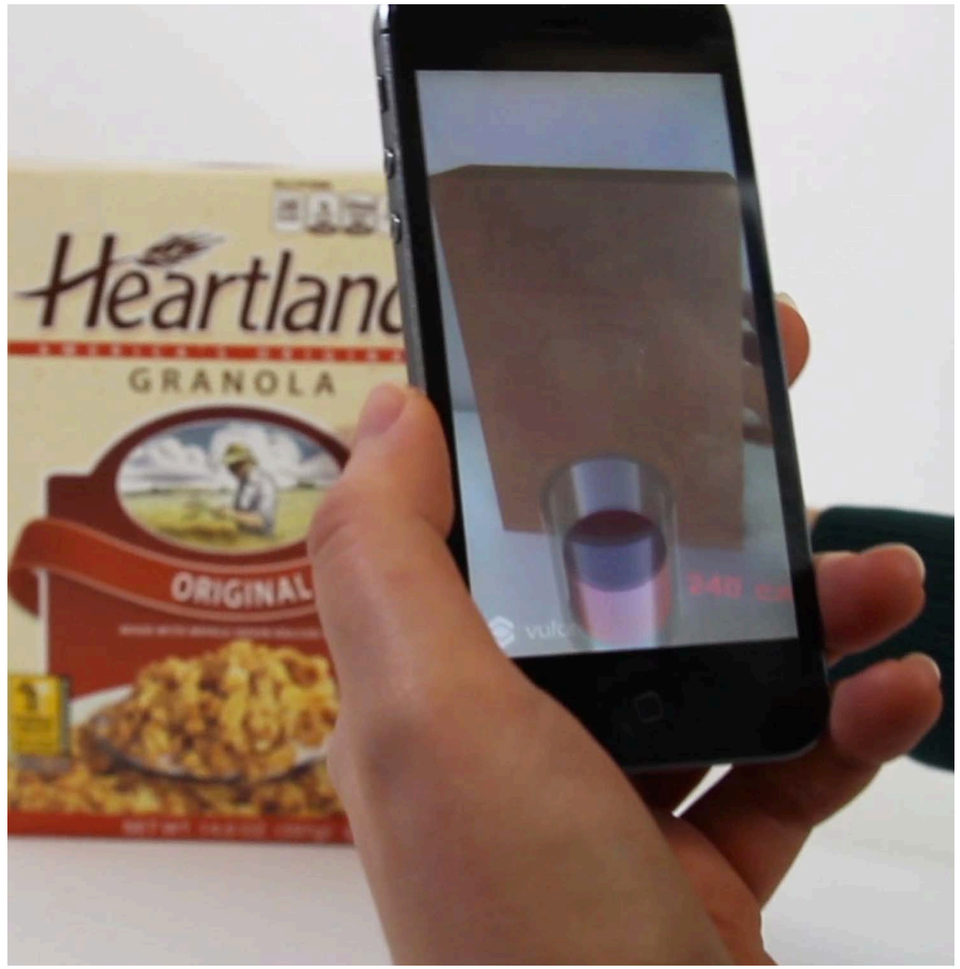


FIG. 7.9
Phone-based AR prototype.

totalitarian regime.

Filmmaker Keichii Matsuda explores some of these concepts in his six-minute short, 'Hyper-Reality'. Shot from a first-person perspective, 'Hyper-Reality' presents a world where holographic augmentation is everywhere, and citizens are being constantly evaluated and awarded points for their usefulness. Both sound and visuals are overpowering, constantly demanding the user's attention – and not once in the short does the first-person character interact directly with another human being. Matsuda's representation of AR is evidently intentionally over the top, and, I believe, rightfully so; it captures a fear of technology continuously permeating into every single aspect of our lives, until there is no "real world" left to be experienced, a fear which I share to certain extents and wish to counter by proposing design solutions that pull towards the opposite end of the spectrum. In the hyper-real dystopia, AR technology isolates and alienates the individual; but it doesn't have to be that way. I see a future where technology seamlessly assists our daily endeavors, and I even have hope that the rise of AR might help drawing us away from the screen, allowing us to spend more time engaging with each other and with the 'real' reality.

Another and much more immediately tangible implication of AR is social acceptability. As mentioned earlier, phone-based AR doesn't provide the full benefits of the AR experience – however, AR headsets are yet to have their commercial breakthrough. The Microsoft HoloLens is so far only intended for development or organization level purposes, as both its form factor and price point reflects (current prices start at USD 3,000 per headset)(Microsoft). Even Google Glass, which was intended for the consumer market, failed to catch on (npr).

These insights made me realize, that to address the holographic experience, one needs also to address the augmenting device. I am thus forming a set of design criteria for such a device to meet.

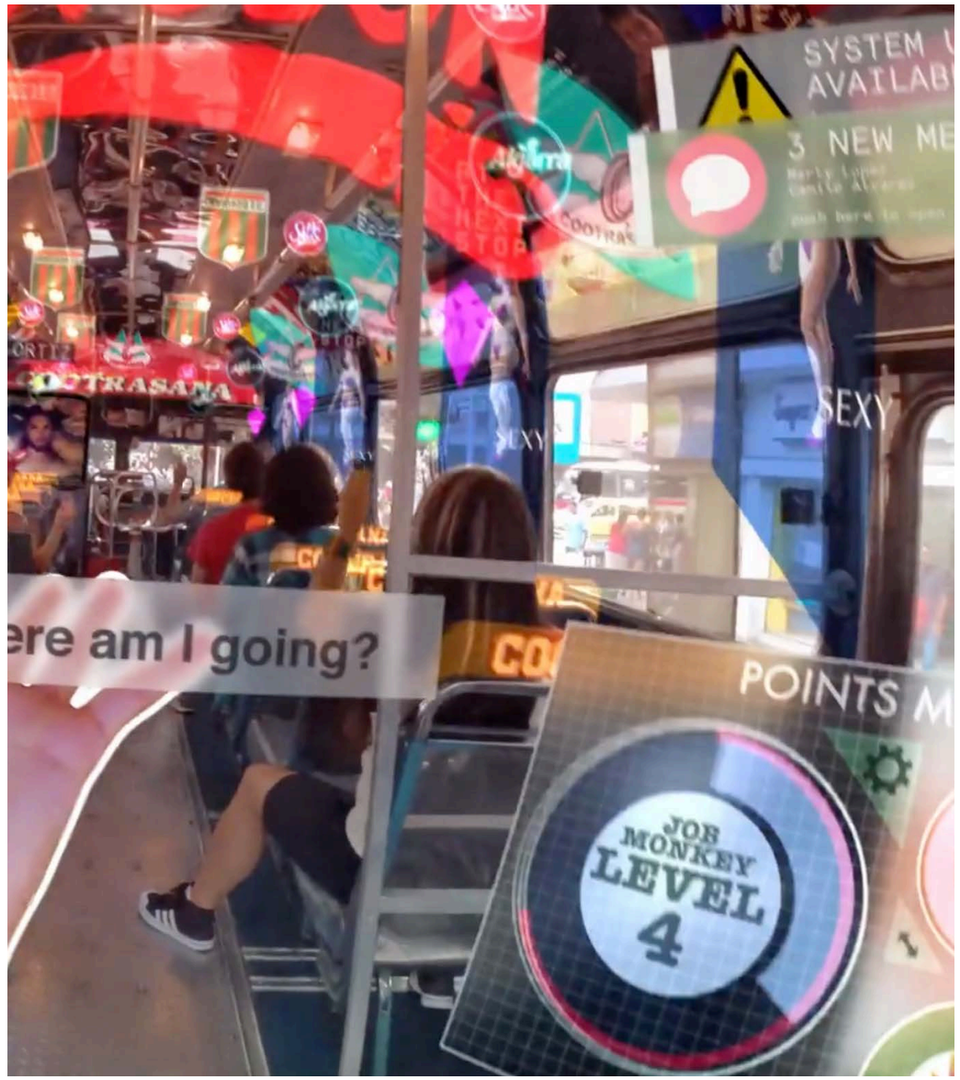


FIG. 7.10
In the 6 minute short 'Hyper-Reality', Keichii Matsuda explores a dystopian future where augmented content is everywhere and people are constantly evaluated through a point system.

Source: Hyper-Reality on vimeo.com

FIG. 7.11
Augmented reality glasses 'Google Glass', in spite of a relatively small form factor, never became a commercial success.

Source: glassappsource.com

FIG. 7.12
The Microsoft Hololens is far from discrete. However, it is not intended for private use and only exists as a developer's version.

01 Social etiquette

There are many speculations on what made Google Glass fail; some point to lack of functionality, others to aesthetic concerns (Doyle).

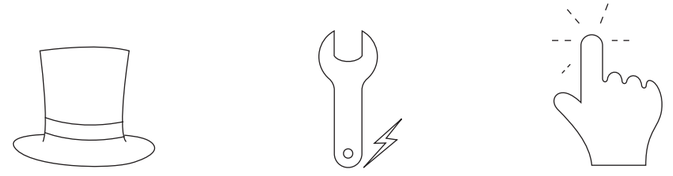
While I find these to be valid concerns that will inevitably need to be addressed in the design of a new augmenting device, I find that one aspect has been overlooked in the media analysis of the Google Glass failure; social etiquette. Head-worn objects are historically tied to etiquette, and even modern devices such as headphones come with clear expectations and social rules for both the bearer and other people present; when the headphones are on, the bearer is unavailable, listening to music; other people can choice to interrupt, in which case the bearer is expected to remove their headphones and direct attention towards the approaching party. In either scenario, the position of the object clearly indicates the state of mind of the bearer, making social interaction clear and rarely intimidating. With Google Glass (and Microsoft HoloLens) this is not the case; the surrounding parties feel uncertain about the bearer's attention and consequently about how they themselves are expected to act – I experienced this first hand during my testing of the HoloLens in various environments. To avoid this uncertainty, my first design criteria for a new augmenting device is that it has clear social etiquette.

