

Linguistic and Cognitive Design Thinking in Phissy

An iOS Application UX and Launch Case Study

Cognitive Science & Applied Linguistics

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1: INTRODUCTION

1.1 *Before Phissy, There Was Phissy*

Everyone loves Grandma Phyllis “Phissy” Shaw because she speaks her mind—particularly when it comes to dining out. Grandma Phissy asks to taste every sauce before ordering, and she doesn’t hesitate to send a dish back as many times as necessary until either it finally meets her nearly unattainable standards or everyone else is already on dessert. While most people harbor a cognitive list of foods they like and dislike, hers takes more the shape of an organic chemistry flowchart, wherein only certain permutations of ingredients are allowed at certain times of the meal. If I had a dollar for every time we had to leave a restaurant after being seated simply because Grandma Phissy didn’t like the look of anything on the menu—even if she thought she’d liked the restaurant before—I’d have had a full ride through college.

However, at the core of Grandma Phissy’s long-held love-hate relationship with restaurants is not merely that she is what we might call a picky eater, which is to say a limitation of palate, but rather a limitation in memory, and not one entirely unique to her. Maybe she has the unique boldness to vocalize her displeasure without concern for social pleasantries or compromise (and was not raised, as I was, with the mantra “you get what you get, and you don’t get upset”), but the fact is *no one* can reliably recall what they ordered at *every* given restaurant they’ve patronized and whether they liked it. Who among us has not asked, “What did I get here?”, “What was the name of that place with the amazing spicy rigatoni?”, “I know I got the salmon teriyaki, but I don’t know if I liked it or not...”, or the far scarier “I know I hated what I got last time, but what was it!?” My whole life, I had known just a handful of ways around this challenge:

- a) *The Stenographer*: Keep a shamelessly disorganized list (or lists) of all your dining history details in the iPhone Notes app or equivalent, then struggle to make any sense of it the next time.
- b) *The Hoarder*: Write your notes on restaurant receipts and hold onto all of them in a junk drawer to reference... probably never?
- c) *The Influencer*: Post photos and detailed, public-facing reviews of your meal to platforms like Instagram or Yelp. Apps like Yelp are wonderful for discovering new places based on crowdsourced public opinions... but when you want to return somewhere, you don’t really care what others thought; you care about what *you* thought, what *you* did, and what *you* would do differently. Besides, unless you’re a full-time influencer, odds are you’re less inclined to pause a meal

to bust out a ring light just so you remember what you thought of the pesto six months later.

- d) *The Defeatist*: Just risk wasting time and money reordering something you didn't like the first time because it's easier than trying to keep track of everything you eat using the options above.

The more I considered this, the more shocking it seemed that in our 21st-century society we still lacked an intuitive, centralized way for individuals to log and rate what they ate at restaurants, much less a tool to help selective and memory-impaired senior citizens avoid routinely repeating mistakes at restaurants. What a difference it would make for Grandma Phissy if she were to know *in advance* that she prefers the chicken piccata at Portobello restaurant to the chicken piccata at Ke'e Grill, where she's had better luck with the steak, so long as she remembers to ask for no green peppers and the sauce on the side. Game-changer.

The bottom line: we spend far too much of our lives ordering, eating, and judging restaurant food not to keep better and more efficient personal records of our experiences.

Drawing on my interdisciplinary studies through the CIS at Tufts, I attempted to solve for this challenge. I learned a multi-paradigm programming language and then designed and built the Phissy iOS application—an innovative memory extension that would allow us to say goodbye to primitive ways of recording what we ate where. In the process, I also determined audience, market strategy, and opportunities for growth. I approached learning to code as acquiring a new language, a subject I had studied in much greater depth than I had computer science. This laid the scaffold for me to leverage my studies in psycholinguistics and developmental psychology to create a product that was not only functional but also uniquely accommodating to unmet consumer needs. My training in cross-cultural linguistics and foreign languages equipped me then to prime Phissy for global accessibility.

Nearly 35,000 lines of code and over 2,000 hours of development, user testing, and marketing later, Phissy successfully launched, and I am humbled to see that Phissy now help hundreds of users in 30+ countries eliminate the cost and clutter of being self-informed diners.

1.2 In This Paper

While substantial scholarly research has investigated the effect of apps like Yelp on the reputation and consequent revenue generated by restaurants that have been reviewed by the public, little research has been done into how to enable users most

effectively to optimize their future dining experiences based on their own dining history. The goal of this written supplement is to begin exploring this question, using the Phissy app as a case study.

In the next chapter, we will review the technical capabilities of the Phissy application and its underlying data structure through a psychological lens. Then, the following three chapters will entertain opportunities for further growth in (a) how new dish-rating technology can best adapt to meet the expectations of diverse age demographics; (b) how keyword extraction can facilitate data mining and the dish review pipeline; and (c) how a brand identity like Phissy then can be linguistically optimized for expansion into international markets—reflecting work in the fields of human development, linguistics, and modern languages respectively.

2: CRAFTING THE EXPERIENCE

2.1 *From Concept to Canvas*

Before building Phissy, it was important to understand, in as much specificity as possible, the unsatisfied needs of potential users—initially, Grandma Phissy and her retirement community. After conducting interviews and a competitive audit of nearly 100 apps in content-adjacent areas, it was clear exactly where the niche was in pre-Phissy technology. Phissy’s minimum viable product needed to:

1. Let a user log what he ordered at a restaurant *and* what his friends ordered
2. Allow flexible customization of orders (additions, subtractions, etc.)
3. Not require photos or public-facing reviews

Guided by these criteria, the Phissy application began to take form. Various features appeared and then disappeared with time, while others were honed, made increasingly user-friendly as it became easier to observe Phissy users in action and adapt to match the behavior they expected. The final application, as it can be downloaded now, offers the following functionality.

2.1.1 *The Phissylist*

The food app sphere is dominated by platforms that invite users to rate restaurants by overall experience. This restaurant-rating structure is essential for social media platforms like Yelp and Google Maps or delivery services like Grubhub and DoorDash, which all rely on aggregate ratings to recommend restaurants to potential diners.

Phissy, by contrast, was not designed with social sharing in mind and therefore had no use for general restaurant reviews. Instead, Phissy opts for a dish-rating structure in order to allow greater specificity in users’ personal notetaking—whereas restaurant review apps’ focal unit is the restaurant, Phissy’s focal unit becomes the dish itself. This dish-centered hierarchical structure, dubbed the Phissylist, takes the following (simplified) form:

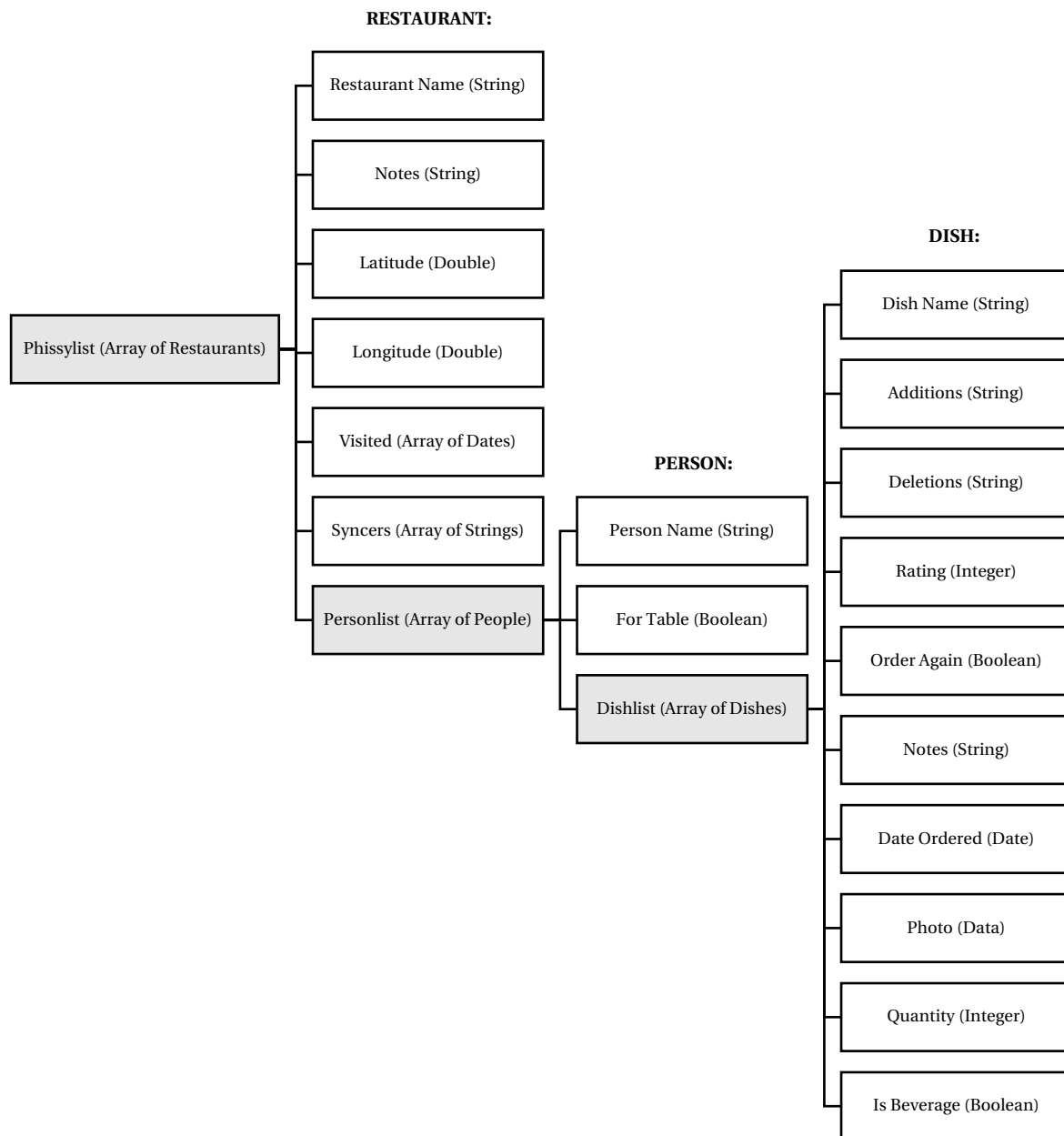


Figure 1: The backbone of Phissy, the Phissylist is the application's underlying framework—a list of restaurants the user has visited, for each of which there is a list of people who dined there with him, for each of whom there is a list of foods they ordered, for each of which there are various criteria by which it can be rated. Additional variables at each tier round out the user experience.

Earlier conceptions of the Phissylist also included a “Datelist” node as a superset of the Personlist. In that model, a user opens a restaurant he has added, then selects from a list of dates the user visited that restaurant, and only then sees who ordered what on that visit. Focus groups informed that users are less interested in what was ordered at one time and more interested in comparing *all* dishes that a person has ordered at a given restaurant. The Datelist node was eliminated before development began, leaving just three levels of folders.

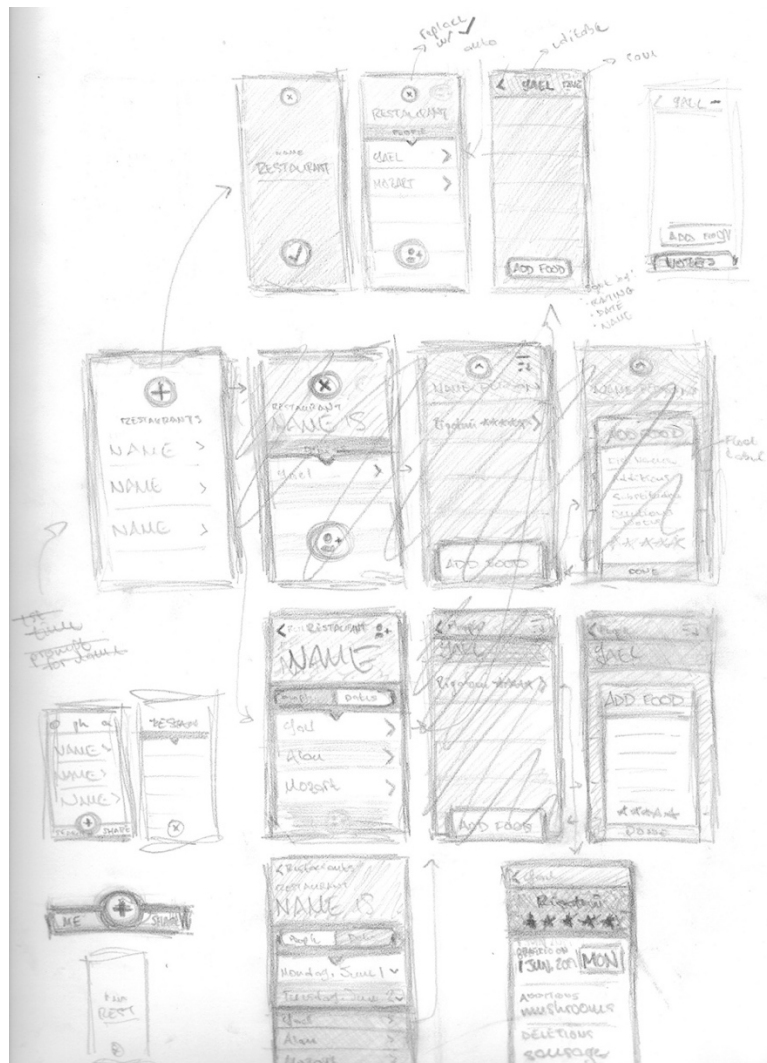


Figure 2: Early wireframes of what Phissy might look like on iPhone. Note the later rejected pathway in which the Phissylist includes visit date as a superset of people who ordered.

Users can tap or swipe to navigate between levels of the Phissylist. This pattern appeals to left-to-right language speakers' predisposition to visualize information in left-to-right hierarchies, which they interpret as nested folders.¹ I have found no existing research to suggest whether speakers of right-to-left languages find this pattern less intuitive than speakers of left-to-right languages. Nonetheless, it has become so commonplace in modern user interfaces, from Mac's Finder to iPhone's Notes, that left-to-right hierarchies are now expected by anyone familiar with the domain—as Albert Einstein famously writes, the more familiar we become with a pattern, the more inclined we become to see the world that way, and by extension, want the world to work.²

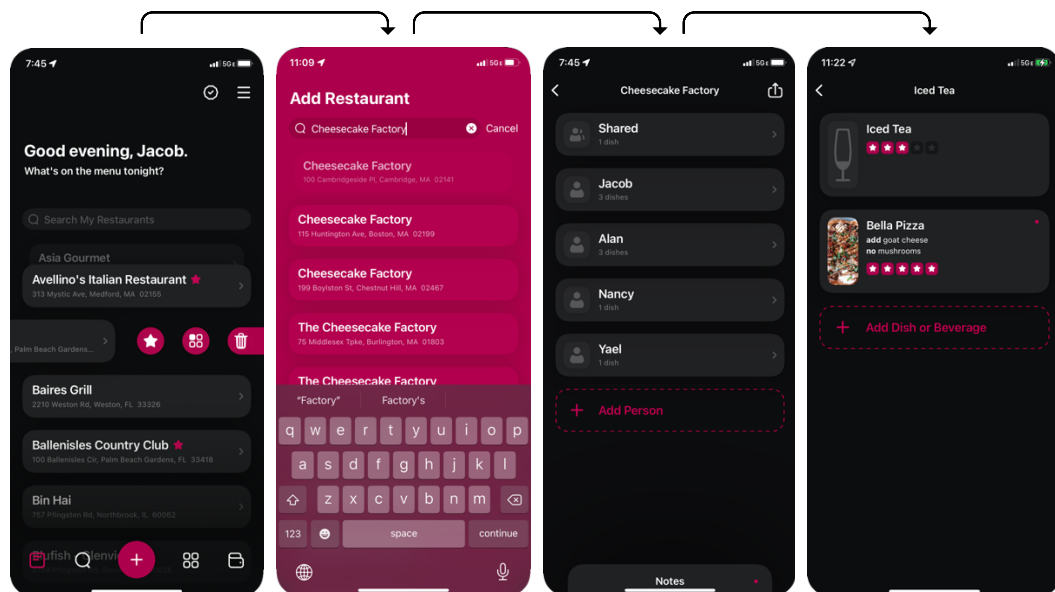


Figure 3: The user flow from (a) the Phissylist to (b) adding a new restaurant to (c) viewing and adding people to that restaurant to (d) viewing and adding dishes ordered by each person takes just about a minute.

2.1.2 Adding Restaurants

The first step in the user flow is to add a new restaurant to the user's Phissylist. To do this, the user types a search query of the restaurant's name until the result is shown, as one would when performing a Google search. Beyond

¹ (Kandel, Schwartz, Jessell, Siegelbaum, & Hudspeth, 2013); (Kozhevnikov, Blazhenkova, & Becker, 2010); (Djamasbi, Siegel, & Tullis, 2011)

² (Einstein, 1979)

Phissy’s hard-coded internal database and Google’s Firebase secure storage service for preserving users’ Phissy data in the Cloud, Phissy draws upon Apple’s reverse geocoder to identify these local restaurants.

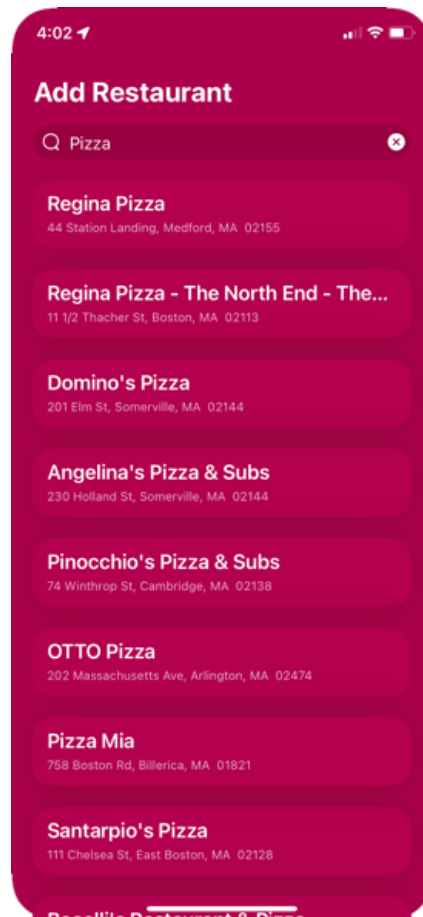


Figure 4: Apple’s geocoder results for query “Pizza”.

This technology—the same technology behind Apple Maps and Siri—presents a vast array of businesses crawled by and logged with Apple. Researchers have found the factors that correlate most with the order in which these restaurants appear in search results are (a) keyword in restaurant name, (b) proximity to searcher’s centroid, or location, (c) category relevance to query, and (d) potentially relevant metadata such as price and hours made available by services like Yelp.³

³ (Goode, 2020)

What if of the millions of restaurants Apple has in its databank a Phissy user wants one that Apple lacks? What about a local lemonade stand or food truck that hasn't made it onto Apple's radar? For that, Phissy does have a uniquely architected solution—I've programmed an additional button at the bottom of the list labeled "Add at your current location" to allow the user to add a restaurant of any name at his geographical coordinates. Tapping that button—or any other restaurant—creates a new node in the user's Phissylist with the restaurant's name, its coordinates to allow the user to sort his restaurants by location later, and the current date.

