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Abstract	<p>In recent years, there are more and more big retail stores which attract a lot of customers. In these big retail stores, sales clerks are so busy that can not serve and help every customer in time. On the other hand, the interaction with sales clerks is very important for customers, especially when they are hesitating whether to buy products.</p> <p>"Cue", a key holder for sales-assistance in large retail stores; designed to detect whether customers are hesitating to by products and tell the sales clerks the cue of approaching and helping them. It aims to help the sales clerks to grasp the information of customers more efficiently, and also meet the customers' needs more effectively.</p> <p>This paper describes my design process from vision to implementation, and a test in a big sporting goods retail store, discusses how to design this interactive key holder for sales clerks and how does it assist them as a new working style and also meet the needs of customers.</p>
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Master's Thesis
Academic Year 2012

“Cue”

A Sales-assistive Key Holder for Sales Clerks of
Large Retail Stores

Graduate School of Media Design,
Keio University

Ang Li

A Master's Thesis
submitted to Graduate School of Media Design, Keio University
in partial fulfillment of the requirements for the degree of
MASTER of Media Design

Ang Li

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Abstract of Master's Thesis of Academic Year 2012

“Cue”

A Sales-assistive Key Holder for Sales Clerks of Large Retail Stores

Summary

In recent years, there are more and more big retail stores which attract a lot of customers. In these big retail stores, sales clerks are so busy that can not serve and help every customer in time. On the other hand, the interaction with sales clerks is very important for customers, especially when they are hesitating whether to buy products.

“Cue”, a key holder for sales-assistance in large retail stores; designed to detect whether customers are hesitating to buy products and tell the sales clerks the cue of approaching and helping them. It aims to help the sales clerks to grasp the information of customers more efficiently, and also meet the customers' needs more effectively.

This paper describes my design process from vision to implementation, and a test in a big sporting goods retail store, discusses how to design this interactive key holder for sales clerks and how does it assist them as a new working style and also meet the needs of customers.

Keywords:

Design Thinking, Interaction Design, Sales-Assistant, Sales clerks-customers communication

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1. Introduction

1.1. Introduction

It was a Friday night, my friend *Chen* (Figure 1.1)¹ and I were shopping around the Yokohama Station. Chen was an exchange PhD student from China. He has finished his one-year study in Yokohama and scheduled to fly back to China in the next morning. Chen told me that he wanted to buy a pair of pants tonight and I planned to take a look at some bags. We entered into a retail shop just neighborho'od to the JR station and stopped by a shelf for pants. Chen picked up a pairs of jeans and told me that he had already searched this pair online and really liked it. But he was hesitating whether to buy because of the high price. At that moment, a sales clerk (a young man around 20 years' old) came, and it seems like that he had already known that Chen was hesitating and suggested him trying that pair on. After coming out from the fitting room and seeing himself in front of the mirror, Chen was still undecided. The clerk advised him in great detail and brought several shirts to let Chen try. And then the clerk gave Chen profound ideas and suggestions. Finally, Chen decided to buy them all, even those shirts.

Another Friday night, I was in a famous retail store looking for a pair of cargo pants. I quickly made up my mind, but the only problem was my size. I knew my size in inches, but not in centimeters described in the tag. I tried to look for assistant, but finally it turned out to be no one around. So I had to randomly pick up a pair and took it to a sales clerk almost twenty meters away and asked to convert my size into centimeters, and then took another twenty meters back



Figure 1.1: *a photo with Chen(left2) and other two friends*

to the shelf, took a suitable size, and heading toward the fitting room (another twenty meters) to try them on. But all of a sudden, I did not need that pants any longer, and finally went straightly out of the store without buying anything.

The previous two scenarios are quite contrasting. In the former one, Chen planned to buy a pair of pants, yet finally leaving the store with more than he budgeted; while in the latter example, I was really like the pants in that store, but finally did not buy it.

Why is that? I honestly think it is because the different services provided by those two stores, those influence of services became especially obvious when a customer was hesitating whether to buy or not. The reason why no sales clerks appeared in need is probably because the retail store was big and there were many customers there, sales assistants were so busy that could not help every customer in time. So there could be some way to assist the sales clerks to work more efficiently and answer most customers' needs in due course.

Therefore, this paper introduces “Cue” (Figure 1.2)², a key holder for sales-assistance in retail stores, which is designed to detect whether customers are hesitating in choosing products and tell the sales clerks the cue of approaching and greeting them. It aims to help the sales clerks to grasp the information of

customers more efficiently, and also meet the customers' needs more effectively. Humanic clues created by sales clerks are most salient for labor-intensive, interactive services. The more inter-personal, customer-oriented interaction, the more pronounced and emotional humanic effects are likely to be. Humanic interaction in the service experience offers the chance to cultivate emotional connection that extends respect to customers and, in so doing, exceeds their expectations, strengthens their trust, and psychologically builds the loyalty to the brand/store.

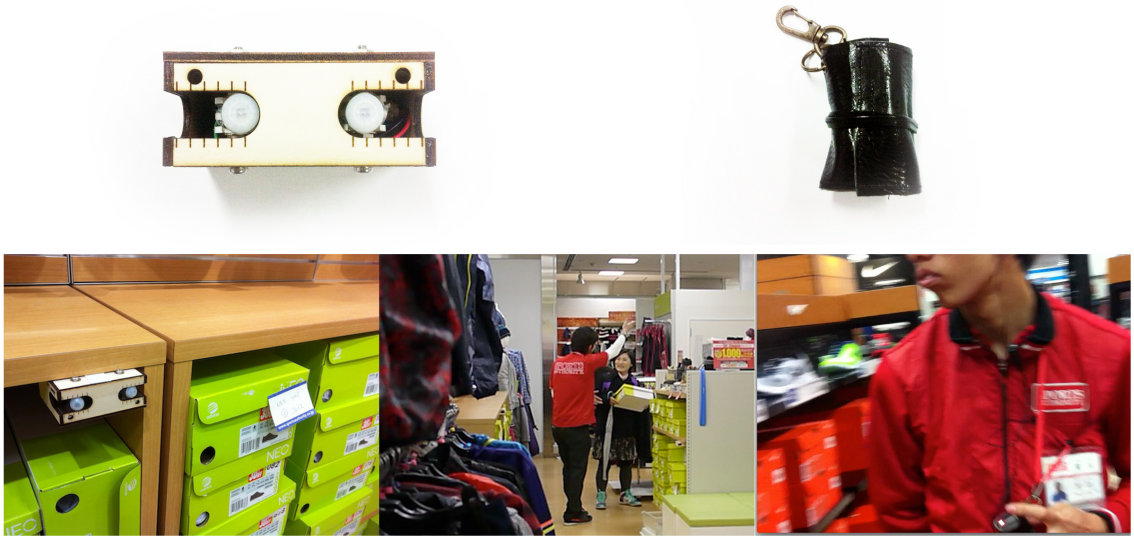


Figure 1.2: *The prototype of “Cue” (the key holder at upper-right, and the sensor box at upper-left) and its validation in a large sporting goods retail store (a clerk working with “Cue” at lower-right, the sensor box on the shelf at lower-left, and the interaction between a clerk and customer being supported by “Cue” at lower-middle)*

This paper is structured as follows. Chapter 2 reviews the shopping behavior field, decision time, verification and hesitation segments, humanic clues, approaching and greeting customers, sensor networks of detecting customers’ behavior.

In the sales management area, “Cue” can help the store save the salesforce size and the labor costs. To assist sales management, “Cue” can also help the sales clerk find a new way to work smarter, which means working more efficiently and matching available offerings to more customers needs. “Cue” is applied to

the unexplored field that not only solves the problem of sales clerks in big retail stores who cannot take care of every customer without improving his working efficiency, especially those customers who are hesitating in choosing products and need advice from sales clerks to help them make their decisions. “Cue” detects the time and tells the sales clerks, which bridges two most important factors-time and communication. The hesitating segment behaviors start when customers pick up and examine a product, which are frequently recognized when customers are reading the label, checking the price, and then selecting one or more similar products for closer comparison. This segment displayed the longest time to compare the alternative products (an average of 48.5 secs). This behavior shows a substantial degree of uncertainty (or hesitation) on their part, which is often because customers appear not to have enough information or experience to make a quick decision. Hesitation decision behavior is unique to this segment because normally the informants intentionally will search for the product of certain brands and are unable to quickly locate it in the shop. Negative emotions emerged under such circumstances which led shoppers to compromise and buy inferior alternatives or even not to consume. Therefore, they need someone to help them in time, and normally the sales clerk would be the best candidates. If we set a unit as 20 secs (two units as 40s), we can filter the customers in habitual and confirmatory segments, also customers who do not want to buy. These units can help us detect those customers who are in hesitation and give sales clerks time to react. “Cue” is expected to timely establish the communication between a busy but enthusiastic sales clerk and those hesitating customers. According to fieldwork results, the desire of sales clerks and that of the customers can not be satisfied simultaneously, thus sales chances are lost. I am dedicating on making a sales-assistance key holder for sales clerks, with which they can be aware of those hesitating customers. With the message from “Cue”, the sales clerks could start with suggestions such as “I saw you’re looking at...” rather than “How can I help you?”. Because sales clerks are responsible to know more what the customers need, this ice-breaking greetings will

make them feel more acceptable, which can improve customers' service quality, exceed their expectations. With "Cue", sales clerks can work more efficiently, he can focus on the main sales area, and arrive at the blind spots timely. Customers will be more comfortable when sales clerks are able to know what they want, and offering timely help in need. This is not only solves the problem of scheduling a suitable communication time, but also creates a new customer-friendly interaction experience.

Chapter 3 introduces the background of "Cue", the design process and introduces the implementation process explaining how "Cue" builds an interaction between the sales clerks and customers.

"Cue" is exactly designed through the process consisting of ethnographic survey, hardware and software sketching, and prototyping experiments. In order to find out how to determine whether they have interests or hesitating in products, and how to approach, greet and communicate with them, I conducted surveys perceptively in an outdoor goods store and a sporting goods store.

After the fieldwork, I concluded that "the duration of customers" as the most elements that detects the hesitation and indecision. For example, Customer B in Namche Bazar and the lady in Adidas Jiyugaoka, they both showed a long time of hesitation in choosing products. On the other hand, the sales clerk longs for the cue to help the customers to make decision. Thus, a device to instruct sales clerks the time to help is highly needed. Additionally, the device should be carried on with the clerks rather than installing at the counter, and it is important that it cannot bother customers. I will focus on the "duration of customers", an output device to sales clerks to instruct the time to show up.

In this case, "Cue" is a key holder for sales-assistance in large retail stores. It is designed to detect those hesitating customers and tell the sales clerks the cue of approaching and helping. In order to fulfill this idea, "Cue" needs to cooperate with sensors setting up at shelves. Sensors detect customers' behaviors when they pass by or approach the product shelf. Then, to judge whether customers

are hesitating in buying products or indecision, sensors will count the time of a customer staying at the products. And confirming his/her hesitation, sensors will send signals to “Cue”, which is hung up on the clerk’ neck with his staff card. “Cue” will cue and tell the sales clerks to help the customer.

In order to get the signal from the sensor box, an actuator for sales clerk is needed. My teammates and I did a lot of ideation. After the ideation, I decided to set a sensor box at products shelf to detect a customer’s duration to judge whether he/she is hesitating in buying the products. On the other hand, a key holder buckled on the ring of clerk’s staff card receives the information from sensor box and tell the clerk the cue of approaching and helping the customer.

Here is the framework of this system.

①. The sensor box is installed under the product shelf and switched on in a “waiting” status.

When a customer stopped by the shelf and is interested in the products. The sensor box will count his/her duration standing in front of the shelf.

②. Customer stops by the shelf, examining the products.

If his/her duration is over 20 seconds, the sensor box will send data A to the key holder.

Key holder will light up two LEDs to cue the sales clerk.

Sales clerk then will be informed by the two shining LEDs that there is a customer staying in front of the shelf for about 20 seconds.

He can keep waiting or get ready to approach the customer. It depends on his conditions.

(If customer leaves from the shelf within the first 20 seconds, the sensor will return to “waiting” status and send data C to the key holder. The key holder also returns to “waiting” status.)

③. If customer’s duration is over 40 seconds, sensor box will send data B to key holder.

Key holder will light up four LEDs and vibrates itself to cue the sales clerk.

Sales clerk will be informed that the customer has been staying over 40 seconds and should be recognized as the status of “hesitation”. Then it would be the time for the clerk to show up and help.

(If the customer leaves from the shelf within this period of time, the sensor will also return to “waiting” status and send data C to key holder. Key holder also returns to “waiting” status.)

④. The sales clerk switches off the key holder in order to pause the receiving message. Then he approaches, greets and serves the customer.

“Cue” is a key holder working in an interaction system with wireless communication. This interaction system is made up by sensor box and the key holder. The whole system is based on the open source hardware prototyping platform, Arduino.

Chapter 4 presents the validation of “Cue”, which was tested in a large sporting goods retail store.

This chapter describes the validation of using “Cue” in a large retail store of real world. The purpose is to validate the performance of the prototype, examine its effect on the working behaviors of sales clerks, and see whether it can meet the needs of customers, and find out potential problems of this system.

This validation was conducted in a big sporting goods retail store on December 14-15, 2012. It was very difficult to get permission as it is a chain store and approval should be passed to the head office to determine. In this paper, I observed three sales clerks during their working period with “Cue”.

Based on the validation results, I made a discussion on suitability of each user sales clerk, customers’ behavior, insufficiency in sensor detection, insufficiency in operation of key holder.

Chapter 5 comes to the conclusion and suggests the future research direction.

“Cue” contributes on providing an assistant for busy sales clerks in large retail stores, building the interaction between altruistic sales clerks and hesitation customers, thus it both meets the customers’ needs and maximize the utilization.

tion of the limited time resource of sales clerks. The current achievements have fulfilled our expectation in several regions but still some minor error needed to be fine-tuned. As a result, for further development, the implementation of new experiences becomes essential.

In future, I hope “Cue” to become a more accurate hesitation sensing system, a more understanding key holder, and develop into a teamwork system for sales clerks in large retail stores, and has other possibilities such as creating a brand new attracting system.

Notes

- 1 *a photo with Chen(left2) and other two friends*
- 2 *The prototype of “Cue” (the key holder at upper-right, and the sensor box at upper-left) and its validation in a large sporting goods retail store(the sensor box on the shelf at lower-left, clerk working with “Cue” at lower-right, the interaction between clerk and customer being supported by “Cue” at lower-middle)*

2. Related Works

2.1. Sales Management

Management Science in Retailing and Salesforce Decisions

M. S. Moyer ¹ introduced the operations research techniques applied for management science in retailing, examined the applications in a decision framework, including Store Location Decisions, Store Building Decisions, Store Layout Decisions, Products Decisions, Pricing Decisions, Promotional Decisions, Salesforce Decisions, Service Decisions and Credit Decisions.

In the Salesforce Decisions area, he talked about the routing of salesmen and the most profitable salesforce size.

Two factors exist which encourage the more rational management go retail salespeople:

1. Sales help is an expensive and unavoidable element of the merchant's marketing mix;
2. Compared to outside salesman, retail clerks and their work are relatively amenable to systematic regulation and accurate observation.

Stokes and Mintz ² have developed a Monte Carlo queuing model to determine the optimum number of clerks to assign to a floor in a store. The objective of the model is to balance the cost of clerks against the cost of lost business in order to maximize the store's profit on sales. The model probabilistically considers five variables:

1. The arrival times of customers;
2. The time required to service various customers;

3. The number of items purchased by each customer;
4. The incremental value go each item sold;
5. The the amount of time each potential customer is willing to wait for service.

Horgan ³ offered a variant of this approach. His purpose is to staff to the point where the probability of a sale is the greatest. It is argued that the likelihood of a transaction occurring is greatest if the customer has been waiting for some period, after which time the probability of a sale to him declines. This claim is supported by data derived by observing about 1,000 shoppers in a ladies' shoe department. The analyst finds the average customer waiting time which will maximize the likelihood of a sale, and from this derives the salesforce size which will produce that particular level of service.

"Cue" can detect the duration of customers' waiting time and tell the clerks the cue of approaching and helping. In the sales management area, it can also help the store save the salesforce size and the labor costs.

Marketing Roles of Sales Clerks and Sales Management

Jeffrey Pfeffer ⁴ said that it can produce the sustainable competitive advantage through the effective management of sales clerks. Let them work smartly and efficiently, without limit their motivations and activities. That makes them being marketing roles.

Weitz, B.A. and K.D. Bradford ⁵ introduced the salesperson marketing roles and focus of sales management.

The sales force objective is satisfying customer needs, while the sales force orientation is customer and buyer need. For salespeople, the critical task is matching available offerings to buyer needs. Their activities can influence customers by practicing adaptive selling. Because the sole of the salesperson is a problem solver, the sales management is focusing on individual salesperson, emphasis on selection and training to improve ability and motivating salespeople to work smarter instead of harder.

Saxe, R. and B.A. Weitz ⁶ took a research on improving the effectiveness of salespeople in the marketing role has largely focused on developing a customer orientation in salespeople. Spiro, R.L. and B.A. Weitz ⁷ encouraged salespeople to practice adaptive selling. Sujan, Weitz, and Kumar ⁸ are supporting this role has examined selection and training methods to improve the abilities and motivating salespeople to acquire the skills and knowledge to work smarter. The sales management requires salespeople to understand customer needs and to convince the customers that the products and services can satisfy those needs.

Thus, “Cue” can help the sales clerk find a new way to work smarter, which means working more efficiently and matching available offerings to more customers needs.

RFID Technology in Sales Management

Want ⁹ introduced that the RFID technology is a new technology used in sales management for precisely identifying an object in providing ubiquitous services. We can learned from Auto-ID Center, Cambridge, MA that RFID is equipped with the capability of automated data capture that uses radio frequency to electronically identify, track and store information about groups of products, individual items, or product components. Borriello ¹⁰ said that an RFID system typically consists of three components: an RFID tag, a reader, and a database. In the u-commerce environment with RFID technology, RFID tags will be attached to all kinds of products, services, to provide a high level of value to organizations and consumers.

RFID technology in sales management is mostly applied in products management. Sales clerks and manager can get the information of consumer behavior. However, after detecting the behavior, the technology is weak in making decision and reaction in time for sales clerks to customers. The connection between clerks and customers in this Auto-ID environment is indirect. Comparing to this, “Cue” can make a direct bridge between sales clerks and customers, good for clerks

making decision and reaction in time.

CCTV in Sales Management

Just Kundu ¹¹ and Carmel-Gilfilen ¹² introduced in their research that, CCTV in retail store is almost applied for security in sales management. For example, a customer steal products from the shelf, or a cashier has missed scanning an item at checkout, or a non-empty shopping cart has exited the store without payment.

Comparing to them, recently Mirela Popa at Delft University of Technology in the Netherlands and colleagues are developing software that can automatically categorize shoppers' behavior using video footage from the fisheye cameras that many retail outlets have on their ceilings. For example, the *system* (Figure 2.1)¹³ can tell if customers appear to be disoriented, are looking around for a specific product, or are heading purposefully towards a particular section. When a customer seems in need of assistance, a member of clerks can be directed to them. The aim is to help customers and increase retailers' profits.



Figure 2.1: *Smart CCTV knows when you need shopping advice.*

Mirela's CCTV system is working for customers appear to be disoriented, are looking around for a specific product, or are heading purposefully towards a particular section. Comparing to this, "Cue" is focusing on helping customers who are hesitating in buying products or in need of help.

