

The Principles of Pervasive Retail Application Design

A Roadmap to the Future of Shopping

Author: Jonathan Morgan | @promorock

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Evidence-based principles providing information and guidance designers need as they create applications for use in smart retail environments.

The findings presented in this paper identify fundamental principles for designing for computationally-enhanced retail environments. **These principles are distilled from over two hundred published research studies** on human-computer interaction, ubiquitous computing, proxemic interaction design, augmented/mixed reality, artificial intelligence, inclusive design, retail architectural design, cognitive science, embodied cognition, digital marketing, retail strategy, and related fields. This analysis reveals a core set of principles relevant to user experience design that are independent of any particular technology platform. The result is a roadmap to the future of shopping.

Define the Actionable Context

1. Define Your Focus (What is 'actionable' to you?)
 2. Define the methods of collecting this information
- 18 references informed this principle

Earn Their Trust

1. Be transparent
 2. Be accurate
 3. Be responsive
- 11 references informed this principle

Give them what the 'real-world' can't

1. Lower the cost of search
 2. Give them smart, hyper-relevant recommendations
 3. Track their progress and spending for them
 4. Provide a quick checkout
- 15 references informed this principle

Reduce the complexity of the physical environment

1. Simplify their view of the store
 2. Focus on items of explicit interest to the shopper
- Accessibility Considerations
- 18 references informed this principle

Let them focus on the real world

1. Modality matters - alerts should be relevant and distinct
 2. Don't be needy - the shopper's primary focus is on the environment
 3. Show, don't tell
 4. Detect and adapt to the attention of the shopper
 5. Adapt calls-for-attention (CFA) to the situation or environment
- Accessibility Considerations
- 14 references informed this principle

Emulate & Augment the 'direct product experience'

1. Map the physical to the virtual
 2. Natural interactions lead to confident purchase decisions
 3. Inclusion (accessibility) First!
- 11 references informed this principle

Keep the shopper moving

- [1. Keep all the shoppers moving](#)
 - [2. Navigation should be proactive](#)
 - [3. Direct shoppers to traverse full aisles to collect their items](#)
 - [4. Re-route them based on shopper override or system intervention](#)
 - [5. Show them their orientation](#)
 - [6. Anticipate the need for support](#)
- [14 references informed this principle](#)

[Put Shoppers in control](#)

- [1. Allow shoppers to take over](#)
 - [2. Offer control in return for their trust](#)
- [8 references informed this principle](#)

[Design hyper-relevant experiences](#)

- [1. Ease into this relationship](#)
- [2. Understand the goals of the shopper to meet the needs of the shopper](#)
- [3. Provide hyper-relevant recommendations](#)
- [4. Understand, then support their personality, preferences and processes](#)
- [5. Support Natural Language](#)
- [6. Leverage what people can do \(focus on abilities, not disabilities\)](#)

[Accessibility Consideration](#)

[16 references informed this principle](#)

[Be fun, smart, attentive, and efficient](#)

- [1. Make it fun!](#)
 - [2. Do the thinking for them \(without being creepy or pushy\)](#)
 - [3. Assume shoppers have better things to do](#)
- [19 references informed this principle](#)

Introduction by Karl Fast | @KarlFast | <http://about.me/karlfast> | May 2013

What happens when computation becomes a pervasive feature of the retail shopping environment? Today, smartphones are transforming the in-store shopping experience. People use their phones to learn more about specific products, compare related items, and check competitor pricing. Where the web replaced the traditional shopping experience—you no longer needed to visit the store—the smartphone is augmenting it. Computation is creating new reasons to visit the mall.

This is merely the beginning. A wave of emerging technologies will deeply embed computation into the retail environment. This means new kinds of in-store devices. It means new ways of understanding how people shop. It means technologies that communicate with smartphones, tablets, and other personal devices. But what it really means is that stores will be designed with computation as an integral part of the shopping experience.

The technologies are here. Estimote Beacons, for example, are distributed wireless sensors that can be used for indoor navigation support, proximity marketing, and contact-less payment. And Apple introduces iBeacon, a technology for seamlessly connecting multiple devices in close-range physical spaces.