2.1.3 Logging Dishes and Drinks

Within a given restaurant, users can add people who dined with them. The user's name is added automatically. Each new person added creates a node under that restaurant's Personlist on the back-end. A "person" also can be set to define a group of shared items ordered family-style for the table.

For each person, a Dishlist is made available for the user to populate with each dish ordered. Users can note anything they removed from (e.g., "no green peppers") or added to (e.g., "extra sriracha mayo") a given dish or beverage, along with overall dish notes, a rating out of five, a photo, quantity, and whether they'd reorder it the next time. These entries can be edited or deleted at any time. They also can be duplicated or even copied to another person (if Aunt Molly and Uncle Matt ordered the same sandwich). If the current date does not match the date when the restaurant was added (i.e., you're returning), the new date is appended to the restaurant node.

2.1.4 Buzzterm Extraction

Phissy's buzzterm extraction feature stems from an exciting back-end function that runs each time a new dish is added. If the dish belongs to the user (i.e., the name of the person who ordered the dish matches the name associated with the user's account), then the dish's name gets added to an array of names of all the dishes the user has ordered, across various restaurants. This quickly becomes a substantial array. To shorten it, words "and," "or," "of," "with," "no," "without," "con," "a," "la," "in," "over," "on," "not," and "get" are removed. Then, remaining terms are cross-referenced with a number of hard-coded database entries in which any type of fish is replaced by the term "fish," any type of pasta is replaced by the term "pasta," etc. Such a database might look like this:

```
let fishTypes = ["salmon", "whitefish", "tuna", "yellowtail", "branzino",
"snapper", "halibut", "tilapia", "sole", "bass"]
```

In this case, an occurrence of any of these words is replaced simply by “fish”. The final array is then sorted by frequency to provide a glimpse into a given user’s favorite foods, or at least those he orders most often. These results are not visible to him, as they can be accessed only from the developer side of the Cloud, but they are a powerful consumer insights tool in informing our marketing strategy. As Phissy collaborates with food industry businesses in the future, these buzzterms data will play a critical role in helping them better understand and serve their customer base.

2.1.5 Sorting and Filtering

Even when using a dish-centered app like Phissy, users still value being able to sort restaurants by their overall qualities. However, the content of these qualities differs. Results of Phissy focus groups corroborated published research findings that when using restaurant-centered (rather than dish-centered) apps like Caviar, users are actively on the prowl for a delicious new gem in their area; they care distance, price point, and cuisine type.⁴ When using Phissy, our research found, users are sifting through restaurants they may want to *revisit* based on their initial experience; they still care about distance, but closely followed by when they visited the restaurant last, what their meal consisted of, and how much they enjoyed it.

Phissy’s second tab is devoted entirely to accommodating this desire to manipulate dining data with the objective of enhancing future dining decisions. Users toggle among four views: sorting by distance, sorting by rating, sorting by last modified, and sorting by calendar, with filtering buttons for even more advanced manipulation.

⁴ (Cho, Bonn, & Li, 2018)

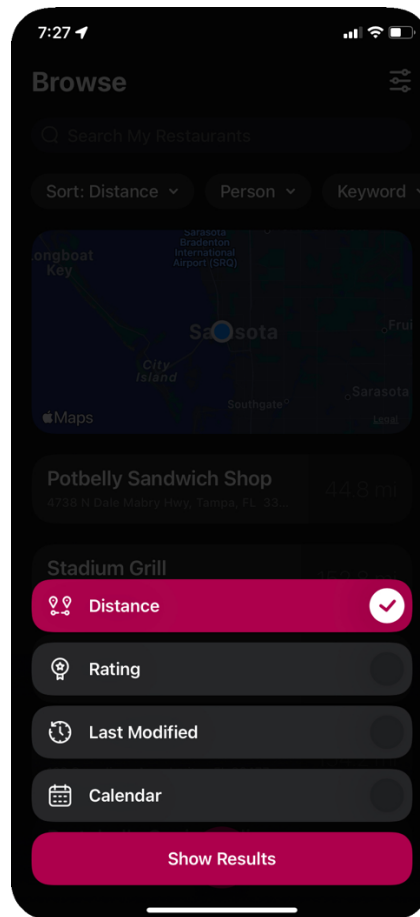


Figure 5: Users toggle among four views, with filtering buttons for advanced manipulation.

2.1.5.1 Sorting by Distance

When sorting by distance, the user sees that all the restaurants in his Phissylist listed from closest to farthest away, each labeled with an exact distance label in miles from the user. At the top of the screen, he finds a visual counterpart in the form of a navigable map with interactive pins for each restaurant the user has logged. Tapping the name of a restaurant opens it to view its contents, which is to say its Personlist, while swiping left on the restaurant launches driving, walking, or public transit directions to its location directly through Apple Maps. As our research has shown this to be the most frequently used of the three sorting methods, this is the default view.

2.1.5.2 Sorting by Rating

Sorting by rating calculates the average ratings given across dishes and beverages ordered at each restaurant. This enables the user to view all restaurants in his Phissylist in order of most liked to least liked.

2.1.5.3 Sorting by Last Modified

Sorting by last modified orders the user's restaurants from most recently edited at the top to oldest at the bottom. While quick access to recently edited restaurants was not a feature that initially occurred to focus group participants as valuable, users later voiced the desire for such a feature after finding themselves scrolling through their entire Phissylist to tweak details of their latest orders.

2.1.5.4 Sorting by Calendar

The calendar option reflects a user's dining history visually by date. Users see a scrollable full-page calendar, on which there are one or two dots beneath dates on which the user visited one or more restaurants. This data does not have to be entered manually by the user, because it already exists! As noted previously, restaurant node has attached to it an array of dates, starting with the date the restaurant was added and containing any unique future dates the restaurant's contents (people, dish details, etc.) were modified. Tapping a date reveals the restaurants where the user went that day, and tapping a restaurant opens it.

2.1.5.5 Filtering by Person, Keyword, or Restaurant

The filter button can be used to perform more advanced operations, filtering the Phissylist data by any details of a user's favorite dishes, including keyword, person, or restaurant. For example, if a user wants to find his girlfriend Sofia's favorite place to order fish, he can just search "Sofia" under *Person* and "fish" under *Keyword* and will be shown every time he had logged that Sofia ordered fish, sorted from highest rating to lowest. These dishes do not all include the term "fish"—Phissy's filter knows to also include words like "salmon" and "tuna".

To do this, Phissy iterates through his Phissylist to isolate all instances of a person named “Sofia” whose Dishlist contains a dish whose title contains either the term “fish” *or* any one of the terms in Phissy’s hard-coded database that I have assigned to “fish,” as illustrated in section 2.1.3.

The result is the intersection, and not the union, of the filtering fields *Person* and *Keyword*. Functionally, this produces a list of fish dishes ordered by Sofia, along with the restaurants at which they were enjoyed.

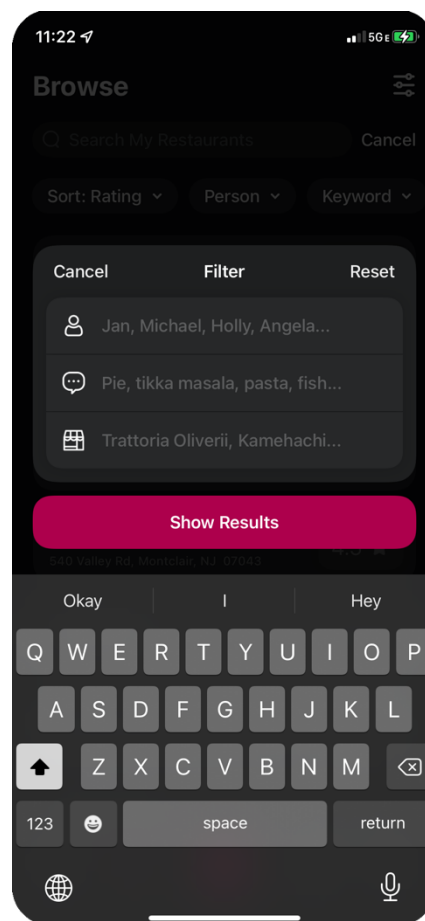


Figure 6: The filter button can be used to perform more advanced operations.

2.1.6 Collections and Shortlist

With Phissy collections, users can create unlimited “playlists” of all their favorite restaurants and dishes (e.g., Thai, Date Night, Dog Friendly, Boston's Best

Cupcakes, etc.). Users can keep them private or share them with friends for personal recommendations and endless inspiration. To add a new collection, users tap the plus icon in the upper right-hand corner and assign it a name. Then, the user can choose from Phissy's extensive collection of icons to find the one that perfectly captures the essence of the collection. To add restaurants to this new collection, the user can tap the *Add Restaurants* button or add them directly from the Phissylist screen to a collection by simply sliding left on a given restaurant and tapping the collections icon. A restaurant can belong to as many collections, and a collection can hold as many permutations of logged restaurants, as a user wishes.

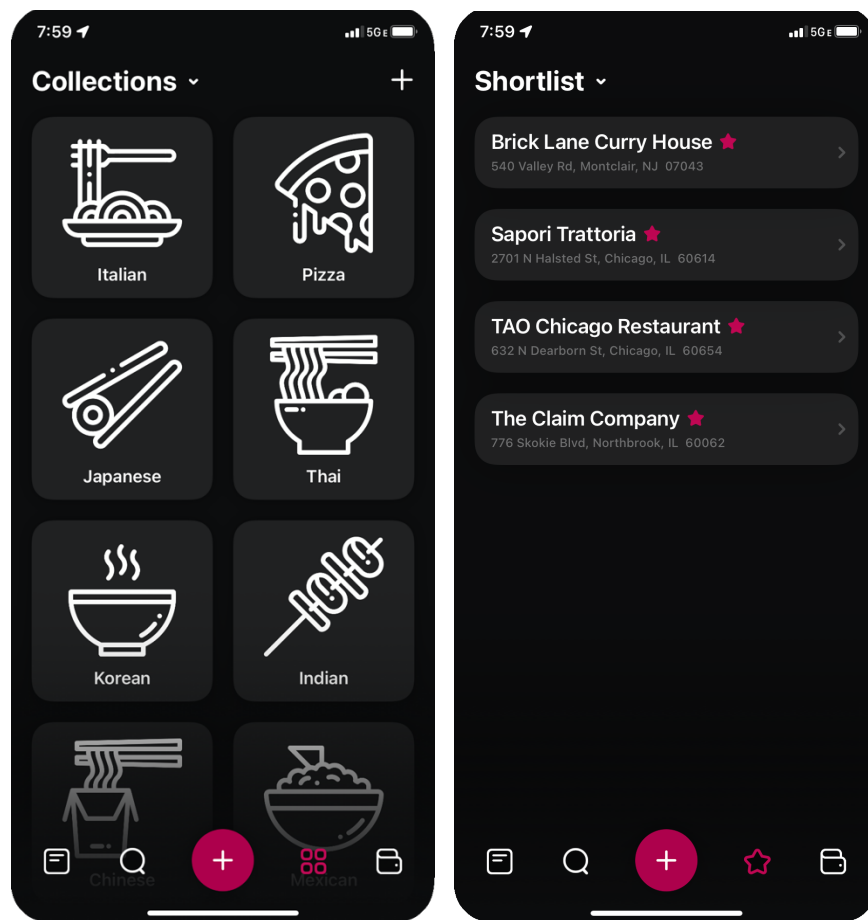


Figure 7: Users can organize restaurants into collections or into their shortlist.

Also on the collections tab is the user's shortlist. If a user has a couple favorite spots to revisit or a friend's recommendation to try, the user can add the

restaurant to his shortlist by sliding it left and tapping the shortlist icon. Phissy Pro subscribers can also see if anyone in their iPhone contacts has any of the same restaurants in *their* Phissy shortlists. If so, users will receive notifications that they have a favorite spot in common. Smooth way of making a date, too.

2.1.7 Share and Sync

Unlike other social sites and apps for foodies, Phissy is a personal dining organizer, not a social networking platform. Phissy was designed to enable users with memory loss (and later, users of all ages and abilities) to seek more positive dining experiences based on their personal taste, not the public one. However, it soon became clear that some amount of user-to-user sharing of dining data would be valuable to even the most private of users. Phissy now offers three ways to share between app users.

2.1.7.1 Syncing Orders

A group of Phissy users are sitting around the table after the meal, preparing to quickly log what they ordered, when an alarming thought occurs. *Do they each need to write down everyone's names, and what each person ate, and what they thought of each thing they ate?* Thankfully, no. Phissy users can sync their orders at a given restaurant with friends automatically, so everyone around the table can each enter only their own order and collaboratively contribute to one shared restaurant note. Think Google Docs for dining information.

To begin syncing orders at a restaurant, a user sends his friend an invitation. Once the friend accepts, every time either of them orders something new at that restaurant, it updates both of their Phissylists in real time.

The piece of code underlying this process involves saving a snapshot of the restaurant on User A's device to the Cloud, where it replaces the data at that restaurant for all users with whom User A is set to sync that restaurant. This, in turn, pushes an update to User B (who was one of those users), whose Phissylist restores from the Cloud with User A's data. If the process were to end here, just a simple replacement operation would take place. That would be problematic in multiple cases, such as if User B happens to add more data while disconnected from the internet,

just to find all her work overwritten upon reentering Wi-Fi. Or more likely still, User A and User B have different dishes stored at that restaurant on their respective devices before they choose to start syncing—whose will win out?

Thankfully, neither user has to relinquish any thoughtful notes. I programmed an algorithm to merge, rather than to replace, data. This is the most essential component of Phissy's syncing program. When restoring User A's Cloud data onto User B's phone, it compares the two restaurants and their contents. If either restaurant contains a person that the other restaurant does not contain, that person and all of their dishes are appended into the lacking restaurant. If either restaurant contains a person that the other restaurant *does* contain but whose list of dishes does not match, the additional dishes are merged likewise. Special code is in place to account for what happens when User A actively deletes a dish or person; only in this case does it get deleted from User B, as well. Syncing can be terminated by either party at any time.

2.1.7.2 Sending a Copy

Say a user's best friends are planning a trip to Paris, but they have no idea where to eat when they get there. They can pay a travel agent to source good spots, or they can spend hours online sifting through menus and mixed reviews. Lucky for them, our user just went to Paris last summer, and he has a whole bunch of personalized recommendations right on Phissy. He doesn't want to sync with all of them because he doesn't feel the need to know what they order when they go, but they would value knowing what he ordered and liked in the past.

Often, Phissy users are eager to share restaurant recommendations with friends but are not as comfortable syncing back and forth indefinitely. Just as a Google Doc can sync in real time or be shared as a copy with an independent third party, so to can a restaurant from Phissy. A user can choose to share a restaurant, which contains a Personlist, respective Dishlists, etc. as one exported file. This can be received by Airdrop, email, message, or by any other means of file sharing, as long as both users have Phissy installed. The received file will open in the recipient's Phissy app and be automatically added to her Phissylist (if she did not have that restaurant before) or merged (if she did).

2.1.7.3 Sharing a Collection

The same can be performed with a collection. This not only sends copies of all the restaurants *in* the collection, but it marks to what collection they belong. For example, if our user has all of his Paris trip restaurants saved in a collection, there's no need for him to comb through his Phissylist for the restaurants he wants to share. He just opens his Paris collection and taps to share it with others, again by Airdrop, email, message, or any other means. All the restaurants from the collection are added to the recipients' Phissylists, but on the recipients' collections tab they now have a new collection called "Paris" with an Eiffel Tower icon containing all those restaurants. In other words, they now have a hand-picked folder of places to go on their trip.

2.1.8 Post Reviews

As Chapter 3 will expound, the younger our user demographic skewed, the more we had to refocus and accommodate a shift in social user expectations. This led to the development of Phissy's public review feature.

With this feature, Phissy Pro subscribers have the ability to share reviews of their dining experiences to Instagram, Facebook, Yelp, Google Maps, or any other social medium of their choice, all right from the Phissy in-app social dashboard. Such a review, exported in text, might look like this:

Definitely a go-to spot for special occasions,
just make sure to get a reservation early!

 Spinach Dip (for the table) — serves 3-4
★★★★★

 Miso Salmon w/ asparagus, no snow peas
★★★★★

 Original Cheesecake
★★★★★

🍝 Impossible Pasta Bolognese — good first
couple times, too salty last time
☆☆☆☆

👤 Visit again? Yes!

🍴 Restaurant: Cheesecake Factory

📍 Location: Skokie, IL

.
. .
. .
. .
. .

#skokie #salmon #asparagus #peas
#spinach #cheese #cake #pasta #miso

What's happening here? The review didn't quite materialize from the tap of a button—all the content was inputted by the user when he first logged the restaurant in his Phissylist. When prompted to create a publishable review, Phissy synthesizes all dishes ordered either by the user himself (i.e., not by his friends at that same restaurant, even if they're in his Phissylist entry) or ordered for the table. For each of these dishes, an emoji is assigned (this mechanism will be discussed at length in Chapter 4) as well as the user-inputted rating in the form of stars on the line below each. If anything was added to a dish, per the user's notes, that is appended to the dish name and separated by "w/"; if the user removed anything from the dish, that is appended and separated by "no"; and if there are both additions and subtractions present, the two are separated by an inserted comma. Following this, any dish-specific notes a user entered are appended after an em dash, whereas any restaurant-general notes are inserted at the top of the entire review. Future variables may include price or tags for dietary restrictions.

Whether a user would "visit again" is determined by taking the average of how the user rated each dish he ate there; any average rating of 3.0 or greater (out of 5.0) returns that yes, the user would visit again. The restaurant name is extracted from the order, and its location is identified by reverse geocoding the restaurant's

stored geographical coordinates. The process that extracts relevant hashtags will be further discussed in Chapter 4, as well.

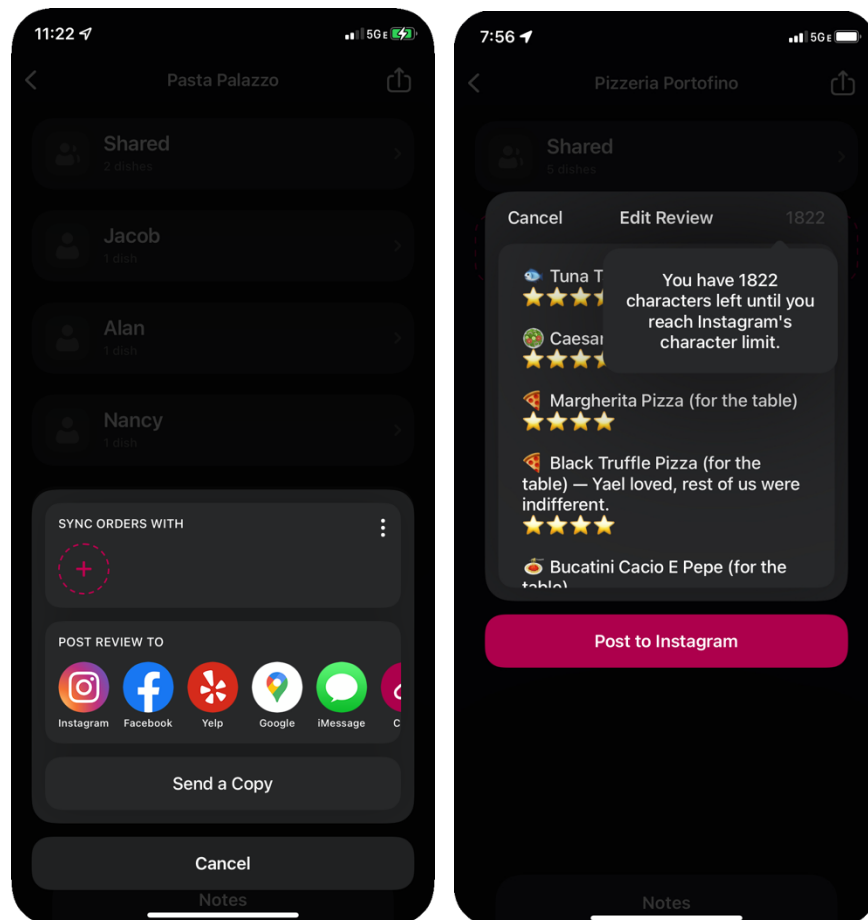


Figure 8: Users can post reviews to social media directly from Phissy.