2.2. Shopping Behavior

Time and Communication of Environmental Psychology

Philip Kotler ¹⁴ introduced his view that retail environments create atmosphere that affects shopping behavior in the Journal of Retailing in 1973. Mehrabian and Russal ¹⁵ developed a framework for analyzing the effects of environments on individuals, emphasizing the role of nonverbal responses to environment factors as a major determinant. Related to Bitner's ¹⁶ exploration of how physical environments might affect both the sales clerks and customers and Donovan and Rossiter's ¹⁷ *PAD framework* (Figure 2.2)¹⁸, Figure 2.1 shows how the environments of stores influence shopping behavior. The last element of the framework Donovan and Possiter summarizing in Figure 2.1 is a taxonomy of possible behavior reactions to the environment. These behaviors can be grouped into four categories based on the type of behavior time, exploration, communication, and satisfaction. Richard F. Yalch and Eric R. Spangenberg ¹⁹ elaborated their understanding of these four categories, especially about time and communication. Time relates to the desire to physically stay in or get out of the environment. This relates to the decision to shop or not shop at the store. It also might relate to the length of time spent in the store. Presumably, attractive in-store environments build store traffic and encourage individuals to linger in the stores. Time is an important factor in retailing because retailers strongly believe in simple correlation between time spent shopping and amount purchased. Communication involves the willingness to communicate with others in the environment. This would be

particularly important in retail stores in which customers must rely on the sales clerks to describe and explain the items in the store.

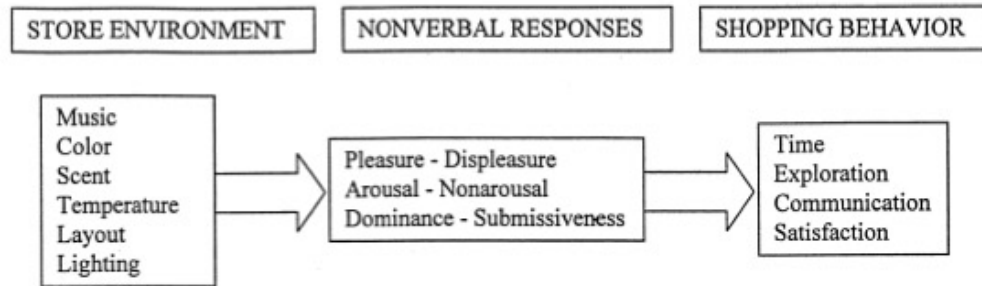


Figure 2.2: *PAD framework*, a framework integrating store environment factors, nonverbal responses, and shopping behaviors.

There somehow should be a way of extending the time spent by customers in the stores and creating the communication between customers and sales clerks. That is what “Cue” can accomplish. To be more important, “Cue” detects the time and calls the sales clerks to approach, which makes a bridge between the two important factors- time and communication.

2.3. Decision Time, Verification and Hesitation Segments

Hansen ²⁰ said that the time required to make a decision is an important process-tracing measure in consumer choice behavior.

Daniela, S., F. Lynne, and Y. Louise ²¹ introduced the definition of four distinct behavioral segment. These segments were characterized by the amount of emotional display and indifferent as Figure 2.3.

The four segments are habitual segment, confirmatory segment, verification segment, and hesitation segment.

Diagram 1.0 *Variations in emotional intensity during shopping visit*

Segment Label	% of Observations	Average Time taken to select product	Emotional Display
<i>Habitual</i>	40.9	6.8 secs	No or Minimal emotive display
<i>Confirmatory</i>	28.9	14.9secs	Low emotive display, high indifference
<i>Verification</i>	18.1	24.1 secs	Moderate Emotive displays, moderate indifference
<i>Hesitation</i>	12.1	48.5 secs	High Emotive displays, low indifference

(n=342)

Figure 2.3: *Variations in emotional intensity during shopping visit*

1. The habitual segment is characterized by the brand being located and picked up immediately. The time taken to select the brand was short (average time taken = 6.8 secs).
2. The confirmatory segment episodes characterized by a brand being picked up quickly whilst visually scanning competitive brands on the shelf. the time taken to select a brand was brief although longer than 'habitual' purchasing (average time = 14.9 secs compared to 6.8 secs).
3. The verification segment contains behavioral episodes characterized by a branded item being picked up. The time taken to choose the brands in this segment was longer than both the previous two (average time=24.1 sec). Although only one brand was actually picked up in the physical comparison, there was definitely greater visual judgment compared to that seen in the previous segment - especially when one or more products appeared to be of a similar nature. Whereas in prior segments, behavior appeared to confirmatory, this groups' action appeared to reveal less confidence in the final choice. This was reflected by the increased time to make the choice, and even when a brand was selected. The key emotional indicator is the total amount of time spent and the fact that even though a choice was made relatively quickly, considerable time was spent reviewing the shelf.

4. The hesitating segment behavior included shoppers picking up a product and examining it closely. This often included reading the label, checking the price visually, and then picking up one or more similar products for closer comparison. This segment displayed the longest time to compare the different product options (an average of 48.5 secs).

This behavior reveals a substantial degree of uncertainty (or hesitation) on their part, often because they didn't appear to have enough information or experience to make a quick decision. "Hesitation" decision behavior is unique to this segment because the product searching tends to be for specific brands that the informants feel strongly about and are unable to locate it at the time of shop. This results in more negative emotions being displayed as shoppers are then forced to make a decision to buy an inferior brand (in their eyes) or go without.

Therefore, they need someone to help them make decision and the best candidate should be a sales clerk.

If we set a unit as 20 secs (two units as 40s), we can filter the customers in habitual and confirmatory segments, also customers do not want to buy. These units can help us detect the customers in hesitation and give the sales clerk time to react.

In other words, the duration factor could be a very important element for detecting customers' hesitation.

2.4. Humanic Clues, Approaching and Greeting Customers

Leonard Berry, Eileen Wall, and Lewis Carbone ²² introduced that because customers' assessment of services is based on performance rather than objects, they rely on the numerous clues that are embedded in performance when choosing services and evaluating service experience. It is often the small clues that influence a customer's overall perception of an experience. What is an experience clue? It

is anything in the service experience the customer perceives by its presence or absence. If the customer can see, hear, taste, or smell it, it is a clue. Haeckel²³ said that clues generally fall into three main categories: functional clues, mechanic clues, and humanic clues. Customers form perceptions based on the technical performance of the service (functional clues), the tangibles associated with the service (mechanic clues), and the behavior and appearance of service providers (humanic clues). Three clues play different roles in creating the customer's service experience.

As *Clue Influences on Customer Perceptions* (Figure 2.4)²⁴ shows, functional clues primarily influence customers' cognitive or calculative perceptions of service quality. Mechanic and humanic clues primarily influence customers' emotional or affective perception. Functional clues support the core of any service because they address the problem that brings the customer to the market. As important as strong functional clues are to competing effectively, they alone are insufficient because functionality usually does not exceed customers' service expectations. Humanic clues pack much more emotional punch in differentiating one company's service from another's.

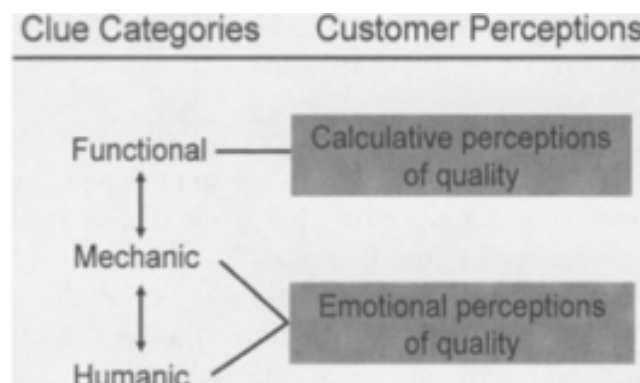


Figure 2.4: *Clue Influences on Customer Perceptions*

Humanic clues created by employees are most salient for labor-intensive interactive services. The more important, personal, and enduring the customer-provider interaction, the more pronounced and emotional humanic effects are likely to be.

Humanic interaction in the service experience offers the chance to cultivate emotional connectivity that extend respect and esteem to customers and, in so doing, exceed their expectations, strengthen their trust, and deepen their loyalty. Keaveney ²⁵, Mohr and Bitner ²⁶ elaborated that customers perception of employee effort in delivering a service has an especially strong impact on service satisfaction and loyalty. Berry said that exceeding customers' expectations by definition, requires the element of pleasant surprise and the best opportunity for surprising customers is when service providers and customers interact. Human interaction affords the best opportunity to demonstrate to customers a commitment to serving. The clues that people emit have greater impact on how customers feel about themselves and therefore have a definitive impact on how they feel about an experience.

Leonard Berry, Elieen Wall, and Lewis Carbone said approaching and greeting customers are the start of humanic clues. The employee physically moves forward to greet the customer rather than waiting for the customer to arrive. This action creates a sense of meeting the customer "half way", helping the customer feel more important, more engaged, and central to the experience. How you approach and greet a customer lays the foundation for building a relationship that leads to results that are mutually beneficial. It is important to start off on the right foot from the moment a customer steps into your store. The idea is to make a customer feel welcome and comfortable, just as you would make someone feel welcome and comfortable in your own home. Don't pounce on the customer when they first walk in. Wait for them to take a few steps into the store before you offer to help them. If they do not know what is in the store, how will they know what they are looking for. Smile when you greet people. One of the key mistakes that sales associates make is asking "What can I help you with today?". Asking an open ended question such as this allows the customer to push you away. A better way to approach a customer would be to take note of certain items they are picking out and make a comment such as "I've noticed you're picking out dresses,

what occasion are you shopping for?”. A question like this demonstrates that you acknowledge what they are shopping for and allows you to connect.



Figure 2.5: *Approaching and Greeting Customers*

“Cue” is designed to support the humanic clues of retail stores, by creating the approaching and greeting customers and the right timing, such as customers are hesitating in choosing products and really in need. With the message from “Cue”, the sales clerks could make a comment such as *Hi, I see you're looking at...* (Figure 2.5)²⁷ instead of the open ended question “ How can I help you? ”. Because sales clerks are trying to help the customers, this will make them feel more being respected and important, which can influence customers’ service quality perception, exceed their expectations.

2.5. Sensor Network of Detecting Customers' Behaviors

Recently, a lot of computer vision researchers have witnessed a surge of interest in human action analysis through videos. Researchers have built several public action data sets (for example, the work of A.Efros²⁸), which provide good test beds for evaluation. Although these camera detection are become very popular, there exists a consider gap between these staged samples and real world scenarios. The majority of the action data sets are collected in well-controlled environment, while the real world actions often happen in much more complex sciences. In most current human data sets, the human actions are generally recorded with clean backgrounds. Y.Hu²⁹ took actions of reaching, pointing, squatting, and bending to merchandise on shelf. However, for a customer who is really hesitating in choosing goods, the duration time is essential factor. It takes a long time for them considering, at least for 30 seconds. A lot of them took several minutes. Besides, statistics and data mining tools can be used to extract from data flows new information and knowledge to enhance management strategies, but Driss Hakimi³⁰ believes that the greatest contribution will result from the improvement of the real time store management and decision making. In general, an *intervention process* (Figure 2.6)³¹ follows four main dependent steps: event, detection, decision and reaction. Faster intervention after an event occurrence can be achieved by three means. First, detect events the earliest as possible. Second, decrease the durations between detection and decision. Third, decrease the time between decision and reaction.

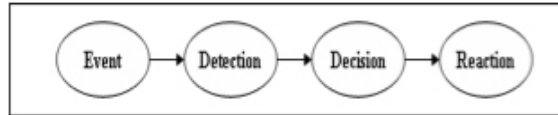


Figure 2.6: *Reactive intervention process*

“Cue” is designed to use motion sensors to detect the essential factor of customers’ hesitation. Also, It is very important for not just detecting the customers’ behavior, but to telling the sales clerks to make decision and reaction as soon as possible. For a sales clerk in a big retail store, he is very busy. “Cue” can be a way to improve the clerk’s working style.

2.6. Positioning of this Research

In the sales management area, “Cue” can help the store save the salesforce size and the labor costs. To assist sales management, “Cue” can also help the sales clerk find a new way to work smarter, which means working more efficiently and matching available offerings to more customers needs. “Cue” is applied to the unexplored field that not only solves the problem of sales clerks in big retail stores who cannot take care of every customer without improving his working efficiency, especially those customers who are hesitating in choosing products and need advice from sales clerks to help them make their decisions. “Cue” detects the time and tells the sales clerks, which bridges two most important factors-time and communication. The hesitating segment behaviors start when customers pick up and examine a product, which are frequently recognized when customers are reading the label, checking the price, and then selecting one or more similar products for closer comparison. This segment displayed the longest time to compare the alternative products (an average of 48.5 secs). This behavior shows a substantial degree of uncertainty (or hesitation) on their part, which is often because customers appear not to have enough information or experience to make a quick decision. Hesitation decision behavior is unique to this segment because normally the informants intentionally will search for the product of certain brands and are unable to quickly locate it in the shop. Negative emotions emerged under such circumstances which led shoppers to compromise and buy inferior alternatives or even not to consume. Therefore, they need someone to help them in time, and nor-

mally the sales clerk would be the best candidates. If we set a unit as 20 secs (two units as 40s), we can filter the customers in habitual and confirmatory segments, also customers who do not want to buy. These units can help us detect those customers who are in hesitation and give sales clerks time to react. “Cue” is expected to timely establish the communication between a busy but enthusiastic sales clerk and those hesitating customers. According to fieldwork results, the desire of sales clerks and that of the customers can not be satisfied simultaneously, thus sales chances are lost. I am dedicating on making a sales-assistance key holder for sales clerks, with which they can be aware of those hesitating customers. With the message from “Cue”, the sales clerks could start with suggestions such as “I saw you’re looking at...” rather than “How can I help you?”. Because sales clerks are responsible to know more what the customers need, this ice-breaking greetings will make them feel more acceptable, which can improve customers’ service quality, exceed their expectations. With “Cue”, sales clerks can work more efficiently, he can focus on the main sales area, and arrive at the blind spots timely. Customers will be more comfortable when sales clerks are able to know what they want, and offering timely help in need. This is not only solves the problem of scheduling a suitable communication time, but also creates a new customer-friendly interaction experience.

Notes

- 1 Moyer, MS (1972)“ Management Science in Retailing, ” in *The Journal of Marketing*, pp. 3–9
- 2 Stokes, C.J. and P. Mintz (1965)“ How Many Clerks on a Floor? ” in *Journal of Marketing Research*, pp. 388–393
- 3 Horgan, C. (1968)“ A Systems Approach to Manpower Planning in Department Stores ” in *Journal of Retailing*, pp. 13–30
- 4 Pfeffer, J. (1995)“ Producing sustainable competitive advantage through the effective management of people., ” in *The Academy of Management Executive* 9, pp. 55–69
- 5 Weitz, B.A. and K.D. Bradford (1999)“ Personal selling and sales management: a relationship marketing perspective, ” in *Journal of the academy of Marketing Science* 27, pp.

- 6 Saxe, R. and B.A. Weitz (1982)“ The SOCO scale: a measure of the customer orientation of salespeople, ” in *Journal of marketing research*, pp. 343–351
- 7 Spiro, R.L. and B.A. Weitz (1990)“ Adaptive selling: Conceptualization, measurement, and nomological validity, ” in *Journal of Marketing Research*, pp. 61–69
- 8 SSujan, H., B.A. Weitz, and N. Kumar (1994)“ Learning orientation, working smart, and effective selling, ” in *The Journal of Marketing*, pp. 39–52
- 9 Want, R. (2004)“ RFID: A key to automating everything, ” in *Scientific American* 10, pp. 56–65
- 10 Borriello, G. (2005)“ RFID: Tagging the world, ” in *Communications of the ACM* 48, pp. 34–7
- 11 Kundu, M., J. Migdal, and M. Farrow (2012)“ Bridging security and good design: Understanding perceptions of expert and novice shoplifters, ”December 20. US Patent 20,120,320,214.
- 12 Carmel-Gilfilen, C. (2012)“ RFID: A key to automating everything, ” in *Security Journal*.
- 13 *Smart CCTV knows when you need shopping advice.*
- 14 Philip Kotler. (1973)“ Atmosphere as a Marketing Tool. ” in *Journal of Retailing* 49, pp. 48–64
- 15 Mehrabian, Albert, and Russell, James. (1974)“ An Approach to Environmental Psychology. ” in *MIT Press, Cambridge, MA.*
- 16 Bitner, Mary Jo. (1992)“ Service scapes: The Impact of Physical Surroundings on Employee Responses. ” in *Journal of Marketing*, 56, pp. 57–71
- 17 Donovan, Robert J., and Rossiter, John R. (1982)“ Store Atmosphere: An Environmental Psychology Approach. ” in *Journal of Retailing* 58, pp. 34–57
- 18 *PAD framework* is a framework integrating store environment factors, nonverbal responses, and shopping behaviors.
- 19 Yalch, R., and Spangenberg, E.. (2000)“ The effects of music in a retail setting on real and perceived shopping times. ” in *Journal of business Research*, 2963
- 20 Hansen, F. (1972)“ Consumer choice behavior: A cognitive theory, ” in *Free Press New York, NY*, Vol. 10.
- 21 Daniela, S., F. Lynne, and Y. Louise (2008) “ Why happy shoppers don’t stop and think, ” in *ANZMAC*
- 22 Leonard, L, Berry, Eileen, A., Wall, and Lewis, P., Carbone. (2006)“ Service Clues and Customer Assessment of the Service Experience: Lessons from Marketing. ” in *Academy of Management Perspectives*, Vol. 20, No. 2, pp. 43–57
- 23 Haeckel, S.H., Carbone, L.P., and Berry, L.L. (2003)“ How to lead the customer experience. ” in *Marketing Management* 12(1), pp. 18–23
- 24 *Clue Influences on Customer Perceptions*

- 25 Keaveney, S.M. (1995)“ Customer switching behavior in service industries: An exploratory study. ” in *Journal of Marketing* 59(2), pp. 71–82
- 26 Mohr, L.A., and Bitner, M.J. (1995)“ The role of employee effort in satisfaction with service transactions. ” in *Journal of Business Research* 32, pp. 239–52
- 27 *Approaching and Greeting Customers*
- 28 Efros, A.A., A.C. Berg, G. Mori, and J. Malik (2003) “ Recognizing action at a distance ” in *Computer Vision, 2003. Proceedings. Ninth IEEE International Conference*, pp. 726–733, IEEE.
- 29 EHu, Y., L. Cao, F. Lv, S. Yan, Y. Gong, and T.S. Huang (2009) “ Action detection in complex scenes with spatial and temporal ambiguities, ” in *Computer Vision, 2009 IEEE 12th International Conference*, pp. 128–135, IEEE.
- 30 Hakimi, D., B. Montreuil, and A. Ruiz (2008) “ Impacts of RFID Deployment on Real Time Management of Retail Stores, ” in *Proceedings of the 17th World Congress The International Federation of Automatic Control Seoul, Korea*
- 31 *Reactive intervention process*

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3. Design

3.1. Concept Overview

“*Cue*” (Figure 3.1)¹, a key holder for sales-assistance in large retail stores; designed to detect whether customers are hesitating to buy products and tell the sales clerks the cue of approaching and helping.