02 Task-based/On-demand

One way of preventing Matsuda's dystopia from becoming reality, is by moving away from the constant immersion model towards a task-based approach. This will be my second design criteria; the designed augmenter should afford AR on-demand, rather than suggest the necessity of non-stop holographic involvement.

03 One-handed interaction

The third criteria is a practicality, but important nonetheless; since the new augmenting device will be designed for use in the supermarket, where the consumer is expected to have both personal belongings, shopping cart or basket, and groceries to keep track of, it should be as easily operable as possible. One-handed (or hands-free) interaction is therefore a must.



01
Clear social etiquette

02
Task-based/on-demand

03
One-handed interaction

FIG. 7.13
Augmenter design criteria

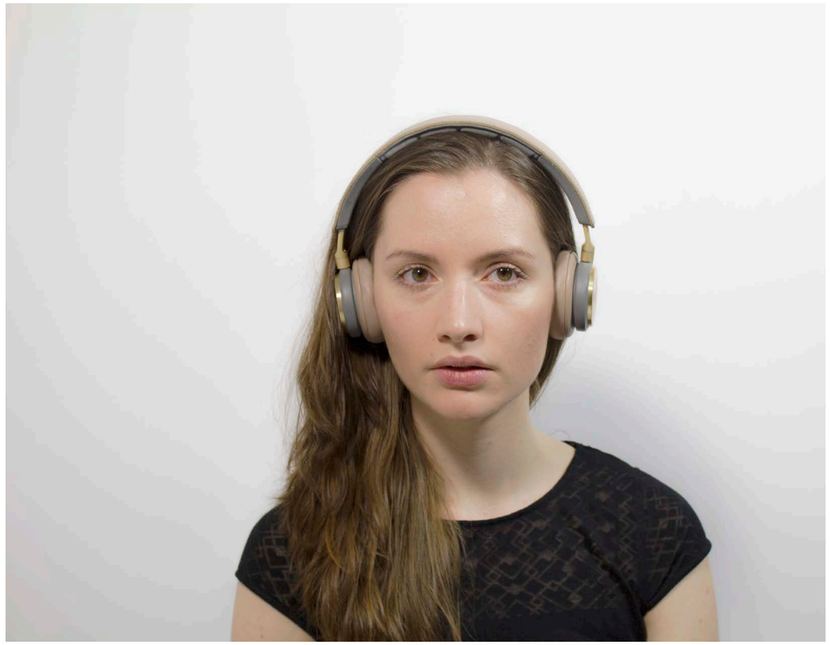


FIG. 7.14-16
Headphones are a widely accepted head-worn device that comes with a clear etiquette. On means listening to music; off means the attention is on the surroundings.

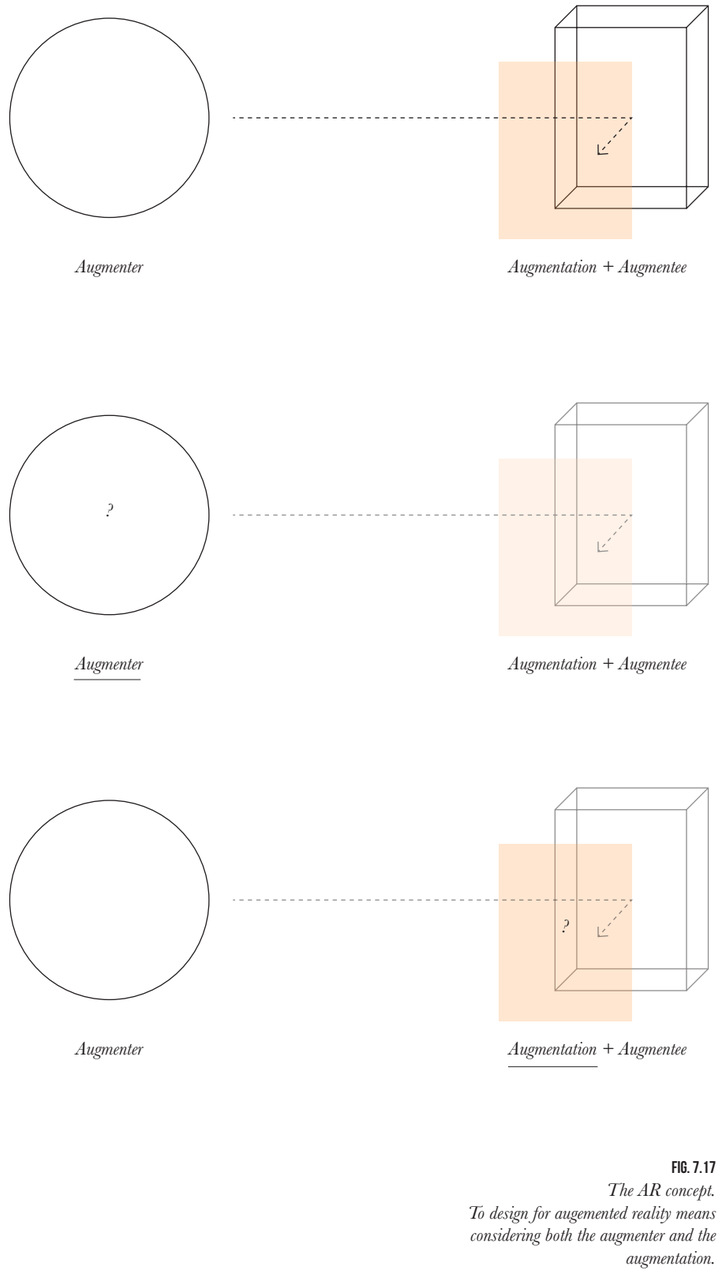


FIG. 7.17
The AR concept.
To design for augemented reality means considering both the augmenter and the augmentation.

A NEW AUGMENTER

Metaphors and etiquette

As a first step towards designing an augmenting device with a clear social etiquette, I investigate existing objects that are used on or near a person's head or face. The headphone example described in the previous becomes the first source of inspiration for a new device; could their clear etiquette and indication of 'on' versus 'off' be applied as to an AR headset? Could it be designed in such a way that it encourages the user to only wear it over-eyes while it is in use, inspired by the way one removes headphones when not listening to music, on sunglasses when not in the sun? These questions form the basis of an initial concept, which is developed and tested through physical as well as digital prototyping.

While the headphone-inspired form development is promising in terms of housing necessary technical components while still offering a way for aesthetic variations and material exploration (Fig. 7.24), user test responses still suggest reservation towards the overall concept. Particularly the task-based aspect is not clear, and with test persons

FIG. 7.18-19
We wear many different things on our heads, just as we have an array of tools that we hold close to our faces to help solve certian tasks. Each item affords a certian etiquette.

FIG. 7.20
Can headphone etiqutte be tranferred to an AR device? The concept is explored.

FIG. 7.21-22
Prototypes provide insights about a potential AR headset etiquette.

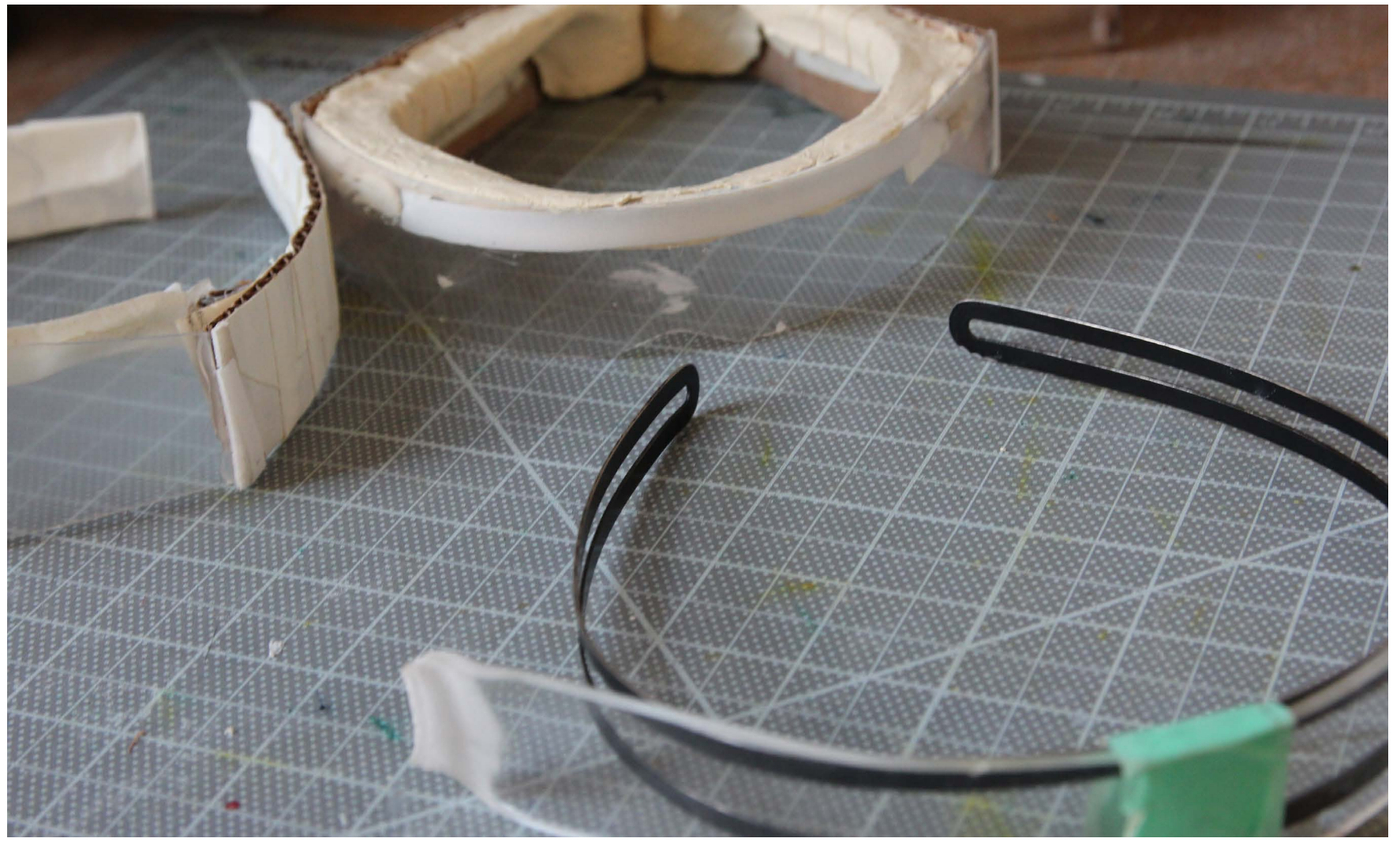


FIG. 7.23
AR headset prototypes.