Naturally, this programmatically generated draft is only a starting point. The user is free to post the review as is, or he can edit and manipulate the review to his liking before posting it. In fact, Phissy facilitates revision by providing character-counters corresponding to given social media platforms to help the user stay under character limits (e.g., 5000 for Yelp, 2200 for Instagram, etc.). Any modifications the user makes to the review are saved, so the user does not need to make the same edits over and over to post to his various social media feeds. Combined with the ease of logging dishes and drinks in Phissy in the first place,

Phissy becomes truly a one-stop shop for the exponentially growing population of restaurant reviewers and foodie bloggers.

Rest assured, just by adopting some social functionality, Phissy has not abandoned its claim to fame as a personal dining organizer and instead entered the boxing ring with various social media companies. Rather, Phissy continues to exist as an independent tool fulfilling a unique niche, but it now also supplements a wider assortment of social and food-related applications.

2.1.9 Earn Badges

Gamification, “*the use of design (rather than game-based technology or other game-related practices) elements (rather than fully developed games) characteristic for games (rather than play or playfulness) in non-game contexts (regardless of specific usage intentions, contexts, or implementation media),*” is a burgeoning user experience (UX) trend in mobile applications and beyond.⁵ Simply put, the objective of gamifying the user experience of an app like Phissy is to foster user retention by reinforcing the user’s behavior while using the app and motivating the user to continue using the app and promoting it to others. In the spirit of Mary Poppins, mundane tasks suddenly become a game—the context is light, familiar, and competitively motivated, yet totally risk-free.

Previous research on the role of gamification in UX design has supported the hypothesis that earning virtual badges, while worth essentially nothing but a smattering of pixels, are tremendous motivators in influencing user behavior.⁶ Ideally, such a mechanism builds on self-determination theory, which gauges whether a user is taking steps on his own intrinsic volition. Like any product, a mobile application is most successful when users are impelled to use it because they crave it, not simply because they require it. This is what Phissy’s badge feature attempts to facilitate.

⁵ (Deterding, Dixon, Khaled, & Nacke, 2011)

⁶ (Wang & Sun, 2011)

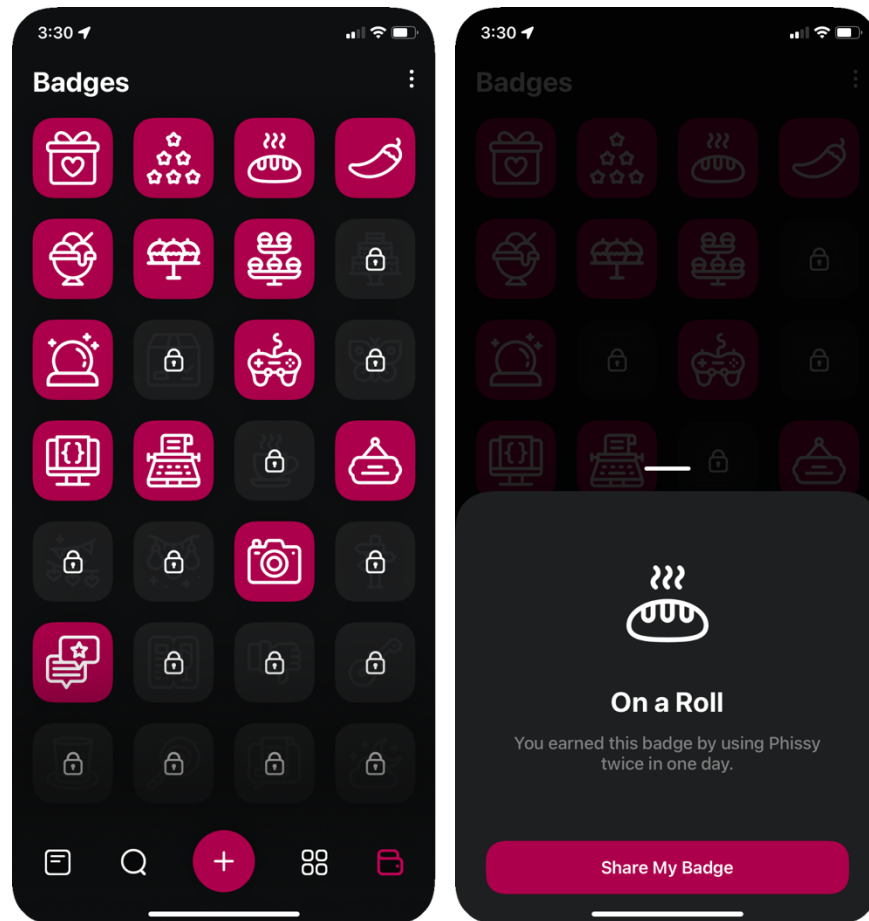


Figure 9: Phissy offers badges for performing tasks.

Badges are the most recent addition to the Phissy model to date. In practice, Phissy users can earn up to 28 badges for various actions they perform. These may include process actions within the application, like logging a tenth dish or visiting the same restaurant twice; extra-application actions, such as reviewing or rating Phissy on the App Store or recommending it to a friend; or Easter eggs, like discovering secret buttons hidden throughout the app. Easter eggs, a term coined in 1979 by then Director of Software Development in the Atari Consumer Division, generally refer to features deliberately hidden in software in such a way that the typical user will never encounter them unless actively seeking them, then prompting a blind search akin to an escape room, or perhaps more aptly, an Easter egg hunt. Some Easter eggs in Phissy include scrolling forward a year in the future on the calendar to discover a secret button or holding down the Phissy logo to launch a culinary-themed spin-off of the viral game Flappy Bird.

The first and second categories—process actions and extra-application actions—lend themselves to a feedback loop, providing dopamine hits as rewards for actions users are encouraged to repeat, such as logging new dishes and restaurants they visit. This feedback loop also incites users to “self-monitor,” or be aware of how frequently they use the app, which in turn may keep Phissy toward the forefront of users’ minds when dining out; this reflects a study by Alsaleh and Alnanih on leveraging gamification in mobile applications to keep users’ cognizant of their health.⁷ A study by Sailer et al., investigating the motivational effects of gamification from an educational psychology perspective, likewise concluded that the presence of badges, as well as other game metrics like leaderboards, points, or performance graphs, increases user retention by stoking users’ need to exercise competence and autonomy, two of the three fundamentals of self-determination.⁸ However, Sailer et al. underscore one caveat in their experimental results: in order for gamification to be effective, users must be made aware of their goals in advance. In other words, the mere presence of positive reinforcement for desired actions produces an insignificant response compared to that of the user who knows he’ll earn another badge after logging a number more restaurants or dishes—even if that number is kept a secret! For this reason, Phissy shows users the names of all 28 potential badges upfront. For process and extra-application actions, these names (“The App Reviewer,” “Frequent Diner,” “Midnight Snack,” etc.) are transparent.

The Easter eggs, by contrast, are more cryptic both in title (“Hot Shot,” “Fortune Teller,” etc.) and in concept. These do not fulfill the criteria posited by Sailer et al., as users are unaware of what they must do to earn these enigmatic badges. However, further research shows that badges may serve yet another function—virtual status symbols.⁹ Because these do not require the prerequisites for earning them to be known to the user, these appeal not only to the user’s competence and autonomy but also the user’s ingenuity. In the same way that solving a particularly complex riddle is all the more rewarding than correctly solving a math problem, the value of the Easter egg is higher, and so too is the drive to earn them. Further research will be required to see if this holds true for Phissy’s badges, though it appears that simply being able to see there are 25, 24, 23... badges left to earn has proven effective at galvanizing users of all ages to keep

⁷ (Alsaleh & Alnanih, 2019)

⁸ (Sailer, Hense, Mayr, & Mandl, 2017)

⁹ (Sailer, Hense, Mayr, & Mandl, 2017) cited (Werbach & Hunter, 2012); (Zichermann & Cunningham, 2011)

plumbing for more. All the while, they spend time in the Phissy app and actively explore its features.

Future developments may incorporate leaderboards to enable users to compare their logged restaurants and dishes with those of other Phissy users, though I maintain reservations that a leaderboard could be more defeating than encouraging. Not everyone has the chance to eat out often, not everyone dines with friends, and not everyone can afford to order the same number of dishes—not to mention if you love the first thing you try, you may not feel compelled to order anything else from that restaurant in the future. At the end of the day, there is no universal metric for how best to utilize Phissy as a tool, so the best incentive for a Phissy user is simply to compete against himself.

2.2 In Summary

The Phissy back-end stores user data in a tree of nested folders, which is a familiar way for humans to visualize and interact with data. During its conception and early roll-out, back-end features were added, altered, or removed to streamline the process of rating and later recalling specific dishes and drinks. In the next chapter, we will address various sociological and developmental considerations that shaped Phissy's front-end as its key user personae began to evolve.

3: HUMAN DEVELOPMENT

3.1 *Designing for the Lifelong User*

Adapting mobile applications for elderly users remains a largely untapped market,¹⁰ and even applications that do target older users often fail to be accessible to them.¹¹ Developers' and designers' unfamiliarity with physical, psychological, and generational differences continues to widen the gap between the young "digital natives," who were raised with digital technology and pick up new platforms by second nature, and older "digital immigrants," who are less technologically literate and may struggle to adapt.¹² Consider, by linguistic allegory, the English speaker who moves as an adult to Russia and must pick up the Russian language. Russian characteristically rejects the rigid word order of English in favor of a complex declension system, leaving the English speaker disoriented. At the same time, even Russian children have no problem intuiting a noun's gender or whether to use it in the nominative or genitive declension, regardless of whether they have never heard the word before. And while Russian may have a dazzling selection of words that English lacks sufficient translations for, Russian likewise lacks translations for several English words that the English speaker may be desperate to convey.

Indeed, the main missing link in older populations' frustration with digital technology and mobile applications is not an inability or lack of desire to internalize new content; it is a foreignness to expected processes—processes that seem to the developer as second-nature as declension to the Russian-speaking child—and a mismatch of desired features. This leads to a preponderance of inaccessible interfaces, superfluous capabilities, and overreliance on user flows that in being so intuitive to digital native audiences isolate digital immigrants entirely. Built on research into specifically senior-friendly design,¹³ Phissy strove to do the opposite. That is, until more millennial users began downloading the app, impelling us to change gears. Now, Phissy is at a crossroads, faced with striking a balance between allowing the range of expected behaviors digital natives want from a mobile app like Phissy and at the same time not alienating our original users, for whom Phissy is an essential tool.

This chapter will use existing literature and the Phissy case study to comment on the contrasting—but not necessarily incompatible—expectations digital natives and digital immigrants have of technology. While the role of such technology overlaps with

¹⁰ (Lvivity, 2019)

¹¹ (Portenhauser, et al., 2021)

¹² (Portenhauser, et al., 2021)

¹³ (Vaportzis, Clauser, & Gow, 2017); (Wang, et al., 2019)

multiple developmental phenomena, we will look closely at two, namely the trajectories of memory and social-emotional development. Each of these two topics will be addressed in its own section, with a corresponding literature review and exploration of solutions for how the Phissy app has been and can be tailored to accommodate users at varied stages.

3.2 *On Memory*

Human brains reach their maximum size at the peak of adolescence, after which they begin to undergo physical changes in volume and vasculature that result in changes in cognition through adulthood and into old age. Among the most prevalent of these cognition changes is that of memory, whose challenges invite potential for intelligent innovation, as well as adverse consequences.

A longitudinal MRI study by Gorbach et al. (2016) related memory decline from young through old age with age-linked decreases in cortical and subcortical grey matter volume and white matter connectivity in the hippocampal region, which was barely evident in participants at age 55 yet significantly evident by age 65.¹⁴ While memory function can be divided broadly into four categories—namely working, episodic, procedural, and semantic memory¹⁵—it is only the first two that are broadly affected by this aging process.¹⁶ Working memory is concerned with information one can hold while executing a task, such as dialing someone's telephone number, while episodic memory, which is the area Phissy was designed to aid, is concerned with recalling details of past experiences, like what one ordered at given restaurant and what one thought of it.

3.2.1 *Review of Literature*

Episodic memory is believed to have later onset and more protracted development than other forms of memory. Researchers find that even when young children do remember episodes clearly, the children exhibit a range of accuracy in recalling details like where and when it occurred.¹⁷ This is because episodic memory is built on what researchers call a binding structure, which takes significant time to develop.¹⁸ For example, two variables must be linked to remember you once ordered eggplant parmigiana and had a positive experience with it: ([eggplant parmigiana]-[delicious]). More often than not, though, two-way

¹⁴ (Gorbach, et al., 2017)

¹⁵ (Atkinson & Shiffrin, 1968); (Baddeley & Hitch, 1974)

¹⁶ (American Psychological Association, 2022)

¹⁷ (Bauer P. , 2007)

¹⁸ (Humphreys, Bain, & Pike, 1989)

binding is insufficient and three-way binding is necessary; say you've ordered the same dish at multiple restaurants with different reactions: ([Arturo's]-[eggplant parmigiana]-[delicious]); ([Benvolio's]-[eggplant parmigiana]-[awful]). Or one step further: ([Arturo's]-[eggplant parmigiana]-[delicious]); ([Arturo's]-[house cabernet]-[awful]); ([Benvolio's]-[eggplant parmigiana]-[awful]); ([Benvolio's]-[house cabernet]-[delicious]). Now we have six variables in mixed association with one another, each relying on another in the network to determine a given third. Suffice it to say, the child's brain takes years to master the logic puzzle that is episodic memory. (At the same time, this logic puzzle begins to bear a strong resemblance to our Phissylist, which serves to supplement these richly organized binding structures for individuals who have begun to lose their episodic memory.)

Episodic memory not only takes the longest to mature; it is also the first area of memory to decline.¹⁹ To explain why episodic memory seems especially vulnerable to the effects of aging, Chalfonte and Johnson (1996) and Mitchell et al. (2000) proposed the binding deficit hypothesis, based on their findings that age (past middle age) correlates most negatively with adults' ability to bind information to *contextual* elements,²⁰ mirroring the difficulties experienced by children in early memory development. Naveh-Benjamin (2000) tested this hypothesis by assigning participants in a young age group and an older age group to study a list of paired items. When later asked to recognize which items were on the list, both groups performed equally well, but when given the same list in a reshuffled order and asked which pairs were intact from the first list, the older adults struggled significantly more than their younger counterparts, intimating an age-linked associative deficit consistent with the binding deficit hypothesis.²¹ A later study by Naveh-Benjamin, Jonathan Guez, and Shlomit Shulman tested whether this deficit was due to decreased attentional resources for older adults as compared to adolescents, but results show that adolescents do not exhibit an associative deficit under divided attention;²² simply put, the factors causing episodic memory to be hit first and hardest with age remain unknown.

Fortunately, assistive technology has proven successful in extending the finite and fading cognitive capacity for episodic memory in many cases. In a study by Nishiura et al. (2019), 15 elderly adults with and without dementia were

¹⁹ (Peters, 2006)

²⁰ (Chalfonte & Johnson, 1996); (Mitchell, Johnson, Raye, Mather, & D'Esposito, 2003)

²¹ (Naveh-Benjamin, Adult age differences in memory performance: Tests of an associative deficit hypothesis, 2000)

²² (Naveh-Benjamin, Guez, & Shulman, Older adults' associative deficit in episodic memory: Assessing the role of decline in attentional resources, 2004)

provided an electric calendar to assist in day-to-day activities while 12 were observed as a control group.²³ In monitoring subjects' cognitive function post-intervention, Nishiura's team found a significant increase in total Mini-Mental State Examination score ($p = 0.020$, a paired t -test) among subjects as compared to the control group, and subjects even exhibited higher motivation and improved ability to self-regulate healthcare-related tasks. The same was found in several like studies, leading researchers to conclude that technology supplementing episodic memory can in fact play an instrumental role in various aspects of digital immigrants' lives.²⁴

It is no oversight that Nishiura's electronic calendars reminded subjects what activities they had to do or whether they already had done them; they did not facilitate the performance of these activities. A key misconception in designing technology to offset natural memory deficit is that the technology must present a novel, simpler way to perform a task. This makes the assumption that elderly users are incapable of remembering how to perform complex tasks they once could, which assumes a deficit not of episodic memory but of procedural memory, which in fact does *not* decline over time.²⁵ Misunderstanding arises in that the task of "practice makes perfect" could be conceptualized as converting one-off episodic memories into cohesive and second-nature procedural memories (and retaining them through sustained engagement), so because older adults have access to fewer episodic memories at a time than adolescents, older adults also must spend more time getting up learning curves. It is crucial to note, however, that older adults face no trouble retaining the procedural information once they have mastered it.²⁶ For this reason, using technology to change the way tasks are to be done does not necessarily increase accessibility for the memory impaired, and often it even can generate frustration.

An investigation by Wang et al. (2019) found this to be the consensus among a group of elderly survey participants who specifically cited their exasperation with a "lack of unified frameworks."²⁷ Merely learning how to perform a task would be manageable, they claimed, but every piece of technology geared toward their age group seemed to work completely differently than the last, forcing them to relearn new methods ad nauseum. The reason? Each successive

²³ (Nishiura, Nihei, Nakamura-Thomas, & Inoue, 2019)

²⁴ (Hackett, 2020); (Vaportzis, Clauser, & Gow, 2017)

²⁵ Unless adversely affected by a neurodegenerative condition like Alzheimer's disease.; (American Psychological Association, 2022)

²⁶ (American Psychological Association, 2022)

²⁷ (Wang, et al., 2019)

piece of technology attempted to innovate a seemingly easier, more sensible user experience, with no concern for the multiple learning curves that their users already had climbed.