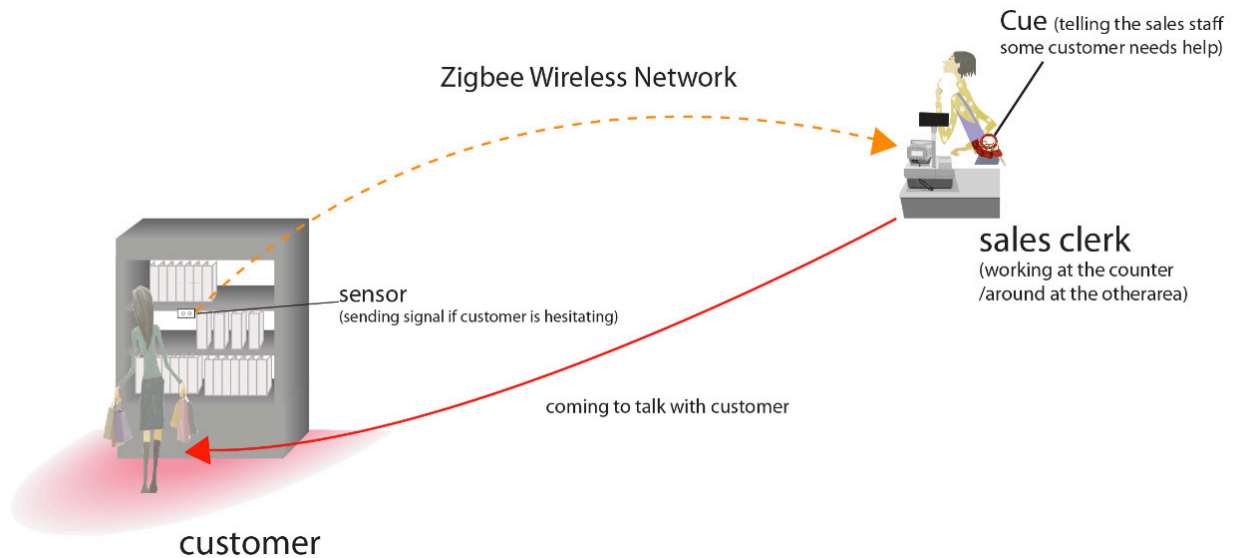


Figure 3.1: *The concept of “Cue”*

In the sales management area, “Cue” can help the store save the salesforce size and the labor costs. To assist sales management, “Cue” can also help the sales clerk find a new way to work smarter, which means working more efficiently and matching available offerings to more customers needs. “Cue” aims to help the sales clerks grasp information of customers’ hesitating about consuming products.

In large retail stores with lots of customers, sales staff are very busy, especially on weekend or holidays. They can not take care of every area and concern about every customer. Even though they may have chance to collaborating with other sales clerk, there are always some blind spots which they can not reach. On the other hand, when customers are hesitating about purchasing products. They will be most happy when the retail assistant is able to understand his needs without him saying it, and providing timely help when needed. Also the sales clerks would be curious about what are customers struggling with and most happy to help someone in need or in trouble. As what I talked about in Chapter 2, humanic clues created by sales clerks are most salient for labor-intensive interactive services. The more important, personal, and enduring the customer-provider interaction, the more pronounced and emotional humanic effects are likely to be. Humanic interaction in the service experience offers the chance to cultivate emotional connectivity that extend respect and esteem to customers and, in so doing, exceed their expectations, strengthen their trust, and deepen their loyalty.

In order to fulfill this idea, “Cue” needs to cooperate with sensors setting up at shelves. Sensors detect customers’ behaviors when they pass by or approach the product shelf. Then, to judge whether customers are hesitating in buying products or indecision, sensors will count the time of a customer staying at the products. And confirming his/her hesitation, sensors will send signals to “Cue”, which is hung up on the clerk’ neck with his staff card. “Cue” will cue and tell the sales clerks to help the customer.

“Cue” can help the sales clerks know customers’ need, approach and greet customers to increase retailers’ profits. Customers stroll around in the store, when being hesitated about choosing the products, they will accept and enjoy the service from the sales clerks at the right timing, relay on the sales clerks to describe and explain the items in the store. There are 2 important aspects to this concept, which includes effectiveness-the sensation of customers states and meeting their needs, efficiency-making the best of limited resource of time of sales clerks.

Focusing on the cue of approaching and greeting customers, to meet the need of customers and increase the efficiency of sales clerks, the concept is designed to provide four steps to achieve the goal: Detection, Transmission, Vibration and Approaching.

1. Detection: Sensors detect whether customers struggling on products by detecting the duration of customers' being before the shelf.
2. Transmission: After being sure about customers' curious on products, sensors send signal to the key holder of sales clerk through ZigBee wireless network.
3. Vibration: After receiving signal from sensors, the key holder tells sales clerk that it is the time to approach and greet customer and where the customers are right now.
4. Approaching: The sales clerk gets the signal from the key holder, and approach and greet the customer.

Context and Target Users

"Cue" is targeted at clerks of big retail stores, who is good at communicating with customers, introducing the products information or sharing his own hobbies. His goal is to get fun from his work. The most happy thing for him while working is to help customers in need or in trouble. He is curious about what they struggling with and gives his advise on the size, color, design and coordinate. However, just because he is working at a big retail store, he is very busy, especially on weekend or holidays. He has to cover several areas and can not everywhere, greet every customer. Some customers walk out of the stores just because he could not serve them in time. To solve this problem, he has tried a lot. He pay mostly attention on the popular areas, and check the areas not that popular 10 minutes a time. However, mostly when he arriving there, the potential customers have already gone and he has to get back to the popular area. He thinks his woking style is not efficient.

On the other hand, the main customers of his store, are ladies from 30 to 50 years old. They are housewives with a lot of spare time. Most of them are aimless, want happy shopping experience and could be easily attracted by something interesting, also to talk with clerks for grasping information about products, such as the color, size or how to maintain them. Thus, the clerks puts the sensor near the products, especially within those unpopular areas. It can assist selling by detecting whether they have been hesitating in products and telling the sales clerks the cue of approaching and greeting customers.

3.2. Process of Design

Dourish and Bell ² introduced the importance of grasping the potential needs of people by ethnographic survey in order to design ubiquitous computing devices to support the daily life. “Cue” is exactly designed through the process which consists of ethnographic survey, hardware and software sketching, and prototyping experiments.

Vision

I want to design a key holder which can detect whether customers are hesitating about choosing products and tell the sales clerks the cue of approaching and helping customers. By putting the sensors near the products, the clerks can work more actively and make more communication changes with customers. This vision can make a new approach for sales clerks, which is more effective for meeting customers’ needs and more efficient for making the best of limited resource of time of sales clerks.

In order to find out how to determine whether they have interests or hesitating in products, and how to approach, greet and communicate with them, I conducted surveys in an outdoor products store and a sports products store. I focused on the sales clerks who are good at communicating with customers.

Ethnographic Surveys

Namche Bazar

In order to realize how the sales clerks makes and keeps the mechanic clues of the store, and communicates with customers as the humanic clues, I went to *Namche Bazar* (Figure 3.2)³, an outdoor products store on Heart Avenue of iiasTsukuba, on Sep. 9th, 2012. This store is about 20m* 10m, sells all kinds of outdoor products for mountain climbing, hiking, camping and walking, provides an outdoor life style with the brand like North Face and Patagonia. There are four clerks there: Mr.H (manager), Mr.K, Mr.T and Ms.K.



Figure 3.2: *Namche Bazar*, an outdoor store in iiasTsukuba.

I was very lucky to have *Mr.K* (Figure 3.3)⁴ as my fieldwork master. Mr.K is 27-year-old, living in in Joso City which is also his hometown. He likes climbing mountains very much and cooks a lot when he is outdoor. He also likes music, did a DJ job several years ago and still controls the BGM of the store right now. And he is very fashionable because his major in college was fashion business.

The fieldwork started from about 14:00, when customers here were few. I guess maybe it was how it's liked on weekdays. Mr.K was standing before the shopping shelf near the fitting rooms, folding up the clothes touched by the customer a moment ago. After that, Mr.K entered the counter, opened a closet, where the stereo equipments are set up. The BGM of this store can be controlled here by selecting music from a IPOD. Mr.K changed the BGM from light music to fast Rap for attracting more customers.



Figure 3.3: *Mr.K*, the sales clerks of Namche Bazar

A lady about 50-year-old (As I checked with Mr.K, this customer was a regular one, Let's name her *Customer A* (Figure 3.4)⁵) entered the store from the right side, carrying two bags of food. Maybe she just finished shopping in the supermarket called Kasumi, also located in iiasTsukuba, and came to this store without purpose.

After meeting Mr.K, she said “ Good afternoon ” first and Mr.K returned a salute with a smile quickly, stopped what he was working on, began to follow customer A to an exhibition table with new autumn products on the left side of this store. Mr.K said they have lots of new products and introduced a *red-black plaid jacket* (Figure 3.5)⁶ to her. The conversation was “Cue”d by this and they began to talk about the color, material, size and warmth of this jacket. Customer A was a little worried about the size because there was only M size but she was not sure whether could fit it wearing a shirt inside. Mr.K suggested her trying it on. After that, they were talking before the mirror. Mr.K thought the jacket suited her and said there was a 10 per cent sales. After checking the information of the brand, customer A paid 5,950 yen and left.

14:20 Mr.K went to right side of the store, put the stuff on *the North Face exhibition table* (Figure 3.6)⁷ in order. There are products like clothes, shoes,



Figure 3.4: *Customer A*



Figure 3.5: *the red-black plaid jacket Customer A bought*

cups and pans, maps of Oze, and a small poster with the words “ Let’s start from hills. There are lots of hills around here. It is good for your health. Please feel free to ask the sales clerks if you have any questions about the products. ” I believe customers like outdoor lifestyle would stop at this table a lot.



Figure 3.6: *he North Face exhibition table in Nacho Bazar*

There was also a *signage* (Figure 3.7)⁸ on the right wall out of the store. Tour photos of customers and clerks climbing Fuji together were being played as contents. Some time customers stop and watch these. By the side of signage, there were notices about red leaves tours and pamphlets about the products information.



Figure 3.7: *the signage of Namche Bazar*

14:30 A lady about 45-year-old (*Customer A* (Figure 3.8)⁹) stopped at the front of signage, watched the tour notice, entered the store and went the shelf in deep.

On the side of this shelf, there was a *POP* (Figure 3.9)¹⁰ made by Mr.K, which was his own tour diary with interesting photos and texture about outdoor cooking and his feelings. After watching this, customer moved her eyes onto a black-purple North Face jacket, touched it and called out to Mr.K. “ Excuse me, do you have S size of this jacket? ” Mr. K said yes and began to introduced her about the jacket. They talked about the waterproofing, longevity and maintenance of this product. Actually this lady was a shopping follower, came to this store without purpose when her friend was shopping at another shop. She borrowed her friend iias member card while purchasing the jacket.



Figure 3.8: *Customer B*

14:50 A family of Dad, Mom and a baby came to this store. While Mom selecting bags, Dad was attracted by a *POP* (Figure 3.10)¹¹ with “ Drinking water is good for your health. Drink water when... ” on it. While waiting his wife and taking care of the baby, he was driven interested in cups near the *POP*. However, they did not buy any products in the end. But the *POP* lengthened the time they spent and gave Dad things to do.



Figure 3.9: the POP made by Mr.K



Figure 3.10: the POP on cup shelf

15:57 Fieldwork ended.

Adidas in Jiyugaoka

In order to find out how the sales clerks detect customers' behavior and make decisions to approach and greet them, I went to *Adidas Jiyugaoka* (Figure 3.11)¹², a sports products store in Tokyo, on Nov. 8th, 2012. This store sells the Originals, Men's and Women's sports products. There are three clerks there: Mr.A (manager), Ms.F and Ms.S.



Figure 3.11: *Adidas in Jiyugaoka, Tokyo*

I was very lucky to have *Ms.F* (Figure 3.3)¹³ as my fieldwork master. She is 22-year-old, a very beautiful, fashionable and charming girl, who is very good at sharing her own experience and knowledge about products. When the new products arrive, she always be the first one learning them. What moved me most was her smile face and sincere attitude. I guess every customer likes her. *Ms.F* let me observe how she watch customers' behavior.

The fieldwork started from 11:51. Customers were few because it was Thursday. *Ms.F* were standing at the front area of the store, where she is in charge.

12:03 A young guy about 22-year-old entered the store. Probably he is a college student. After him getting in, *Ms.F* said "Welcome. Please feel free and help yourself." as the first approach. She told me afterward that this is the basic



Figure 3.12: *Ms.F*, the sales clerks of Adidas Jiyugaoka

greeting she has to say to every customer within 10 seconds after they entering the store. Yes, no matter who he/she is, how does he/she looks, it is the rule for nearly every retail store. The young guy just walked around, and stopped before a shelf of Original's jackets for about 10 seconds. He had touched the jacket quickly to feel the material, took a look at several ones to check the design and color. Then he went on into the inner part of the store, where the shoes are. After taking a round of this store, he returned to the jacket shelf. This time, he picked one up, and checked the price tag. Ms.F decided to take the second approach. She got closer to him, but not that close because it will put pressure onto customers and they will leave. Ms.F said "You can try it on if you like it." with a smile as the second approach, and watched his reaction and stood by. This guy was very shy and did not want to talk that much. He returned a smile and kept on looking at the jacket. After a few minutes, he left the store and Ms.F said "Thank you!"

"Yes, actually there are a few customers who do want to talk. However, you can not give the greeting chances up because there are also customers who will

turn angry and bad if you do not approach and greet them in time. ” said from Ms.F.

12:15 A lady about 30-year-old got into the store, wearing adidas products. Ms.F welcome her, watched and stood by. The customer walked slowly and came to a shelf with women’s running trousers for over 30 seconds. I guess she was there with goals because she went to the shelf directly. Here are her behaviors, watching the products for a long while(longer than 30 seconds) for design and color , touching them for checking material, picking them up and trying them before her legs for size. While Ms.F was just about to approach and greet her, the customer looked at her and asked “Do you have any other colors of this pair?” Yes, she was hesitating and wanted to see other collars to make her decision. Then Ms.F found some other for her and showed her to the fitting room.

12:30 Fieldwork ended.

Design Points

Although Mr.Kikuchi is good at communicating with customers, there was only him working through the fieldwork. In this situation, he has to watch and pay attention to customers in more than one areas. His working style is to pay most attention to popular area and check the unpopular area every few minutes. Basically, he was not so active to greet customers.

On the other hand, the main customers of this store are ladies from 40 to 50 years old. They want to know about the information of the products and talk with clerks about it. However. without seeing any clerks around, some of them give it up and walk out of the store.

Therefore, sometimes the hesitating customers can not get helped and shopping chances run off. So I want to find a way to help sales clerks pay attention to customers in unpopular area, which can both make the best of limited resource of time and meet customers’ needs.

From the fieldwork in Adidas Jiyugaoka, we can found that there are several timings for clerks approaching and greeting customers when they find that customers are being struggling with choosing products:

1. Customers standing before the products for a long while;
2. Customers watching more that two products, taking a long time to make a decision among them;
3. Customers leave the products shelf and return. After being back, spending more time to make a decision;

The main factor to judge hesitating customers is customers ' duration before the products.

After the fieldwork, I concluded that "the duration of customers " as the most elements that detects the hesitation and indecision. As the Customer B in Namche Bazar and the lady in Adidas Jiyugaoka, they both showed a long period time hesitating about choosing products.

On the other hand, the sales clerk longs for the cue to help the customers to make decision. Thus, a device to instruct sales clerks the time to help is highly needed. Additionally, the device should be carried on with the clerks rather than installing at the counter, and it is important that it cannot bother customers.

I will focus on the " duration of customers ", an output device to sales clerks to instruct the time to show up.

Ideation

After investigating the needs of customers and sales clerk, I decided to focus on the "duration of customers", an output device to sales clerks for telling them the time to help.

The Idea of Key Holder

In order to get the signal from the sensor box, a actuator for sales clerk is needed. My teammates and me did a lot of ideation. First we thought about *a LED speaker*(Figure 3.13)¹⁴ being putting on the counter table for sales clerk, with which he can get the signal by seeing the light or hearing a sound effect of wind bell. I supposed that even the sales clerk is not at the counter, he could hear the sound. However, loud sound effect and bright light is needed for cuing him and it would bother the customers near the counter. Therefore I gave this idea up.

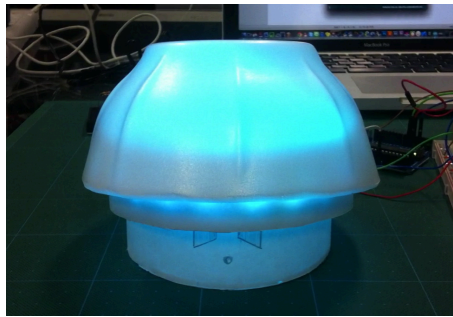


Figure 3.13: *The rough prototype of LED speaker idea*

After this experience, I realized that the key point for this actuator should be portable and output only for sales clerks, which means it should not be nosed out by customers. Imaging how a sales clerk working, Mr.M came out a idea of key holder, which could be buckled at the ring of his/her *staff card on neck* (Figure 3.14)¹⁵. Thus, he can work around and get the signal at any time and any where.

In order to design the output for sales clerks and not bother the customers, I consider the relatively quite output for sales clerk. The idea of vibration and LED light came out. Also, for not being pushing pressure to sales clerk, a buffer step for clerk is necessary.



Figure 3.14: *The idea of key holder, coming from the staff card*

3.3. Design

After the ideation, I decided to set a sensor box at products shelf to detect a customer's duration to judge whether he/she is hesitating in products. On the other hand, a key holder buckled on the ring of clerk's staff card receives the information from sensor box and tell the clerk the cue of approaching and helping the customer.

Thus, "Cue" is a key holder for sales-assistance in large retail stores; designed to detect whether customers are hesitating to buy products and tell the sales clerks the cue of approaching and helping them. "Cue" works with sensors which the sales clerks set up together with the products at the shelves they can hardly take care then they are busy. Sensors detect customers' behavior since their passing by and getting close to product shelf. Then, to judge whether customers are hesitating about choosing products or indecision, sensors will count the time period customers being before the products. After detecting the hesitation and indecision of the customers, sensors will send signals to "Cue", which is being hung up on the clerk's neck with his staff card. "Cue" will cue the sales clerk to approach and greet customers.