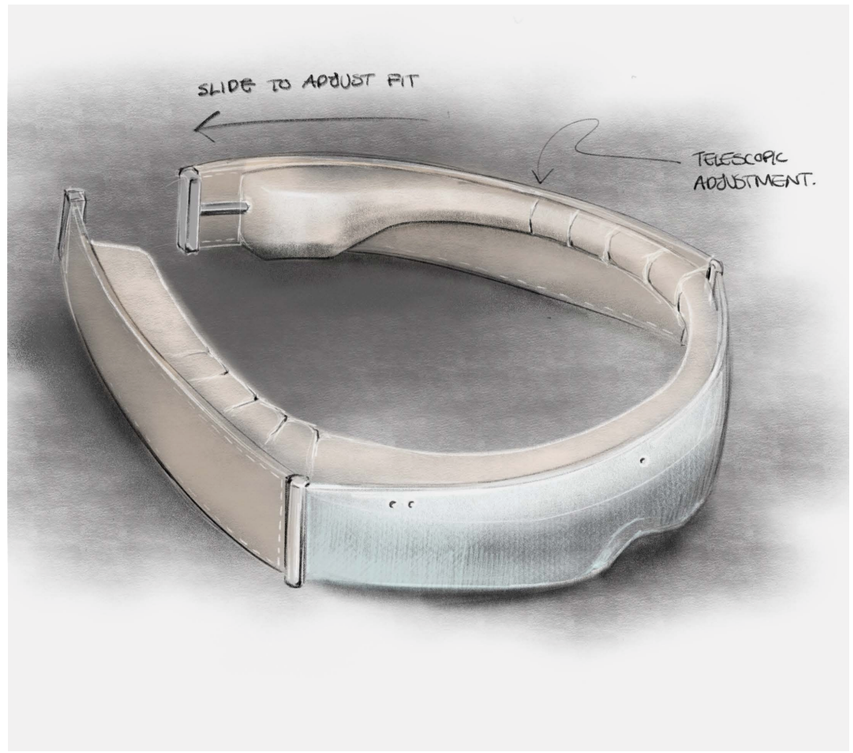
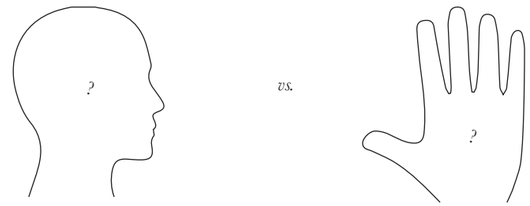


FIG. 7.24
Headphone-inspired AR concept headset.

expecting the device to be worn on a consistent basis (like glasses), the form suddenly appears large and heavy (which is less of a concern with headphones). These results suggest that it is worth exploring a different concept; which is why, to make the task-based intention completely clear, I decide to investigate the potentials of designing a handheld augmenting device instead.

Hand-held vs. head-worn

The choice between pursuing handheld and head-worn AR device concepts is essential; they each come with inherent benefits and limitations, and the decision will greatly influence the final experience. My greatest reservation towards a hand-held device springs from the concern that it will not add sufficient functionality to battle existing phone-based AR, therefore rendering a potential device superfluous. However, initial prototyping makes it clear that a handheld device with a clear display offers substantial benefits over a smartphone with a "regular" display; a transparent screen moves the holographic display from the realm of mixed reality into "real" augmented reality, meaning that holograms appear spatially aligned in real world surroundings. This is also a condition for achieving the benefits of a bigger canvas for information display as described in the beginning of this chapter. Another potential disadvantage of a hand-held device is that it is exactly hand-held, leaving the user with only one hand free for other engagement. But when compared to the HoloLens, this disadvantage is quickly leveled out, as the HoloLens also requires one hand to perform the "click" action when interaction with holograms. The combination of these considerations with the realization that a hand-held device automatically affords task-based, on-demand-only interactions, suggests this to be the stronger design direction in terms of moving towards fulfilling my defined objectives. A breakthrough in terms of discovering a metaphor affording the appropriate social etiquette further strengthens this suspicion, finally establishing the hand-held route as the most opportune.



Head-mounted *Hand-held*

FIG. 7.25
AR concept directions.

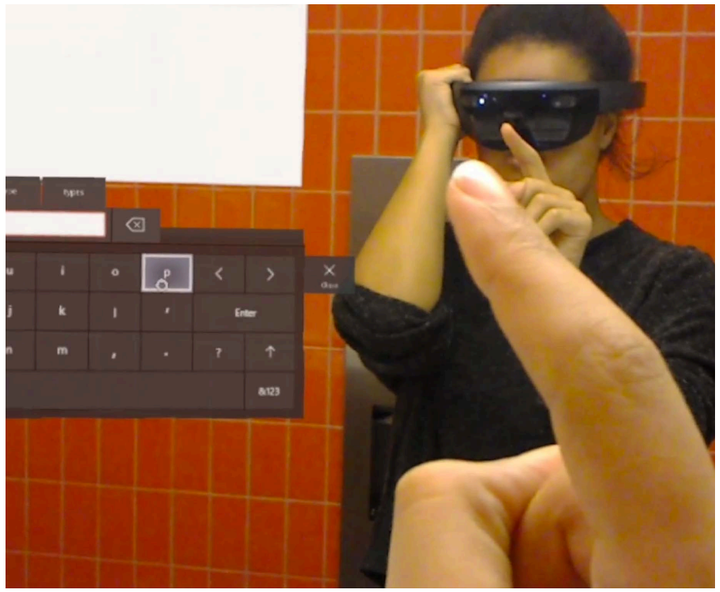


FIG. 7.26
Typing on the Microsoft Hololens is much slower than typing with on a phone or laptop; it requires orienting your gaze (and head) towards each holographic letter, then performing the click-motion with a finger.

FIG. 7.27
There is much speculation about phone giants such as Apple or Samsung lanching a clear phone with AR capabilities in the near future.

The magnifying glass metaphor

The magnifying glass is an iconic object. Instantly bringing about associations of detective movies, it bears strong connotations of inspection and discovery (Fig. 7.31). More recently it has become ubiquitous in our online day-to-day lives, synonymous with actions of searching and filtering through digital content. All of these concepts fit perfectly with what I aim to achieve at the supermarket; allowing consumers to search, filter, discover, and inspect "real world" products as easily as they can online ones. And it turns out that the magnifying glass as a metaphor for an AR device is just as appropriate formally as it is conceptually; the lens and handle are perfect for the desired one-handed interaction. Thus, as I final concept I will develop an AR device and interface based on the magnifying glass metaphor.

= *Discover*
Inspect
Search
Filter

FIG. 7.28
The magnifying glass metaphor.

FIG. 7.29
It is difficult to interact with a clear phone in its current shape without obstructing the view.

FIG. 7.30
The magnifying glass shape lends itself well to an augmented reality device.

FIG. 7.31
The magnifying glass is iconic, and perhaps most famous for it's appearance in the hands of detective Sherlock Holmes.

Source: noobist.com

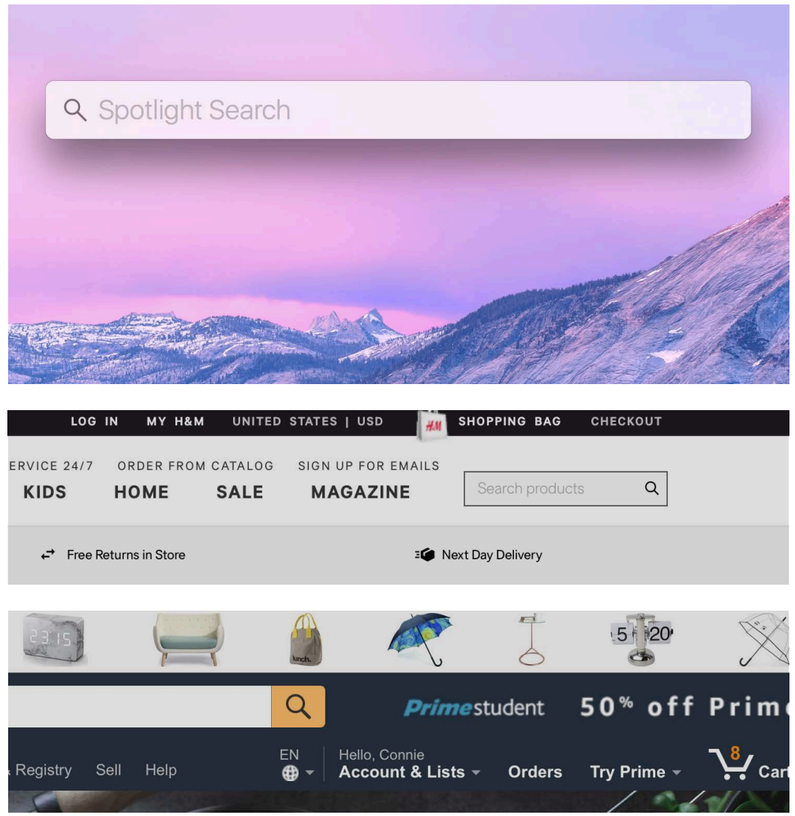


FIG. 7.32-34
The magnifying glass is synonomous with search and filter online and on the computer in general. Pictured here are icons from MacOS, hm.com, and amazon.com.

A CHAPTER ON
DETAILING THE DESIGN PROPOSAL

Form and interaction concept studies lead the path towards the final design proposal.