You know how to design an e-commerce app, but how do you design for this?

Define the Actionable Context

Context is far more than location.

When designing applications for use in a sensor-enhanced, 'smart' retail environment, it's especially important to identify and prioritize the information that defines a shoppers' "context". Take time to understand the full breadth of contextual information available to you and you're far more likely to find opportunities to support the shoppers' need at a particular moment in time.

1. Define Your Focus (What is 'actionable' to you?)

Pervasive technologies afford us the opportunity to collect a broad range of contextual information about shoppers, their environment, and the relationships they share. It is critically important to define which of this information is most actionable for the goal of your design. The resulting set of actionable contextual information should give you a greater understanding of the full **context of use** of your application and **the user themselves**.

As a general rule, actionable context should be persistent -- not a one-time occurrence -- unambiguous, multi-faceted, and give you a better understanding of the characteristics of the shopper.

Consider including some combination of spatial (physical & relational), temporal (time-based), psychological (emotional), social, and cultural context.

2. Define the methods of collecting this information

When designing pervasive, in-store retail applications, an actionable set of contextual information should contain a mix of profiled (customer supplied), sensed (captured by sensors), and derived (interpreted from multiple sources) data. We collect this information in two distinctly different ways:

A. Implicitly: This is generally captured through interaction with the environment. It's primarily

sensed by either hardware placed in the environment (Beacon's, NFC readers, Visible Light Communication sensors, etc.), the shoppers handheld device, or ideally a mix of both. In fact, the quality and accuracy of implicit data is much greater when it's collected by multiple sensors and/or methods.

Several types of implicitly collected information you should consider when defining your actionable context are the shopper's location, trajectory, cadence, and orientation in relation to the physical space as well as the relative location of objects or other shoppers within the space.

B. Explicitly: Explicit information, on the other hand, is captured based on deliberate and conscious actions of intent by the shopper. Anytime a shopper creates a shopping list, requests information about a product, rates a product, or deliberately re-routes their path through the store, they are providing explicit information.

As you can imagine, the combination of implicit and explicit contextual information opens a world of possibilities for designers of pervasive applications. For example, the combination of information collected from a shopper's list, sensor-based in-store analytics, and an explicit request for help because someone spilled a gallon of milk in a specific aisle, can provide enough contextual information for an application to redirect a shopper along a more optimal path. Making for a far more rewarding shopping experience.

Streamlining shopping sessions of task-oriented shoppers free's their time to explore once they have met their goal (collected all items on their list). This has been proven to increase the number of hedonic purchases made by these shoppers and ultimately in greater satisfaction with the shopping experience and the brand.

In conclusion, Actionable Context:

- helps you understand the full-context of use and the user themselves
- must be persistent and multi-faceted - it can't be based on a single event
- must be based on quality, unambiguous information
- must be specific to your customers in relation to your store, establishment, or brand - you must know your customers before you can define the contextual information that is important to understanding them and designing for them
- must help you define then adapt to the characteristics of the shopper

18 references informed this principle

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Earn Their Trust

Pervasive computing by definition places computation at the core of experiences taking place in physical environments. This 'computation' largely survives off of the passive collection of contextual information about people -- their actions, interactions, preferences, etc. This creates a challenge for designers.

Shoppers, and people in general, are skeptical of giving up their personal information. We must treat their context as their personal information. It is critical to adoption and continuance that we instill a sense of trust that we are using this information for the benefit of that person. **If the perceived benefit of your application is less than the perceived risk of sharing personal information with you, trust erodes and so does their perception of your application and brand.**

Earning trust is difficult, especially in the context of pervasive computing. It's a long-term relationship that needs to be nurtured over time. Trust is the cumulative result of good experiences.

Many factors can build trust if done appropriately or erode trust if not. These factors relate to the degree of (perceived) transparency regarding how the system uses shoppers' information; the accuracy of the virtual representation of the physical environment and features like navigation or recommendations; and the overall responsiveness of the application to environmental and manual interaction.