Here is the framework as shown in Figure 3.15,

- ①. The sensor box is installed under the product shelf and switched on in a

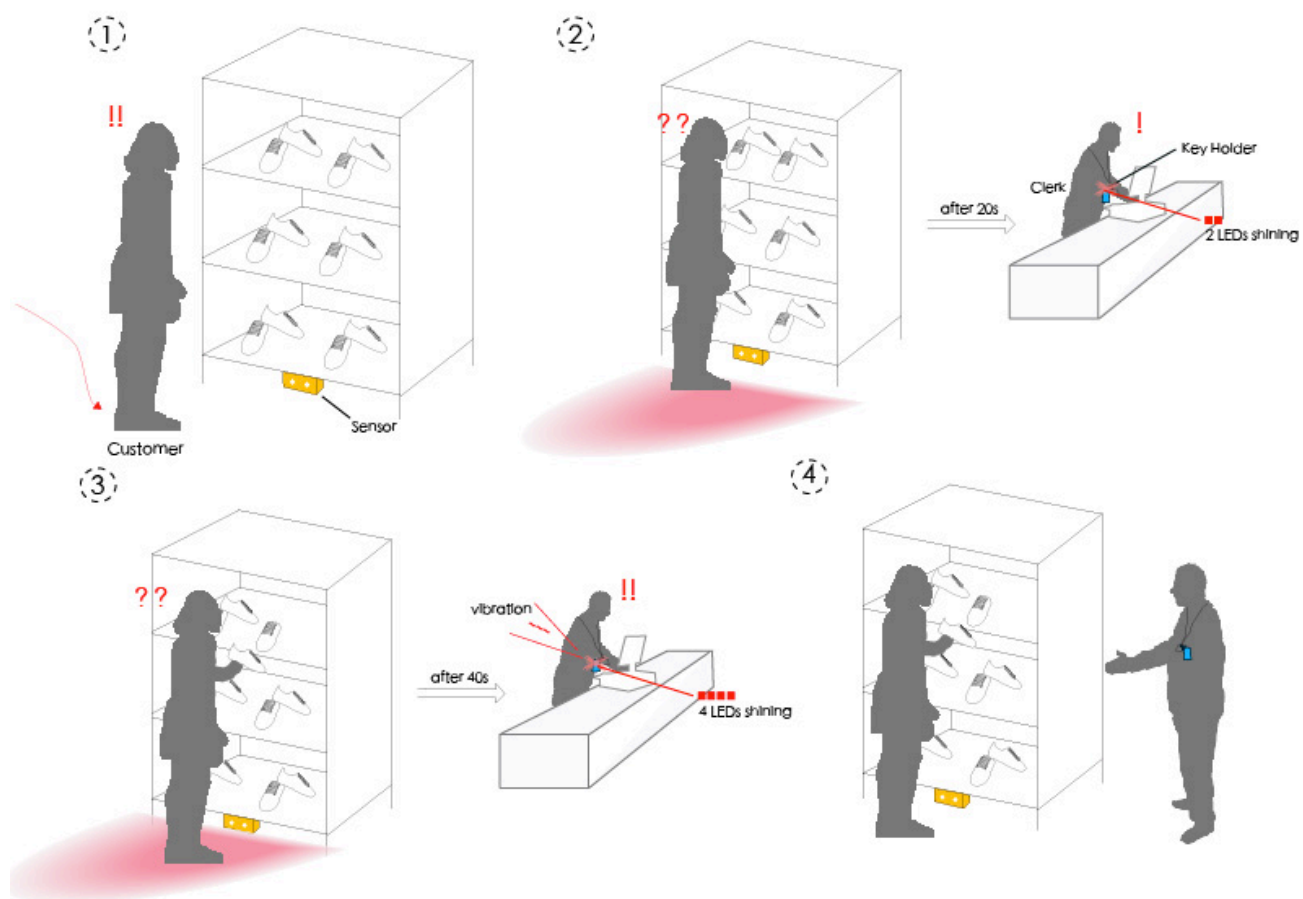


Figure 3.15: The framework of “Cue”

“waiting” status.

When a customer stopped by the shelf and is interested in the products. The sensor box will count his/her duration standing in front of the shelf.

②. Customer comes to the shelf, watches the products.

If his/her duration is over 20 seconds, the sensor box will send data A to the key holder.

Key holder will light up two LEDs to cue the sales clerk.

Sales clerk then will be informed by the two shining LEDs that there is a customer staying in front of the shelf for about 20 seconds.

He can keep waiting or get ready to approach the customer. It depends on his conditions.

(If customer leaves from the shelf within the first 20 seconds, the sensor will return to “waiting” status and send data C to the key holder. The key holder also returns to “waiting” status.)

③. If customer’s duration is over 40 seconds, sensor box will send data B to key holder.

Key holder will light up four LEDs and vibrates itself to cue the sales clerk.

Sales clerk will be informed that the customer has been staying over 40 seconds and should be recognized as the status of “hesitation”. Then it would be the time for the clerk to show up and help.

(If the customer leaves from the shelf within this period of time, the sensor will also return to “waiting” status and send data C to key holder. Key holder also returns to “waiting” status.)

④. The sales clerk switches off the key holder in order to pause the receiving message. Then he approaches, greets and serves the customer.

3.4. Implementation

“Cue” is a key holder working in *an interaction system* (Figure 3.16)¹⁶ with wireless communication. This interaction system is made up by sensor box and the key holder. The whole system is based on the open source hardware prototyping platform, Arduino.

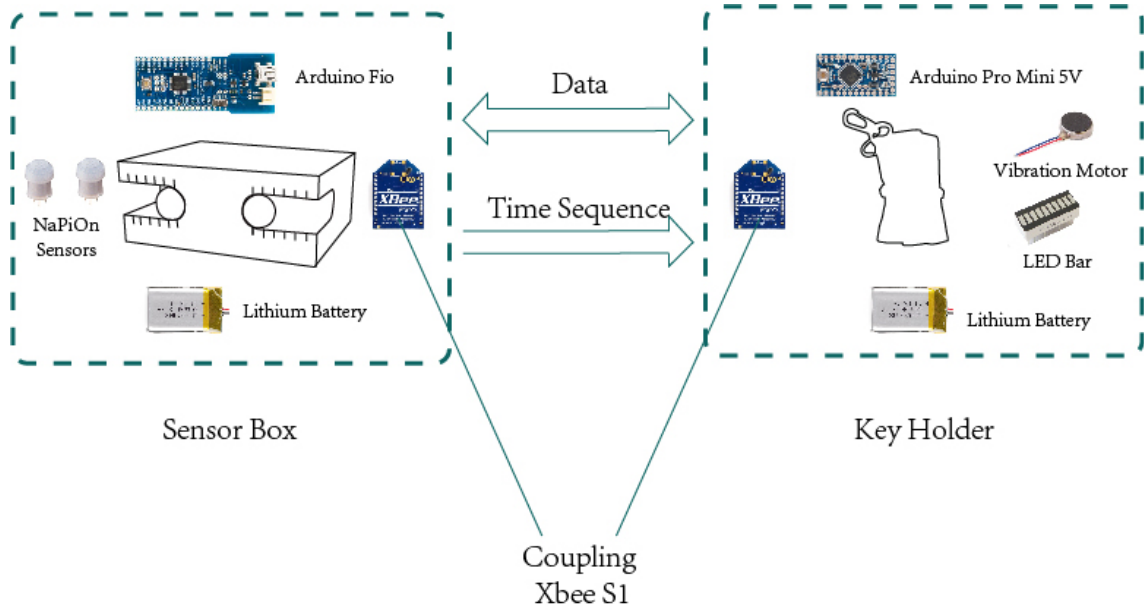


Figure 3.16: The system of “Cue”

Sensor Box

Customers Detection Prototype

In order to detect the customers’ movement such as passing by before the production shelf and getting close to the products, we decide to use *NaPiOn* (Figure 3.17)¹⁷ sensors, which are high-performance infrared human detection sensors made by Panasonic, containing the necessary functions in a small package. There are four kinds of NaPiOn, Standard type, Slight motion detection type, Spot type and 10m detection type. According to our context and situation, we decide to use

the Slight motion detection type. Its *detection area* (Figure 3.18)¹⁸ is like a cone one (about 2m height, and the angle of vertex is about 102 °).



Figure 3.17: *NaPiOn sensor*, slight motion detection type

In order to make sure exactly how far can it detect when we fix it on a horizontal axis, I made a *NaPiOn prototype 1* (Figure 3.19)¹⁹. First, I put the NaPiOn sensor into a hollow wood ball, fixed it on to two “L” stainless steel slices with two screws. The screws are actually an axis, with which we can change the angle of NaPiOn. Secondly, I fixed them onto a woodblock. Finally, I fixed the woodblock onto a board at 1000mm height, which is imaged as the height putting the sensor on the shelf or table of the store.

With this prototype, I made an *experiment* (Figure 3.20)²⁰ with Mr.M, who is also a member of iias Project. I let him stand right before the sensor to check how far can NaPiOn sensor detect. We put a ruler onto the floor and made marks with green tape. And we found that the sensor can detect until about 2.3m.

With the results from the experiment which is to make sure how far can NaPiOn sensor detect, next step was to consider how to use it to detect customers' duration. Basically, we can only one NaPiOn sensor to count one time per second. However, NaPiOn sensor is not that accurate to work well very second. So I decide to bring two more and let them do the same work together. Moreover, we

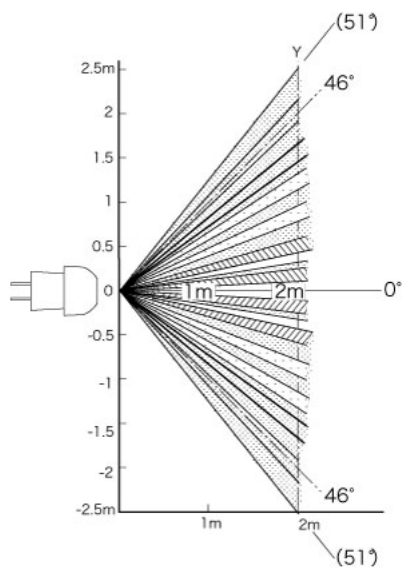


Figure 3.18: the detection area of NaPiON slight motion type

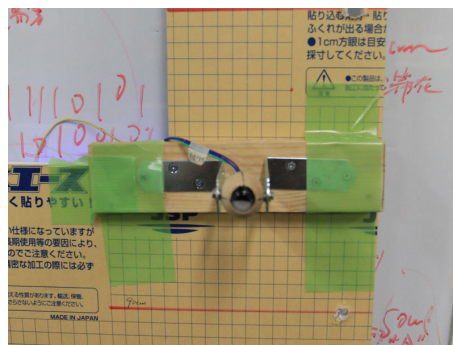


Figure 3.19: NaPiON prototype 1



Figure 3.20: *The experiment to make sure how far can NaPiOn sensor detect*

make another counting, which expresses none of them has detected customer one time. Also, I changed the counting frequency to improve the accuracy.

The next step is to make the sensor boxes, which are to set up on the shelves of real retail stores. I started from make a *hardware prototype* (Figure 3.21)²¹. Considering the size of the box and the wireless network, I decided to use Arduino Fio, a lithium battery, a Xbee module and three NaPiOn sensors.

Industrial Design of Sensor Box

After finishing the hardware prototype of sensor box, next work is to design the box.

The box has to

1. be easy to adjust the angle of sensors;
2. be small and with a low-key face;
3. be easy to be fixed on the shelves;

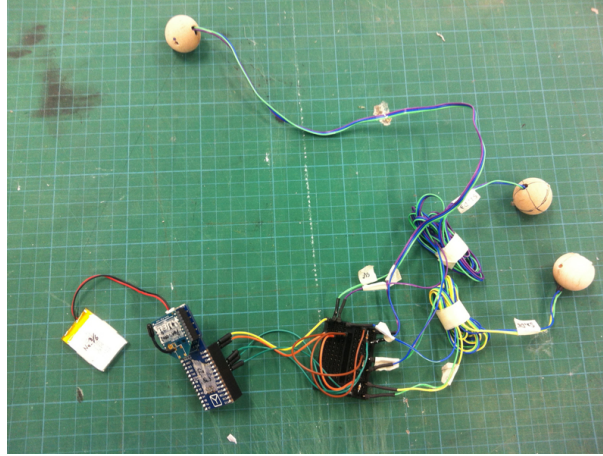
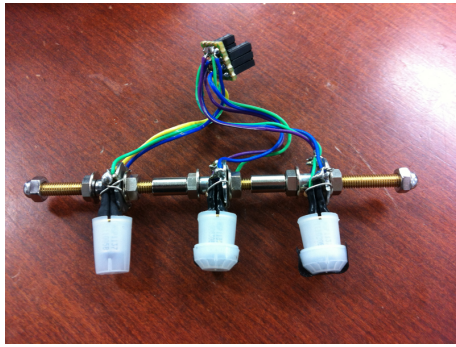
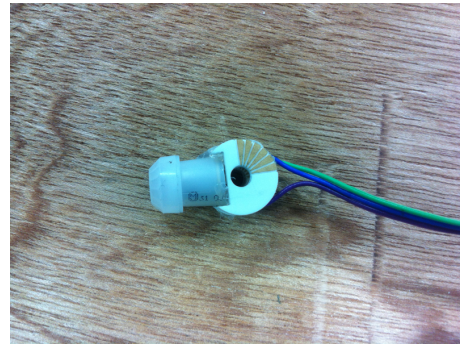


Figure 3.21: *The first hardware prototype of sensor box*

To make it be easy to adjust *the angle of sensors* (Figure 3.22)²², I made a *axis* (Figure 3.22(a))²³ with screws to change the angle firstly, and replaced the metal parts with *original acrylic acid resin or wood parts* (Figure 3.22(b))²⁴. as much as possible to lose its weight. We also have scale range on the parts to memory the angle of each one. The angle between two lines is 15 °. With this, we can change the angle of sensors' easily and accurately.



(a) The metal axis to adjust sensors' angle



(b) The original acrylic acid resin or wood parts

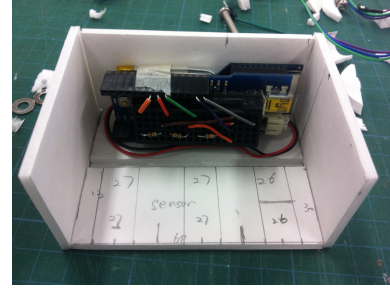
Figure 3.22: The axis to adjust sensors' angle

To make it be small and with a low-key face, firstly I made a *rough prototype with popcorn* (Figure 3.23)²⁵, to make sure the basic size and idea; then I made the

sketches (Figure 3.24)²⁶ and files for laser cutter, finished *a high-level prototype* (Figure 3.25)²⁷.



(a) The idea of changing the angle



(b) The idea of placing Arduino Fio



(c) The idea of NaPiOn orbits



(d) The idea of fixing

Figure 3.23: The rough prototype with popcorn

Considering the case which we can fix the sensor on the legs of table, or side of shelf, I also made *a vertical version*(Figure 3.26)²⁸ of this sensor box. Comparing to the horizontal version, the advantage is that it is more cryptic and difficult to be discovered by customers; its weakness is not that stable and well-balanced.

I brought a sensor box to a real retail store to check it whether fits, and found that it is still a little big for setting on the products shelves. So I decided to cut down one of NaPiOn sensors and make the left two sensors work harder-count five time per second instead of once. Therefore, I made *a small version*(Figure 3.27)²⁹, it also can be set horizontally or vertically. Moreover, I tried several colors and materials. As a result, white wood became my best choice.

To make it easy to be fixed on products,we have four kinds of methods:

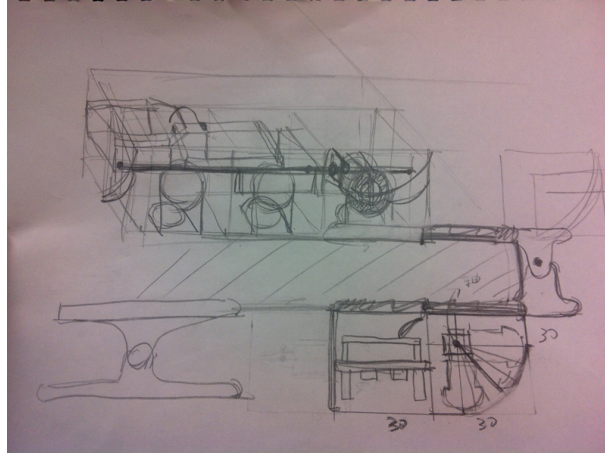
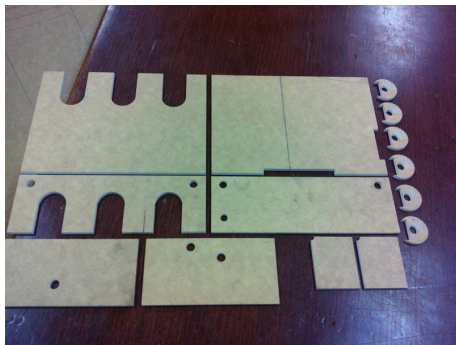


Figure 3.24: *The sketches of sensor box*

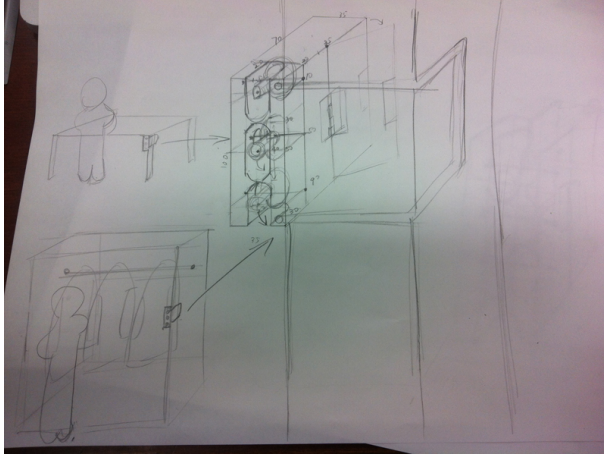


(a) The parts of sensor boxes made by laser cutter

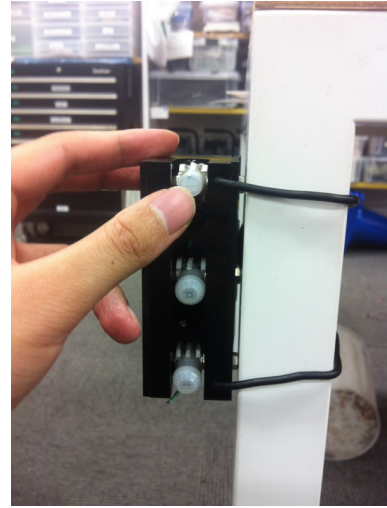


(b) The high-level prototype of sensor box

Figure 3.25: The high-level prototype of sensor box

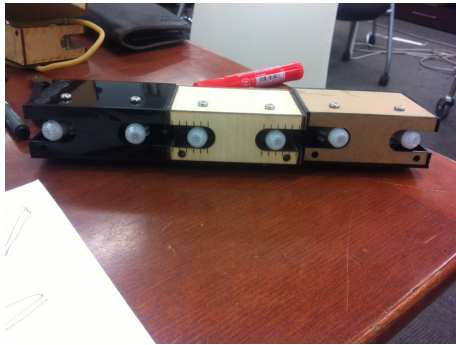


(a) The sketch of vertical version sensor box

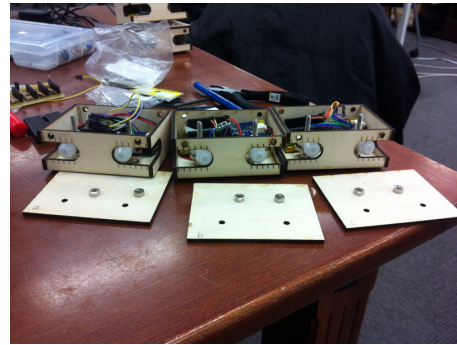


(b) The vertical version prototype on a leg of table

Figure 3.26: The vertical version of sensor box



(a) The small version with several colors and materials



(b) The small version prototype, white wood

Figure 3.27: The small version of sensor box

1. Use horizontal version and just put it under the shelf without any fixer;
 2. Use horizontal/vertical version and fix it with a wire called JIYUJIZAI, which is very flexible and easy to use;
 3. Use vertical version and fix it to the leg of tables with a rubber band ;
 4. Use horizontal/vertical version and fix it to the shelf with flexible clip;
- Fixing methods will be considered and decided concretely within the real retail store according to the very shelf to be fixed on.