As the world shifts toward digital ubiquity, this problem becomes increasingly apparent. Take for example streaming platforms; Netflix, Apple TV, Peacock, and Hulu each deliver the same mode of content and yet present distinct user interfaces. Learning where the menu button is, what the settings button does, how the search bar works, and when to click, tap, slide, or drag all contribute to a new learning experience per platform. To the digital native with a broader procedural repertoire of various platforms, these differences seem negligible, but to the digital immigrant, they are vast enough to spur a user to resign himself to just sticking with Netflix, at best, or at worst giving up on streaming services altogether and storming out in a huff. Of course, UI/UX designers intend the opposite effect, but in cases like this, each platform has devised its own proposal for the consummately intuitive, original design, rather than aim for cohesion with its most closely related competition.²⁸ In practice, what strives to set these technology companies apart from the competition compromises usability among the digital immigrant community. To avoid alienating this core constituent, developers and designers must thoroughly audit their competition to know not just how to stand out, but also how and when to blend in.

One solution: don't reinvent the wheel, just do a better job explaining how to use it. A survey by Vaportzis et al. (2017) collected such insights from elderly participants in the UK who owned digital tablets. The researchers found that while digital immigrants tend to be willing or even eager to learn how to interact with new technologies, the instructions simply are not made available to them because it is assumed they will be unable to understand.²⁹ This most often comes in the form of unlabeled buttons, relying on the user to intuit the significance of icons that may be more arbitrary than iconic, e.g., that three horizontal lines denotes *menu*, that a bell signals *notifications*, or that a given window likely would have a yellow button in its upper left corner to make the window smaller and a green one to make it bigger. Kurdoghlian (2020) adds that digital immigrants yearn for manuals to read because they were never given the chance to internalize these symbols linguistically in the way that younger people were.³⁰ Children who grow up on screens instill these patterns into their semantic memory, another type of

²⁸ (Matthew, 2020)

²⁹ (Vaportzis, Clauser, & Gow, 2017)

³⁰ (Kurdoghlian, 2020)

memory that typically does not decline with age. To add insult to injury, technology companies frequently avoid being explicit about these symbols and patterns at risk of alienating their younger demographic.³¹ According to Vaportzis et al., even in the rare cases that instruction manuals can be found for certain mobile applications, they are written by developers, not users. This makes them dense and loaded with technical jargon that remains unhelpful to digital immigrants.³² Compare this to the ease of a child's acquiring a second language during their most sensitive period versus the effort to learn the same second language as an adult thrown into a country rife with diverse dialects where the natives are ashamed to sell dictionaries—and the ones available on the black market are barely intelligible.

Why the stigma around instructions? It would seem there is a sociological game being played, in which appealing to older users is viewed as a negative that can blight a mobile application's reputation (take for example Facebook, which lost its young following once they felt it had become the domain of the older generation).³³ To keep up appearances, many applications play it cool with minimalist designs and sparse instructions, enabling younger users with shorter attention spans to get right to the action.³⁴

Interviewed participants in both Kurdoghlian's (2020) and Wang et al.'s (2019) papers further report error messages as highly disconcerting. Seeing something go wrong technologically stokes fears among older users, unlike younger users, that they may have broken something, at times leaving them paralyzed in making any further interaction lest they exacerbate the issue.³⁵ This is understandable, given the lack of helpful instructional tools, and discouraging, as older users already must apply greater effort to commit procedure to memory. Importantly, however, the fear is observed less when error messages are articulated in conversational style, which deescalates the situation and empowers the user to overcome the issue. Kurdoghlian's (2020) research suggests that positive feedback, on the other hand, is tremendously validating for digital immigrants.³⁶ There appears to be no evidence that digital natives feel strongly for or against positive feedback from technology; its presence is explicitly reassuring,

³¹ (Kurdoghlian, 2020)

³² (Vaportzis, Clauser, & Gow, 2017)

³³ (Hutchinson, 2021); (Heath A. , 2021)

³⁴ (McClinton, 2019)

³⁵ (Kurdoghlian, 2020); (Wang, et al., 2019)

³⁶ (Kurdoghlian, 2020)

and its absence is implicitly reassuring because it implies the user is competent enough not to need it.

Interestingly, it is possible that digital natives may need episodic memory support as well, but not for the same reason as their geriatric family members. While this is not due to physiological changes of the brain with old age, some researchers posit that children who grew up with the internet develop such a strong dependence on information-on-demand that their brains wire to store episodic memories differently than those who did not grow up with the internet.³⁷ According to cyberanthropologist Amber Case, “Memories are becoming hyperlinks to information triggered by keywords and URLs. We are becoming ‘persistent paleontologists’ of our own external memories, as our brains are storing the keywords to get back to those memories and not the full memories themselves.”³⁸ If this is true, then a platform like Phissy provides a value add to young users by allowing them to drop retraceable breadcrumbs toward memories they otherwise would not store as vividly.

3.2.2 How This Has Been Applied to Phissy

The minimum viable product for Phissy was created for digital immigrant use. On the UI level, button quantity was kept to a minimum, reducing clutter, while button size was maximized to reduce room for error and consequent spikes in frustration. I prioritized legibility over originality in our choice of typeface, adopting Apple’s native “San Francisco” typeface to facilitate cohesion with Apple’s native Notes, Mail, and Messages apps, with which users likely were familiar. Additionally, I opted for a greater than average font size contrast (i.e., the interval between title and subtitle font sizes), with the average font size skewing three points larger than Apple’s and weight skewing at least one point thicker. While the research explored in the previous section confirms that greater contrast and size in text is more accommodating to older individuals’ eyesight, a Nielsen Norman study shows that adolescents also prefer larger than average font size—a win-win.³⁹

³⁷ (Anderson & Rainie, 2012)

³⁸ (Anderson & Rainie, 2012)

³⁹ (Wang, et al., 2019)

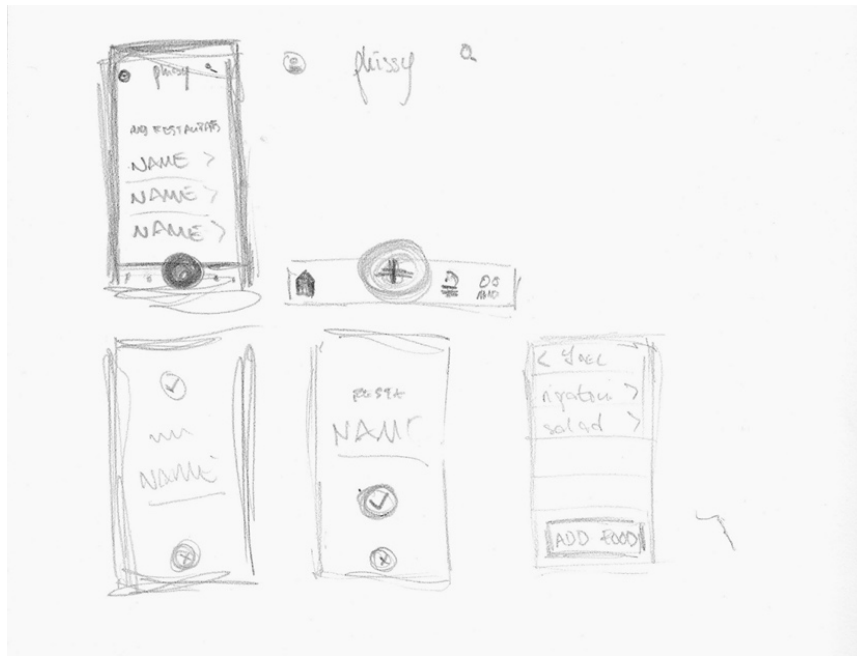


Figure 10: An early prototype flow, featuring large type and a dearth of social features, intended solely as assistive technology for elderly use.

Then, to make the UI environment “less boring” to the desensitized digital native eye, as 70% of our younger focus group participants later requested, Phissy had to become a bit more playful, with a much stronger presence of icons and images over text. However, it was critical that the iconicity of these icons remain high, which is to say they could not be so abstract as to intimidate older users for the reasons described in the previous section. Similarly, while the addition of in-app badges and rewards validates older users, it also enlivens the interface for younger users. The color scheme of the interface is made up of up of dark greys with a pop of pink for verve—mature, but not outdated. Making the app mainly dark was a conscious decision, as it makes the app less invasive to take out at even the classiest of restaurants. This is especially relevant for older crowds, who are sooner to frown at a glaring cell phone at the dinner table.

Beyond the UI alone, I also took steps to make the UX more accessible to digital immigrants. I followed the recommendations put forth by Kurdoghlian and Vaportzis et al. pp for the first time! At the same time, digital natives can bypass this guided toto include detailed instructions in the app; this took several iterations and rounds of market testing to perfect. Early proposals included a lengthy walkthrough video and a help documentation booklet, both of which were

created in full and implemented. Later, the decision was made to switch out the video tutorial for a built-in, interactive guided tour of the app that invites users to participate actively in learning at their own pace. This also does not require users who already have an episodic memory deficit to then remember every instruction given in a 12-minute video before entering the app instructions more swiftly if uninterested, rather than having to sit through a video.

To the same effect, I paid careful attention to empty states—the appearance of a list when there is nothing in it. Most users are familiar with empty states in the form of a new browsing tab or, for the most expeditious of us, a clear inbox. Since Phissy revolves around populating lists (each level of the Phissylist, the shortlist page, the collections page, etc.), I needed to craft an environment in which these pages, when unpopulated, would not be intimidating to new users. To do this, I converted the friendly but unhelpful “There’s nothing here!” text I had initially written to concise directives, such as “When you add a restaurant to your Phissylist, you’ll see it here. Tap the plus button below to add your first restaurant!” This provides guidance to enable the older user to feel in control and the younger user to feel a much-anticipated sense of action.

3.2.3 How This Can Be Applied to Phissy: Beyond User-Friendly Tutorials

Despite the app’s recent success, there remains room for UX enhancement. For one, while the tutorial format is more *accessible* to older users, its language still can be reworked to be less developer-centric and more user-friendly, as proposed by Vaportzis et al. The same follows for error messages—while seeing an error message should be a rare occurrence on Phissy, Wang et al. highlight the importance of making their content easy to digest, not too technical, and clear in expressing how the user should respond. Even small steps like this can have long-lasting and far-reaching implications for user retention. With respect to the app’s UI, I am pleased with most recent feedback from older users on Phissy’s design choices. I still want to pay especially close attention to the tab icons at the bottom of the app interface; as the UX evolves, I may decide to highlight different pages in the four tab slots I’ve built, which would require a change of icon. Since these tab icons are so small, labeling them with text would be unhelpful in ensuring clarity, so any new icons that replace existing tab icons will need to cue its meaning especially well. Rounds of A/B testing with older users will be implemented at that time.

3.3 On Social-Emotional Development

Social-emotional development is a domain of human development that focuses on the establishing of positive and rewarding relationships with others.⁴⁰ Although social-emotional development is discussed typically in the context of child development, humans continue throughout their lives to evolve in both intrapersonal processes, such as cultivating self-esteem, and interpersonal processes, such as mitigating feelings of empathy or jealousy among peers. This lifelong progression is manifest across generations' expectations for technology.

As suggested in the previous section, older generations leverage technology principally for consumption (of information, health and safety monitoring, and occasionally entertainment) and communication only with a small group of loved ones. According to Wang et al. (2019), 87.1% of elderly technology users rank their levels of mistrust high when submitting any personal data, even non-sensitive material, to a digital platform outside the scope of their friends.⁴¹ Younger generations, on the other hand, gravitate toward technology more as a tool to mediate the broader social-emotional sphere, according to Laurie Orlov, principal analyst at Aging and Health Technology Watch.⁴² Look no farther than Venmo to witness a transformation from a generic user-to-user payment app to a social platform to meet the demands of a younger audience—specifically, an audience that validates its purchases by voyeuristically perusing the purchases of others.

Though various theories attempt to explain this heightened desire for social comparison among young people, the prevailing theory is that younger users are more likely than older users to actively seek validation through comparison. There is disagreement, however, on whether social media is the cause of this desire or merely a tool to indulge it.

3.3.1 Review of Literature

In two Pew Research Center releases, Anderson & Rainie (2012) and Auxier & Anderson (2021) propose that growing up in the world of social media has engrained into digital natives a significant dependence on extrinsic validation.⁴³ The earlier study quotes Purdue professor of computer science Eugene Spafford in his prediction that young adults would become “unable to function in a

⁴⁰ (Cohen & Onunaku, 2005)

⁴¹ (Wang, et al., 2019)

⁴² (Hackett, 2020)

⁴³ (Anderson & Rainie, 2012); (Auxier & Anderson, 2021)

confident and direct manner without immediate access to online sources and social affirmation,”⁴⁴ and the later study provides evidence in favor of his prediction within the decade elapsed.⁴⁵ As of 2021, Auxier & Anderson cite a difference of 63 percentage points between the roughly 65% of adults between ages 18 to 29 who use apps designed exclusively for social sharing and the mere 2% of individuals 65 and older who do. Of these younger users, 71% report using these apps daily, most of whom use them multiple times a day. These data are consistent with Spafford’s hypothesis in that they imitate addictive tendencies of adolescents who thrive on, if not rely on, regular doses of social validation.

Here it is important to take a step back. Social media use certainly has amplified these self-conscious tendencies, but they very much are a facet of natural human development. Literature shows that searches for identity and concerns with meta-perceptions (i.e., how one is viewed by others) throughout adolescence and even young adulthood long predate the advent of the internet and, for that matter, the entire academic field of child study and human development.⁴⁶

A study by Stapleton et al. (2017) looked at emerging adults’ social media use in the context of social comparison theory, a pre-internet idea proposed in 1954, which posits that young individuals develop a sense of self through comparing themselves with others.⁴⁷ Stapleton and colleagues hypothesized that the idealized images users are allowed to project onto platforms like Instagram would beget upward social comparison and in turn have adverse effects on self-esteem, but only among groups who are sensitive to such comparison. Results of the study supported this. Users’ age positively correlates with self-esteem after engaging with social media; younger users felt personally defined in contrast to others, whom they considered to have “happier, more successful lives” than their own, while older users of the same social platforms expressed more resilience, putting less stock in strangers’ lives as a reflection of their own.⁴⁸ These data would suggest social media is not the root cause of young people’s preoccupation with meta-perceptions; it is simply their tool of choice. One might predict that young people would find and cling to such a tool in any historical or future era.

⁴⁴ (Anderson & Rainie, 2012)

⁴⁵ (Auxier & Anderson, 2021)

⁴⁶ (Bettino, 2021)

⁴⁷ (Festinger, 1954)

⁴⁸ (Stapleton, Gabriella, & Hannah, 2017)

Unlike image-based social validation, language-based social validation appears to have few effects detrimental to social-emotional development.⁴⁹ In many cases, users draw on these founts for objective media, like news and fact-checking, as well as subjective media, like endorsements and recommendations, to a prosocial end. Hicks et al. (2012) underscores that since business conglomerates no longer have a monopoly on the dissemination of media, digital natives are fueled to consume user-generated media (UGM) rather than content generated by established companies.⁵⁰ When looking to buy a product, for instance, digital natives are more inclined both to seek and to value the recommendations of others, even strangers with reputable followings, simply because unpaid, unscripted endorsements seem—and often are—more honest, trustworthy, and accurate.⁵¹ In this way, UGM becomes a sort of social currency. Where to a digital immigrant, the only opinions that matter are their own and perhaps those of their close friends and family, digital natives trade in recommendations constantly and place more of a premium on being able to share them with the world. This fosters a sense of human openness while strengthening the social perception that all are entitled to an opinion.

Again, this is a well-documented developmental trajectory appears not to be a product of social media, though social media has proven a powerful tool in enabling both healthy social-emotional growth and unhealthy social-emotional dependence.

3.3.2 *How This Has Been Applied to Phissy*

Since Phissy inherently is a *personal* dining organizer, older users should feel equally comfortable providing the details of their orders without the fear of inadvertently publicizing it. However, additional social features have been built into the app to cater to younger users at the same time. Being able to sync and send orders within Phissy to others who also have the app fosters a sense of community and connectedness and encourages younger users to dine among friends, but unlike in similar apps, this is optional. Another later addition to Phissy was the capability to share and post public reviews of what users ordered at restaurants to their favorite social media platforms, like Instagram, Yelp, etc. This

⁴⁹ (Hicks, et al., 2012); (Sen & Lerman, 2007); (Armstrong & Hagel, 1997)

⁵⁰ (Hicks, et al., 2012)

⁵¹ (Sen & Lerman, 2007); (Armstrong & Hagel, 1997)

allowed Phissy to bridge the gap between private and public without becoming another social media platform itself.

3.3.3 How This Can Be Applied to Phissy: The Risk of UGM

To continue to improve Phissy for younger users, on the other hand, the key is UGM through language. Various steps can be taken to increase the UGM output from Phissy, like enabling users to “follow” one another, which would necessitate the need for a “feed” that pre-populates with recommended content or building in a short-form video “reels” feature, as Instagram and Facebook have adopted in the wake of TikTok’s unprecedented popularity. This is all doable in theory. However, Phissy would begin to succumb to the mold of every other social media platform, which hinges on the creation of content exclusively for others’ consumption and in turn compensates the creator with validation, no matter whether technology breeds low self-esteem or simply facilitates it. This is not, and never has been, the mission of Phissy.

Regardless of audience, Phissy is an instrument that enables users to thrive, first and foremost, based on their own data. Phissy users are gratified by remembering their previous orders and being able to better inform their future meals as a result. No performative artifice plays any role in this relationship because the user is the only one the user needs to impress. In light of this, I would be comfortable losing a portion of Phissy’s younger demographic if it means remaining true to this purpose statement, preserving a platform that can be pro-social without being mediated by interpersonal comparison or instant validation.

4: PSYCHOLINGUISTICS

4.1 *Where Language Meets Code*

As a novice, self-taught programmer, I opted whenever possible to think of it as a new language, which I felt much more adept at acquiring than any sort of mathematical or scientific shorthand. After all, my studies had equipped me to recognize the systematicity inherent in language and to be familiar with the course of language acquisition from developmental and pedagogical perspectives—so surely this time would be no different! What I found was that while thinking of programming languages as true “languages” may fall short when measured up to Hockett’s design features of language or Bell’s criteria for linguistic viability, it is at the same time more than merely a metaphor. Programming has syntax. Programming has semantics. Programming even has pragmatics. I feel my background enabled me more seamlessly to master the logic of programming, and my experience programming has in turn reinforced my appreciation for the distinct grammars of diverse natural languages. That said, a litany of my observations as a humanities-oriented linguist learning to code, interesting as it may be in its own right, is not relevant to our discussion of how to optimize Phissy moving forward. Instead, this chapter will focus on the very important intersection between programming *and* the thought processes underlying natural language, insofar as both relate to the role of keyword extraction in facilitating the dish review pipeline.

Keyword extraction is a linguistic text analysis process that attempts automatically to extract salient terms from a given text. Depending on the text and algorithms applied, this can take various forms. The process may be more statistical in nature, or it may leverage machine learning artificial intelligence in tandem with natural language processing. It may require training data to improve its accuracy, or it may work within the constraints of a single document only. The objective may be to extract single words or entire keyphrases, the latter of which introduces a need to parse collocations and compounds to determine when two words form a salient expression, independently of simply how often they cooccur. Simply put, the options for keyword extraction are multifold, as unique cases call for specialized techniques.

Like the last, this chapter is divided into two sections, one on the topic of buzzterm analysis and the other on emoji mapping. Each will begin with a literature review surveying the current keyword extraction techniques that have been developed for that section’s purpose. In the discussions that follow, I will compare the techniques that Phissy currently uses to existing or theoretical techniques that could serve the app more effectively in the future.