08

PRODUCT DETAILING

01
Pointing

02
Clicking

03
Typing

FIG. 8.1
Interaction modes.

THE RIGHT SHAPE

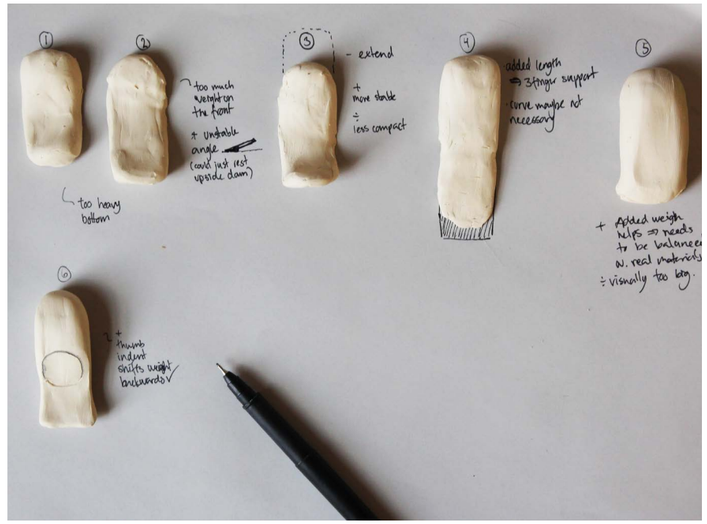
Form and interaction development

Shape and interaction model for the magnifying glass-inspired AR device are determined by interaction goals as well as aesthetic and ergonomic considerations. To meet the design objective of comparability, the consumer will need the ability to input information into the system, as well as interact with holograms. Pointing, clicking, and typing functionality are the essential components allowing for this.

Cursor studies, form studies, UI/UX experiments, and holographic display development based on Tufte's data-ink-maximization principle (though here applied in three dimensions) lead the way towards the final design proposal.

FIG. 8.2-3
Cursor studies.

FIG. 8.4
Handle form studies.



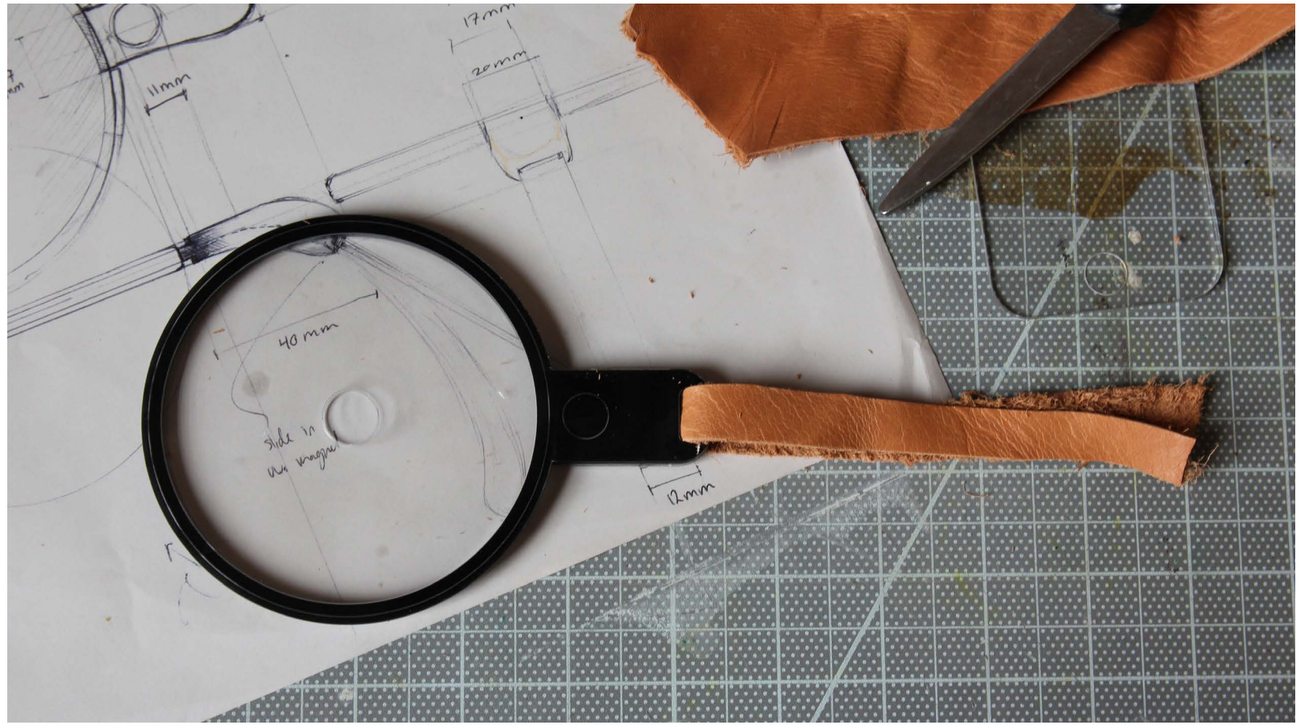


FIG. 8.5 (TOP)
Handle form studies.

FIG. 8.6 (BOTTOM)
Handle and strap form studies.

FIG. 8.7-8 ▶
Form development.

FIG. 8.10
UI prototyping

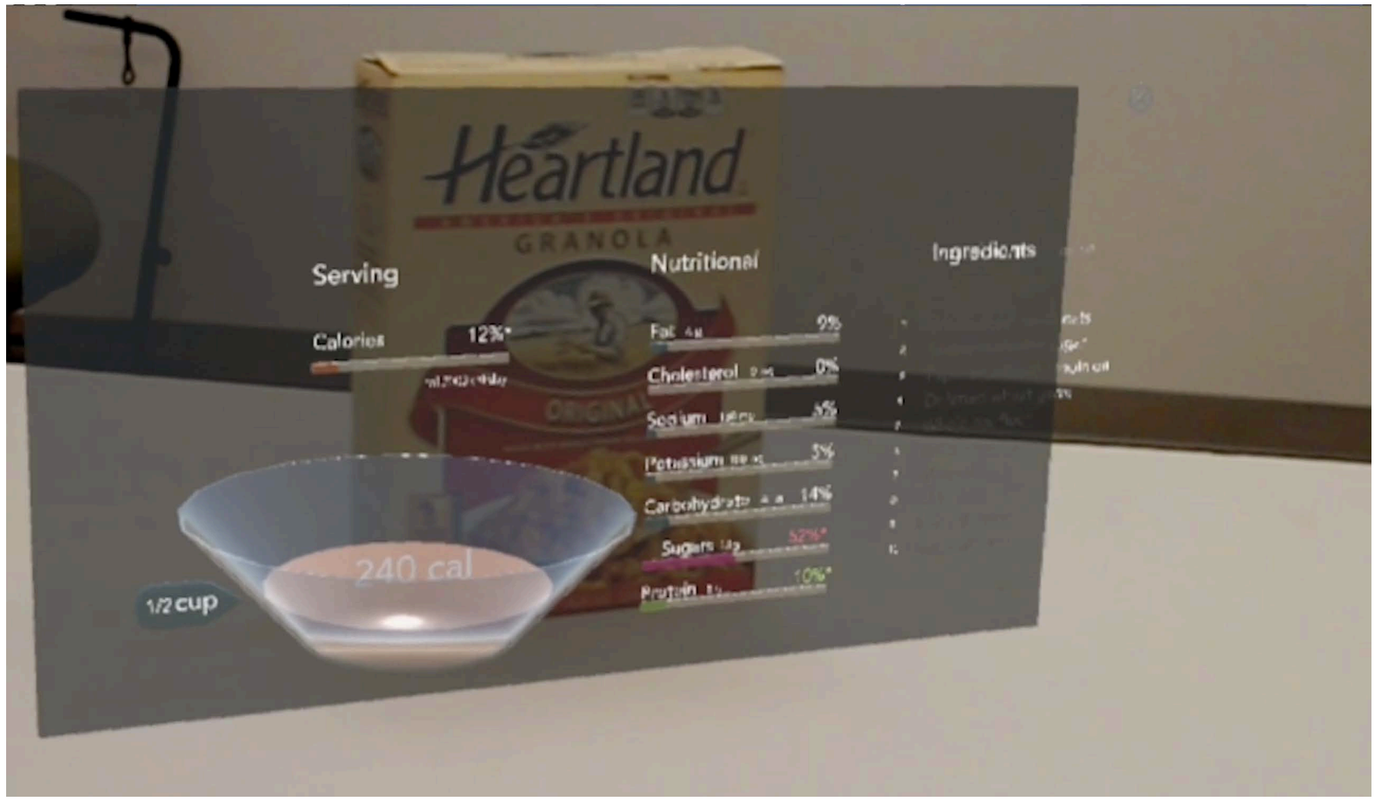


FIG. 8.11
Hologram prototype shot through the HoloLens

A CHAPTER ON
THE PROPOSED DESIGN SOLUTION

09

PROPOSAL & CONCLUSIONS

loup

FIG. 9.1


Ingredients
Part-Skim Milk
Partially Hydrogenated Oil
Passion Fruit
Peas
Peaches
Peanuts
Pear
Pecans
Pectin
PGPR
Phosphate
FIND
AVOID
Nutrients
Label

FIG. 9.2

FIG. 9.3
Loup interface.