1. Be transparent

People are skeptical of how their information is used. Be upfront about the information you collect and why and how it will be used. Allow them to control what they share and let them remain anonymous if they choose. Provide options to opt-in to advanced functionality that depends on increased access to personal information. As a rule, always ask for permission.

2. Be accurate

The level of trust shoppers have in an application is affected by how well it matches their mental model of the expected experience. If the application doesn't align with the expectations of its users, they will question its accuracy. The intent of pervasive applications is not to command constant attention, so when users choose to view and interact with your application, the information it provides must be accurate and easy to comprehend.

3. Be responsive

Trust in the application erodes when the system is slow to respond. Any lag in the time it takes for a response from the application chips away a little bit of its perceived value. Slowness at times is inevitable but if we provide appropriate feedback that the system is still working to catch up, the shopper will be far more forgiving. Remember, these types of applications are used on-the-go so the system needs to keep up with the pace of the shopper. As a rule, if it can't keep up, it hinders more than it helps and will be abandoned. Much like a GPS application that gives directions two blocks too late.

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Give them what the 'real-world' can't

Enhance the experience of shopping with features that add value not easily found in the physical environment. Our applications should reduce the amount of thought and effort it takes to plan shopping trips, manage expenses, checkout, or search for and explore products.

1. Lower the cost of search

Reduce the amount of time, thought (cognitive effort), and physical effort it takes shoppers to find what they need. Features that help match products to shoppers' explicit goals, like going "low-carb", can reduce much of the thought and effort it takes to choose the right product. Any feature that can minimize this "cost" is worth the effort. The more tedious the search for products, the less shoppers tend to buy.

2. Give them smart, hyper-relevant recommendations

Smart recommendations come from a deep understanding of the individual shopper. Shoppers consistently and continuously tell you what they like and don't like, whether they know it or not. Their shopping lists, ratings, reviews, account preferences, shopping history, and returned purchases give you a lot to go on. Add their physical proximity to a product, location within the store, their trajectory, the time they linger in an area, and so on, to that and you have a truly unique opportunity to provide value.

Consider the following:

- **Take advantage of everything you know about the shopper to help them make better decisions.** If you know their 13-item shopping list contains 10 organic items, show them organic alternatives to the other 3 or lead them past the organics aisle in-store.
- **Stray away from 'sponsored' or 'featured' products unless they match what you know of the shopper.** Since shoppers will likely be engaging these applications through smart phones or wearables (Apple Watch, Samsung Gear, etc.) with limited visible space, the stakes are even higher than with traditional eCommerce experiences. Every time you present an irrelevant recommendation or content, shoppers see less value in your application. Over time they will begin to ignore all recommendations and could stop using the application altogether.
- **Leverage recommendations of personality matched influencers.** We trust others like us more than we do the people selling to us. *Shocking!* Personality-matched recommendations can come from a single person (person-to-person or trusted expert

recommendation) or from a like-minded group (group-to-person or endorsement). Get creative in embedding the power of the social influence of like-minded individuals.

- **Understand what drives the shopper's decisions.** Some shoppers are very price-conscious while others aren't. Some shoppers are driven by exclusivity or being an early adopter. Know where the shopper falls across the spectrum of motivators and recommend accordingly. Generally speaking, deals and special offers are attractive to shoppers but the more we know, the better we can position these incentive. Just make sure that no matter what the deal, the product you recommend is relevant to that shopper.

3. Track their progress and spending for them

When you track the progress of shoppers, you can proactively and automatically check items off their shopping list and calculate the total amount of money they should expect to pay.

Functionality like this helps reduce stress by instilling a sense of security that they have not forgotten any items while allowing them to accurately and actively control their spending.

Note: These features are very attractive to shoppers but be sure to communicate these behind-the-scenes interactions and allow them to override the actions of the application at any time.

4. Provide a quick checkout

If you know the contents of the shoppers' carts, you can accurately calculate the total cost of these items. If the shopper provides a preferred payment method in their profile, allow them to check out without having to wait in line. The principle, 'Be fun, smart, attentive and efficient', explains how extremely attractive this service is to shoppers, especially those who are time-sensitive.