Key Holder

The Hardware and Interaction of Key Holder

As a portable actuator, the key holder should be as small and light as possible. I choose the Arduino Pro Mini 5v as the platform for key holder. Considering using ZigBee wireless network, I use the xbee shield for Arduino Pro Mini, which is designed by Mr.Sugiura. And made *the basis of key holder hardware*(Figure 3.28)³⁰.

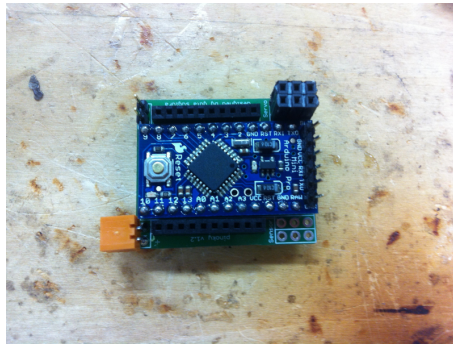


Figure 3.28: *The basis of key holder hardware*

In order to design the output for sales clerks and not bother the customers, we consider the relatively quite output for sales clerk. I choose *the vibration motor*(Figure 3.29)³¹, like the ones in our mobile phone. It is in our daily life and we have got used to it. Besides, after we made the prototype and hang it

on our neck, we feel the vibration from the cord of the card rather than from the hardware itself, which is a little down of clerk's chest. I tried a lot of ways of vibrations, and vibration three times with a interval of one second. The power is strong first, which is to alarm, turn weaker for confirmation on the second time and turn stronger in the end for cuing in case.

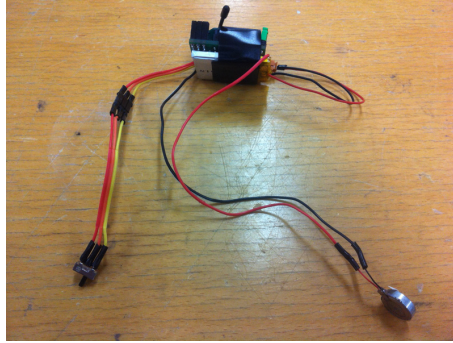


Figure 3.29: *The hardware with vibration motor*

However, if we keeping pushing vibrations to a sales clerk, it will give him a kind of pressure and unpleasure. Besides, there is also a kind of possibility that he is serving other customers. Also, after coming to serve the customer, there is also no need for the vibration any more. So I consider giving sales clerk a chance of ignoring the vibrations. Firstly, there is a switch of key holder. Clerk could cut it off when he is serving other customers or serving this customer in need.

Another way is adding another output method and cooperate with vibration. A *LED bar*(Figure 3.30)³² is embedded in the key holder, corresponding with duration of customer. When a customer's duration is over 20 seconds, LED1 and LED2 will be turned on, corresponding with 20 seconds duration. When the customer was standing there over 40 seconds, LED3 and LED4 will be also be turned on and stand for 40 seconds, and the vibration happens to cue the clerk. When the customer leaves from the shelf, the LEDs will be turned off. Lastly, when the clerk decides to approach, he can switch it off and all the LEDs and vibration will be off.



(a) Luminace from LED1 to LED2, standing for customers' 20s duration



(b) Luminace from LED1 to LED4, standing for customers' 40s duration



(c) All the LEDs are off when no customers



(d) All the LEDs are off when clerk switching the key holder off

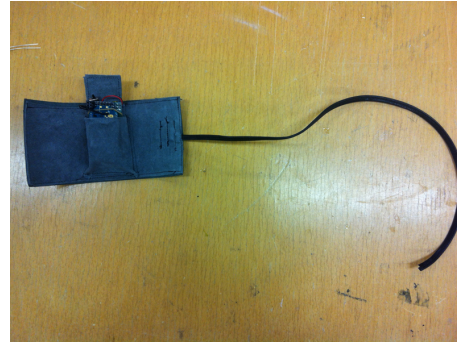
Figure 3.30: The hardware after LED bar being embedded

Industrial Design of Key Holder

In order to make the key holder with a good looking, I decide to make a *leather reel key holder*(Figure 3.31)³³, with black leather. There is a plush bag inside, which is the place to set the hardware. The reel design is convenient for clerk to take out the module out and charge the a lithium battery.



(a) Making the leather reel with sewing machine



(b) The bag inside of the reel with hardware prototype



(c) The prototype of leather reel key holder

Figure 3.31: The leather reel key holder

ZigBee Wireless Network

In the tradition sensor system, the data are transmitted through the cable network. However it is hard to be used in some special or complex situations, like big retail stores. In the research of Qiang Ruan ³⁴, they did a ZigBee based manufacturing monitoring system, which is a technology of following IEEE 802.15.4 Protocol. Low complexity, low cost, low power consumption, low transmitting rate, high reliability, wireless short distance transmission (compared with global Internet), and being capable of ad-hoc networks are all its features. It is suitable for the fields of automatic control and remote control, and it can be embedded in many different devices. In short, ZigBee is a wireless ad-hoc networks capable communication technology which is cheap and low power consumption. Therefore, I use ZigBee to build the wireless network between sensor box and key holder.

Key holder receives the data from sensor box. Based on the data, the Arduino Pro Mini of key holder runs logic operations and make decision when and how to cue sales clerk.

1. The sensor box sends "a" if it has detected the customers' duration over 20 seconds, key holder turns on the light of LEDs from LED1 to LED2;
2. The sensor box sends "c" if it has detected the customers' duration over 20 seconds, but leaves later;
3. The sensor box sends "b" if it has detected the customers' duration over 40 seconds, key holder turns on the light of LEDs from LED1 to LED4, and asks motion sensor to vibrate itself;
4. The sensor box sends "c" if it has detected the customers' duration over 40 seconds, but leaves later;

Notes

- 1 *The concept of "Cue"*
- 2 Dourish, P., and Bell, G . (2011)" Divining a Digital Future: Mess and Mythology in Ubiquitous Computing. " in *The MIT Press*

- 3 *Namche Bazar in iiasTsukuba*
- 4 *Mr.K, the sales clerks of Namche Bazar*
- 5 *Customer A*
- 6 *the red-black plaid jacket Customer A bought*
- 7 *the North Face exhibition table in Namche Bazar*
- 8 *the signage of Namche Bazar*
- 9 *Customer B*
- 10 *the POP made by Mr.K*
- 11 *the POP on cup shelf*
- 12 *Adidas in Jiyugaoka, Tokyo*
- 13 *Mr.K, the sales clerks of Adidas Jiyugaoka*
- 14 *The rough prototype of LED speaker idea*
- 15 *The idea of key holder, coming from the staff card*
- 16 *The system of “Cue”*
- 17 *NaPiON sensor, slight motion detection type*
- 18 *the detection area of NaPiOn slight motion type*
- 19 *NaPiON prototype 1*
- 20 *The experiment to make sure how far can NaPiOn sensor detect*
- 21 *The first hardware prototype of sensor box*
- 22 *The axis to adjust sensors’ angle*
- 23 *The metal axis to adjust sensors’ angle*
- 24 *The original acrylic acid resin or wood parts*
- 25 *The rough prototype with popcorn*
- 26 *The sketches of sensor box*
- 27 *The high-level prototype of sensor box*
- 28 *The vertical version of sensor box*
- 29 *The small version of sensor box*
- 30 *The basis of key holder hardware*
- 31 *The hardware with vibration motor*
- 32 *The hardware after LED bar being embedded*
- 33 *The leather reel key holder*
- 34 Ruan, Q., W. Xu, and G. Wang (2011) “ RFID and ZigBee based manufactur- ing moni-
toring system, ” in *Electric Information and Control Engineering (ICEICE), 2011 Inter-
national Conference*, pp. 1672 1675, IEEE

4. Validation

This chapter describes the validation of using “Cue” in a large retail store of real world. The purpose is to validate the performance of the prototype, examine its effect on the working behaviors of sales clerks, and see whether it can meet the needs of customers, and find out potential problems of this system.

This validation was conducted in a big sporting goods retail store on December 14-15, 2012. It was very difficult to get permission as it is a chain store and approval should be passed to the head office to determine. In this paper, I observed three sales clerks during their working period with “Cue”.

The aim of this chapter is

1. To evaluate if there is an effect on the performance of helping sales clerks get the information of customers’ hesitating about consuming products and making the best limited resource of time of sales clerks.
2. To evaluate if there is an effect on the performance of meeting customers’ needs when they hesitating. Will they accept these three sales clerks’ help, feel satisfied and pleased, and consume products?

In the following sections, we are going to mention the user study (including feasibility survey of the store, the arrangements with manager and procedure), results basing on three clerks’ user experience and customers’ behaviors within their working period having “Cue” on their staff cards, and discuss the achievements of current “Cue”.

4.1. Method

I consult the user study process of Daniela and Lynne who are also focus on the interaction between sales clerks and customers. The method I used is based on video-cued recall method, as Costello, B., L. Muller, S. Amitani, and E. Edmonds¹ wrote in his book. The user study is conducted as followed:

1. After acquired the approval from the store, I made a feasibility survey of the Store and have a arrangement with the manager on Dec 8th, 2012.

2. After the conversation with manager, we did the setting up and conduct the user study with three target sales clerks formally on Dec 14th and 15th. Each of them worked with “Cue” for about 2 hours. I observed how they worked with “Cue”, especially when they got the cue of approaching and helping customers. Memo and photos were taken. On the other hand, a video camera was set up at the area of target shelf. My friend X helped me shoot the customers since they began hesitating on shoes until being helped by our target sales clerks and took memos. After the conversation between the customers and sales clerks, we interviewed the sales clerks for their feeling about “Cue” and information about the customers’ behavior by showing them the memo, photos and videos. We also interviewed the customers who consumed the shoes.

4.2. User Study

Feasibility Survey of the Store

After acquiring the approval from the store, I conducted a feasibility survey of the store to realize the situation of this big sports retail store on Dec 8th.

The store is *Sports Authority @ Kamiooka, Yokohama* (Figure 4.1)², a sporting goods retail store from the United States, which sells sports goods from football, basketball, table tennis, baseball, running, volleyball, training, golf, softball, tennis, badminton, fitness, supplement, walking, swimming, trekking, skiing wear,

etc. Also there are specialty sections of Adidas Neo and NIKI.



Figure 4.1: *Sports Authority @ Kamiooka, Yokohama, a sporting goods retail store from the United States*

In the section of Adidas Neo, I found something very strange. There was no clerks here mostly. Customers helped themselves selecting products, even before the shoes shelves.

For instance, a lady around 40-year-old entered this section as shown in Figure 4.2 , went to the shoes shelf, got interested in a pair of shoes, bent down to search for her size for a while from the lower half of the shoes shelf, picked the box out, put it on the small sofa, took a shoe out and in her hand to watch. It last about 90 seconds until then and no sales clerk came to approach while she was hesitating whether to buy the shoes. Besides, it seems like this lady wanted to try them out but find it embarrassing to do it just because no clerk was served her. In the end, she put the box back and walked out the section. What a pity for missing this chance. I supposed if any clerk came to help her, things could be totally different. I approached her and asked why she put the box back? She said it was because she could not try them on and know whether that pair fit her.

Actually, she not not the only customer who did not get the help from sales clerks within 20 minutes. There were some others like her as shown in Figure 4.3.

Later, I found a clerk and asked him why no clerks came? He said because they were very busy on the hot spots . Some clerks came to this section about every 10 minutes or more. When they came here, saw no one and went back. Actually,



(a) The lady went to the shoes shelf. (b) The lady bent down to search for her size. (c) The lady picked the box out. (d) The lady took the shoe in her hand. (e) The lady put the box back. (f) The lady put the box back.

Figure 4.2: The lady who didn't get the help from clerks



(a) A guy served himself



(b) A lady finally tried the shoes on with herself

Figure 4.3: Other customers who didn't get the help from clerks

they were also in trouble because the boxes became be at sixes and sevens after customers helping themselves.

After hearing his words, I realized that this store is exactly the situation for evaluation.

Arrangement with Manager of the Store

Later on the same day, I had a arrangement with the manager of this store, Mr.T. I told him about what i saw at the section of Adidas and asked him why.

Pointing at *the staff position map* (Figure 4.4)³, he explained to me that the sales clerks in the store work around and approach and greet customers rather than being in a same section all the time. There is no clerk being stationed just at the section of Adidas all the time indeed. The sales clerks who take charge of Area A (sections of NIKI and UNDER ARMOUR), or taking charge section of feet, or taking charge of golf give attention to this section temporarily. However, there sections are far from Adidas, being separated at least a aisle. They have to watch the customers in their main zone and cover Adidas temporarily. It is a big issue for them. Considering the labor costs, they also could not add new clerk. What they can do right now is let the clerk check around every five or ten minutes. He admitted that it did not work very well some time.

After this talk with manager, we decided to set up the sensors at the shoes shelf of Adidas. The shoes shelf is a blind spot for clerks because there are several shelves blocking their sight. These shelves are just like walls that makes them can not observe the customers before the shoes shelf easily. Besides, comparing to the clothes, customers want to be helped more when they are hesitating to choose shoes. They want to try them on under clerks' help, ask the clerks to find the right size for them, also look for the advice from clerks about the coordination or colors.

We also decided to have three clerks from each Area A, B and C as my user clerks, who are not in charge of this section but giving attention to Adidas. I



Figure 4.4: *The staff position map in manager 's office, as you can see that there is no clerk just covering Adidas.*

am going to examine “Cue”’s effects on the working behavior of these three sales clerks and whether meeting the needs of customers as shown in (Figure 4.5)⁴,

Procedure

1. Explain the purpose and operation of “Cue” (both sensor and key holder) to user clerks (Clerk A, Clerk B and Clerk C). Setup the sensor box with Clerk A as Figure 4.6.
2. Let each of user clerks work with “Cue” for 2 hours;
3. Observe how user clerks worked with “Cue”, especially when they got the cue of approaching and helping user customers. Taking memos and photos.
4. Observe the user customers hesitating in shoes within their woking period, shooting them since they began hesitating in shoes until the communication with user clerks was over.
5. Interview the user clerks for information about the customers’ behavior and

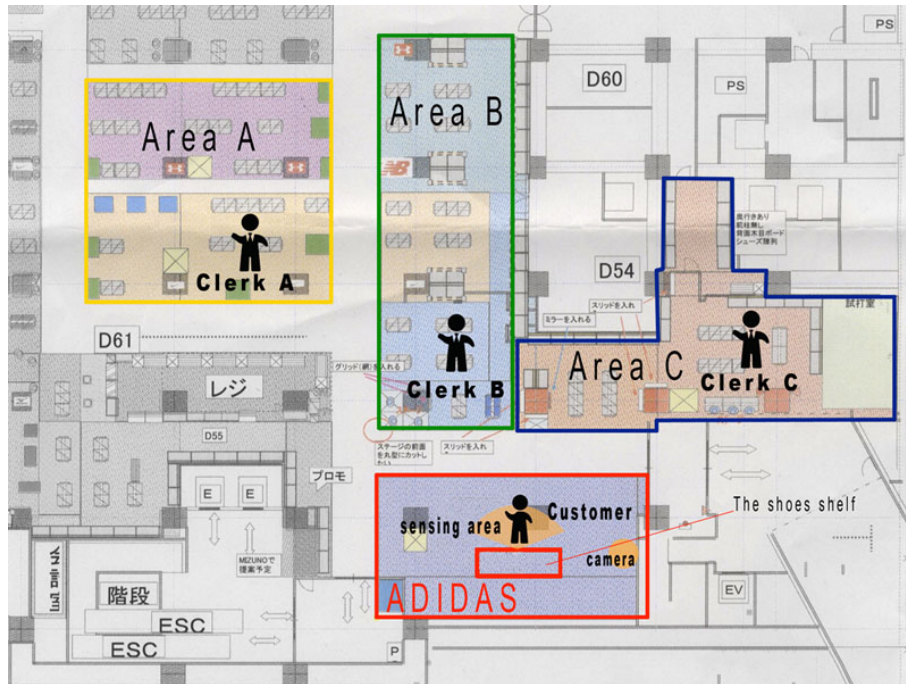


Figure 4.5: The setting up and plan of user study.



Figure 4.6: Setup the sensor box on the shoes shelf with Clerk A

their feeling about “Cue” by showing them the memo, photos and videos.

6. After explaining the purpose of “Cue”, interview the user customers who bought the shoes with help of user clerks.

4.3. Results

I conducted the user study on December 14th and 15th, 2012. I let each of user clerks work with “Cue” for 2 hours, especially observed when they got the cue of approaching and helping user customers. I also observed the user customers who were hesitating in shoes and being helped within these period with “Cue”. Clerk A worked with “Cue” from 12:00 to 14:00 on December 14th, I also set up the sensor box with him. Clerk B worked with “Cue” from 14:30 to 16:30 on the same day. Finally, the period of Clerk C was from 13:00 to 15:00 on December 15th.

Clerk A and Customers in His Period

Clerk A

Clerk A (Figure 4.7)⁵ is a sales clerk taking charge of the Area A, including the store of NIKI and UNDER ARMOUR. He is one of the clerks who gives attention to ADIDAS section. I asked him for working with “Cue” from 12:00 to 14:00 on December 14th, and observed the communication between him and the customers hesitating in shoes.

Case 1

Observation: 12:40 Dec. 14, 2012 (Figure 4.8)

An old man about 60-year-old stopped before the shoes shelf, looked up among the shoes (Figure 4.8(a)). Meanwhile, his wife was also selecting shoes before a small shoes shelf, which is without sensor box. It seems the old man was



Figure 4.7: *Clerk A*

searching for his favorite pair. About 10 seconds later, he picked a shoe with red sole and black body, checked the inside of the shoe and touched the material (Figure 4.8(b)). Then he turned the shoe around and watched it from another angle, and touched the inside again. It seems like he was caring about the material and comfort very much. The place he was standing was just before the sensor box. The sensor box should have sent data to key holder.

On the other hand, Clerk A was working at the section of NIKI, tidying up the coats before a shelf (Figure 4.8(c)). He wasn't aware of the signal until feeling the vibration (Figure 4.8(d)). After seeing the four LEDs to confirm, he walked towards to ADIDAS in hurry (Figure 4.8(e)). And it seemed like he forgot to switch it off.

When Clerk A arrived at ADIDAS, the first thing he did is to check who was the hesitating customer because the old man's wife was also selecting shoes. However, depending on the position of sensor box, Clerk A walked straight to the old man (Figure 4.8(f)). And the man asked Clerk A for help before Clerk A starting to greet. He pointed at the shoe he had picked up and began to asked about the

material of the inside. It turns out that he was hesitating about whether the material was water-repellent. Clerk A told him that only the soft part inside was not a water-repellent part and afraid of water, but the material outside was water-repellent (Figure 4.8(g)). He also suggested the old man another pair with white sole which is water-repellent (Figure 4.8(h)) and the old man said he would consider it and ended the conversation.

Interview

I interviewed Clerk A about this approaching experience. He said that the vibration of key holder was pretty clear but he wasn't aware of the first two LEDs. He said maybe that was because he was busy on putting the coats in order. However, he likes the idea of getting the duration of customer from the numbers of shining LEDs. Besides, he said he switched the key holder on the way and preferred a better way to pause it. It was a little inconvenient for clerks to switching it off, especially when being in hurry.

Clerk A was very thankful for getting the cue of approaching. When he got the shoes shelf, found the hesitating customer. Being asked for help before he said anything showed that the old man was in need. He was happy that he helped the old man. Even though he didn't buy the shoes, his hesitating was solved. That was good for the customer.