Navy, Lentil & Garbanzo Beans
Low Sodium
LOVE GROWN
Frosted
Flakes
Sweetened with Cane Syrup
NET WT 12 OZ (340 g)
Vegan
CHOCOLAT
CRISP
Fly Through the
a Cosmic Chocola
NET WT 9.5 OZ (269 g)
$6.79
Navy, Lentil & Garbanzo Beans
4g Protein per serving
LOVE GROWN
Bean Flakes
Mighty Flakes
A Delicious Toasted Cereal Made with Beans
Made with a 3-Bean Blend
NON GMO Project VERIFIED
WF WHEAT FREE
NET WT 10 OZ (283 g)
Vegan
$6.79
Navy, Lentil & Garbanzo Beans
6g Protein per serving
LOVE GROWN
Original
Power O's
A Delicious Toasted Cereal Made with Beans
Unsweetened
NON GMO Project VERIFIED
Certified GF Gluten-Free
NET WT 8 OZ (227 g)
Vegan
MANAGER SALE
LOVE GROWN
ASSORTED CEREAL
$4.99
SHOP & SAVE!
12 OZ
PEACE CEREAL
Protein per serving
NON GMO
Blueberry Pomegranate
Clusters & Flakes
Crispy Rice and Oat Clusters, Wheat Rice Flakes with Pomegranate Juice Concentrate and Blueberries
3g Fiber
Low Sodium
NON GMO Project VERIFIED
NET WT. 12 OZ (340g)
$6.69
MANAGER SALE
PEACE CEREALS
ASSORTED CEREAL
$3.9
SHOP & SAVE!
GLUTEN FREE SELECTIONS
NATURE'S PATH ORGANIC
Whole O's
WHOLE GRAIN RICE & CORN, LIGHTLY SWEETENED
GLUTEN FREE
14g WHOLE GRAIN | WHEAT FREE
Certified GF Gluten-Free
NON GMO Project VERIFIED
USDA ORGANIC
CEREAL - NET WT. 11.5 OZ. (325 g)
$6.99
MANAGER SALE
NATURES PATH
ASSORTED ORGANIC CEREAL
$3.99
SHOP & SAVE!
10-16 OZ
Honey'd
Corn Flakes
GLUTEN FREE
LOW FAT | WHEAT FREE | NO CHOLESTEROL
CEREAL - NET WT. 10.6 OZ (300 g)
$6.99
FLAX PLUS®
Multibran Flakes
EXCELLENT SOURCE OF ALA OMEGA-3†
5g FIBER | 4g PROTEIN | 12g WHOLE GRAIN
CEREAL - NET WT. 13.25 OZ (375 g)
FIG. 9.4

save compare

Serving

cup g

Calories 24%*

of 2000 cal per day
for **Isabel**

\+

480 cal

1 cup

—

Nutritional

Fat 10 g 18%

Cholesterol 0 mg 0%

Sodium 260 mg 10%

Potassium 360 mg 10%

Carbohydrates 82 g 28%

› Sugars 26 g 104%*

Protein 5 g 20%*

Ingredients

123 abc

6 Brown rice syrup
4 Defatted wheat germ
2 Evaporated cane sugar
3 Expeller pressed canola oil
7 Molasses
9 Natural flavor
8 Salt
10 Soy lecithin
5 Whole oat flour
1 Whole grain rolled oats

FIG. 9.5

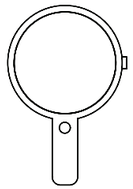
ABOUT

loup

Loup offers a wholesome solution to not just one, but two major design challenges. The first is nutrition fact accessibility and communication. The second is social acceptability and destigmatization of augmented reality devices. By thoughtfully combining, synthesizing, and integrating the two, the Loup AR concept facilitates fact-based decision-making for grocery shopping consumers. The nutrition aspect: Loup is designed to help its users define and meet their nutritional goals. With a mission to demystify the nutrition label, the device lets grocery shoppers access personalized visualizations in augmented reality. Without the limitations smartphone screen sizes or packaging real-estate, the interactive holographic display provides instant overview of product facts on-site, considerably easing the shopping experience for consumers with allergies, diet-related health-issues, or simply a desire to gain insights regarding their nutrition intake. The AR aspect: Investigating the future of augmented reality, Loup proposes a non-intrusive experience for accessing holographic product information when grocery shopping. Using the magnifying glass as a metaphor, the device embodies concepts of discovery, inspection, searching, and filtering, all of which align perfectly with the supermarket use scenario. Furthermore, the familiar shape takes the futuristic edge of the AR technology, making it accessible to consumers across generations and with varying technical aptitude. With Loup augmented reality becomes a tool for problem-solving rather than constant distraction from the real physical surroundings. It provides seamless integration between physical and digital interfaces in both two and three dimensions, and represents the hope for, and belief in a future where technology is a friendly helper rather than a dystopian omnipresence.

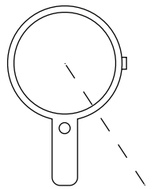
The Loup concept consists of three parts: A physical product, a graphical user interface, and a holographic app. The project balances product design, UX/UI, and data visualization to provide a complete system where everything is developed to work together; using consistent colors, cues, and concepts to create an effortless user experience. The holographic content is designed and tested using the Microsoft HoloLens, allowing for thorough experimentation and development of the augmented reality experience.

STEPS OF INTERACTION



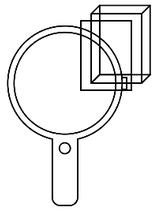
01 DEFINE

Use the graphical user interface to define search criteria. Select ingredients to find or avoid, and nutrients to get more or less of. Define your personal nutritional intake goals.



02 SEARCH

Find products that match your search criteria using the holographic display. Filter through supermarket offerings with precision and efficiency.

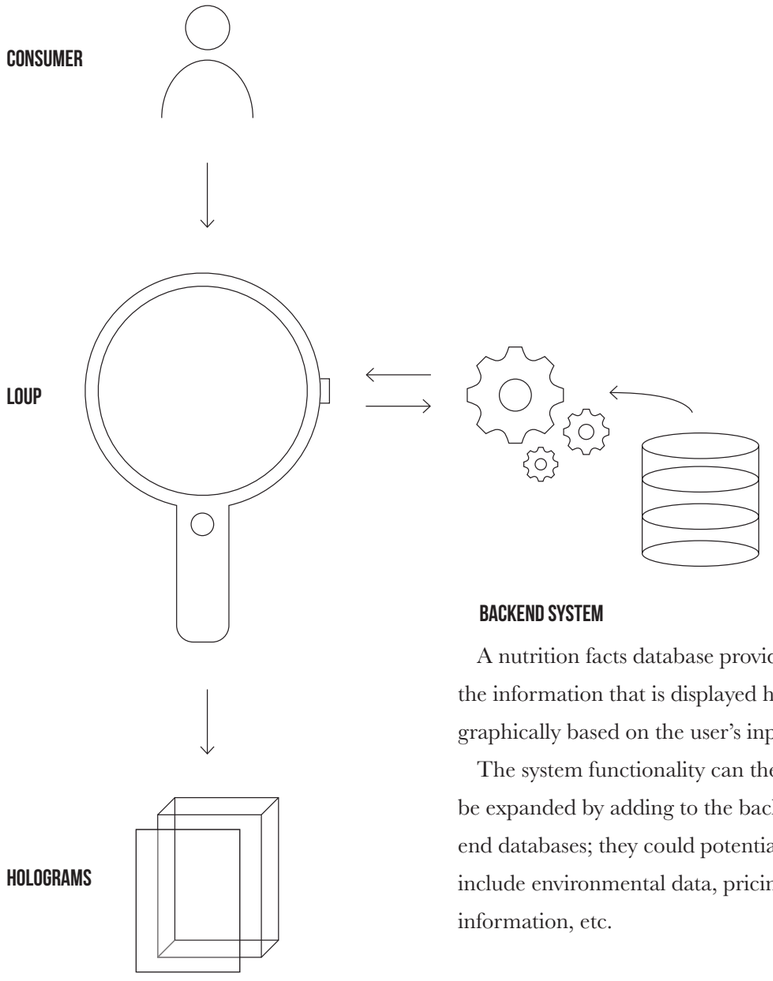


03 INSPECT

Inspect holographically displayed nutrition facts; Get instant access to a personalized visual display of information.

FIG. 9.6

LOUP SYSTEM



BACKEND SYSTEM

A nutrition facts database provides the information that is displayed holographically based on the user's input.

The system functionality can then be expanded by adding to the backend databases; they could potentially include environmental data, pricing information, etc.

FIG. 9.7

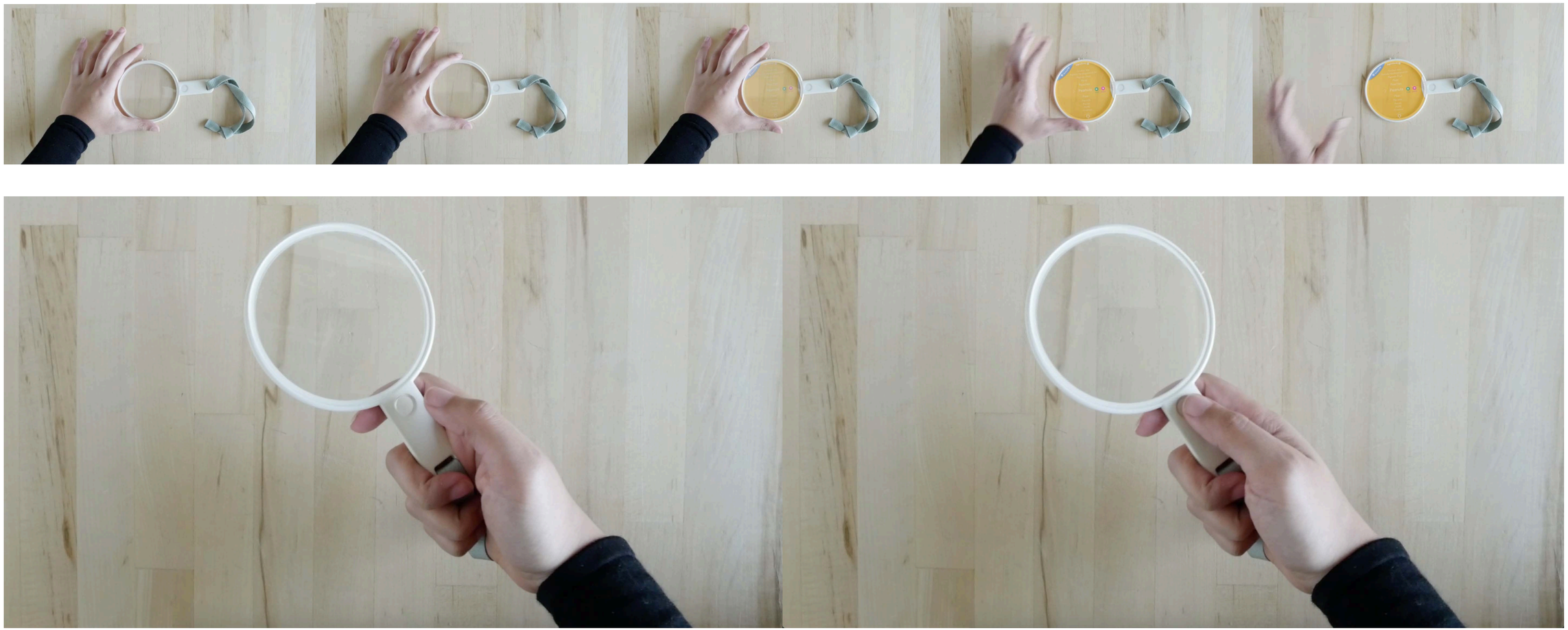


FIG. 9.8 (TOP)
The Loup GUI turns on and off by the click of a button, allowing users to switch between screen-based and hologram-based interactions.