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Reduce the complexity of the physical environment

People look for order in their environment out of an inherent need to organize it in their minds.

The shopping experience is rich with sensory stimuli intended to attract and persuade shoppers to a particular product or promotion. Stores often create distractions or inhibit direct pathways for shoppers if it leads to an increase in impulse purchases. A common tactic in grocery stores is to place essential items far from the store entrance in order to force shoppers to navigate a larger area of the store. This introduces distractions that often cause shoppers to overlook items as they navigate the store, resulting in the need to backtrack to gather missed items and a higher level of frustration with the experience.

Complexity in the store environment might increase impulse purchases, but that doesn't necessarily lead to more spending. In fact, the study, Drawing Attention to Context-Awareness with CaST: A Context-Aware Shopping Trolley, shows that **shopper frustration can significantly decrease the amount of money shoppers spend on a given trip** because frustrated shoppers are more likely to deviate from their initial plan. Longer-than-expected shopping trips tend to make shoppers more purposeful and, in turn, increases their reliance on shopping lists; it decreases exploratory behaviors and overall time shopping; and reduces their tendency to make hedonic purchases. This has also been found to motivate shoppers to purchase less items in order to qualify for express or self-checkout lanes to make up lost time.

Remember, good experiences make happy customers and happy customers are more loyal customers. Design the complexity out of the environment!

1. Simplify their view of the store

A simplified but accurate representation of the store eliminates unnecessary elements much like a subway map does for a city. Design the map of the store so that it divides the complex space into smaller, more easily identifiable and navigable areas. Focus on districts (produce),

landmarks (citrus fruit table), and routes (take me to the oranges) as well as the holistic view of the store. These varying levels of focus allows shoppers to identify familiar landmarks and regain their orientation within the environment.

2. Focus on items of explicit interest to the shopper

Shopping lists and other explicit declarations of intent allow the application to further simplify the view of the store by focusing distinctly on the items, routes and landmarks relevant to the products shoppers have chosen. Ideally, these lists are the primary refinement that defines how we virtually represent the physical environment. Therefore it's important to allow shoppers to create or edit lists whenever and wherever is convenient. This includes planning at home, while shopping, or anywhere they have the time or motivation to do so. Learn more in the principle, "Be fun, smart, attentive, and efficient".

Accessibility Considerations

The perceived complexity of the store environment is relative to the abilities of the individual shopper as well as their familiarity with the environment. Novice users and individuals with physical or cognitive deficiencies greatly benefit from simplified representations of complex environments and situations like those associated with shopping.

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Let them focus on the real world

Pervasive applications should not distract from shoppers' natural interactions with products, each other, and the environment. Shoppers' focus should remain on their physical surroundings until either they choose to focus on the application or the application takes action to assist them in completing their task.

These **calls-for-attention** (CFA) should be contextually appropriate and take advantage of multiple modalities (visual, auditory and haptic) to accommodate differences in the abilities of shoppers and the current state of their immediate environment.

1. Modality matters - alerts should be relevant and distinct

High-value events require shoppers' attention. They should be distinct, emphatic, and relevant. As a general rule, the greater the risk that the shopper will go off task, the more distinct the CFA should be. Reserve audible and haptic methods for infrequent, but critical alerts or to escalate an earlier alert that had gone unnoticed. This helps to avoid habituation or desensitization to these type of feedback. You don't want your shoppers to become blind to the fact that their attention is needed.

2. Don't be needy - the shopper's primary focus is on the environment

The most useful pervasive applications stay out of the way until they are needed. They limit the amount of dialog with the shopper and are smart enough to know when to ask for attention. By attracting attention only at key points in the experience, they allow shoppers to more accurately, efficiently and safely distribute their attention between the environment and your application.

3. Show, don't tell

Display a persistent view of the shoppers' environment. Visually explain the context, but allow them to zoom in on areas or elements of interest. This contextual view of the environment allows shoppers to quickly orient themselves, understand their options and choose the best path. The visual representation should provide them anytime/anywhere access to just about anything the application or environment has to offer. But remember, this is a pervasive application -- it should not be the focus; the environment should be.