When referring to the elder customers, Clerk A said that most customers of this store are old ones. At their age, most of them have bad eyesight. They could not find out their size or read the words on the label easily and want help from sales clerks. However like this section, there are no sales clerks being stationed all the time, so "Cue" can help solve this problem just in time.

Case 2

Observation: 13:09 Dec. 14, 2012

A lady about 40-year-old, entered the section of ADIDAS. She was interested in a pair of shoes with black body and white stripes. She stood before the shoes shelf



(a) An old man stopped and looked up.



(b) The customer picked a shoe with red sole and black body.



(c) Clerk A was working at the section of NIKI.



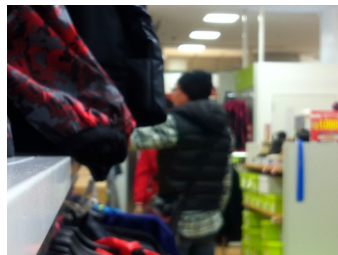
(d) Clerk A wasn't aware of the signal until feeling the vibration.



(e) Clerk A walked towards to ADIDAS in hurry.



(f) Clerk A walked straight to the old man.



(g) Clerk A told him that only the soft part inside was not a water-repellent part.



(h) Clerk A also suggested the old man another pair.

Figure 4.8: Case 1
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long than one minute. She didn't appear to have enough information to make a quick decision so she even began to try the shoes on herself. It was strange that why Clerk A didn't come and help.

So I searched for Clerk A and found him working in the storage, checking up and clearing out a clearance of the products in stock. He told me that "Cue" had not got any message from the sensor box, neither the LED light not the vibration. The storage is far from the section of ADIDAS, more than 100 feet. Besides, there are several cement walls between them. I guess it had already went beyond the range of XBee S1, which is 100ft indoor.

Clerk B and Customers in His Period

Clerk B

Clerk B (Figure 4.9)⁶ is a sales clerk taking charge of the Area B, which is the Feet one. He is also one of the clerks who gives attention to ADIDAS section. As a senior student struggling on his thesis and working here as a part-time job, Clerk B has a lot of knowledge about shoes and coordination. I asked him for working with "Cue" from 14:30 to 16:30 on December 14th, and observed the communication between him and the customers hesitating in shoes of ADIDAS section.

Case 3

Observation: 14:53 Dec. 14, 2012 (Figure 4.10)

A young lady around 25-year-old entered this section and stopped by the shoes shelf, looked the shoes from left to right, and stopped at the right side (Figure 4.10(a)), picked up the white shoe on the third line. She was a little far from the sensor box, which I guess the first 20 secs duration hadn't being detected. The customer bent her back, tried to find her size. She was checking the labels on



Figure 4.9: *Clerk B*

the shoe boxed for long over another 20 seconds duration. The sensor box should have sent data to key holder at least once.

Clerk B was just finished serving a customer at Area B, put the shoe box back to the shelf. After him putting it back, he got the message from “Cue”. It seems like he happened to bend his head and saw the first two LED lights. So he switched it off (Figure 4.10(b)), and run to ADIDAS section (Figure 4.10(c)).

Clerk B tried to approach and greet this customer from her side, and said “ May I help you? ”. This customer turned back and accepted his approach naturally (Figure 4.10(d)). She pointed at the white shoe on the third line and asked the sales clerk for finding her size (Figure 4.10(e)). At this time, more and more customers entered this section (Figure 4.10(f)). I think maybe the communication between the sales clerk and customer has an effect on attracting other customers. Clerk B let the lady sit down on the sofa and served her (Figure 4.10(g)). After that, I saw the customer talking with Clerk B a lot but I could not get what they were talking about. After a conversation about 5 minutes, the customer finally decided to buy the white shoe. Clerk B took a basket for her and show her the

way to the counter (Figure 4.10(h)).

Interview

I interviewed Clerk B about this approaching experience. He said he just finished serving another customer and put the box back. When bending down, he happened to see the first 2 LEDs. He felt it very funny and a little excited to approach customer with “Cue” for the first time. He admitted that it was a little hurried. However, since the sensor didn’t detect the first 20 secs duration, I should thank him for this conversely. Clerk B said when getting there, he did not approach the customer right away. Instead, he checked again and tried to greet her from her side not back. He was very pleased that this customer accepted his help, which showed that “Cue” worked and helped.

When referring to the talking with the customer, Clerk b said that this customer was hesitating about the size. The habitual size of her was 23cm. But she had to change her shoes when getting into and out of the office. So she wanted to find a suitable size for her to put on and take off the shoes. The size was for easy to put on instead of walking with. She was hesitating whether to choose the 24cm pair. Clerk B said that 24cm pair was certainly easy to be put on and taken off, but it was still a little uncomfortable and dangerous some time. He suggested 23.5cm. The customer accepted his advice finally and Clerk B was very happy about that.

Meanwhile, my friend X helped me interviewed the customer. She said that she was doubt that which one to buy firstly. Her size was 23cm but she want to try a bigger pair, about 24cm. However, it was hard to find out her size by herself and she wanted to try on several pairs of different size. So she was about to find a clerk. She thanked for the clerking coming in time and advising her the suitable size.

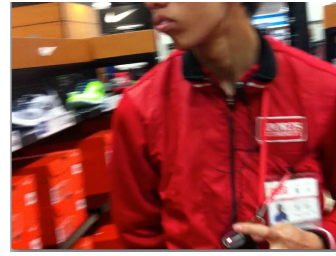
Case 4

Observation: 16:28 Dec. 14, 2012

A man about 45-year-old, with glasses, was standing before the shoes shelf. It



(a) A young lady looked at the shoes from left to right.



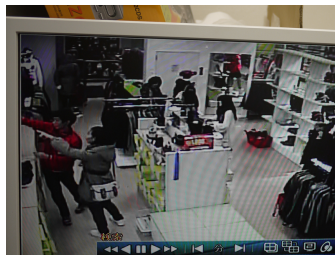
(b) Clerk B switched the key holder off after deciding to approach.



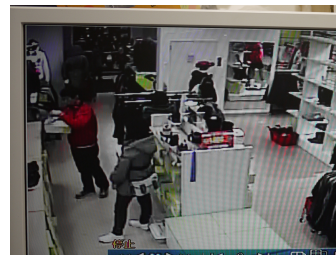
(c) Clerk B run to ADIDAS section.



(d) Clerk B tried to approach and greet this customer from her side.



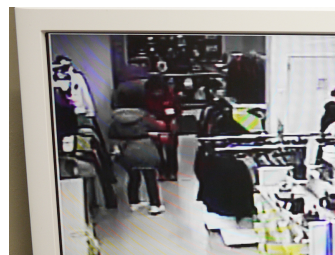
(e) The lady pointed at the white shoe.



(f) More and more customers entered this section.



(g) Clerk B let the lady sit down on the sofa and served her.



(h) The customer finally decided to buy the white shoes.

Figure 4.10: Case 3

had been a long time since him coming to his area. However Clerk B didn't come until this customer walked out of the section.

The reason why Clerk B didn't come was that he was serving another customer at Area B (Figure 4.11). "Cue" vibrated itself and he had to switch it off, which made him a little embarrassed before that customer. During the period of Clerk B, "Cue" worked three times. At the first time Clerk A had a chance to help. However, at the other two times, Clerk B was busy on serving customers of Area B. Even though he wanted to go, all he could do was ignoring it.



Figure 4.11: Clerk B was serving another customer when "Cue" was vibrating.

Clerk C and Customers in His Period

Clerk C

Clerk C (Figure 4.12)⁷ is a sales clerk taking charge of the Area C, which is the Golf one. He is also one of the clerks who gives attention to ADIDAS section. The Area C is most close to ADIDAS section among the three areas. Besides, comparing to clerks in Area A and B clerks like Clerk C work not that busy. However, the main working area of Clerk C is a room connecting with the outside by a door. So when working inside, they could not grasp the conditions of ADIDAS section. I asked friendly Clerk C for working with "Cue" from 13:00 to 15:00 on

December 15th, and observed the communication between him and the customers hesitating in shoes of ADIDAS section.



Figure 4.12: *Clerk C*

Case 5

Observation: 13:20 Dec. 15, 2012

A family entered and stopped before the shoes shelf. Mother and a daughter about 10-year-old. It seemed like that they were choosing a pair of shoes for this daughter. The mother picked up a pair of pink shoes and asked his daughter whether she liked it. The daughter shook her head and pointed at the black pair beyond the pink pair. Mother took it down and they were talking about which pair was better.

Clerk C got the vibration from the key holder while he was making accounts at the counter of the Golf room. He rushed out of the Golf room of ADIDAS without switching it off, and said “ May I help you? ” immediately. The mother and daughter were a little frightened. They turned back, then smiled and said

“ No, thank you. ” Clerk C said “ Sorry. ”, stepped back and began to put the clothes of the section in order.

Interview

I interviewed Clerk C later. He said he was too hurry. Maybe he should wait a while after arriving that section. Besides, in some cases of family, they prefer talking about the products with each other first. It is not good idea to interrupt. Clerks could stand by until being asked for help.

Case 6

Observation: 14:37 Dec. 15, 2012 (Figure 4.13)

A lady about 30-year-old, at first she picked up a brown body shoe with white stripes and put it back soon. It seemed like she didn't like that one. Then she walked to the right side of the shelf, stared at a black shoe, which is the same one mentioned before. As shoe was on third line and the lady was not that tall, she got that on tiptoe, which I think it was a little laborious for her (Figure 4.13(a)). When she was watching and touching the inside of the shoe, sensor box sent data to key holder (Figure 4.13(b)).

Clerk C was working at the Golf room, putting the clothes in order when feeling the vibration of “Cue” (Figure 4.13(c)). He walked out of the room, watched and checked whether the conditions of ADIDAS shoes shelf, paused the key holder while moving towards there. This time, he reacted more cautiously (Figure 4.13(d)).

Another man happened to come and stop before the shoe shelf. So when Clerk C arriving at the shelf, he spent a little time on confirming which customer was the hesitating one. It was difficult for him, because at the right time both of the customers were in the detecting zone (Figure 4.13(e)). Luckily, the lady greeted Clerk C. Clerk C went close to this customer and was shown to the black shoe. Clerk C tried to find the pair for her but there was not her size among the boxes (Figure 4.13(f)). Clerk C told the lady that he was going to the storage to check

and asked for her waiting. About a minute later, he returned without what she wanted. However, Clerk C suggested her trying on another pair, the same design with pink color (Figure 4.13(g)). At first, the customer thought the color was too bright. But after trying that on and watching before the mirror. She thought it was OK and bought it finally. Clerk C showed her the way to the counter and the lady left with a satisfied smile (Figure 4.13(h)).

Interview

I interviewed Clerk C after the customer left. He was happy that the lady bought the shoes he suggested finally. There are actually some size of the shoes in the storage. If the customer do not ask for clerks, they could not find the pair of their size. The customer liked the design very much. Although there was not her size in black, he suggested the pink one and advised her to try them on when she was hesitating in the bright color.

He thought “Cue” worked quite clearly when cuing him the timing. But when arriving at the shelf and seeing the two customers, he was confused by that. He hoped “Cue” could tell him which customer was in need.

4.4. Discussion

In this section, I am going to discuss the achievements of current prototype of “Cue” in big sporting retail store of real world. Based on the validation results, I am going to discuss suitability of each user sales clerk, customers’ behavior, insufficiency in sensor detection, insufficiency in operation of key holder.

“Cue” did provide sales clerks a new experience and style of working and also meet the customers needs. During the validation, there were 7 hesitating customers in all, 4 of them got helped, 2 of them purchased shoes in the end. On the other hand, 2 of them didn’t get the help because clerk was serving other customers. 1 of them didn’t get helped because clerk was working in storage and didn’t get the signal. Manager was very happy about the results.



(a) A lady picked the black shoe on tiptoe.



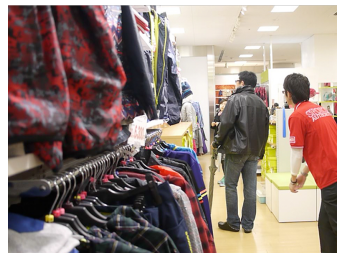
(b) The customer was watching and touching the inside of the shoe.



(c) Clerk C felt the vibration.



(d) Clerk C moved towards the shelf more cautiously.



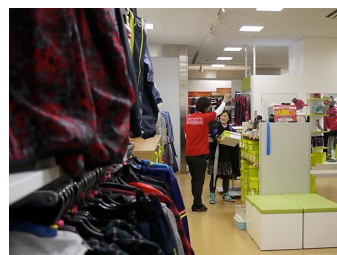
(e) Clerk C spent a little time on confirming which customer was the hesitating one.



(f) Clerk C tried to find the pair for her but there was not her size among the boxes.



(g) Clerk C suggested the lady trying on another pair.



(h) Clerk C showed her the way to the counter.

Figure 4.13: Case 6

Suitableness of Each Sales Clerk

I am going to make a comparison among these three user clerks.

The working area of Clerk A is the furthest one from ADIDAS section, also is the largest one. I thought he was just taking charge of NIKI and UNDER ARMOUR. However, he also spent a lot of time in checking up and clearing out a clearance of the products in storage. Therefore, depending on the current wireless network, Clerk A could only get the cue in the area of NIKI and part of UNDER ARMOUR. For him, I should extend the distance of the wireless network of “Cue”.

Clerk B is full of passion and very willing to help customers. However, when working at Area B, he spent a lot of time serving customers’trying on shoes. Therefore, there may not be that many chances for him to help ADIDAS. When getting the cue from the key holder in busy situation, he got more and more pressure. For him, I should brush up the ignoring function.

Clerk C maybe is the perfect clerk user for “Cue”. Area C is close to ADIDAS. The issue is the Golf room is not an open area and Clerk C can not grasp the conditions of ADIDAS while working in that room. Besides, he is less busy than A and B. Before “Cue” on his staff card, Clerk C’s working style towards ADIDAS is going out of the room, checking the conditions of ADIDAS and returning with few communications with customers. Now he can take care of ADIDAS more efficiently.

“Cue” is not for avoiding the lost of every hesitating customer. It is for reduction of this kind of loss when clerks have time and are willing to help. All of the three user clerks are fantastic guys, from whom I learned a lot about passion on work and altruism. They are not just working for money. Instead, they work for some meaning. They gave a lot of precious advice on “Cue”. And I hope “Cue” will help them better.

Customers' Behavior

According to this user study result, when hesitating in shoes most customers were willing to accept the help from sales clerks. Some of them even asked for help when seeing clerks. When they were uncertainty on the shoes, they did not appear to have enough information or experience to make a quick decision. So the help from sales clerks is needed and important. Besides, customers will be most happy when the sales clerk is able to understand his needs without him saying it, and providing timely help when needed.

Especially for the elder customers. At their age, most of them have bad eyesight. They could not find out their size or read the words on the label easily and want help from sales clerks. In Case 6, while Clerk C was serving the lady, I was asked for help from an old lady. She could not find a coat with M size because of her bad eyesight. It was a good experience of being a sales clerk to realize the need of customers more deep.

For the group customers, it is better to wait near by than interrupting their conversation. So after getting the information from "Cue" and arriving at the shelf, checking the conditions becomes necessary for clerks.

Finally, I guess the communication between the sales clerk and customer has an effect on attracting other customers. When they see the communication from outside, they will feel the products maybe attractive subconsciously.

Insufficiency in Sensor Detection

The sensor box did not work well while more than one customer stopped before the shelf during this user study. It confused the clerks with incorrect information. I think it was a big mistake. Besides, while clerks arriving at the shelf and seeing more than one customer, it also put them in trouble.

Insufficiency in Operation of Key Holder

The most insufficiency in operation of key holder was the ignoring function. The little switch was inconvenient for clerks pausing it. Sometimes they could not remember which was on and which was off, sometimes they were so hurried to forget to switch it. It took more than 1 second for them switching it, which was long enough to make them feel troublesome.

Notes

- 1 Costello, B., L. Muller, S. Amitani, and E. Edmonds (2005)“ Understanding the experience of interactive art: Iamascope in Beta space, ” in *Proceedings of the second Australasian conference on Interactive entertainment*, pp. 49–56
- 2 *Sports Authority @ Kamiooka, Yokohama, a sporting goods retail store from the USA*
- 3 *The staff position map in manager ’s office, as you can see that there is no clerk just covering Adidas.*
- 4 *The setting up and plan of user study.*
- 5 *Clerk A*
- 6 *Clerk B*
- 7 *Clerk C*

5. Conclusion

5.1. Conclusion

“Cue”, a key holder for sales-assistance in large retail stores; designed to detect whether customers are hesitating to buy products and tell the sales clerks the cue of approaching and helping them.

“Cue” provides a new way of working for sales clerks in large retail stores. It could help them grasp information of customers’ hesitating about consuming products. In large retail stores with lots of customers, sales staff are very busy, especially on weekend or holidays. They can not take care of every area and concern about every customer. Even though they may have chance to collaborating with other sales clerk, there are always some blind spots which they can not reach. “Cue” is not for avoiding the lost of every hesitating customer. It is for reduction of this kind of loss when clerks have time and are willing to help.

On the other hand, with “Cue”, customers who are hesitating in products and do not have enough information or experience to make a quick decision could get help from sales clerks and feel most happy when the sales clerk is able to understand his needs without them saying it.

However, the current prototype is still not ideal in the widely utilization of sensing customers’ duration, especially when there are more than one customers in the detection area. The detection of customers’ hesitation could be more accurate if communicating with other criterion. Key holder is not perfect neither. The switch function is not smart enough for sales clerks using the ignoring function, making them feel a little troublesome. Besides, the LED function could be used for

telling the sales clerks more information, such as the accurate place of hesitating customers.

“Cue” contributes on providing an assistant for busy sales clerks in large retail stores, building the interaction between altruistic sales clerks and hesitation customers, thus it both meets the customers’ needs and maximize the utilization of the limited time resource of sales clerks. The current achievements have fulfilled our expectation in several regions but still some minor error needed to be fine-tuned.

5.2. Future Works

“Cue” is still at imperfect beta version and still not ideal in several aspects. As a result, for further development, the implementation of new experiences becomes essential.

A More Accurate Hesitation Sensing System

In this paper, I just use the NaPiOn sensors to detect customers’ duration before the target shelf. The sensor box did not work well while more than one customers stopped before the shelf during the user study. It can be solved by adding more sensor boxes and limit the detection area of each, then categorize the data and cue the sales clerks by different LED color as shown in Figure 5.1.

In future development, I wish to design a more accurate hesitation sensing system which is not just detecting the duration but also reading the customers’ high emotive displays via facial expressions, head movements, and posture. I had the idea of Tri-Axis sensor on hanger to detect the behavior which a customer picks up an item of clothing and try it before his body. I can also use camera or Kinect to read the movements and facial expressions of customers. The sensing system will be more accurate with more criterion.