4.2 Data Manipulation: Buzzterm Analysis

The most widely sought implementation of keyword extraction is to sift through masses of unstructured data—from online reviews about a company’s products to what customers are saying about the competition—to obtain the most important and relevant terms. Doing this with an automatic system saves hours of manual labor. Then, as these data are synthesized, associations can be drawn to group these terms by topical relatedness. In this chapter, I coin the expression “buzzterm” to refer to these salient terms, as a given buzzterm can be a single keyword or a multi-word keyphrase.

Phissy performs a similar analysis on its back-end to determine the most frequent buzzterms that appear in each user’s overall orders, across all restaurants that user has visited. This is not for filtering purposes but rather to help shape a data-driven business strategy, which may include selling this data anonymized to restaurants to inform them of their clientele’s broader food preferences (e.g., 90% of patrons who ordered steak at your restaurant also order a significant amount seafood elsewhere, so a “surf n’ turf” special is statistically likely to sell). To do this, Phissy relies on a semantic understanding of category (e.g., a user who enjoys “linguini” likes “pasta,” and if he also enjoys “rigatoni,” then he likes “pasta” even more). While computers do not (yet) possess humanlike intuition for semantics when presented with an unknown term, various keyword extraction techniques rely either on intra- or inter-document comparisons to other human-generated text.

4.2.1 Review of Literature

When it comes to extracting important terms from a piece of text, the most obvious approach is to consider word frequency alone. This technique—a modified version of which Phissy currently utilizes—is often referred to as the bag of words (BOW) approach. The BOW approach is helpful for identifying recurring words, which for some applications might be all that is needed. What word frequency does not account for, however, is anything linguistically relevant, such as a word’s part of speech, its significance, or its sequencing.

In light of this, many data scientists have turned instead to term frequency-inverse document frequency (TF-IDF). TF-IDF seeks to measure a term’s importance to a document by calculating the percentage of the document comprised of the given term and multiplying this frequency by the term’s inverse frequency across several other related documents. The greater the resultant score, the more relevant the document may be to someone searching for that particular

term. It follows that TF-IDF algorithms paved the way for search engines to rank articles based on their relevance to a search query.⁵² TF-IDF also stands out for its ability to extract keywords by discriminative weight rather than pure frequency. TF-IDF handles the issue of synonyms more elegantly than my workaround for the BOW approach (e.g., with TF-IDF, the terms “linguini” and “rigatoni” do not need to be hard-coded as related because this could be intuited by their low inverse document frequency). A more refined model was proposed by Wan and Xiao (2008) that computes each word’s global saliency by adding greater weight to the words around it, to general positive results.⁵³

Where both TF-IDF and BOW fall short is in the area of collocations, or identifying words that are semantically bound together, even if they are physically separated. To this end, techniques have been developed to assess potential collocations to determine whether multiple separate words should be counted as one. Witten et al. developed KEA, which performs TF-IDF evaluations by treating phrases as individual documents within a text, which performed with mixed results.⁵⁴ In a paper by Mihalcea and Tarau (2004), an algorithm called TextRank, which uses a “co-occurrence sliding window” of two words on either side of a central term, was shown to be helpful in that it did not limit itself to bigrams or trigrams and scanned more fluidly for potentially related keyphrases.⁵⁵ TextRank also applied syntactic filters to extract only nouns and adjectives. Florescu and Caragea (2017) later built upon the TextRank algorithm by assigning larger weight to words found early in a text than those that occur later. This modified algorithm, dubbed PositionRank, scored as even more effective than its predecessor in extracting salient information.⁵⁶ It should be noted, however, that PositionRank was tested only on scientific papers, which predictably frontload their abstracts.

As an alternative to TF-IDF-based formulae, Rose et al. (2010) proposed rapid automatic keyword extraction (RAKE). RAKE uses a list of phrase delimiters, or stopwords, to break up a piece of text into candidate keyphrases. The words in these candidate phrases then are scored based on two factors: their frequency and their degree. The latter refers to the number of words that appear in all keyphrases containing that word throughout the document, including the word itself. Each word is scored individually by dividing its degree by its frequency (which is to say the word’s RAKE score is proportional the word’s degree and inversely

⁵² (Kaur & Gupta, 2010)

⁵³ (Wan & Xiao, 2008)

⁵⁴ (Witten, Paynter, Frank, & Gutwin, 1999)

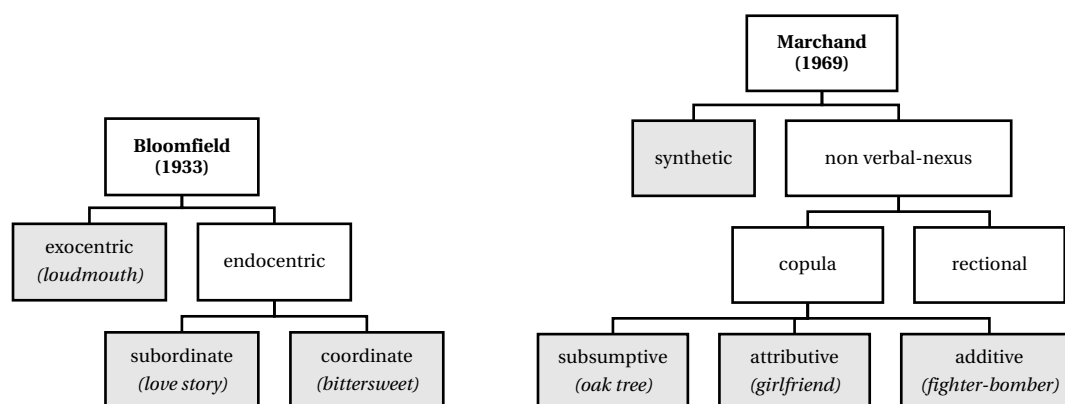
⁵⁵ (Mihalcea & Tarau, 2004)

⁵⁶ (Florescu & Caragea, 2017)

proportional to its frequency). The word scores of each candidate keyphrase are then added, returning the top third highest scoring candidates as the ultimately extracted keyphrases. Rose et al. found RAKE to achieve greater precision than preexisting techniques.⁵⁷

Still other methods of keyword extraction take a more syntactic approach, combining natural language processing with part-of-speech (POS) tagging to build a grammatical tree of a given phrase, which may better inform how to extract keyphrases without the need for hard-coded stopwords.⁵⁸ The accuracy of keyword extraction done with POS tagging correlates with the completeness of the source's grammatical structure; without full sentences, the results become less insightful. Still, we must not rule out the importance of POS tagging in our process. Such knowledge still could provide unique detail about the words that comprise a multi-word keyphrase, which could prove useful when faced with noun-noun or adjective-noun compounds.

Since 1933, linguists have proposed myriad organizational trees to illustrate the taxonomy of such compounds most accurately. Of the twenty most famous taxonomies,⁵⁹ the six most popular are as follows:



⁵⁷ (Rose, Engel, & Cramer, 2010)

⁵⁸ (Kaur & Gupta, 2010)

⁵⁹ (Scalise & Bisetto, 2011)

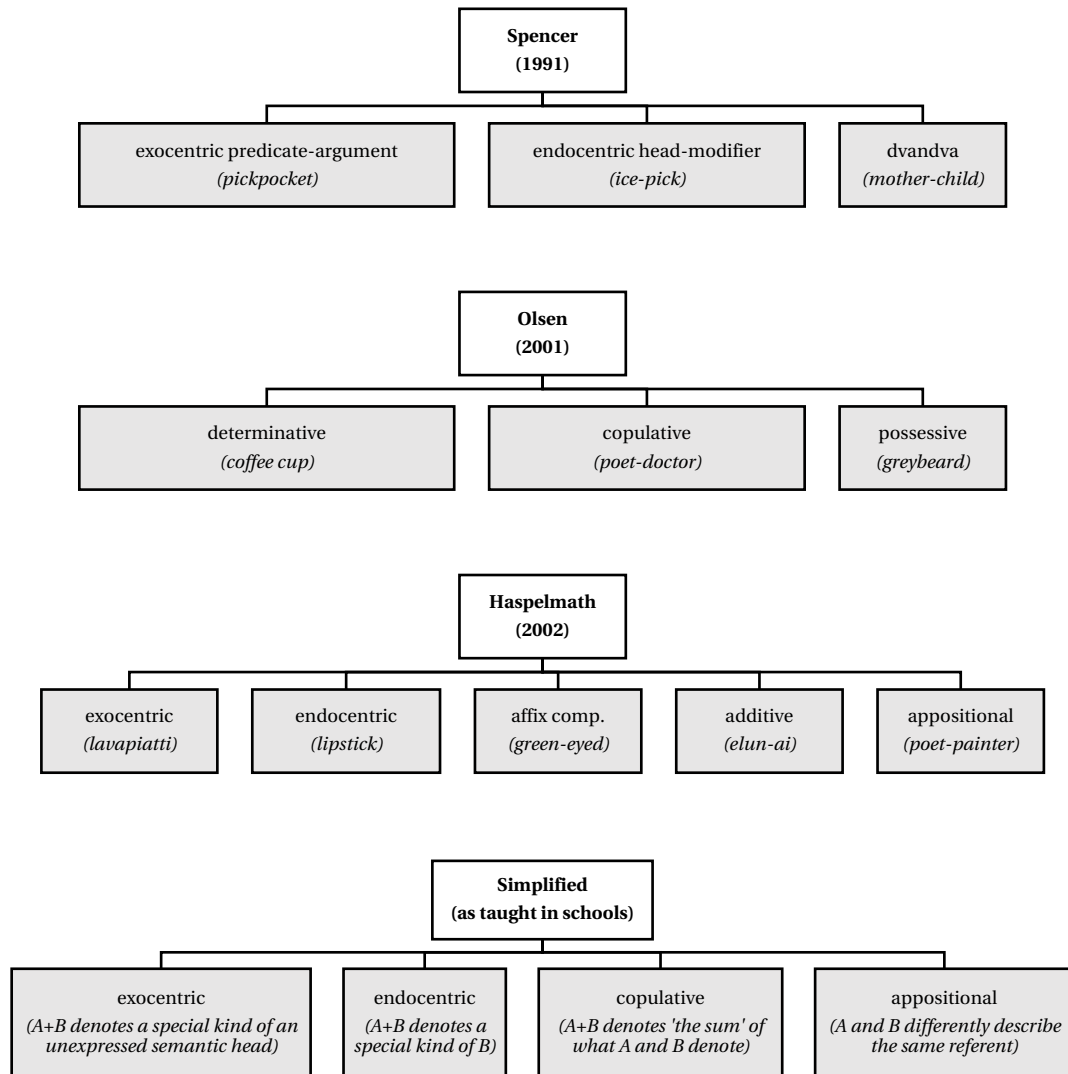


Figure 11: Trees representing the taxonomy of compounds, as presented by Scalise and Bisetto (2011).

It is essential to acknowledge this is English-specific; these taxonomies are not universal and in fact are rarely simultaneously compatible across languages. To use the simplified taxonomy, the most common types of compounds found in English menus and food items, according to the sum of user-inputted text data across Phissy users, are exocentric and endocentric. Copulative compounds generally appear only in nested modifiers (“strawberry banana” in “strawberry banana milkshake”) or in translations from foreign languages (“spicy-tuna-crispy-rice”). Appositional compounds do not appear in any Phissy entries scanned—the

only food-related example that comes to mind is “chef-author,” which likely would not be included in a menu item.

Although narrowly parsing types of compounds has not been introduced widely into keyword extraction algorithms, the above taxonomies are beneficial to bear in mind when considering semantic-pragmatic questions in section 4.2.3 about when to count two words separately or as one.

4.2.2 How This Has Been Applied to Phissy

Phissy currently uses a modified BOW model to extract buzzterms. This model is helpful in that it is self-contained (because it does not need additional corpora of data to reference) and consistent (because it cannot “misjudge” what the most salient terms are or what to collocate when it simply returns the most commonly used words across all restaurant orders). The BOW model also presents various problems, for some of which I have attempted to devise workarounds. For example, to reduce the likelihood of extracting a frequently used but irrelevant keyword, I created a word bank of conjunctions, prepositions, determiners, and other linking phrases (e.g., “a la”) to be omitted from extracted results. To account for potential synonyms, another issue for which word frequency keyword extraction is notorious, I programmed Phissy to replace any extracted word that matches a hard-coded category with the generic title of the category. This process is described in greater detail in section 2.1.3.

At this time, Phissy does not have a solution for extracting salient terms that consist of multiple words.

4.2.3 How This Can Be Applied to Phissy: Ice Cream & Strawberry Milkshakes

Suffice it to say, other models may help Phissy achieve its desired results more successfully than BOW. The ideal buzzterm extraction model should be able to extract single terms and multi-word phrases systematically, without the need to hard-code what to rule out.

A syntactic approach could be trained to automatically parse out certain parts of speech deemed irrelevant, but it would not be useful here because identifying these parts of speech is largely contingent on words’ sentential relation to verbs, which these entries (e.g., “lamb burger with sliced heirloom tomatoes and chive aioli”) generally lack. TF-IDF, conversely, does not require verbs to give strong results, but it fails in the area of collocations. And although it purported to

bridge this gap, KEA's results were mediocre at best. For these reasons, RAKE is the most appealing option to take the place of the BOW model currently in place. The advantages of RAKE are its speed, computational efficiency, ability to rule out phrase delimiters, and can identify more complex salient phrases in addition to singular words. RAKE is additionally appealing in that it does not need much data beyond the text in question.

Before proceeding with this decision, we must pause and consider the purpose of our buzzterm extraction implementation in the first place: to inform restaurants of their customers' taste preferences. We must ask, what does the restaurant care about? To what extent do collocations offer or detract value from the overarching objective? I might propose that in this specific case, *certain* food terminology may be better left undivided (i.e., not compounded into keyphrases). For instance, "strawberry milkshake" may be a viable collocated keyphrase if Shira orders them more often than any other strawberry dish or any other flavor of milkshake. However, is the most relevant insight to a restaurant data client that Shira likes strawberry milkshakes or that she likes strawberry and milkshakes? The latter opens more opportunity for the restaurant to promote its strawberry dishes and/or assorted milkshakes to diners like Shira, since it is likely she would be interested in both. At the same time, however, it is unhelpful to divide idiomatic compounds like "ice cream," as informing a restaurant their customers enjoy the flavors of "ice" and "cream" would give an inaccurate picture. If we were to implement a RAKE model, it would have to be enhanced to systematically assess these semantic nuances in noun-noun compounds.

This is where we must return to the semantic taxonomy of compounds. Let us refer to the simplified chart for reference:

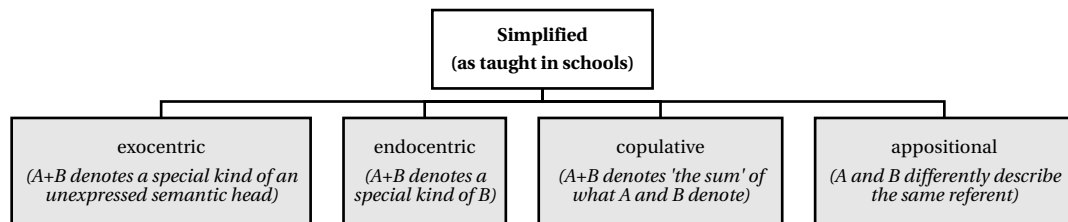


Figure 12: The simplified tree representing the taxonomy of compounds.

The taxonomy makes clear the principal difference between noun-noun compounds "strawberry milkshake" and "ice cream": the former is endocentric,

in which the compound's referent is a type of milkshake, and the latter is exocentric, in which the referent is neither ice nor cream. For the purposes of refining Phissy's buzzterm extraction model, this begs the important question of whether a key compound is endocentric. If so, then it may be more beneficial to restaurant clients to split the compound apart. If not, then it loses its meaning when split apart.

To answer this question requires human intuition or deeply sophisticated understanding of semantics, which is beyond the scope of most existing artificial intelligence. I propose one potential solution, and that is to leverage Word2Vec, a natural language processing tool published in 2013 by Tomas Mikolov at Google. The algorithm uses a neural network to learn word associations from a corpus, such as Google News, and then can produce words related to an input word.⁶⁰ Each is assigned a vector, the intervals between which indicate the degree of semantic similarity between the words represented by the vector.

Say Phissy were to run a Word2Vec process on a given noun-noun bi-gram compound found in the RAKE results. If the compound's head (the second word of the two, as English is a left-branching language) appears in the top ten Word2Vec results, Phissy can assume the compound is endocentric and return two parts separately. If not, Phissy can assume the compound is exocentric and return both parts as one. To test this hypothesis, let us run a Word2Vec process on buzzterms "strawberry milkshake" and "ice cream". In both cases, the second word in the compound is the head is, and the first is the modifier. We will look for the head in the search results.

⁶⁰ (Mikolov, Chen, Corrado, & Dean, 2013)

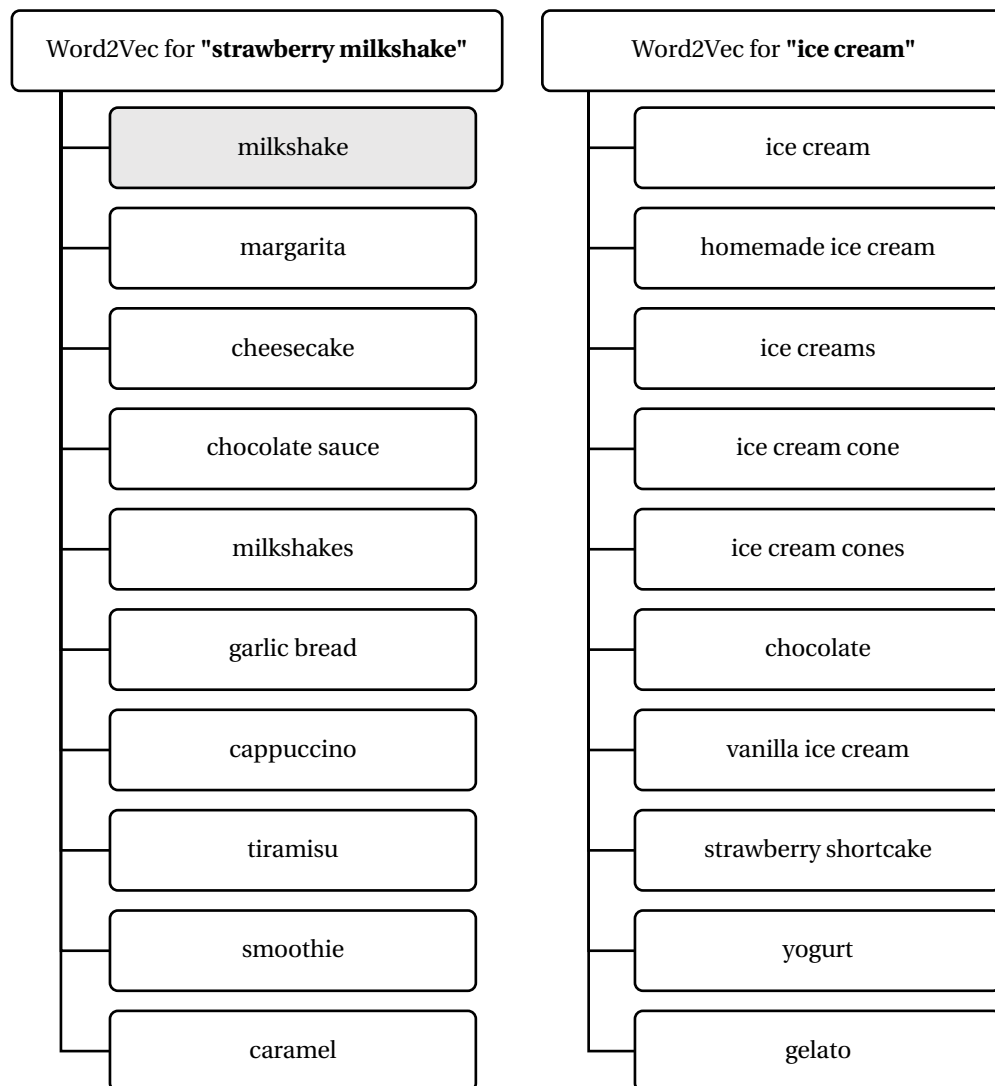


Figure 13: Word2Vec results for inputs "strawberry milkshake" and "ice cream".