4. Detect and adapt to the attention of the shopper

While the system actively tracks shoppers and their context, the application patiently waits for a cue to act. Don't wait for shoppers to tap, swipe, or yell to get the application's attention.

Most modern mobile devices have front-facing cameras and some have proximity sensors (and who knows what's next). Utilize these features to sense the attention of the shopper and adapt accordingly. If your application can detect the focus of the shopper, it can more accurately assess the need to adapt its feedback methods and modalities. For instance, if the shopper is looking at the device, there may not be a need for an audible alert to an approaching event.

5. Adapt calls-for-attention (CFA) to the situation or environment

Understanding the context of the shopper includes situational factors of the environment, like ambient noise and inconsistent lighting. This information can be used to more accurately choose the modality of a CFA. For instance, in a loud environment, there is a point where raising the volume of an audible alert is less a solution than it is an aggravation. In situations like this, the application should escalate its CFAs appropriately and distinctly, perhaps with a random or erratic pattern of vibrations.

Example: A shopper is presented with a visual CFA, but does not appear to be paying attention. The system escalates the CFA to include auditory cues. If that cue is ignored, the system increases the volume only to the level that it will not distract other shoppers. The system then escalates the CFA by flashing the display with a bold color (visual) or vibrating the device in a distinct pattern (haptic).

Accessibility Considerations

Audible and haptic feedback can help visually and cognitively impaired shoppers better understand and navigate the environment than visual cues can alone. Haptic feedback should replace audible feedback in areas with excessive ambient noise or if the shopper requests silent operation.

14 references informed this principle

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Emulate & Augment the 'direct product experience'

The **Direct Product Experience** is the full sensory interaction that shoppers have with physical products and their immediate environment. Pervasive applications should be on-call to facilitate a robust sensory experience to allow self-guided exploration of the elements of the product that the shopper needs to make a confident purchase.

1. Map the physical to the virtual

Previous knowledge of the physical properties of a product makes the act of finding and choosing that product easier and faster. A consistent visual representation between physical and virtual products can reduce the amount of thought and effort it takes to shop. This visual representation should consider the particular product name, description, size and form. Communication of this information should be consistent across **all channels**. Keep a close eye out for changes to the products you stock. Any discrepancies between what shoppers see on their screens and what they see on the shelf will potentially slow them down, confuse them, frustrate them, and erode their trust in the application. The devil is in the details.

2. Natural interactions lead to confident purchase decisions

Allow the shopper to naturally interact with and manipulate the virtual representation of the product. People use multiple senses when interacting with a product and they explore it at varying levels of focus. The more difficult the decision, the more deeply they explore the information available. If we limit how shoppers can interact with our virtual representations of products, we will likely inhibit their ability to make confident decisions. In fact, H. Li, et. al. conclude in their study, *The Role of Virtual Experience in Consumer Learning*, that retailers who utilize robust virtual interaction techniques tend to reduce the number of returned purchases.

3. Inclusion (accessibility) First!

Ask yourself what information you need to confidently buy a loaf of bread. Consider that you are gluten intolerant but you've never bought gluten-free bread before. Now consider that you are in a wheelchair and can't reach the loaves you'd like to compare. What does each loaf feel like? Are they dense or light and fluffy? Are they mass-produced and packaged 3,000 miles away or baked locally? How can your design help in this situation?

If we mandate inclusion as a consideration in our designs, we can help **everyone** make more informed decisions.

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Keep the shopper moving

Pervasive retail applications should assist the shopper in navigating the physical environment (the store). This navigation should consider all relevant contextual information available to it and adapt accordingly. In most cases, shoppers have tasks and objectives they need to accomplish. The longer they take to do this, the more purposeful they become and the less time they spend exploring. Design pervasive applications to minimize distractions inherent to the environment and keep them moving to allow them to find essential products quickly. When we keep them moving towards their goal, we free their time to explore.