FIG. 9.9 (BOTTOM)
Loup affords one-handed interaction with a button that is easily clickable using a thumb.

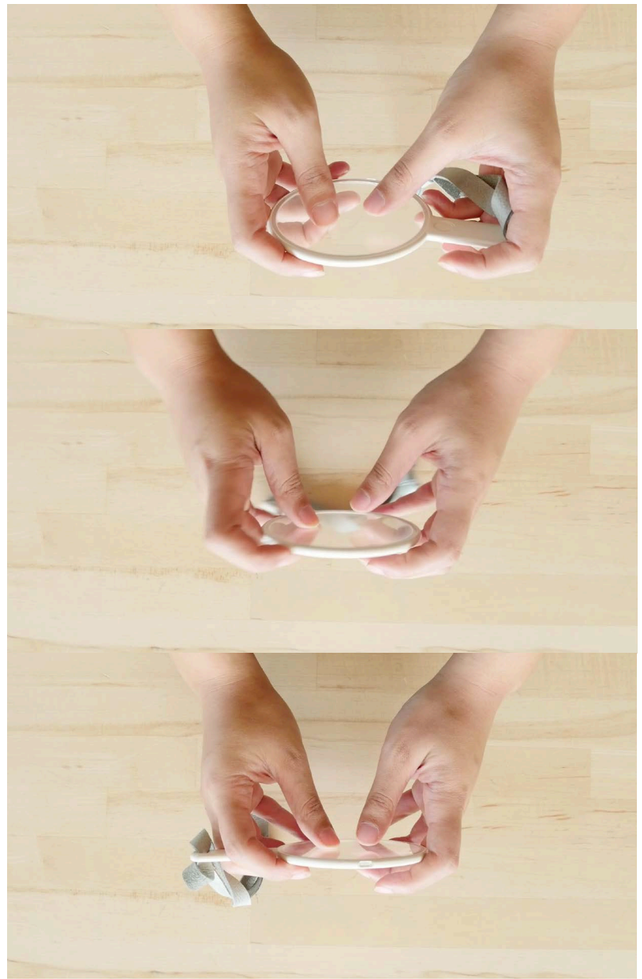


FIG. 9.10-11
The Loup interface can be used in any orientation.

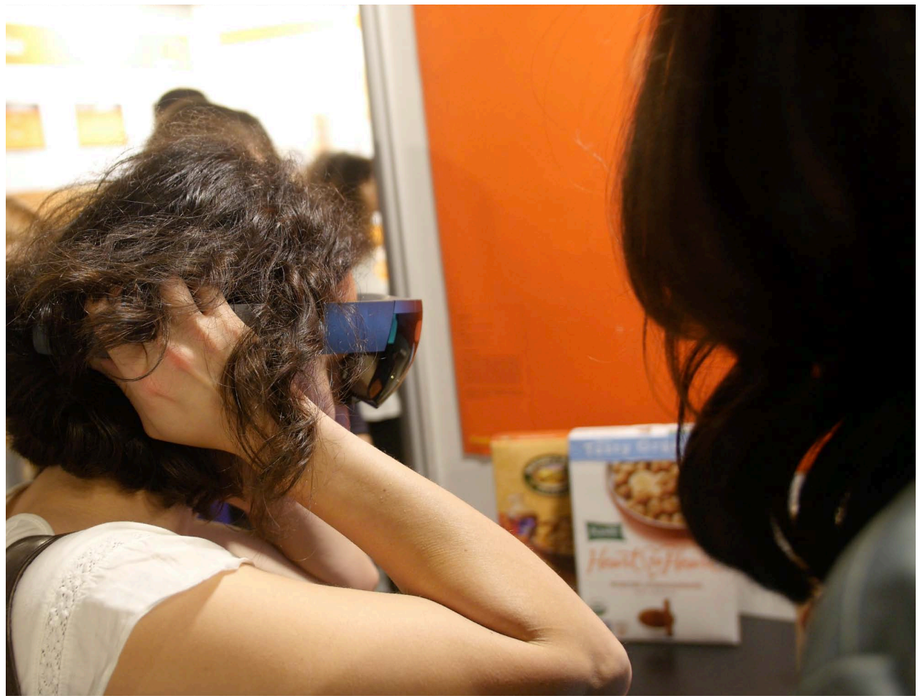


FIG. 9.12-13
Users experience the loup holograms via a demo app on Microsoft HoloLens.

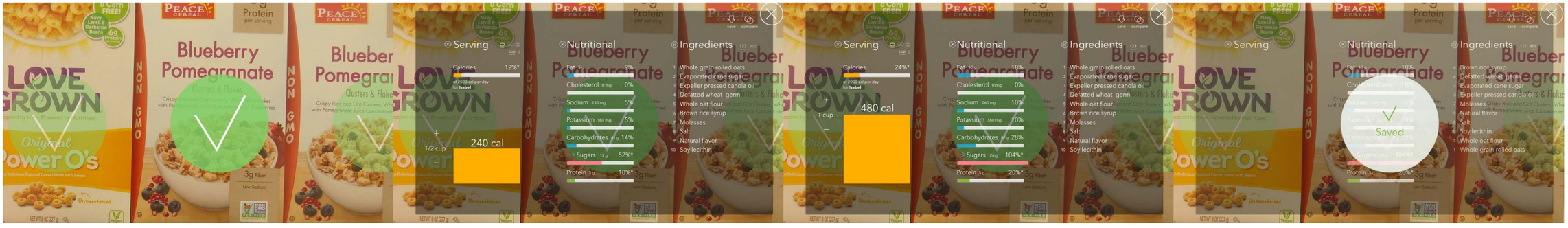


FIG. 9.14 (TOP)
Loup search mode holograms.

FIG. 9.15
Loup inspect mode holograms.

PATENT PENDING

As of May 4th 2017, I filed a provisional patent to protect some of the unique functionality that Loup proposes. This includes the any-orientation display and the focal-point cursor. Hand-held devices for AR (that are not smartphones), have not been given much attention, and I believe that Loup is a valuable proposal in suggesting this new use case.

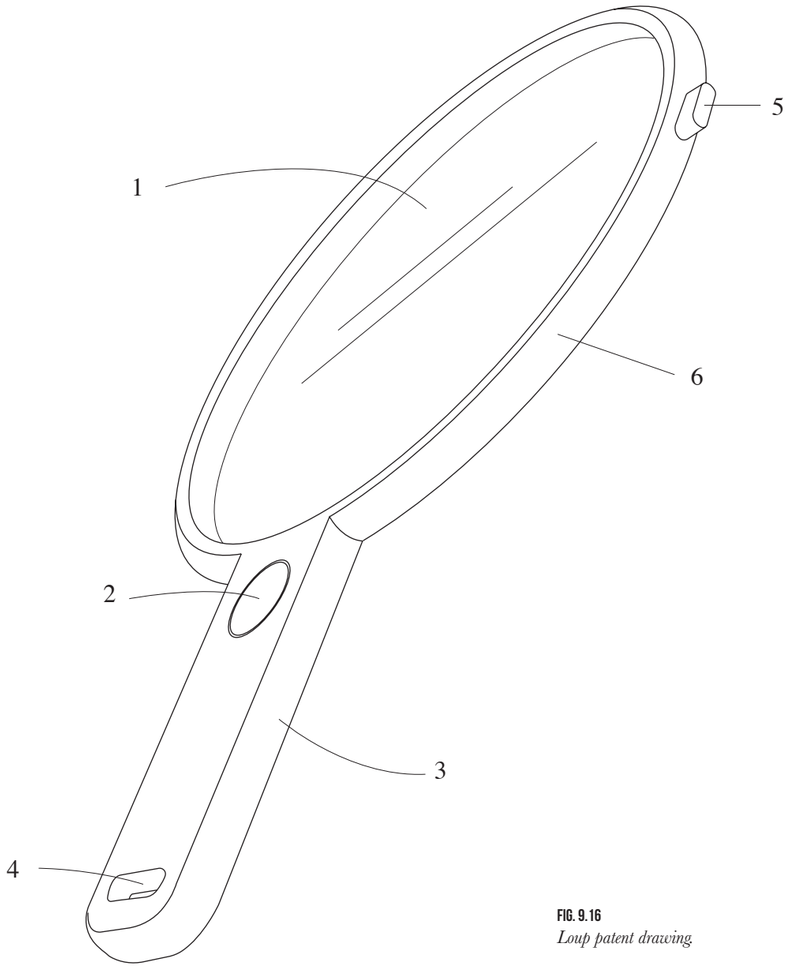


FIG. 9.16
Loup patent drawing.