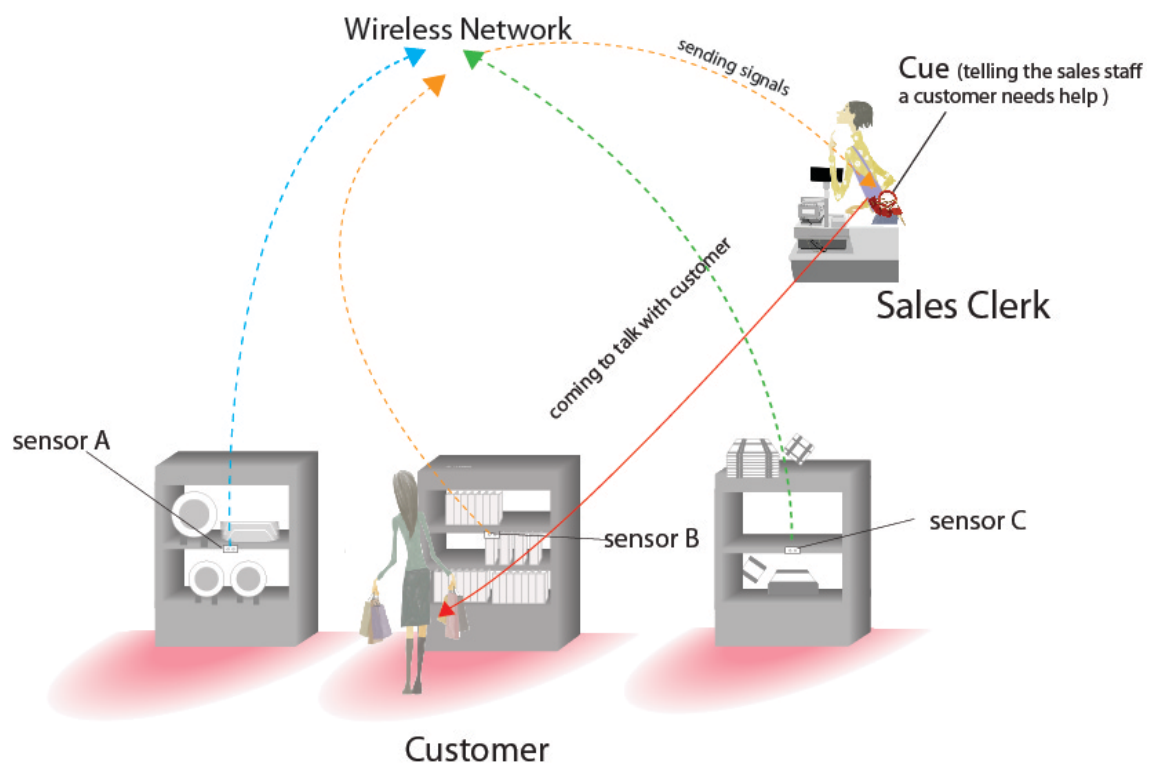


Figure 5.1: *key holder woking with multi sensor boxes*

A More Understanding Key Holder

The key holder could be more understanding, especially for the ignoring function. If being paused by clerks simple movements, such as touching or lifting, it could be smarter and loved by clerks. The LED colors could also be added, in order to categorize the target shelf ID and cue the clerks exactly who is the hesitating customer.

A System for Teamwork among Sales Clerks in Large Retail Stores

In most large retail stores, clerks are working with interphones. The collaboration between “Cue” and interphones could create a new system for teamwork among sales clerks. For instance, the team leader works with “Cue” and arrange the available clerk to help the customer in need.

A Brand New Attracting System

Finally, I guess the communication between the sales clerk and customer has an effect on attracting other customers. When they see the communication from outside, they will feel the products maybe attractive subconsciously. So if we showed the customers where are the hot spots the interaction between sales clerks and customers happened most, it maybe attract them and make them curious to explore.

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References

- Areni, C.S. and D. Kim (1993) “The influence of background music on shopping behavior: classical versus top-forty music in a wine store,” *Advances in consumer research*, Vol. 20, No. 1, pp. 336–340.
- Berlyne, D.E. (1971) “Aesthetics and psychobiology..”
- Berry, L.L., E.A. Wall, and L.P. Carbone (2006) “Service Clues and Customer Assessment of the Service Experience: Lessons from Marketing.,” *The Academy of Management Perspectives*, Vol. 20, No. 2, pp. 43–57.
- Bitner, M.J. (1992) “Servicescapes: the impact of physical surroundings on customers and employees,” *The Journal of Marketing*, pp. 57–71.
- Borriello, G. (2005) “RFID: Tagging the world,” *Communications of the ACM*, Vol. 48, No. 9.
- Carmel-Gilfilen, C. (2012) “Bridging security and good design: Understanding perceptions of expert and novice shoplifters,” *Security Journal*.
- Costello, B., L. Muller, S. Amitani, and E. Edmonds (2005) “Understanding the experience of interactive art: Iamascope in Beta.space,” in *Proceedings of the second Australasian conference on Interactive entertainment*, pp. 49–56, Creativity & Cognition Studios Press.
- Daniela, S., F. Lynne, and Y. Louise (2008) “Why happy shoppers don’t stop and think,” ANZMAC.

- Dijksterhuis, A., P.K. Smith, R.B. Van Baaren, D.H.J. Wigboldus et al. (2005) "The unconscious consumer: Effects of environment on consumer behavior," *Journal of Consumer Psychology*, Vol. 15, No. 3, pp. 193–202.
- Donovan, R.J., J.R. Rossiter, G. Marcolyn, and A. Nesdale (1994) "Store atmosphere and purchasing behavior," *Journal of retailing*, Vol. 70, No. 3, pp. 283–294.
- Efros, A.A., A.C. Berg, G. Mori, and J. Malik (2003) "Recognizing action at a distance," in *Computer Vision, 2003. Proceedings. Ninth IEEE International Conference on*, pp. 726–733, IEEE.
- Gavin, H. (2006) "Intrusive music: The perception of everyday music explored by diaries," *The Qualitative Report*, Vol. 11, No. 3, pp. 550–565.
- Haeckel, S.H., L.P. Carbone, and L.L. Berry (2003) "How to lead the customer experience," *Marketing Management*, Vol. 12, No. 1, pp. 18–23.
- Hakimi, D., B. Montreuil, and A. Ruiz (2008) "Impacts of RFID Deployment on Real Time Management of Retail Stores," in *Proceedings of the 17th World Congress The International Federation of Automatic Control Seoul, Korea*.
- Hansen, F. (1972) *Consumer choice behavior: A cognitive theory*, Vol. 10: Free Press New York, NY.
- Horgan, C. (1968) "A Systems Approach to Manpower Planning in Department Stores," *Journal of Retailing*, Vol. 44, pp. 13–30.
- Howard, J.A. and J.N. Sheth (1969) "The theory of buyer behavior."
- Hu, Y., L. Cao, F. Lv, S. Yan, Y. Gong, and T.S. Huang (2009) "Action detection in complex scenes with spatial and temporal ambiguities," in *Computer Vision, 2009 IEEE 12th International Conference on*, pp. 128–135, IEEE.

- Keaveney, S.M. (1995) "Customer switching behavior in service industries: An exploratory study," *The Journal of Marketing*, pp. 71–82.
- Kotler, P. (1973) "Atmospherics as a marketing tool," *Journal of retailing*, Vol. 49, No. 4, pp. 48–64.
- Kundu, M., J. Migdal, and M. Farrow (2012) "NOTIFICATION SYSTEM AND METHODS FOR USE IN RETAIL ENVIRONMENTS," December 20. US Patent 20,120,320,214.
- Mehrabian, A. and J.A. Russell (1974) *An approach to environmental psychology.:* the MIT Press.
- Milliman, R.E. (1982) "Using background music to affect the behavior of supermarket shoppers," *The journal of Marketing*, pp. 86–91.
- Mohr, L.A. and M.J. Bitner (1995) "The role of employee effort in satisfaction with service transactions," *Journal of Business Research*, Vol. 32, No. 3, pp. 239–252.
- Moyer, MS (1972) "Management Science in Retailing," *The Journal of Marketing*, pp. 3–9.
- North, A.C., D.J. Hargreaves, and J. McKendrick (1997) "In-store music affects product choice.," *Nature; Nature*.
- North, A.C. and D.J. Hargreaves (1999) "Can music move people? The effects of musical complexity and silence on waiting time," *Environment and Behavior*, Vol. 31, No. 1, pp. 136–149.
- Park, C.W. (1978) "A conflict resolution choice model," *Journal of Consumer Research*, pp. 124–137.

- Payne, J.W. (1976) "Task complexity and contingent processing in decision making: An information search and protocol analysis," *Organizational behavior and human performance*, Vol. 16, No. 2, pp. 366–387.
- Pfeffer, J. (1995) "Producing sustainable competitive advantage through the effective management of people.," *The Academy of Management Executive*, Vol. 9, No. 1, pp. 55–69.
- Ruan, Q., W. Xu, and G. Wang (2011) "RFID and ZigBee based manufacturing monitoring system," in *Electric Information and Control Engineering (ICEICE), 2011 International Conference on*, pp. 1672–1675, IEEE.
- Saxe, R. and B.A. Weitz (1982) "The SOCO scale: a measure of the customer orientation of salespeople," *Journal of marketing research*, pp. 343–351.
- Schafer, R.M. (1977) "The Soundscape: Our Sonic Environment and the Tuning of the World. Alfred Knopf."
- Smith, P.C. and R. Curnow (1966) "" Arousal hypothesis" and the effects of music on purchasing behavior.," *Journal of Applied Psychology*, Vol. 50, No. 3, p. 255.
- Spiro, R.L. and B.A. Weitz (1990) "Adaptive selling: Conceptualization, measurement, and nomological validity," *Journal of Marketing Research*, pp. 61–69.
- Stokes, C.J. and P. Mintz (1965) "How Many Clerks on a Floor?" *Journal of Marketing Research*, pp. 388–393.
- Sujan, H., B.A. Weitz, and N. Kumar (1994) "Learning orientation, working smart, and effective selling," *The Journal of Marketing*, pp. 39–52.
- Sullivan, M. (2002) "The impact of pitch, volume and tempo on the atmospheric effects of music," *International Journal of Retail & Distribution Management*, Vol. 30, No. 6, pp. 323–330.

- Treasure, J. (2011) *Sound business*: Management Books 2000 Limited.
- Want, R. (2004) “RFID: A key to automating everything,” *Scientific American*, Vol. 10.
- Weitz, B.A. and K.D. Bradford (1999) “Personal selling and sales management: a relationship marketing perspective,” *Journal of the academy of Marketing Science*, Vol. 27, No. 2, pp. 241–254.
- Yalch, R.F. and E.R. Spangenberg (2000) “The effects of music in a retail setting on real and perceived shopping times,” *Journal of business Research*, Vol. 49, No. 2, pp. 139–147.

Appendix

A. Ethnography Research and Analysis of Namche Bazar

DATE / /

NAME

OIKOS
ART LIFE PROJECT
Graduate School of Media Design, Keio University

THICK DESCRIPTION

Describe everything you remember chronologically in detailed sentences

DATE: 2012/09/19 13:55~14:57

PLACE: Namche Bazar, Ilas Tsukuba

Namche Bazarの店員さん 菊地さんと挨拶する。李昂「はじめまして、慶応義塾大学の李昂と申します。」菊地「はじめまして、菊地です。」李昂「研究のために、ちょっと店内に1時間ぐらい観察させていただきませんか。」菊地「はい、大丈夫ですよ。どうぞ、ご自由に」

李昂「ありがとうございます。」

フィールドワークは始まる。

Namche Bazarは大体20メートル×10メートルの大きさで、登山、キャンプからトレイルランニング、ウォーキングまで、あらゆるアウトドアの商品を売っている。人気のノースフェイス・パタゴニアなど本格ブランドはもちろん、レディス・キッズも豊富にラインナップ。お客様たちに対して、アウトドアのライフスタイルを応援するやさしい店だろう。

今は水曜日の午後2時で、店内のお客様は少ない。平日のこの時こんな感じかな。菊地さんは今試着室の辺のノースフェイスの展示棚で、先お客様が触ったある黒いTシャツを畳んでいる。いつも、お客様が触った後に、ちょっと待ってから片付けていくだろう。

服を整理してから、菊地さんはカウンターに入って、裏にある低い戸棚を開く。中にはステレオセットだ。ステレオの後ろから延長ケーブルがのびされ、ある黒色IPOD CLASSICと繋がっている。なるほど、この店は有線BGMを使っている。これはIlasメインのラジオBGMと違って、店員さんたちは自由に店内の音楽を変えられる。先はとても静かな音楽が流れているけど、菊地さんは音楽リストを変えて、Rapが入る盛り上がる音楽にした。たぶんお客さんを引き寄せたいだろう。音楽を変えてから、菊地さんはまた試着室の辺に戻って、触られたノースフェイス服を整理する。

ある50歳ぐらいの女性は店の右側から入って、手にビニール袋を二つ持っている。果物、豆腐などが入っている。たぶん同じIlasにあるカスミというスーパーでショッピングしたばかりで、ここにふたっと足を踏み入れたお客さんだろう。菊地さんと会って、「こんにちは」と挨拶する。菊地さんも「こんにちは。いらっしゃいませ！」と返事する。このお客さんは常客だろう。菊地さんと挨拶したら、このお客さんは店の左側に行き、レディスの2012年秋新作を見る。菊地さんはすぐ手持ち整理の仕事をやめて、このお客さんの隣にスタンドバイする。

今日は新しい服がありますよ。」と菊地さんはいって、お客さんさんにある赤と黒の格子デザインのジャケットを紹介する。「色はこの色以外

Figure 5.2: *Thick Description 1*

DATE / /
NAME

OIKOS
ART LIFE PROJECT
Graduate School of Media Design, KUIS UNIVERSITY

THICK DESCRIPTION

Describe everything you remember chronologically in detailed sentences

DATE: 2012/09/19 13:55~14:57

PLACE: Namche Bazar, Ilas Tsukuba

四種類がありますよ。」

「あ、そうなんですか。」とこのお客さんが聞いた。

「夏のに比べると、そんなに薄くない。UVはあるんですけど。」と菊地さんは答えた。「どちらかというと、秋冬になると、汗をかくというより、逆に寒いので、暖かさは大事ですね」

「これはMサイズ？」とお客さん聞いて。

「海外だと、Mサイズで普通より大きいですね」と菊地さんは答えた。

「Mサイズだと、ちょっと薄いシャツは入らないかもね、私に。カップがありますか？」とお客さんは心配して

「そうですね。あたたかい空気というのは、カップだと保つことができるんですけど、暖かくすることができないんで、やっぱりなかに一枚着てもたったら、あたたかい感じがやすいんです。」と菊地さんは答えた。

「これだと、なかにどんな服でいいですか？」とお客さんは聞いて

「これだったら、薄いシャツで多分大丈夫だと思います。試着してみたら。。。と菊地さんは答えた。

「いいですか、こっち？」とお客さんは試着したい。

「はい。どうぞ、こちらへ。」と菊地さんは言って、お客さんを試着室に連れていく。カーテンを引いて、「どうぞ」とお客さんを案内する。

お客さんが中にいる時、菊地さんはちょっと離れた櫃で服を片付ける。大体一分後に、お客さんは服を着て試着室から出て、試着室の外すぐ隣の鏡の前に自分の格好を見る。「すみません、これでどんなんでしょう、大きさは？きつそうですか？」とお客さんは突然私に聞いた。

私は側面から、このお客さんの格好を見て、とても似合うと思うので、「ちょうどいいと思います。」「ちょうどいい？でも。。。とお客さんは話す時、菊地さんは素早く歩いてきて、「これはシャツと？」とお客さんはまた菊地さんに聞き、「シャツ？シャツとこれだったらいい」とと菊地さんは答えた。「いまの感じだと、ちょうどいいです。暖かくなれるんです。逆に大きくなれば、空気がはいて暖かさは分散してしまうから。。。」

「綺麗な色ですね。」お客さんはやはりこの服を好きであろう。

「ええ、大体いいと思います。ここの中にそこまで着込むであれば、逆にないと思うので、シャツ一枚で、そのサイズ考えれば問題ないと思います。」「これで、いくらでしょう？」お客さんだいたい決まったみたい。な感じです。「6000円ぐらいですね。この上、10%の割引があります。」と菊地さんは答えて「バランドは？」とお客さんは聞いて、

THICK DESCRIPTION 05

Figure 5.3: *Thick Description 2*

DATE / /
NAME

OIKOS
ART LIFE PROJECT
Graduate School of Media Design, Keio University

THICK DESCRIPTION

Describe everything you remember chronologically in detailed sentences

DATE: 2012/09/19 13:55~14:57

PLACE: Namche Bazar, Ilas Tsukuba

「コロンビアです。アメリカの会社です。」と菊地さんは答えた。
「これはいいですね。じゃこれでください。」とようやくお客さんが決めた。菊地さんはお客さんをレジに連れて、会計する時にまたお客さんと最近天気がちよっと涼しくなったという余談の話をしている。会計は5950円になって、お客さんはお金を払って、店の外向きドアから出る。

このお客さんは店からでてから、菊地さんはまた店頭の右側にいて、ノースフェス2012秋新作展示テーブルにいて、整理する。ここには服、カバン、靴、なば、水杯、椅子などの商品、「低山から始めよう！筑波山、尾瀬、日光など、筑波近辺にはたくさんあります。気分転換、ストレス解消、運動不足、癒し、理由なんて何でもいいます。さあ色々な山に出かけましょう！服装、装備など質問はスタッフまで、お気軽にどうぞ」という看板と尾瀬などの地図などを一緒に並べている。まるでアウトドアライフスタイルの展示しているみたい。アウトドアが好きな人たちはここに止まるだろう。

右側の店頭にはディスプレイがある。Namche Bazarはよく富士山とか、ほうきょうさんのツアーをアレンジしていて、スタッフがお客さんと一緒に山に登って、そのツアーの写真をディスプレイに表示させる。店頭にパスしたお客さんたちはたまにのディスプレイの前に止まって、写真を見る。もうすぐ秋なので、お店はまた紅葉のツアーをアレンジしようとする。ディスプレイの隣の壁に、10月14日安達太良山のツアー、11月4日荒船山のツアーと12月2日の金時山のツアーのお知らせを張られている。まえ、ツアーに行くお客さんたちは、大体60歳以上の年配の人と30歳から40歳までの主婦たちだ。ディスプレイの左側にはパンフレットなどをのせる棚がある。Nameche Bazar会社の紹介パンフレット、ノースフェスとパタゴニアなどの商品のパンフレットいっぱいある。ある45歳ぐらいの女性、店の右からくる。ディスプレイの前に止まって表示されている写真を見る。そして目線は10月14日のツアーのお知らせに向かう。それをみてから、また店の左側に行って、レディスノースフェスの棚の側面に吊られてる「つくば店スタッフ菊地さんの御岳山・日の出山単独トレイル」の看板を見て、そこには菊地さんの7月25日の山登りの写真と地図がある。滝、神社、昼ご飯（カレー）、樹と石などの写真がたくさんある。このお客さんはさらに服を見る。ある黒と紫色の

THICK DESCRIPTION 05

Figure 5.4: *Thick Description 3*

DATE / /
NAME

OIKOS
ART LIFE PROJECT
Graduate School of Media Design, Keio University

THICK DESCRIPTION

Describe everything you remember chronologically in detailed sentences

DATE: 2012/09/19 13:55~14:57

PLACE: Namche Bazar, Ilas Tsukuba

ジャケットを触って、菊地さんに話しかける。「この服は、Sサイズありますか?」「ちょっとまってください。」菊地さんは言って「ありますよ?」「防水はどうでしょう?」とお客さんはきいて「防水はとてもよいです。摩耗につよいですよ。こっちとか使ってて、寿命があるけれど、5年ぐらいいだめになるんですけど。」と菊地さんはさらに紹介する。「ああ、この服は?」お客さんは隣のもう一つ赤の黒のジャケットを指して聞いて。「これは十年ぐらいですね。その以外はほとんどさはないですね。」と菊地さんは答えた。お客さんはこの後、ずっとこの服を触って、買うかどうか迷っているらしい。この時、菊地さんはレジに戻って、自分の携帯をUSBでPCと繋いで充電する。五分後に、このお客さんはカウンターに先のジャケットを持ってきて、菊地さんに聞いて、「このような防水の服はどうやって洗濯しますか?」菊地さんは、レジの横のテーブルの上から「GORE-TEXプロダクトとずっと仲良くする方法」というパンフレットを出して、中の「How to 洗濯」のページを見せながら、説明する。「洗濯する前に、ファスナーをしめて、ネットにいれて、いつもの洗濯用洗剤でOKです。洗濯する時にぬるま湯がベターで、