1. Keep all the shoppers moving

Like it or not, we're in this together. Pervasive applications should use the collective (distributed) contextual information of discrete shoppers in relation to all shoppers in the store to optimize traffic patterns and reduce congestion.

Example: If an area of the store has become congested, the system re-routes the shopper to avoid the area.

2. Navigation should be proactive

Timely instructions and a longer sequence of directions to the next landmark allow the shopper to keep moving as well as reduces the amount of thought it takes them to reach their destination.

3. Direct shoppers to traverse full aisles to collect their items

Shoppers want their shopping paths to be as efficient as possible. Many factors can affect their ability to progress through the store, including aisle congestion or unfamiliarity with the location of items. Navigation features should take advantage of environmental information to limit the amount of backtracking for the shopper, thus reducing frustration and time spent shopping.

Example: The shopper has five items on a list. The system provides an optimal path that leads down entire aisles to keep forward momentum (as opposed to dipping in and out of aisles) until done.

4. Re-route them based on shopper override or system intervention

Shoppers should be able to update or edit their shopping list while in the store. The system should recognize a change to the list, then utilize it to recalculate the optimal path. This applies equally to events the system detects, like congestion in a particular area of the store, and a shopper that has deviated from the recommended path. The system should make every effort to seamlessly correct errors (human or system) to keep shoppers moving along a forward path, but always allow them to override and manually re-route on the fly.

Example: A shopper follows the path provided by the system until seeing a friend three aisles away. The shopper walks to her friend to say hi. The system detects deviation from the navigation path and re-routes the shopper to provide them the most optimal path based on her new location.

5. Show them their orientation

The virtual view of the shopper should show their real orientation. Most GPS-enabled navigation systems do this. The map should show directional cues to inform shoppers which way they are facing. Without these cues, they may be forced to re-orient themselves in their heads; essentially making an (up to) 180-degree cognitive rotation - turning the map upside down in their mind.

6. Anticipate the need for support

The system should prompt and initiate calls for assistance and provide contextual help based on patterns indicative of confused or lost customers.

Example: A shopper spends an extended period of time in a single aisle or navigates repeatedly between two aisles. The system detects this and assumes the shopper is having difficulty, so it asks if the shopper needs help finding something. If the shopper says “yes,” the system presents an automated method for help. If the automated method fails, the shopper is presented options to have a human representative help.

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Put Shoppers in control

Happiness is the feeling of control

No one likes to feel like they've lost control. The nature of a pervasive application is to seamlessly integrate into a person's normal routine. This is largely accomplished by making assumptions about the shopper based on their actions and interactions, then executing what is believed to be the most relevant response. It's impossible to make accurate assumptions 100% of the time. We need to accept that our applications won't be perfect and design to error scenarios. Allow shoppers to step in, turn off auto-pilot, and take control for themselves.

1. Allow shoppers to take over

Manual control of the system is very important to users of pervasive applications. We must allow them the freedom to interact with the system to inspect, override, discard, revert, store, retrieve, focus, preview, and generally kick the tires. Give them the ability to quickly explore the application and environment from the smallest detail associated with a product to the entire context of the store. These manual explorations support shoppers in making decisions as well as help them assess their location and orientation in the full context of the store.

2. Offer control in return for their trust

By allowing shoppers to control their experiences as well as the information we collect, we build trust that we are here to help them and not just sell to them. Build trust that we're not just taking their information, but using it to help them. Most people don't trust sharing their personal or behavioral information. So, we must be transparent in our intentions and let them control what they share with the application. More on this in the principle, 'Earn their Trust'.

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Design hyper-relevant experiences

Design for them, not ‘people like them’

Collecting the contextual information a shopper comes with a lot of responsibility. Over time, our applications can collect massive amounts of information on shoppers' habits, product preferences, dietary needs, personal style, and so on. These shoppers have trusted us with **their** information, so it's our duty to give them something of value in return. This value needs to be greater than the perceived risk of giving up information about themselves. For our applications to be most relevant to our shoppers, we must customize their experience to be as personal, efficient, fun, and rewarding as possible.