These preliminary results validate the hypothesis. The closest vector, or most related word, to "strawberry milkshake" is its head, "milkshake". By contrast, "cream" (nor "ice," for that matter) does not appear in any of the top ten most related words to "ice cream," implying its meaning is more idiomatic than literal.

Based on these findings, I would recommend Phissy exchange its BOW buzzterm extraction model for a RAKE model with a Word2Vec compound assessment.

4.3 Social Tools: Emoji Mapping

The other implementation of keyword extraction that this chapter will address applies to emoji mapping, which attempts to assign one emoticon to an entire phrase. This becomes especially important for Phissy's social review posting feature, which assigns an emoji to each listed dish or beverage in the order. As there exists a finite number of emoji from which to choose, the question shifts from "What are the salient terms in this broader piece of text?" to "What is the most emblematic term for this particular collocation or compound?". The latter is significantly more difficult to answer because no existing technology or literature has addressed it directly. It is as much a syntactic and pragmatic question as it is a semantic one, in particular of the semantics of glyphs as language.

4.3.1 Review of Literature

In 2015, the Oxford Dictionaries defied all expectations by naming the 🤔 emoji their word of the year, justifying the choice as reflecting "a digital world that is visually driven, emotionally expressive, and obsessively immediate."⁶¹ By 2021, emoji have become so iconic that they no longer are merely expressive visuals in place of words, but they also serve as universal supplements in place of otherwise lost non-verbal cues in text.⁶² Understanding their pragmatic role is the first step toward solving our emoji mapping problem.

Herring and Dainas's (2017) observational study, which investigated the pragmatic functions of emoji in online discourse, found emoji were used more in reactive than symbolic senses.⁶³ In other words, emoji were more likely to don a phrase its tone than contribute any meaningful content. Findings of the Understanding Emoji Survey, which was administered a year later, confirm Herring and Dainas's (2017) taxonomy of graphic functions for emoji: survey respondents (n = 523) overwhelmingly preferred *tone modification* as their preferred emoji function.⁶⁴ Arafah and Muhammad (2019) came to an identical conclusion, with the additional observation that tone-modifying emoji, unlike emoji used for other pragmatic functions, are placed in sentence-final position 76.9% of the time.⁶⁵

⁶¹ (Oxford Dictionaries, 2015)

⁶² (Tossell, et al., 2011); (Dainas & Herring, 2021); (Arafah & Muhammad, 2019)

⁶³ (Herring & Dainas, 2017)

⁶⁴ (Dainas & Herring, 2021)

⁶⁵ (Arafah & Muhammad, 2019)

Because the emoji application with which Phissy is concerned—to map a single emoji to each dish or beverage ordered to symbolize its substantive content—falls outside the area of tone modification, little scholarly literature exists on the subject. Still, tangential linguistic studies of emoji may prove helpful in developing a systematic way of assigning these food-meaning emoji. Linguist Tyler Schnoebelen, who defended his Stanford doctoral thesis on the linguistic function of emoticons, found that multiple emoji in sequence also tend to respect a particular order, typically beginning with the tone modifier and then depicting adjectives, nouns, and verbs to tell a coherent story even without text.⁶⁶ This is relevant in that it suggests emoji can stand on their own in place of nouns and adjectives, although Schnoebelen does not give any explanation for the order of these emoji or whether any is more important than another, as would be essential to determine which single emoji best encapsulates the phrase. In fact, even Schnoebelen’s claim that emoji can be meaningful sans text is hotly contested. In 2019, Khandekar et al. developed Opico, an “emoji-first” social media app, that touted its universality because its users had to converse completely pictorially, eliminating potential language barriers.⁶⁷ Khandekar’s hypothesis, like Schnoebelen’s, was met with criticism for reasons that Alshenqeeti (2016) and Donato and Paggio (2017) had published years prior. These studies argued that while emoji do facilitate cross-cultural communication, they lack sufficient syntax to function as more than a paralanguage.⁶⁸ Even noun-modifier order alone differs so much across languages that 🍅🥚🌶️ could suggest tomatoes with spicy eggs, spicy tomatoes with eggs, or some combination of the three ingredients, like shakshuka. Zhou et al. (2017) and Daniel and Camp (2018) underscore that this is precisely why emoji on their own are less meaningful than text.⁶⁹ In Daniel and Camp’s study, text messages with emoji (of varying pragmatic functions) were rated far easier to understand than messages with no emoji or an inappropriate emoji.⁷⁰ This indicates that while emoji alone are less meaningful than text, the combination of emoji and text is more meaningful than text alone—but only when the emoji have a semantic match with the text’s content.

What, then, points us in the direction of extracting the most important word in a given food order, like “carrot cake,” and mapping an emoji to it? Is the text better elucidated by prefixing it with a 🥕 or a 🍰?

⁶⁶ (Steinmetz, 2014)

⁶⁷ (Khandekar, et al., 2019)

⁶⁸ (Alshenqeeti, 2016); (Donato & Paggio, 2017)

⁶⁹ (Zhou, Hentschel, & Kumar, 2017); (Daniel & Camp, 2020)

⁷⁰ (Daniel & Camp, 2020)

One possibility is to default to the head. According to the *Oxford Handbook of Compounding*, when an English compound is comprised of a head and modifiers, the head is considered the most important element.⁷¹ However, the question of *importance* in a compound is complex. Section 4.2.1 introduces a model for conceptualizing the taxonomy of compounds in English, and it serves our discussion to expand upon that taxonomy here. We defined endocentric compounds as a special kind of B resulting from compound A+B. Allen (1978) takes umbrage at this definition, since the relationship between two elements of an endocentric compound in English is too loosely defined. Allen calls this relationship the Variable R, and its variability accounts for why sun cream blocks the sun, face cream is applied to the face, hormone cream contains hormones, rash cream cures a rash, and whipping cream is meant for the purpose of whipping!⁷² All are endocentric compounds with radically diverse semantic relationships. Granville Hatcher (1960) suggests there are four such relationships, while Levi (1978) suggests a dozen, and Brekle suggests well over a hundred.⁷³ If it were the case that head were more important in certain endocentric subtypes and the modifier were in others, then this would be an attractive solution to Phissy's emoji mapping question. However, no research has affirmatively posited this, nor is it likely that a piece of technology could be trained to identify not just what type of compound a phrase is but also its subtype.

An alternative solution may lie in a study of how elementary school children process semantic structure. It tends to be true that compound adjectives have adjectival heads and that compound nouns have nominal heads—as a compound tends to belong to the same word-class as its head—yet when comparing two compounds with the same head (e.g., “carrot cake” and “chocolate cake”), it is the modifier, which is to say the differentiator, that may strike listeners as more important in each. A similar trend emerged in Hornby et al.'s (1970) assessment of developmental psycholinguistics. In the study, Hornby and colleagues asked students in kindergarten and students in 2nd grade to identify the most important word in each of a set of phrases. This was done with a focus on opposition, which the researchers defined as a cognitive operation used in conversational interchanges such as “Ari loved the cat” vs. “Ari loved the *dog*” or “Ari *hated* the cat,” respectively. Researchers found the younger students showed a tendency to choose the subject, or head, regardless of the locus of opposition,

⁷¹ (Bauer, 2011)

⁷² (Allen, 1979)

⁷³ (Bauer, 2011) cited (Granville Hatcher, 1960); (Levi, 1978); (Brekle, 1970)

while the older students opted strongly toward the differentiator.⁷⁴ This suggests that to the more discerning brain, the most important part of a phrase need not be a static entity. Far beyond matters of head and modifier, a phrase's most important component in fact must adapt to context to best clarify the phrase's significance.

4.3.2 *How This Has Been Applied to Phissy*

Currently, Phissy maps emoji to individual dishes and drinks in reviews by using a piece of code called EmojiMap, developed by Matias Villaverde.⁷⁵ In it, a series of associated terms are linked to each emoji in a database. One such entry could look like this:

```
"soup": {
  "keywords": ["soup", "gazpacho", "chowder", "broth", "cereal"],
  "char": "🍲",
  "Fitzpatrick_scale": false,
  "category": "food_and_drink"
},
```

This entry is concerned with the emoji commonly associated with soup, though the keywords note the emoji may also be used to represent adjacent food items that look similar. Phissy does not use the category variable, as all Phissy emoji fall into the “food and drink” category, nor the Fitzpatrick scale, which refers to the desired skin tone of an emoji representing a human face. With the help of a team of marketing interns, I contributed significantly to the database of emoji Villaverde had constructed, adding additional emoji that had been introduced since 2017 and adding additional related terms to each emoji to expand its “lexicon” and “semantic awareness”.

When a user prepares to post a review from Phissy to an app like Yelp or Instagram, EmojiMap iterates through each word in the name of a given dish in order to assign one emoji to the entire dish. If that word matches a keyword in the emoji database, then its corresponding emoji icon is assigned to that dish, and the program moves on to the next food item in the order. In practice, an order for “Andalusian gazpacho” might not turn up any emoji for “Andalusian” but will

⁷⁴ (Hornby, Hass, & Fedman, 1970)

⁷⁵ (Villaverde, 2017)

assign the dish the 🥗 emoji because “gazpacho” is a semantic match. If no keywords match any part of the dish’s name, it receives a generic fork and knife (🍴) emoji.

4.3.3 *How This Can Be Applied to Phissy: Cucumber Salad & Truffle Salmon*

The first drawback of the EmojiMap system is that it is entirely hard-coded. For dish items whose names do not match any keyword in the EmojiMap database, I would consider integrating Eisner et al.’s (2016) Emoji2Vec program, a pre-trained Word2Vec spinoff that generates related emoticons rather than words.⁷⁶ While some dish names may still be too unique to match any emoji, this will greatly reduce the percentage of dishes that get assigned the generic 🍴 simply due to inevitable incompleteness of the hard-coded EmojiMap database.

A second, and far more complicated, drawback of the EmojiMap system as it works now is that it has no regard for which of the terms in the name of a dish is most important; it only assigns the first identified match. This is not a problem for single-word entries, but those are rare in menu items; almost all are compounds.

Most users would argue that 🍄 is not the emoji they want to see assigned to “truffle salmon,” even though “truffle” is in the first position (more often, they want to see the 🐟, as it is more a salmon-featuring dish than a truffle-featuring dish). On the other hand, simply defaulting to the head of the compound is not always right, either. While it may work for “truffle salmon,” it fails for “cucumber salad,” for which most users would prefer to see a 🥒 than a 🍅, even though “salad” is the grammatical head. This could be for various reasons, the most obvious of which is a visual inconsistency—a cucumber salad contains just cucumbers, not lettuce and tomato, as are depicted in the latter emoji. I suggest an alternate reason that users would rather see the modifier depicted than the head to represent “cucumber salad,” namely that the modifier defines a more categorical head. Yet, this is not generalizable either; making the iteration sequence right-branching, which is to say defaulting to the modifier of the compound, fails for “truffle salmon”. A conundrum. 🤔

In response to this, the idea has been raised simply to assign one emoji *per word* in the name of a dish, rather than one emoji per dish overall. I am inclined to rule out this “hieroglyphic” approach for reasons noted by Alqensheeti (2016) and Donato and Paggio (2017)—the aim is to elucidate each item, not distract from

⁷⁶ (Eisner, Rocktäschel, Augenstein, Bošnjak, & Riedel, 2016)

it. In this way, each single emoji functions as a meaningful bullet point that visually expresses the gist of its following information. Multiple emoji for each item become cluttered and deeply ambiguous.⁷⁷

Instead, let us revisit the taxonomy of compounds to unpack the issue. “Cucumber salad” and “truffle salmon” both are endocentric noun-noun compounds, which is to say they are not idiomatic and that both involve components A+B that yield a special kind of B. Nonetheless, there seems to be a discrepancy on a semantic level between the relationship of A to B in this resultant B, the Variable R. To clarify this point, let me propose a modification to the taxonomy tree:

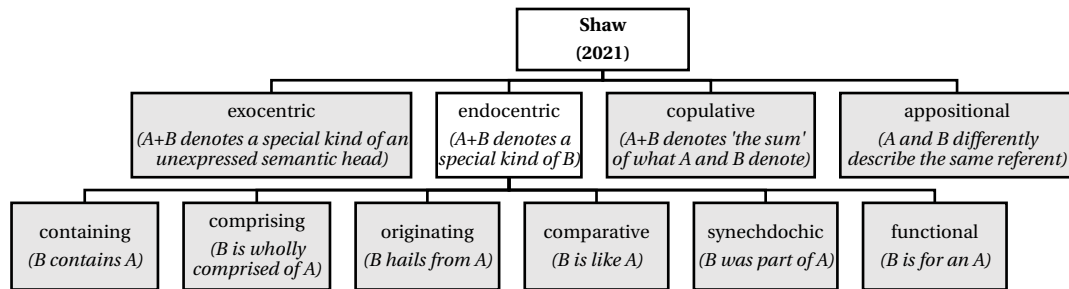


Figure 14: A proposed modification to the taxonomy of compounds tree.

With this modification, I draw a dichotomy between endocentric compounds of subtype *containing* (e.g., “truffle salmon,” which contains but is not made of truffle), for which a user sooner would recognize an icon of the head, and subtype *comprising* (e.g., “cucumber salad,” which is a salad made of cucumbers), for which a user sooner would recognize an icon of the modifier.

I also note additional subtypes to cover observations made by Granville Hatcher, Levi, and Brekle but in the context of menu items.⁷⁸ The third subtype *originating* accounts for terms whose modifier specifies its geographic origin (e.g., “sea urchin,” “lake trout”) and favors the iconic head. A fourth subtype *comparative* applies in the case of modifiers that illustrate similarity between the referent and something else (e.g., “watermelon radish”), also favoring the iconic

⁷⁷ (Alshenqeti, 2016); (Donato & Paggio, 2017)

⁷⁸ (Granville Hatcher, 1960); (Levi, 1978); (Brekle, 1970)

head.⁷⁹ A fifth subtype *synecdochic*, which refers to part of a whole, applies mainly to meat products (e.g., “chicken breast,” “ham hock,” “beef tenderloin”) and favors the iconic modifier. A sixth subtype *functional* (e.g., “wallpaper,” “handbag”) fulfills the last sufficient condition for endocentricity and favors the iconic head, though I am unable to identify a food or beverage item that would be a member of this subtype.

This takes us a few steps closer to solving the puzzle, but the limiting factor is existing technology. The strategy I propose in section 4.2.3 could enable Phissy to deduce whether a compound is endocentric with decent accuracy, but it still cannot deduce whether that endocentric compound is containing, originating, comparative, or functional (and favors the head), or comprising or synecdochic (and favors the modifier). The potential for future research in systematizing such a deduction is exciting but outside the scope of this paper.

For this reason, I believe the best course of action at present is to learn from Hornby et al.’s (1970) study, which demonstrates that the most meaningful word in a phrase can change in context. In Phissy’s specific use case, if a user ordered and is posting a review of several types of taco, the user wants readers of the review easily to glean a sense of the various tacos in the context of each other. Rather than arbitrarily assign the 🍌 emoji to dishes like “chicken taco,” “beef taco,” and “shrimp taco,” Phissy instead could assign the 🍗, 🍖, and 🍤 (or 🐔, 🐖, and 🍤) emoji, respectively, to stress the distinguishing factor. To do this, Phissy would take note that the order contains the head “taco” repeated three times and subsequently block that word from the EmojiMap iteration sequence, forcing the modifier instead. While this will not always account for containing and comprising endocentric subtypes (such as if the cucumber salad were not ordered in addition to another kind of salad, or if the truffle salmon were just one of many salmon dishes ordered), it is far more likely to account for them than the existing EmojiMap program.

⁷⁹ Although the referent is not a real watermelon, it still is a radish, so this is a type of endocentricity rather than exocentricity.

5: MODERN LANGUAGES

5.1 *Beyond the Anglosphere*

While the Phissy product will continue to develop in order to meet the evolving demands of its user base, Phissy’s marketing calls for special attention. After the Phissy MVP went viral in the United States following its release in September 2020, I united a team of undergraduates from the United States, United Kingdom, Italy, and Tunisia to collaborate on advertising Phissy to the broader global community. We leveraged our pooled insights to hone key brand equity generators from logotype and tagline to relevant social media campaign themes. Our promotion and positioning strategies drew on creative and strategic decision-making, backed by questions such as what the smartest channels were for spreading awareness, how to craft our company voice considering prospective customer personae, and what consumer data could reveal about how diverse cultures respond to the Phissy brand.

When I say brand, I use the term broadly—a consistent name, mark, or character that enhances the value of a product beyond its functional purpose.⁸⁰ No matter how strong our product already was, we knew Phissy could penetrate the global market only if it also had a brand presence that could appeal to diverse users. As of fall 2021, Phissy has achieved its goal of expanding beyond the United States, but significant market penetration outside the English-speaking world is yet to happen. Although we are proud to have users in over 30 countries, the vast majority speak English as their first language, which limits sustainable growth. This is unsurprising; the application does not yet have full functionality in languages other than English, and most of its advertising has targeted English-speaking audiences, apart from one trial campaign in Italy. Simply translating the app and its advertising to various languages is a feasible undertaking and easy could take place in the next few years. But before we can do that, we must more fully understand the psychological effects that our linguistic choices will have on consumer behavior among demographics whose native language is not English.

This chapter will address that question by looking at the power of brand names. From those who sacrifice flair for clarity (e.g., “Air Products & Chemicals Inc.”) to those who sacrifice clarity for flair (e.g., “Zoosk”), the power of a brand name is one of a company’s most important assets. Brand names often are a product’s first impression on a consumer and the legacy a company leaves long after a given product’s lifecycle. At the intersection of phonology and semantics, the associations drawn from a brand name can cast the brand as luxurious or rugged, rapid or tranquil, large or small, etc. Translated to

⁸⁰ (Farquhar, 1989)

foreign languages, some brand names take on new meanings that are favorable (e.g., Wanadoo has no meaning in its native French, but in English it is coincidentally fitting for an internet provider) or unfavorable (e.g., toothpaste brand Colgate suffered unexpectedly upon learning its name in Argentinian Spanish translates to “hang yourself”). Suffice it to say, brand strategy is where psychology and language are at their strongest partnership, and this gives rise to the field of brand linguistics—the specialized focus on using language in defining brand identity to impact consumer behavior.