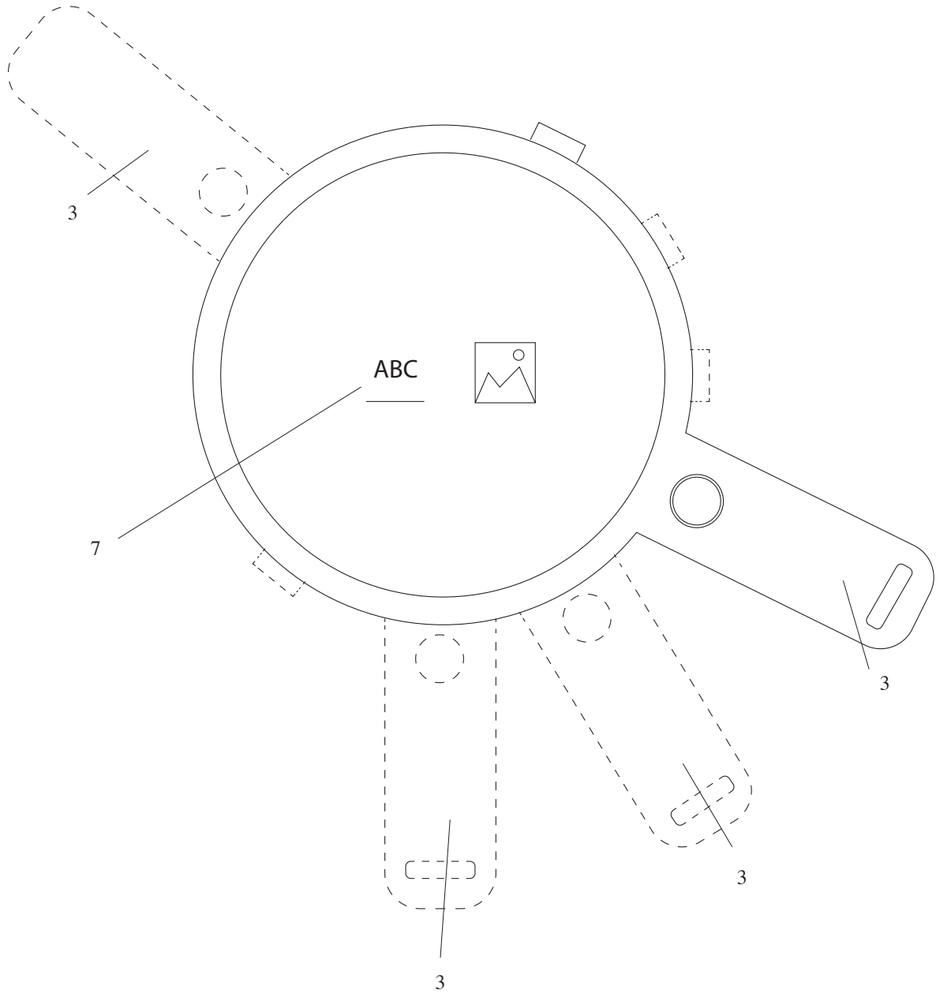


FIG. 9.17
Loup patent drawing
for any-orientation interface.

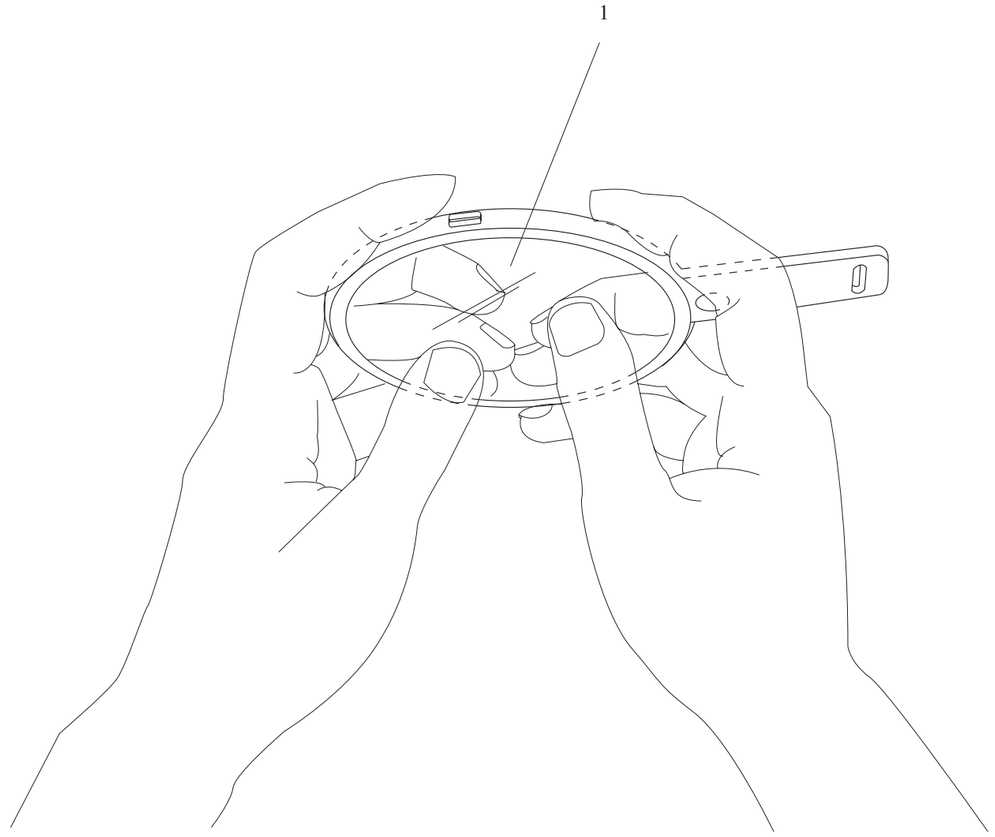


FIG. 9.18
Loup patent drawing
for any-orientation interface.

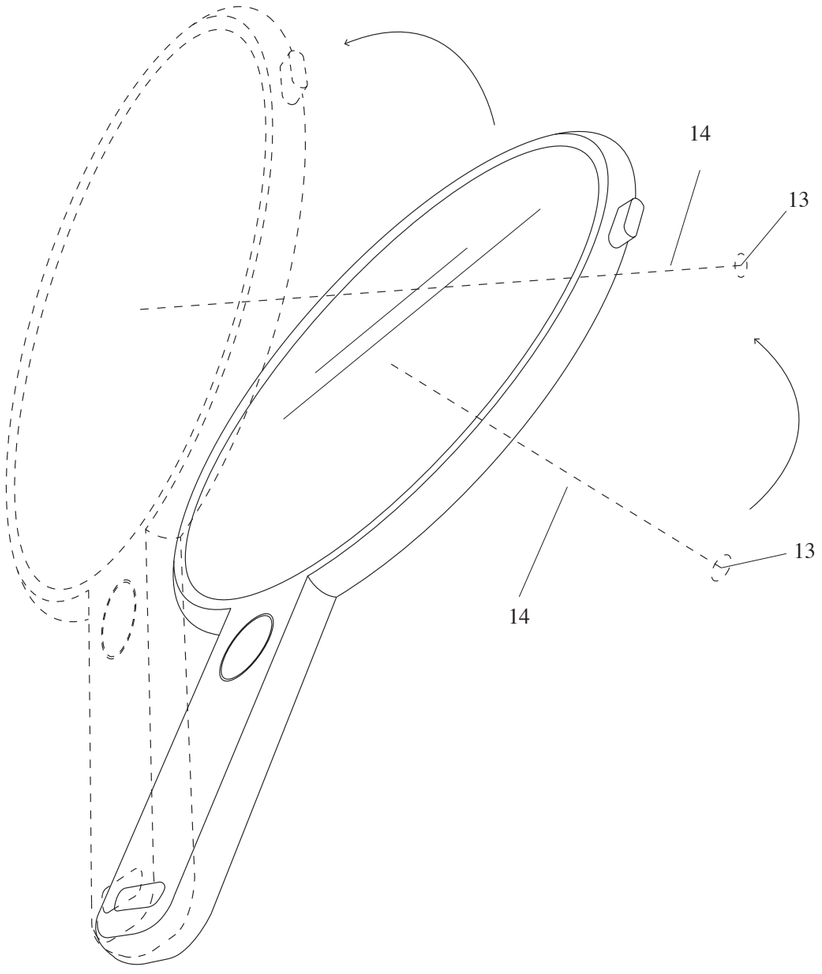


FIG. 9.19
Loup patent drawing for focal-point cursor.

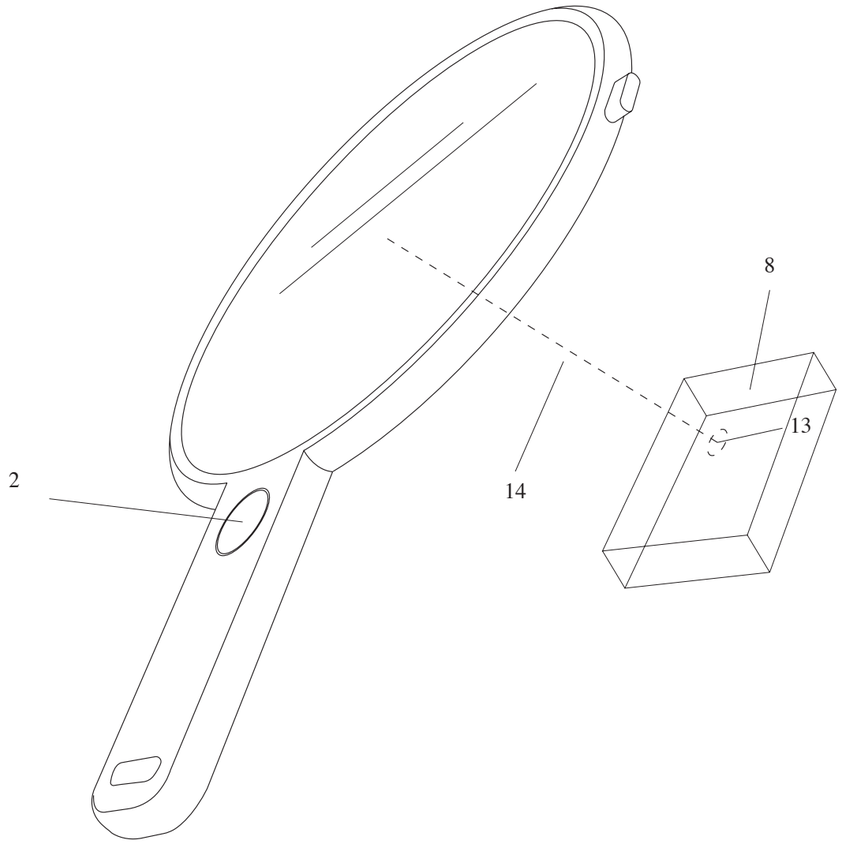


FIG. 9.20
Loup patent drawing for focal-point cursor.