1. Ease into this relationship

As shoppers begin using our applications, the data we collect is difficult to confidently act on. It's general and ambiguous. Even information explicitly provided by shoppers early on isn't enough to inform long-term personalizations. Remember, 'actionable context' is persistent and unambiguous. One-time events aren't enough to accurately define relevant personalizations.

As a customer interacts with the environment and application over time, our inferences or 'best guesses' increase in accuracy, or at least they better. The more information we have, the more explicit and direct our personalizations can be. Don't jump the gun. There is far greater risk that shoppers will abandon your application if it is overly presumptive and inaccurate in its recommendations and personalizations.

2. Understand the goals of the shopper to meet the needs of the shopper

Understanding the goals of the shopper is extremely powerful information when driving personalization and customization. As we build a more complete understanding of the shoppers purchase behaviors, shopping cadence, average transaction amount, time spent shopping, etc., we can **assume** what their goals are at a high level. The accuracy of our assumptions is not guaranteed so it's important to seek opportunity to get explicit validation from the shopper. For example, if a shopper consistently purchases reduced-fat products and they are spending a

long time in close proximity to the yogurt section, ask the shopper if they would like to compare the nutritional values of yogurt currently available on the shelf in front of them.

Timing is critical. Don't be afraid to directly ask the shopper what they need to accomplish or want from the shopping experience. But be sure to ask them at a time that maximizes their benefit while minimizing the inconvenience of providing an answer.

Sidebar: The combination of implicitly collected contextual information, an accurate understanding of the shoppers long-term (“lose weight”) and short-term (‘spend less than \$80 at store’) goals is key to providing the most relevant and valuable recommendations.

3. Provide hyper-relevant recommendations

Hyper-relevant recommendations are the byproduct of intimately understanding the customer. This class of personalization is most successful when we leverage a diverse mix of quantitative and qualitative information of a particular shopper.

Scenario: A shopper regularly visits a store several times a week to purchase small quantities of products -- never anything more than she can carry in a handbasket. She tends to shop very slowly on each trip and on occasion uses a store-supplied electric cart. The majority of her time spent in store is in the dairy and produce departments. An assumption might be made that this is an elderly or otherwise physically challenged individual who feels it is important to personally inspect dairy products and produce prior to purchase. A highly relevant (hyper-relevant) recommendation might be to offer scheduled home delivery for some of her regularly purchased products, reserving high-touch products like dairy and produce for her regular shopping trips.

The closer we are to providing recommendations based on accurate “personalities” of the shopper, the more likely we are to help people reach their goals, deepen engagement with your brand, and ultimately help you sell more products. Win-Win-Win!

4. Understand, then support their personality, preferences and processes

For the application to seamlessly weave into shoppers' normal interaction with the environment, we must support them as they plan (create lists, collaborate), shop, complete their purchase (checkout) and reflect on their experience. The method and extent of support we need to provide depends on shoppers' personalities as well as the speed or cadence with which they prefer to shop. A task-driven or goal-oriented shopper just wants to get in, buy their stuff, then get out. Recreational shoppers may take their time, collaborate or engage with friends and family. The latter might find an application pushy if the experience is optimized for the

fast-paced nature of the task-oriented shopper. If you don't have enough information to accurately support a shopper, strike a balance between utility and sport.

5. Support Natural Language

Provide a robust vocabulary of terms related to the products and environment to allow shoppers to communicate with the application in a more natural and personal way. For instance, some shoppers might be looking for soda, while others want pop. We know the meaning of these two words are the same and so should your application. Understanding the personal subtleties of shopping is one thing, communicating it is another.

6. Leverage what people can do (focus on abilities, not disabilities)

Our applications should be designed with the understanding that shoppers have different levels of experience at shopping and potentially, physical and cognitive impairments that can limit their ability to complete their tasks. This includes situational-induced impairments like loud noise or inadequate lighting. Our applications should sense when a shopper is having difficulty and intervene when necessary. It should then use this information to improve their experience in the future.

As a general rule, design for flexibility, personalization and inclusion and the shoppers' experience will be uniquely rewarding.