In the next section, I will review scholarly literature that has used a brand linguistics lens to study the effect of consumers’ native language on their perceptions of brand names. In the discussion that follows, I will analyze the brand name “Phissy” by the criteria identified in the literature, and I will conclude with recommendations for linguistically optimizing the Phissy brand identity for more successful expansion into international markets.

5.2 *Review of Literature*

From Haagen Dazs ice cream (hailing from the loveable Danish town of... the Bronx?) to Ginsu knives (hardly Japanese, more like Ohioan), the ethnic “flavor” of a brand name is a major player in its success—provided it can be pronounced in the first place.

LeClerc et al. (1994) were the first to investigate this with formal experiments. In one experiment, English-speaking consumers were asked to score several brands on various criteria, based on the brand name alone; some of the brands used Francophone spelling and sound, whereas others evoked more familiar English. Participants resoundingly gravitated toward the French-sounding brand names, expressing that products from French-sounding brands were likely to contribute more hedonism, which is to say to be more pleasurable to use, than products from English-sounding brands.⁸¹ This effect lingered even after participants were invited to physically experience the products. In another experiment, LeClerc et al. tested whether adding a congruent country-of-origin label (e.g., “Made in Paris”) would further enhance brand equity. Notably, the addition of this information had no impact on hedonistic perceptions when the country of origin was congruent with the brand name, but dramatically more negative perceptions when the country of origin and brand name were incongruent.⁸² Altogether, this intimates that consumers wield inherent cultural associations drawn from linguistic cues that can greatly influence attitudes toward products, even in spite of direct sensory experience. These associations can be founded in that certain countries are known for

⁸¹ (LeClerc, Schmitt, & Dubé, 1994)

⁸² (LeClerc, Schmitt, & Dubé, 1994)

higher-quality products in general, but they also can be founded in stereotypes about countries' lifestyles, fashion, beliefs, or worldview.⁸³ However, what enables consumers to make these associations is an implicitly, and perhaps naively, assumed honesty. When this honesty is breached (e.g., that a brand called Prego is not Italian at all but rather manufactured by Campbell's Soup Company), consumers feel swindled and are more apt to reject the brand. For this reason, Keller (1993) affirms that that incongruent brand associations result in "less cohesive and more diffuse brand images."⁸⁴

Olavarrieta Soto et al. (2009) builds on LeClerc et al. (1994) in the context of branding for a Latin American demographic, specifically Chilean Spanish speakers. Results from Olavarrieta Soto et al. confirm prior findings, with one caveat—foreign branding effects are sensitive to the market context and specific language used.⁸⁵ When given a choice between products with English and French brand names, LeClerc et al.'s English-speaking participants rated the French-sounding products more hedonistic, but when given a choice between products with English, French, or Spanish brand names, Olavarrieta Soto et al.'s Spanish-speaking participants rated the English-sounding products most hedonistic, as well as most expensive-sounding.⁸⁶ One might interpret these data to say that English brand names are universally more appealing than French, and French more than Spanish; this is a particularly myopic view. Others instead might say that consumers are biased by the cultural relations between their country and the foreign country in question, in which case consumer insight is especially crucial. Still others could argue a product's perceived hedonism has less to do with the overall impressions of the country from which it comes and more to do with that country's specific reputation for making that type of product (e.g., many consumers are sooner to buy miso paste from a Japanese-sounding brand and perfume from a French-sounding brand than vice versa, based on earned reputations for quality in those respective areas).

What is there to say, then, for culturally ambiguous brand names? Can any recourse predict the appeal of brands with names that do not exhibit characteristics of any one identifiable language? A school of thought known as sound symbolism suggests that yes, a word's sounds alone can convey meaning.⁸⁷ This would mean specific sounds in a brand name can alone affect consumer perceptions of brand attributes.

In traditional linguistics, the smallest units of meaningfulness in language are morphemes, and the function of individual phonemes is purely to discriminate between

⁸³ (Kelman, 1965)

⁸⁴ (Keller, 1993)

⁸⁵ (Olavarrieta Soto, Manzur Mobarec, & Friedmann, 2009)

⁸⁶ (Olavarrieta Soto, Manzur Mobarec, & Friedmann, 2009)

⁸⁷ (Klink, 2000); (Yorkston & Menon, 2004)

them.⁸⁸ With the exception of onomatopoeia, in which a word's sounds deliberately reflect its referent, phonemes are considered meaningless, and the relationship between sound and meaning is arbitrary (after all, the sound /θ/ takes initial position in words *thank*, *thick*, and *thermometer*, none of which share any meaning). Sound symbolism challenges this view by positing that a word's phonology can communicate meaning in complement to its morphology.⁸⁹ While the concept was first posited by Plato in the dialogues of Cratylus,⁹⁰ it was not until the 1920s that British linguist J. R. Firth documented a trend of certain phonemes, which he dubbed phonesthemes, that seemed to appear at a disproportionate rate in words with similar semantic properties. In 1929, linguist Edward Sapir released a study that aimed to codify these apparent coincidences in a systematic way. Participants in Sapir's (1929) study were asked to ascribe nonwords to furniture of varying sizes, and by a significant margin, nonwords with back vowels were associated with largeness, while nonwords with front vowels were associated with smallness.⁹¹ Klink (2000) performed a more comprehensive study in this area, which reports that back vowels are also associated with darkness, heaviness, slowness, sweetness, richness, and masculinity, while front vowels are also associated with lightness, brittleness, speed, bitterness, thinness, and femininity.⁹² In the same study, Klink investigated associations drawn from plosive and fricative sounds—the former is characterized by a complete stop of the airflow (e.g., /b/, /k/, /d/, /g/, /t/, /p/) and the latter by a moderate restriction of the airflow (e.g., /f/, /s/, /ʃ/, /θ/, /z/, /ʒ/). Associations drawn from plosive and fricative sounds had respective similarities to associations drawn from back vowels and front vowels, in which the harsher plosive felt more assertive and the softer fricative weaker.⁹³ Plosives were also associated with sharpness and fricatives with speed; these are almost onomatopoeic on the phonemic level.

As a linguist, it is challenging not to take this with a very large grain of salt, or perhaps the entire shaker, and it certainly is worth distinguishing between meaningfulness in a traditional sense (i.e., referring to a specific referent) and the sort of associative imagery conjured by sound symbolism. What cannot be dismissed, though, is the success with which experiments like those by Sapir (1929) and Klink (2000) have been replicated, validated, and expanded over decades. Perhaps the most famous of these experiments is known as the Bouba-Kiki effect, in which nonword “bouba” is associated with a fatter, rounder shape while “kiki” is associated with a thinner, spikier one.⁹⁴

⁸⁸ (Preziosi & Coane, 2017) cited (Hinton, Nichols, & Ohala, 1994)

⁸⁹ (Nuckolls, 1999); (Sapir, 1929)

⁹⁰ (Yorkston & Menon, 2004)

⁹¹ (Sapir, 1929)

⁹² (Klink, 2000)

⁹³ (Klink, 2000); (Subkowski, 2019) cited (Hinton, Nichols, & Ohala, 1994)

⁹⁴ (Köhler, 1929)

Researchers have found this effect exists in infants as young as four months⁹⁵ and in languages ranging from Anglo-Saxon to Romance to Swahili.⁹⁶ Even fMRI scans point to greater prefrontal activation when participants are told associate “bouba” with the spiky shape, supporting the idea that this “audiovisual relationship ... stems at least in part from an early sensory origin.”⁹⁷

Similarly, Thompson & Estes’s (2011) cross-modal theory predicts that sound symbolism may have developed evolutionarily and that it is informed by an amalgam of onomatopoeic triggers, phoneme frequency, and mouth shape during articulation.⁹⁸ It follows that this phenomenon is not only predictable but also universal. Mounting evidence supports that unlike ethnic association, which depends on the cultural relations and knowledge of a given target demographic, the tenets of sound symbolism remain consistent across audiences.⁹⁹ Sapir’s (1929) original experiment found identical results in children, university students, American adults, and Chinese adults.¹⁰⁰ Yorkston and Menon (2004) claim sound symbolism is experienced across all six main continents;¹⁰¹ for example, Subkowski (2019) highlights that words expressing smallness across languages contain more emphasized front vowels (e.g., Spanish *chico*, French *petit*, Greek *mikros*, and Japanese *chiisai*), while words expressing largeness across languages place more overall emphasis on back vowels (e.g., Spanish *gordo*, *grande*, French *grand*, Greek *makros*).¹⁰² Examples of Sapir’s and Klink’s findings further abound in literature and pop culture, from the miniscule Lilliputians and giant Brobdingnagians in Jonathan Swift’s *Gulliver’s Travels* to the big Bludgers and Quaffles and small, fast Snitch in J.K. Rowling’s *Harry Potter* series¹⁰³ to personal names like the skinny Quijote and stout Sancho, sprightly Tintin and gruff Captain Haddock, and Spanish comic characters Zipi and Zape, with fair and dark hair, respectively.¹⁰⁴

Sound symbolism and the cross-modal theory in tandem seem to add a powerful new tool to the marketer’s toolbox. With the surge in nonword branding that has

⁹⁵ (Maurer, Pathman, & Mondloch, 2006); (Ozturk, Krehm, & Vouloumanos, 2013)

⁹⁶ (Sidhu & Pexman, 2015)

⁹⁷ (Peiffer-Smadja & Cohen, 2019)

⁹⁸ (Thompson & Estes, 2011)

⁹⁹ (Maurer, Pathman, & Mondloch, 2006); (Ozturk, Krehm, & Vouloumanos, 2013); (Sidhu & Pexman, 2015) (Peiffer-Smadja & Cohen, 2019); (Thompson & Estes, 2011); (Usunier & Shaner, 2002); (Pogacar, Plant, L.F., & Kouril, 2014); (Ladefoged, 1975)

¹⁰⁰ (Sapir, 1929)

¹⁰¹ (Yorkston & Menon, 2004)

¹⁰² (Subkowski, 2019) cited (Hinton, Nichols, & Ohala, 1994), (Klink, 2000); The former also cites the Japanese *ookii* as an example of back vowels’ connoting largeness, though it in fact serves as a counterexample because the word contains back and front vowels in equal ratio and emphasis.

¹⁰³ (Preziosi & Coane, 2017)

¹⁰⁴ (Milan, et al., 2013)

accompanied the advent of the Internet, these linguistic insights can enable marketers to better anticipate how a brand or product name might be perceived, no matter where in the world it is launched. No peer-reviewed case studies show sound symbolism applied to actual brands, though a few studies have simulated its application. Heath et al. (1990) find a correlation between the hardness of consonants (i.e., plosives over fricatives) in fictitious brand names and the perceived coarseness of paper towels and strength of kitchen cleaners.¹⁰⁵ The results of a study by Klink (2000) demonstrate similar reactions, in this case with voiceless plosives connoting a sharper knife product than those with voiced plosives.¹⁰⁶ Yorkston and Menon's (2004) participants were willing to pay more money for ice cream whose pretend brand name contained a back vowel rather than a front vowel.¹⁰⁷ They did note one exception, namely the implications of this research on the use of personal names as brand names; if the ice cream were for its creator, the sound symbolism effect would be greatly diminished if present at all. Of course, this is dependent on whether the consumer knows to interpret the brand name as a personal name or as a nonword.

Usunier and Shaner (2002) summarize many of these concepts in their criteria for optimizing brand names to be multilingually sustainable.¹⁰⁸ First, it is vital that the name be pronounced globally; to do this, they recommend using the more global Roman alphabet, no more than three or four syllables, a syllabic structure of single consonant/vowel units to avoid clusters, and no diphthongs or triphthongs. This reduces the brand name to a phonotactic lowest common denominator, making it easy for as many languages as possible to pronounce. Some phonotactic or orthographic cues can be retained in the name if the brand desires a foreign appeal, but marketers must bear in mind that consumers always construct the identity of brand based on their own language and culture, which can be detrimental. In the same way, a brand with a lexically meaningful name is dissuaded from translating its name when entering foreign markets, as this fragments global brand awareness. However, by not translating its name, such a brand runs the risk that the name might hold an unfortunate significance in the host language (e.g., Nescafé instant coffee sounds all too much like “*não é café*,” meaning “you are not coffee”).¹⁰⁹ In fact, even if a brand name translates *favorably* in a foreign language, Usunier and Shaner advise determining whether the unintended meaning is a match for the product category. Name-attribute fit is not to be overlooked, considering brand recall and memorability are significantly increased when there is a strong fit between the brand

¹⁰⁵ (Heath, Chatterjee, & France, 1990)

¹⁰⁶ (Klink, 2000)

¹⁰⁷ (Yorkston & Menon, 2004)

¹⁰⁸ (Usunier & Shaner, 2002)

¹⁰⁹ The perceived negative effect of the Nescafé name on its sales in Brazil also may be confounded by a well-documented existing stereotype that American coffee is considered weak and therefore inferior (Gidney, 2022).

name and product attributes or function.¹¹⁰ The ideal brand name, according to Usunier and Shaner, is one that is lexically “blank,” which is to say it has no direct meaning in any language. Blank brand names leave more room for impactful advertising and global spread. At the same time, even if a brand name is not blank in every language, it still may carry associations due to sound symbolism, and these, too, must be considered.

5.3 How This Has Been Applied to Phissy

Grandma Phissy was born neither grandma nor Phissy; her older sister is to blame for the one-of-a-kind moniker in a botched effort to pronounce “Phyllis” as a toddler. But it has stuck, as the best of nicknames do, and has lent our startup a uniquely catchy and impressionable brand name from the get-go.

Before launching the app under the name Phissy, I assessed the name’s phonetics. By and large, /'fisi/ is quite easily pronounced in most modern languages. In many languages, the short vowel /ɪ/ is absent, while /i/ is present. However, /ɪ/ is widely considered allophonic with /i/, which is to say that speakers of many languages would not hesitate to replace the former sound with the latter to fit their familiar phonology. Italian, for example, uses both /ɪ/ and /i/, but not contrastively—the sound is realized as [ɪ] exclusively before geminate consonants and [i] everywhere else, so the two distinct phonemes are “heard” as the same sound. Spanish does not have /ɪ/, but it is so close phonetically to /i/ that it is effortlessly realized as [i]. In both cases, the vowels in /'fisi/ does not present a serious pronunciation issue and seems always to have an intelligible substitute available. The same can be extrapolated to almost all modern languages.

Even more rarely, a language may lack one of the consonant phonemes in /'fisi/. Through studying loanwords that contain these consonants in the languages that lack them, we can assess how much difficulty a brand name like Phissy would have catching on among consumers who speak these languages. The rule of thumb is that languages without a certain consonant necessitated by a loanword tend to replace it by changing its voicing or manner or place of articulation by as few degrees possible until finding an available phoneme with which to replace it. For example, Japanese and Korean lack all labiodental fricatives, so they lean on their unvoiced bilabial fricative /ɸ/, producing /ɸisi/. Tagalog must change both manner and place of articulation to produce /pisi/. As for the /s/ phoneme, Tamil lacks the fricative as English speakers know it, but /ç/ is a close replacement. Hawaiian, on the other hand, has no sibilants at all; its closest phoneme is either /t/ or /k/, which are in free allophonic variation with each other. This, producing /fiki/ or /fiti/ interchangeably, is extremely atypical of modern languages. With these

¹¹⁰ (Lowrey, Shrum, & Dubitsky, 2003)

exceptions, Phissy fits Usunier and Shaner's (2002) phonetic criteria for brand names, as it uses the Roman alphabet, has only two syllables of alternating consonant/vowel units, and has no diphthongs or triphthongs.

On the semantic level, Phissy would be considered blank in English. It has no obvious lexical meaning. However, that does not conjure ideas related to similar existing words. At the time of product launch I considered English words similar to "Phissy," from which such associations could be drawn. These included *fussy*, *fizzy*, *fishy*, and *pissy* with only one phoneme change, and *fuzzy*, *prissy*, and *picky* with two phoneme changes. Of these six, almost half have name-attribute fit with the Phissy product, an app that caters mainly to fussy, prissy, and picky eaters. I assigned affect scores to the other terms; *fizzy* positive for the celebratory association English speakers have with sparkling drinks, *fishy* negative because it denotes suspicion and odor, *pissy* negative for its vulgarity and affect, and *fuzzy* neutral because it evokes a comforting, albeit unappetizing, texture. To me, these semantic associations did not warrant a brand name change. In fact, some we even leveraged in ad campaigns (e.g., "Fussy? Try Phissy.").

5.4 How This Can Be Applied to Phissy: Cats and Rifles

While I hold it is unwise to change the Phissy brand name at this time, it is important to note the associations it invites in not just English but other languages, so we can market the product accordingly. Below is a list of words similar to Phissy, along with their translations. Each word also is assigned an affect score, which I based imprecisely on the word's emotional valence and its name-attribute fit. This data collection takes into account f-replacement and flexibility in the short /ɪ/.

Language	Spelling	Translation	Affect Score
Turkish	pisi	cat	positive
Venetian	pisi	fish	positive
Jamamadí	fisi	monkey	positive
Czech	píši	write	positive
Tongan	fisi	blossom	positive
Hebrew	פִּיסי	tangible	positive
Quechua	pisi	beginning	neutral

Tagalog	pisì	string	neutral
Greek	φῑσι	unpaid debt	negative
Swahili	fīsi	hyena	negative
Italian	fissi	landlines	negative
Danish	fise	farts	negative
Norwegian	fisi	to fart	negative
Hungarian	pisi	urine	negative
Finnish	pisi	urinated	negative
Lithuanian	pisi	vulgar, to fuck	very negative
Haitian Creole	fisí	rifle	very negative

Figure 15: A table listing the language of origin, translation to English, and affect score for 17 non-English words that are phonologically similar to “Phissy”.

As in English, about half of the semantic associations foreign languages may have with the name Phissy are either positive or neutral. Some of the negative associations are negative only because they have a significant name-attribute mismatch with the product; Italian speakers may mistake Phissy for a telephoning app, and Greek speakers may assume it facilitates online banking. These predicted associations are not a given, but it would be prudent for Phissy to prepare to respond strategically should they arise. Some other negative associations are so deeply negative that they warrant *preemptive* action to protect how the Phissy brand would be perceived. One solution is to invest more in foreign market advertising to emphasize the /f/ pronunciation and penultimate stress pattern of the original English brand name. Olavarrieta Soto et al. (2009) cite an example of this in PepsiCo’s allocating a major advertising budget to teach Spanish-speaking consumers to pronounce 7-UP as “seven up” rather than “siete u pé”.¹¹¹ I predict this would help the brand avoid the worst of the above associations. Maybe wise just to stay out of Lithuania.