CONCLUSION

Combining aspects of data visualization, interaction design, and product design, Loup is an ambitious, wide-spanning project, and what is presented in this book is merely scratching the surface of what the project could be. Further investigations will include optimization of the user interface, particularly by considering what data is the most important to certain users; the possibilities are endless, and identifying the right content to display as well as the way to display it will be crucial. Another major component to the Loup system is the nutrition facts database; ensuring a consistent user experience depends on the accuracy and comprehensiveness of the database. While expertise beyond design is necessary to solve these challenges, I believe that the design approach is valuable across all aspects to ensure seamless integration between components of a system.

Moving forward, I will continue to develop not only the Loup concept, but also the rhizomatic design approach of pulling from all sources of relevance, which allowed for the design proposal to arrive to its current state.

FIG. 9.21

10

THE CLOSING ACT

NOTES

1. Nature's Path Organic Gluten Free Selections Honey Almond Granola with Chia contains 7 grams of sugar per 30 gram serving, corresponding to 28% percent of recommended daily value (Food Facts).

2. On their website, the US Food and Drug Administration offers, in addition to the infographic depicted in Figure X, a downloadable nutrition glossary (FDA, "Glossary")

3. Yearly government spendings on obesity-related healthcare issues estimated at more than $150 billion (State of Obesity)

4. The food industry accounts for more than 50% of annual greenhouse gas emissions worldwide (Goodland 11)

5. While relationships of affordances per definition exist whether or not they are discoverable, they are not effective unless they are perceived (Norman 11); for this reason my analysis of the Sage Project focuses on perceptible affordances.

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lishment on Comprehension and Memorability of Charts. Atlanta: Publication of the University of Saskatchewan.10 April (2010). Web. 10 Nov. 2016.

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The rhizome represents a non-linear framework for thought and writing, challenging the traditional root-tree book structure.

Designit, n. d. Web. 4 Dec, 2016. <https://designit.com/contact>

Di Russo, Stefanie. "A Brief History of How Design Thinking Came To Be". I Think I Design. 8 Jun, 2012. Web. 11 Dec. 2016.
<https://ithinkidesign.wordpress.com/2012/06/08/a-brief-history-of-design-thinking-how-design-thinking-came-to-be/>

The Service Design discipline emerged from participatory design in the early 2000s.

Ferdman, Roberto A. "The Crucial FDA Nutrition Label Battle You Probably Don't Know About, But Should". *The Washington Pos*t. 2 Jul, (2014). Web 11 Dec 2016.

The FDA's proposal of adding the line "added sugars" to the nutrition label caused dissent from the food industry.

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"Understanding and Using the Nutrition Facts Label". *The US Food and Drug Administration (FDA)*. Web. 1 Dec. 2016.
<http://www.fda.gov/downloads/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/LabelingNutrition/UCM501646.pdf>

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Label (…)". Federal Register, Vol. 81, No. 103, 27 May. 2016. 33741-33745.

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Nature's Path Organic Gluten Free Selections Honey Almond Granola with Chia contains 7 grams of sugar per 30 gram serving, corresponding to 28% percent of recommended daily value.

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<http://www.frogdesign.com/jobs/design>
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Kasik, David J., David Ebert, Guy Lebanon, Haesun Park, and William M. Potteng. "Data Transformations and Representations for Computation and Visualization". Information Visualization 8:275 (2009). Web. Sept. 21 2016.
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< http://blog.blprnt.com>
Jer Thorp is the former Data Artist in Residence at the New York Times R&D Group.

Tufte, Edward R. The Visual Display of Quantitive Information. Cheshire: Graphics Press, 1983. Print.
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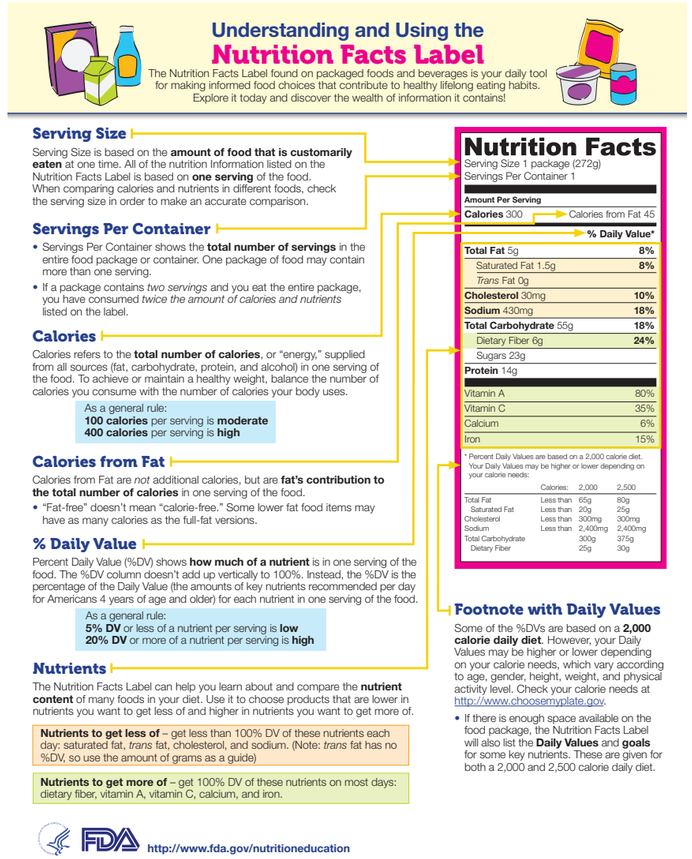
Wickham, Hadley. “Tidy Data”. *Journal of Statistical Software*, Vol. 59, No. 10. 2014.

APPENDIX

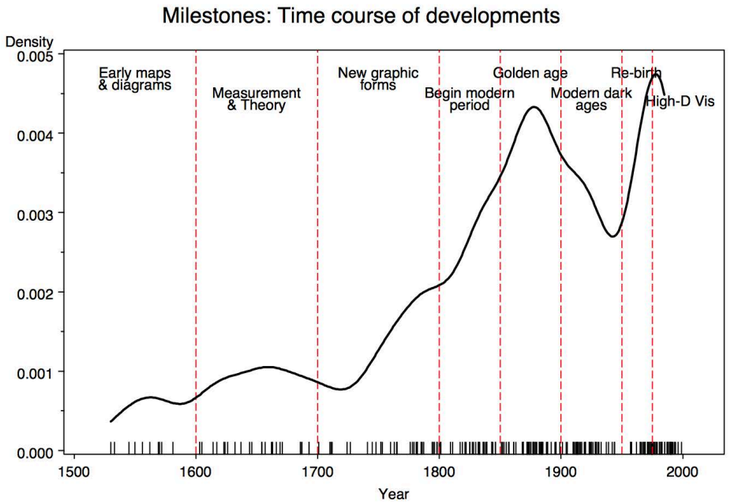
Appendix I



The FDA explains the nutrition label.

Source: FDA, "Understanding and Using the Nutrition Facts Label"

Appendix II



Visualizing the history of data visualization.

Source: Friendly, Michael. "A Brief History of Data Visualization". Handbook of Computational Statistics on Data Visualization. Toronto: York University. 21 Mar, 2006. 3.

Appendix III

"My thesis is about food data; my goal is to make it more enjoyable and more informative. With your help I can hopefully move a little closer towards this.

Start press ENTER

1 → How often do you read nutrition labels?**

If your answer is "never", you can skip ahead to Question 4.

A Daily

B Weekly

C Monthly

D Rarely

E Never

2 → Which of the following apply to you?
When looking at nutrition labels, I'm usually looking for information about...

Choose as many as you like

A Calories per serving

B Serving size

C Sugar content

D Fat content

E Carbohydrate levels

F Protein levels

G Dietary fibers

H Allergens

I Overall ingredient use

J Added sugars (e.g. high fructose corn syrup)

K Artificial sweeteners (e.g. aspartame)

L Artificial color

M Organic certification of specific ingredients

N Other

3 → Where do you read nutrition labels?

A Only at the supermarket

B Mostly at the supermarket, sometimes at home

C Mostly at home, sometimes at the supermarket

D Only at home

E Other

4 → Do you get facts about food products from other sources than nutrition labels?**

Y Yes

N No

5 → If you answered **yes**, please specify by describing the media, apps, web platforms, blogs, etc. that you use.

E.g. "I use MyFitnessPal to keep track of calories" or
"I use FoodFacts.com to get more detailed information about ingredients in

6 → Lots of food facts are not on nutrition labels.
Please rate the following food facts according to your level of interest in them.

a. Nutritional value per 100 g (instead of per portion)**

b. Water usage in production of the food item**

c. The distance the food item has traveled**

d. Land usage efficiency in production of the food item (e.g. acres of land to produce x amount of food)**

e. Facts about company ownership and affiliations**

E.g. "Kashi is an American cereal brand owned by Kellogg's" or "Produced by a family-owned business"

f. If there are other food facts that are important to you, please specify here.

7 → Finally, please specify the following about yourself

a. Your gender**

A Female B Male C Other

b. Your age**

A 18-24 B 25-34 C 35-44 D 45-64
E 65+

c. Where do you currently live?**

A United States B Other

d. If you have any further comments, feel free to add them here.

Thank you for participating (this is the final question). You're awesome.
When you're ready, scroll all the way down and click **submit**.