Accessibility Consideration

Measuring the cadence of the shopper can be valuable in determining the degree of mobility of the shopper (walking with a basket, pushing a cart, riding a wheelchair).

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Be fun, smart, attentive, and efficient

Your significant other will be jealous of your application!

1. Make it fun!

Designing an application that is fun doesn't mean it has to be a game. Remember, your shoppers still have goals you need to support. Think of fun in terms of making it engaging, compelling, enjoyable and collaborative. Each of these elements are known to increase continuance, satisfaction, loyalty and motivation. Perhaps you can incorporate social shopping features, like real-time collaborative shopping*, or just lighten up the language you use. When an experience is fun, the shopper is more motivated to use it and satisfied with the outcome.

*check out [Instacart's](#) social shopping feature. It is simple and powerful!

2. Do the thinking for them (without being creepy or pushy)

Fundamental to the perceived value of a pervasive application is how well it augments and extends the cognitive abilities of the shopper. Our applications should make shopping lists and cart contents readily available; display how much money the shopper has spent and how to find the best deal; and be on-call with information relevant to the task at hand. While the list of features that might support a shopper in this sense are extensive, there are a few that designers of pervasive retail applications should seriously consider:

- A. Show the shopper what the product label can't.** Product information is a strong influence on purchase decisions. Shoppers are unique individuals who need different information to make confident purchase decisions. Provide comprehensive product information not readily available in the physical environment but don't overwhelm the shopper by showing it all at once. Use what you learn about the shopper over time to elevate the most relevant supporting information on a particular product but always let the shopper take control. Learn from these manual overrides to further personalize future

interactions with the application.

- B. Allow for constant visibility of cart contents and cost.** The ability to monitor the total cost of items in a shoppers' cart is one of the most attractive features for pervasive shopping applications. It helps shoppers monitor their budget more effectively than traditional in-store shopping and fosters trust in the store/brand.
- C. Facilitate list building, editing, collaboration and sharing.** Lists are one of the most important (if not the most important) steps when planning a shopping trip.

Lists, in general, help people focus and decrease the amount of cognitive effort it takes them to complete a task. It essentially becomes an extension of their mind. List information should be used to feed the profile of the individual as well as filter the view of the environment (see "Reduce Complexity of the Physical Environment"). Lists can be the most powerful and relevant explicit inputs that define the holistic 'personality' of the shopper. Design simple, omni-channel, device-agnostic, collaborative features that help shoppers build, edit, organize and dynamically check off items on their lists.

3. Assume shoppers have better things to do

Much to retailers chagrin, shoppers don't always want to hang out and wander around their stores. We must approach our designs with the assumption that the shopper has a goal that we need to support. If we don't support their goals, our applications will lose their attention quickly and end up in the junk drawer of unused apps or just deleted. Some rules you should consider include:

- A. Expedite their access to necessities to afford them more time to explore.** Features designed to help shoppers navigate the store should be proactive. When our application is one (or two) step(s) ahead of the shopper, it helps alleviate uncertainty and minimize the negative effects of time-pressure.
- B. Show the shopper what's available, where to find it and how to get there with the least amount of stress.** Shoppers will then have more time to explore.
- C. Provide a smart, predictive, natural language search.** Difficulty finding items through search has a profound negative effect on shoppers' ability and willingness to purchase. Provide a method to search for products and accommodate for the nuances of how individuals communicate (think "soda" vs. "pop"). Search is important, but should not be the primary focus. Remember, these applications are meant to be used "in the wild." Just think of search as a crutch (just make sure it's a damn good one!).
- D. Know your inventory, then let the shopper know immediately if the item they want is out of stock.** Don't let them waste their time navigating to a product that isn't there. Inventory awareness opens up the opportunity to use what you know of the shopper to recommend highly relevant alternatives.
- E. Provide a smart checkout.** If you know what the shopper has in their cart (ideally, you will), let them bypass or minimize their time in the checkout queue. According to

Kourouthanassis, et. al. , this is the most attractive proposed feature for shoppers, especially time-sensitive and recreational shoppers.

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