Another key implication of these data is that the name Phissy is multilingually present, or at least words are that sound very similar. This means the phonotactics of the name Phissy do not call to mind any particular language, so any foreign allure effect is not

¹¹¹ (Olavarrieta Soto, Manzur Mobarec, & Friedmann, 2009)

expected here. If anything, its orthography most resembles English, which could bode well at least in Latin America.¹¹²

Sound symbolism, on the other hand, seems perhaps rooted more in nature than nurture, meaning it transcends national and linguistic borders. According to prior findings in sound symbolism, an analysis of phonemes independently of lexicon tells the consumer that something called “Phissy” should be quick, small, and feminine. This is a combination of higher acoustic frequency in the two front vowels, which tend associate with smallness and quickness, and that the other two phonemes unvoiced fricatives, which are reminiscent of rushing air and further contribute to the feeling of speed.¹¹³ Given that Phissy is tech startup, the portability, simplicity, and efficiency emphasized by its phonologically inspired quickness and smallness are semantically apposite with Phissy’s function.

However, any perceived femininity of the name Phissy raises the question of how we want to position our product such that its name does not preclude men from downloading it. A data analysis of Phissy users as of summer 2021 shows that while about 57.1% of our total users are women, more than 75% of users who log the most meals are men. This underscores that men appear to be the more lucrative target audience, but for some reason they are less likely to make the initial download.

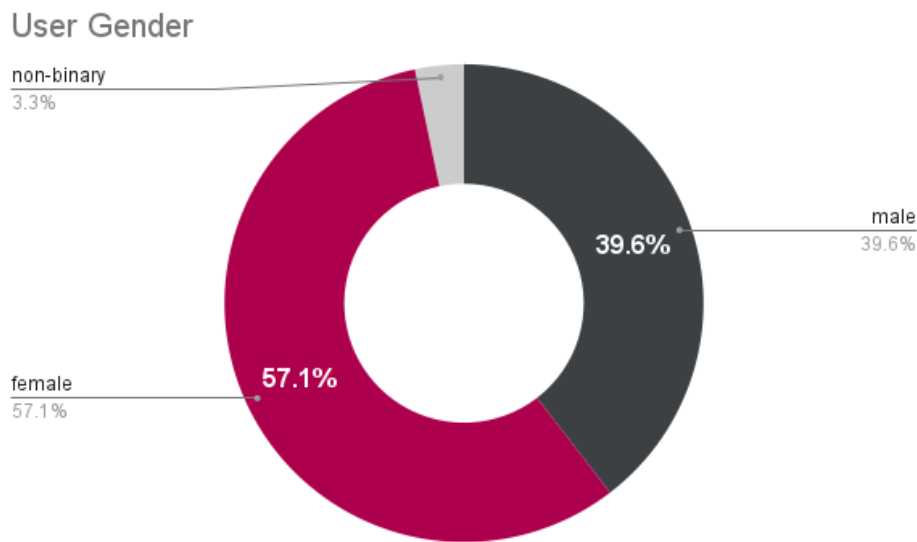


Figure 16: A breakdown by reported gender of Phissy users as of summer 2021.

¹¹² (LeClerc, Schmitt, & Dubé, 1994)

¹¹³ (Klink, 2000); (Subkowski, 2019) cited (Hinton, Nichols, & Ohala, 1994)

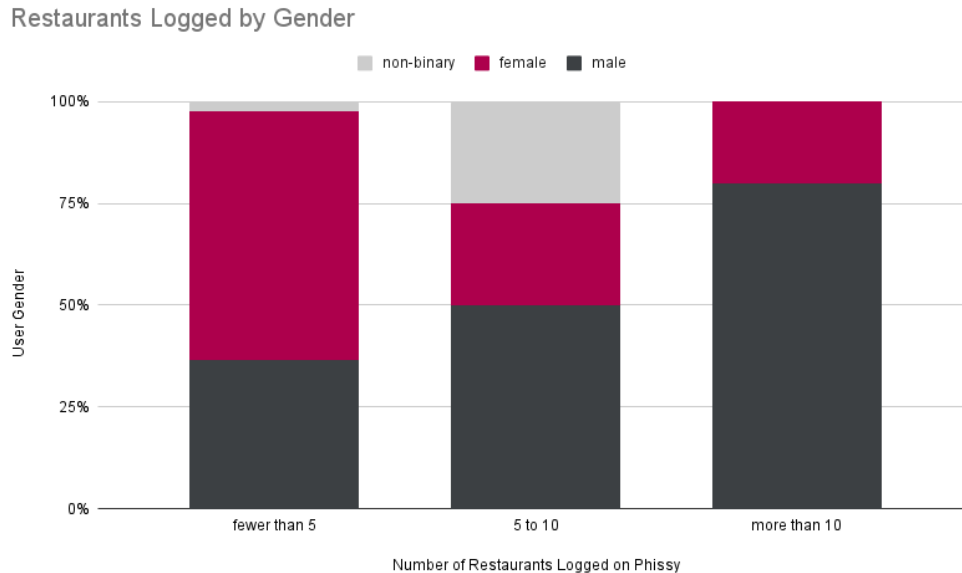


Figure 17: A breakdown of restaurants logged by gender of user.

At first, we were under the impression this was due to our pink accent color, an homage to Grandma Phissy, so we were puzzled when poll results came back that men actually preferred the color scheme more than women did, on average. Perhaps the app name itself was an overlooked cue for femininity that should be countered in future marketing efforts. There also remains the question of emotion these phonemes evoke. Hinton et al. (1994) in Subkowski (2019) find that high front vowels like /i/ are perceived as both emotionally sweeter, whereas Klink (2000) finds the same vowels to be perceived as more bitter. Surely the former is more desirable for a food-related application. Further research and focus groups would be required to assess where on the bitter-to-sweet continuum our target audience associates these vowels.

Keller (1993) claims the desirability of a brand name is to best gauged on two dimensions—the inherent ease with which the name can be committed to, retained in, and recalled from memory, and the extent to which the name supports or enhances the product’s strategic positioning.¹¹⁴ Based on the simplicity and phonotactic accessibility of the Phissy name and an informed plan to reinforce its name-attribute fit, I am confident Phissy now makes a viable candidate to penetrate multilingual markets.

¹¹⁴ (Keller, 1993)

6: CONCLUSION

As we barrel toward a future propelled by and dependent on technology, the implications of a platform like Phissy are tacit. Young users around the world are hungry for honesty in media, especially in the form of user-generated reviews from their peers, while older and memory-impaired users grow increasingly distrustful of technology that could help them. Phissy bridges this gap around a cultural universal—the dinner table. With special attention paid to cross-cultural and cross-generational language use, language analysis, intuitive and user-friendly design, positioning, and branding, I strove to create a tool that solves an everyday problem with universal appeal, usability, and value. With no pressure for external validation and no fear of publicizing private data, family members of all ages can share in doing just what I hoped when I first drafted Phissy’s tagline: dine to remember.

While drafting this paper was then a natural segue, I would be remiss not to acknowledge the limitations it holds. I am by no means a computer science student, and as much as can be said for the value of self-teaching when truly determined, there may be gaps in my understanding. Surely, someone with more academic training in writing code could have done so far more elegantly than I. For this reason, I have geared this paper to investigate more profoundly what has been my focus all along—leveraging language to solve a cognitive problem. With more time and resources, I would have loved to develop and release beta features to test the various hypotheses set forth in this paper, and then to collect insights from users with diverse language, culture, and age backgrounds. That said, I believe that the components of my paper—the app itself and each chapter of this paper—together paint a comprehensive picture of my experience becoming knowledgeable on this topic.

As for the future of Phissy, I remain humbly confident. If in time restaurants are receptive to partnering with businesses like Phissy, both merchant and user will enter a symbiotic relationship that helps restaurants maximize customer retention. This will require defining and evaluating new key performance indicators, such as returns per user per restaurant, and thoughtful extrapolation of these metrics to ensure this data is a value add for the restaurant but does not jeopardize the autonomy and privacy of our user base. Additionally, as today’s youngest generations grow older, it will be particularly interesting to follow their usage trends and expectations for technological media, as there may arise an unanticipated wave of needs that Phissy does not meet.

But this project has touched even closer to home than that. During the past year while I composed this paper, I had to watch idly as my *grandfather*—always the sharpest,

classiest man in the room and first choice to emcee any family event—developed rapid-onset dementia. Now, even visiting a restaurant and placing an order can be unexpectedly frustrating for him. So, while Grandma Phissy is still reticent to use the Phissy app for herself—*she knows what she likes*, after all—it has been gratifying to see family members use the app to help my grandfather feel more in control when dining out. Whether Phissy continues to grow or inspires a larger company to pick up—or buy—the concept, if even one person can be aided by what I’ve built, it has been well worth the time and effort, not because it was a natural segue for any one of my interests but because it was situated at the intersection of all of them. This is why we chase what we love—to shape it into a lifetime of continued learning. And maybe enjoy some food along the way.



Figure 18: The author and his eponymous Grandma Phissy.

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Competitive Audit Conducted Summer 2021
with Lauren Witmer, Martina Izzo, and Ferial Lejmi

Platform	Category	What Phissy has, they don't	What they have, Phissy doesn't	Relationships with restaurants	User base	Marketing approach, voice
Grubhub	food delivery	seeing who ordered what; collections of your restaurants; rating individual dishes	seeing partnered restaurants easily on app; different kinds of offers tailored to restaurant; sort by price, fastest	Grubhub pays restaurant's cut once a week thru deposit or monthly by check ; Grubhub marketplace advertising; 20% marketing fee from Grubhub platform and 10% delivery fee for delivery services	25-34, 45-54, women	Work heavily with the eSports audience. Created "Soundbites", a live-streaming event as a way to entertain and add value during diners' at-home ordering experiences. This event has commanded 2-7 million viewers per show and watch times of 10-12 minutes, a level of engagement rarely seen by brands.
UberEats	food delivery	sharing history with friends, more complex rating system	simple thumbs up/down rating for dish ; optimizing restaurants based on user; partnered with Marriott Bonvoy	restaurant pays fee to start (Gets tablet), then UberEats gets 30% commission on those orders	delivery: most low-income young, but high income also	started TikTok, 20K followers but no content?
Doordash	food delivery	rating and logging dishes, sharing with friends what you ordered, seeing who went with you if logged	personalization, ads for restaurants, order interface; different offers based on restaurant	20% commission for businesses, advertising --> businesses put up a deal and .99 per order to DoorDash?	likely 18-29?	uses TikTok a lot
Toast	food delivery	rating dishes for self, food	POS integration, contactless, credit	on top of installation,		

		journal, collections	card linked loyalty program, ordering system, handheld POS system, integration partners; scanning powered by toast receipt to pay;	hardware, payment processing, 79/mo per terminal for subscription, loyalty program additional 25/mo, then gift card + online ordering 50/mo EACH		
Caviar	food delivery	rating dishes, use at any restaurant; sorting and making collections	curated restaurant list for delivery, 1 per cuisine (luxury delivery), categorized by "fastest near you" and "hidden gems"	no general commission, depends on restaurant; one got 8%, one got 10%	wealthy (9.99/mo for users)	Caviar uses a business model that prefers a small selection, offering a single vendor per cuisine.
Seamless	food delivery	rating dishes, who ordered what; collections	price sort; rate restaurant; pictures, delivery support service	commission: around or over 20% per order		Seamless is owned by Grubhub but marketed totally separate from the Grubhub brand. Seamless advertises on social media but is based in the New York City area.
Slice	food delivery	rating dishes, more than pizza-focused; collections, shortlist, sharing with friends and family; photos optional	pizza-specific online delivery platform; for restaurants, tech and marketing	takes \$1.95/slice, or 6-7% on average (from 2018 article)		Slice focuses on Pizza. They have invested a lot into TV advertisements. They offer easy food delivery service directly from your favorite pizza shops only.
ChowNow	food delivery	food diary, rating dishes, logging friends' meals, collections, shortlist	marketing team, mobile app, delivery, help build website, menu optimization	pay monthly subscription + setup fee for tablet/etc.: base cost \$149/mo, \$399 setup, annual		

				plan \$119/mo, \$199 setup fee, two-year is \$99, \$199 setup fee		
Postmates	food delivery	food diary, rating dishes, logging friends' food, collections, sharing collections	delivery service; finding food by cuisine; finding where to eat (instead of just a log)	Postmates does not actively partner with restaurants; restaurants appear automatically on app when searched for. This has led to much dispute. postmates plus is flat 3.99 fee so merchants cover the rest of the fee in place of customer paying it in exchange for prominent placement on the website	younger, 18-29	They are creative on TikTok, giving users the chance to share their unique analytics that track their trends with food.
EatStreet	food delivery	food diary, rating dishes, logging dishes, collections, sharing dishes with friends + family	delivery service; employee drivers, ads, digital marketing advice	12% commission, no fees otherwise ; partnering with smaller businesses		
Delivery.com	food delivery	food diary, rating dishes, logging dishes, collections, sharing dishes with friends + family	food delivery, groceries, alcohol, laundry??, custom software, marketing strategy	comission of 15% + credit card fee of 2.75% + \$0.25		
Eat24 (defunct)	food delivery	food diary, rating dishes, logging dishes, collections, sharing	food delivery	n/a		VERY funny; mostly focused on email campaigns, radio spots, YouTube ads.

		dishes with friends + family				Their email campaigns were hailed as hilarious by the person who facilitated Yelp's acquisition. EAT24 ALSO created the app HANGRY, which randomly chooses a restaurant and generates an order for you
Aloha Online Ordering	food delivery	food diary, rating dishes, logging dishes, collections, sharing dishes with friends + family	food delivery / pickup, inhouse delivery and third-party delivery support	pay fee, included in Aloha Essentials (see below), but optional add-on for silver Pro		
Popmenu	food-related services	saving multi-restaurant reviews; sharing with friends and family	tailors menus, saves reviews on restaurant site	flat fee (one site said 269/mo but pre-COVID)	smaller restaurants use it for their customers	
Yelp	food-related services	search by dishes ; saving dishes; reliable info from friends/family	community reviews, viewing hours/map of location; table reservations;	restaurant pays for ads / gets 70% vouchers, 90% gift certificates. Reimbursed monthly	18-34; 100K+ income	runs blog with COVID, reviews with COVID, trusted consumers gave COVID feedback on website; photos of people are working well; started on TikTok
TripAdvisor	food-related services	personal log; personal collections	community reviews; events in area; reservations; hours	pay for clicks // premium for rest.: determined by size, location, traffic // review hub , which won't show me price	female, 35-54	

				// ads risk-free, only pay per click // thefork is 125 pounds / mo for UK		
ChefsFeed	food-related services	more personal; friends & family-focus	chef's recs, online classes, connect to chefs and follow them	they vet chefs, chefs use free + get the advertising, users pay for classes	Instagram 28.7% F 71.3% M	
Grabull	food-related services	food diary, any restaurant, rating dishes, sharing with friends and family	website optimization, advertising restaurant, creates online ordering platform	8% commission and other stuff?	naive restaurant owners	they have no social media, their website is riddled with typos, and I'm not sure this isn't a scam
EDiningExpress	food-related services	food diary, logging and rating dishes, sharing collections with friends and family	online ordering platform	pay "low monthly rate", no commission BUT must deliver yourself		
Clover	food-related services	food diary, logging dishes, sharing collections with friends and family	POS integration, payment processing, multiple loyalty programs, hardware and software, online ordering	paying over \$1000 for hardware, then \$70/mo fee PLUS a small percentage on transactions (2.3% in-person 3.5% keyed-in)	claims it's the best for small businesses	
the.ordering.app	food-related services	food diary, logging dishes, sharing collections with friends and family, rating dishes	build ordering website (optimized for mobile), group orders, reorders, google search/maps discoverable, payment processing, POS integration with clover	Two different things on website: on home page, free for pay at pickup orders, but if payment online then 2.9% + \$0.30; on FAQ page, 1.5% per order		
Chowly	food-related services	food diary, logging dishes, sharing collections, etc.	POS integration, works to integrate delivery services into one tablet	restaurants pay fees		

TheLevelUp	food-related services	food diary, logging and rating dishes, sharing collections with friends and family	mobile ordering, mobile payment			
TableUp	food-related services	food diary, logging and rating dishes, sharing collections with friends and family, notes on restaurants, user focus	helps increase restaurant \$\$, marketing campaigns to bring back repeat customers, customizable loyalty program	fee per month, by feature		
Aloha Essentials	food-related services	food diary, logging and rating dishes, collections, sharing dishes with friends + family	POS system, online ordering support, QR code payment and ordering	silver pro subscription 149/mo; aloha essentials definitely more		
Tapmango	food-related services	food diary, logging and rating dishes, sharing dishes with family & friends, collections	POS support, online and mobile ordering, sets up restaurant app	just "affordable" :/		
Superlocal	local-focus resource	dishes, food-diary aspect, friends + family connection	local news, focus on neighbors, checking in to places	n/a?	cities	
grabbd		rating dishes; shortlist separate from collections	recommending places for me; different sortings for lists (insta worthy), rating place separation between i want to try and i have been; different experts	n/a?	cities; seemed more women	
Pao		rating dishes, photos not necessary, dish focus;	following other users (social side); global lists	n/a?	cities + female-identifying ppl	has been GREAT on TikTok, specific locations have

						seen more engagement
Mapstr		rating dishes, sharing collections with friends, go or not again, all sorts of reviews	saving all kinds of places (not just restaurants), collaborate on map with others, pictures added easily	n/a?		
OpenTable	reservation	rating dishes, shortlist; discounts off restaurants	reservations (obv), discounts thru Amazon/hotel/etc. from rewards, POS integration; history likely includes price; browse restaurants to eat at by cuisine	fee for joining; then basic (\$29/mo), core(\$249/mo), pro (\$449/mo). On top of that, pay per diner from OpenTable AND customer's website.	30-49, older	
Tock	reservation	individual recs; more than just partner restaurants	restaurant-specific deals; membership access to exclusive events/merch (cookbooks, etc) discounts; Tock Time: noting dining restrictions, preferences for future restaurant visits; badges to earn;	plans for restaurants, 199/mo (2% reservation fee) or 699/mo (no fee)	wealthy ppl (fancier restaurants)	
Resy	reservation	individual dish ratings; able to add photos, share with friends + family, Phissy Cash discount system	FOH services, SMS messaging with guests, POS integration, VIP experiences	plans for restaurants, 249/mo, 399/mo, or 899/mo	wealthier people, NYC, cities with more restaurants using Resy	
B-Local	local discount app	rating dishes, all restaurants; sharing collections	partnered with local Boston restaurants	restaurants who give discounts get reimbursed (by the CARES act?)	--	
Yummi	food diary	photos not necessary, rating dishes, collections	logs by cuisine, cities, Photos, social media-esque, visual calendar, near me	n/a?	people in their 20's	reuses marketing material, feels fake, younger target

						audience, uses facts and stats, no tiktok presence
EatList	food diary	additions, subtractions for dishes; easy-to-understand interface, collections	logging date when you log restaurant; rating VISIT more than just dish; can add visits and see different ratings; restaurant notes	n/a?	i can't even tell...	
Weekout: social food club	food diary	saving dishes, rating dishes, additions, subtractions	restaurant recommendations in social-media format, following people, saving directly from Instagram to your feed, "explore mode" so personalized recommendations, adding friends to get access to ALL their reviews	n/a		
Untappd	food diary	saving dishes, rating dishes, additions, subtractions, sharing collections with friends and family	beer-specific, checking in, achievements, rating beers, rating restaurants, finding recommendations, breweries near you	untapped for business, \$599/year but monthly billing is an option		