すぎはいつもより丁寧にしましょう。乾燥する時に、また広げて軽く見ずを振り落としてください。」お客さんはこれを見て、ようやく買うことにして、「これください。ポイントつきます?」「はい。」と菊地さんは答えて「もうちょっと待ってください。」お客さんはあせて出かけました。十分後に、このお客さんさんがポイントカードを持って戻ってきた。同行する友達みたいな同じ世代の女性もいる。たぶん、このお客さんはショッピングフォローだろう。友達と一緒にIlasに来て、途中で離れて、ちょっと見てみようという気分で店に入り、買うつもりなかったが、友達のポイントカードも使って、結局買っちゃった。

ある30世代の夫婦と赤ちゃんの三人家族。奥さんは前に歩いて、旦那さんは後でベビーカーを押して。店の左側に入って、奥さんは主にカバンを探してみても、旦那さんは店頭の柱に止まっている。そこには「Water Blz」という小さな看板があって、周りは全部コップとボトルだ。旦那さんの視線は看板に引かれて、「出社したらコップ一杯の水を飲もう」「外出する前にコップ一杯の水を飲もう」などと書かれて。奥さんは旦那さんと呼んで、旦那さんは奥さんの方へいって、奥さんは手持ちのカバンを見せて、白黒格子のカバンだ。旦那さんはそのカバンを開いて、中身を見て、頭を振った。たぶん容量は少ないからかな。

THICK DESCRIPTION 05

Figure 5.5: *Thick Description 4*

DATE / /
NAME

OIKOS
ART LIFE PROJECT
Graduate School of Media Design, Keio University

THICK DESCRIPTION

Describe everything you remember chronologically in detailed sentences

DATE: 2012/09/19 13:55~14:57

PLACE: Namche Bazar, Ilas Tsukuba

また、旦那さんは奥さんと呼んで、先のボトルの棚に来て、旦那さんはある銀色のボトルをピックアップして、二人でそれを見てる。旦那さんはまたボトルのキャップをとって、中身を見ている。また中身だ！旦那さん中身大事派だな。何かの理由で私にはわからないけれど、この家族は最後に何も買わず店から出た。

もうすぐ時間なので、私は菊地さんに最後、年齢、出身、住所、趣味などの個人情報を質問する。

14:57ぐらいに、菊地さんに礼を言う。フィールドワークが終了。

THICK DESCRIPTION 05

Figure 5.6: *Thick Description 5*

DATE / /
 NAME _____

OIKOS
 ART LIFE PROJECT
Graduate School of Media Design, Keio University

TARGET PERSONA

PHOTO



NAME 菊地 昌司

AGE 27 SEX 男

CURRENT CITY 常総市、茨城県

HOMETOWN 常総市、茨城県

OCCUPATION 店員さん、ナムチュバザールレイアスつくば

PERSONAL PROFILE about his/her history, background, family, hobby, favorite things, interest in everyday life etc...

趣味はアウトドアに関連することです。。山登りとか、写真もよく撮っています。

アウトドアにいる時に、よくカレーみたいな料理を作ったりします。

音楽も好きです。昔DJを趣味としてやっていました。

仕事する時、有線で店内の音楽をコントロールしています。

イケメンです。おしゃれも好きです。

WORKING PROFILE about his/her working experience, student life, and other professional activities

ドレースメーカー学院から卒業しました。

Namche Bazarに入社してから3年目

GOAL(S) about persona's goals covering his/her "mental model, environment, skills, frustrations, attitude, typical tasks,
in critical to understand the behavior pattern"

↓

売上げをとりたい。

TARGET PERSONA 12

Figure 5.7: *The Fieldwork Master*

Describe the people's roles, responsibilities, and how they communicate to achieve the goals

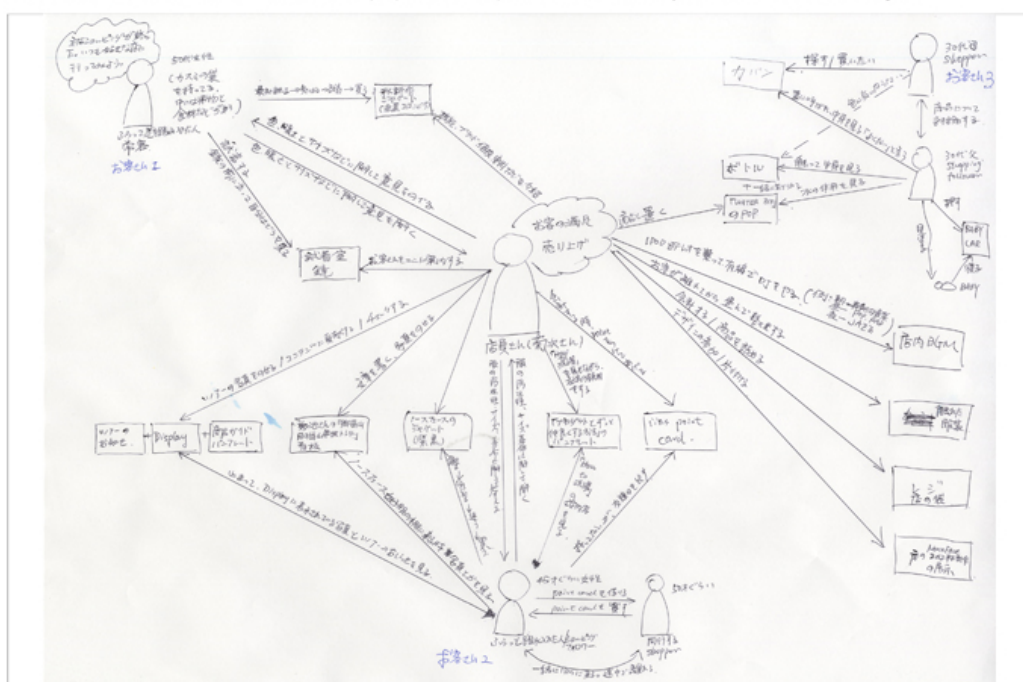


Figure 5.8: *The Flow Model Analysis*

SEQUENCE MODEL Describe the work tasks chronologically

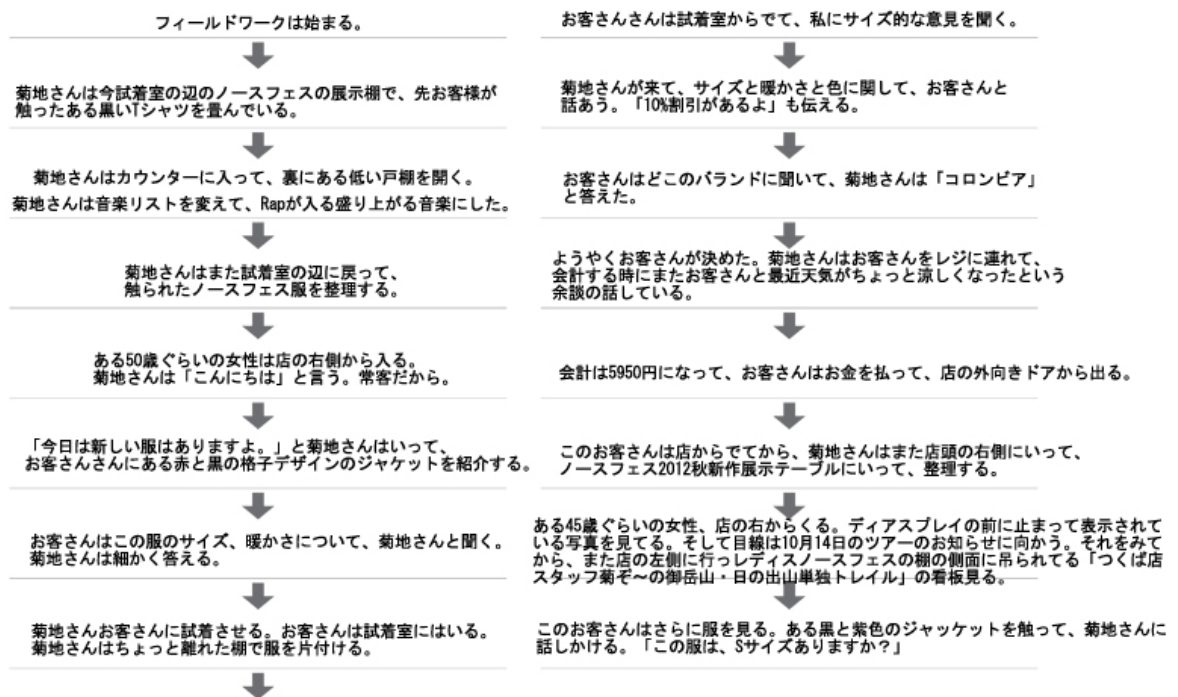
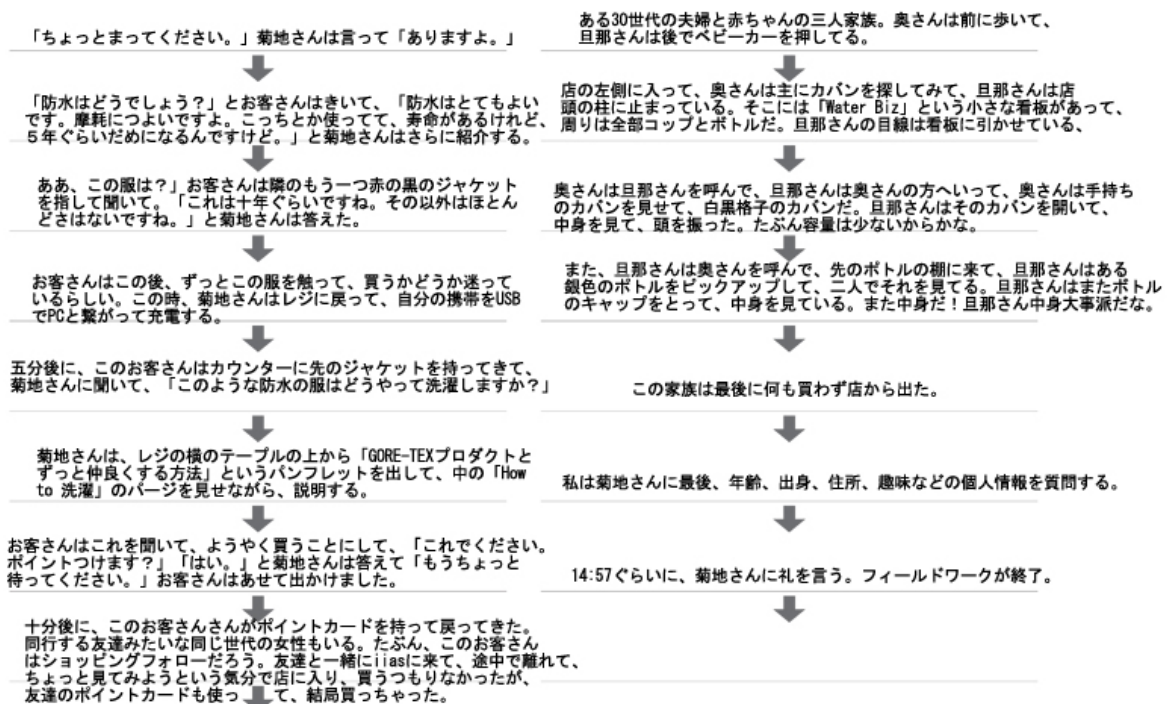


Figure 5.9: The Sequence Model Analysis 1

DATE / /
NAME

OIKOS
ART LIFE PROJECT
Graduate School of Media Design, Aichi University

SEQUENCE MODEL Describe the work tasks chronologically



SEQUENCE MODEL 08

Figure 5.10: The Sequence Model Analysis 2

DATE / /
NAME

OIKOS
ART LIFE PROJECT
Graduate School of Media Design, Keio University

ARTIFACT MODEL

Describe the things your master creates, uses, and modifies in the course of achieving the goals



ARTIFACT MODEL 09

Figure 5.11: *The Artifact Model Analysis*

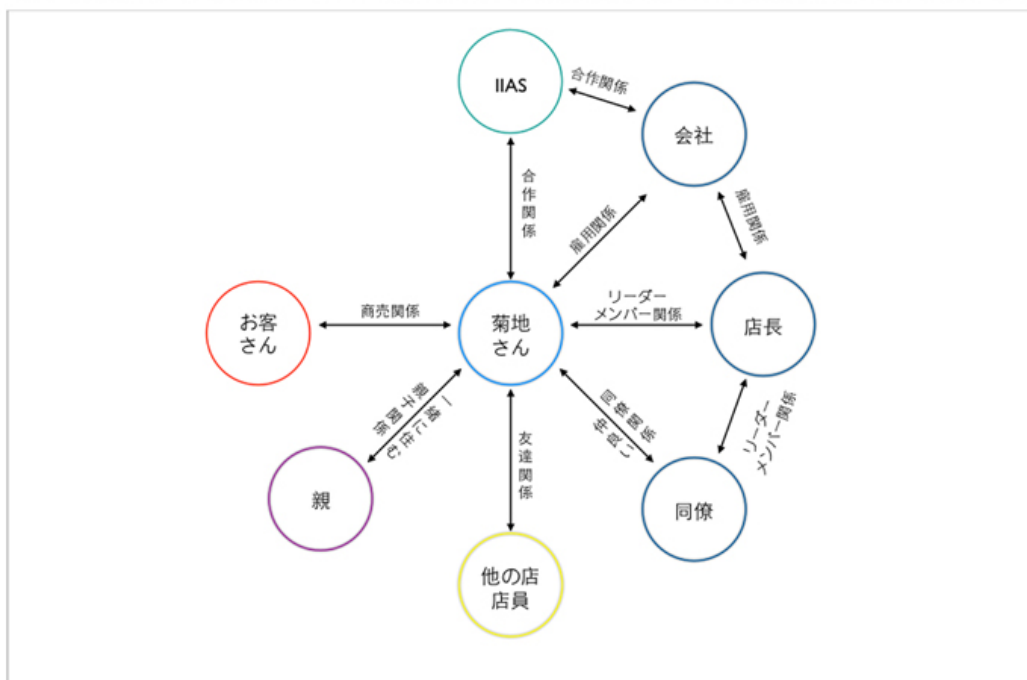
Describe the physical environment supporting or enabling achievement of the goals



Figure 5.12: *The Physical Model Analysis*

CULTURAL MODEL

Describe "expectations, desires, policies, values and the whole approach" people take to achieve the goals



CULTURAL MODEL 11

Figure 5.13: *The Cultural Model Analysis*

B. Cue Schematics

Sensor Box

In the schematics of Sensor Box, the black ‘N’ units stand for NaPiOn sensors.

We have two NaPiOn sensors, which are connected to D5 and D6.

There are three pins of a NaPion sensor.

1 is connected to 5V, 2 is connected to Digital Pin, 3 is connected to GND.

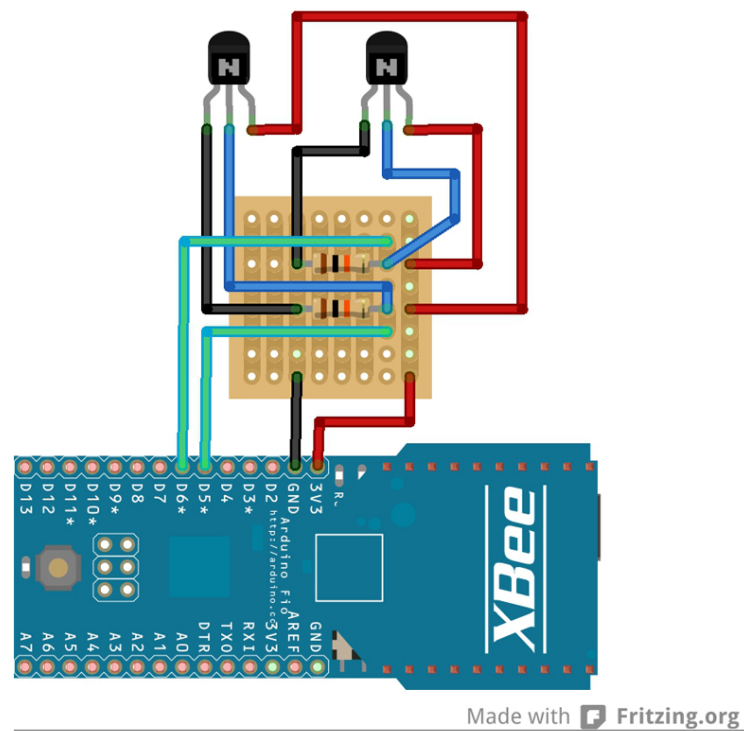


Figure 5.14: *The Schematics of Sensor Box, the black ‘N’ units stand for NaPiOn sensors*

Key Holder

In the schematics of Sensor Box, the round unit stands for vibration motor.
The four LEDs stand for LED bar.

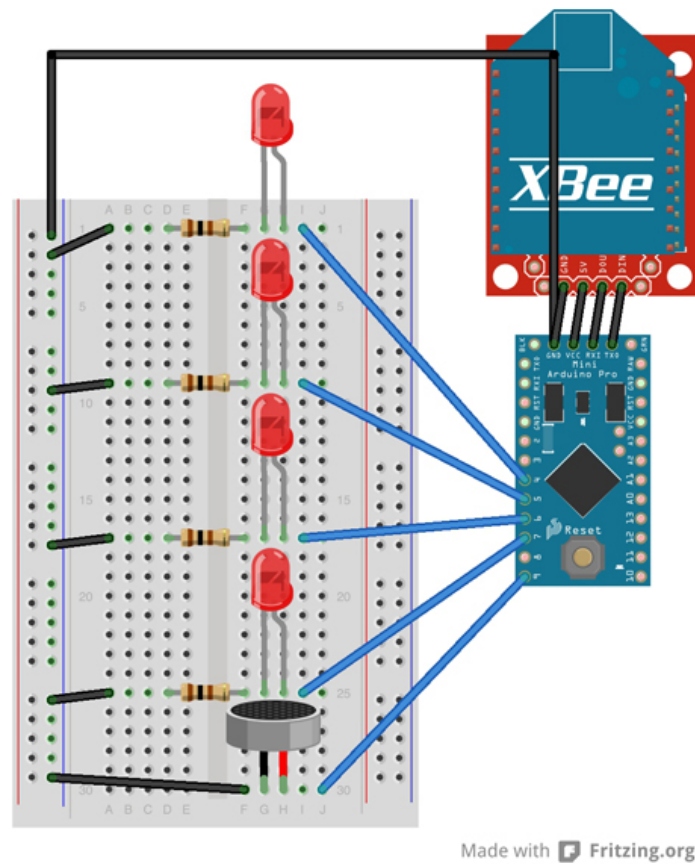


Figure 5.15: *The Schematics of Key Holder*