Solo Dining Restaurant: Environmental Interior Design & Interactive UX Design

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SOLO DINING
RESTAURANT
Environmental Interior Design & Interactive UX Design

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for the Degree of Master of Fine Arts in Visual Communication Design

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Abstract

Individualized dining can be anxious and awkward experiences for people. Especially when it comes to the sharing style of some foods (e.g., hotpot, barbecue, etc.) In addition to the form of food, the perception of social judgment creates discomfort for the individual. This project aims to incorporate the 3D interior design to model a restaurant that has embedded interactive UX design in the physical environment so that solo guests can enjoy the comfort of dining alone.

A case in point, imagine yourself sitting in a crowded restaurant, a giant pot with hot soup boiling in front of you. Every other table around you has more than one person sitting by it; people are all eating with family or friends. Moreover, you saw the way that others look at you; you can feel the invisible social pressure in the air: why is this person alone in a hotpot restaurant? No one comes to eat this type of food alone. Even your waiter told you that you had enough food after you ordered three items because the food serving sizes are not for one. You start to feel a little embarrassed, but why should it be that way? You just want to eat some hotpot. That’s why a solo dining restaurant is needed.

In fact, solo living has become a global trend, whether people like it or not. Fourteen percent of adults choose to live alone in the United States. Americans eat more than half of their meals alone. Till 2017, China stands as the country with the most rapidly growing solo living population. In Japan, 23.3% of males remained single their entire lives, many by choice. Moreover, the four countries with the highest rate of people living alone are all from Europe. This evidence supports the need for people to have a wonderful place to eat by themselves.

The simple model of solo dining is the traditional high bar seat. This model does not offer enough privacy to customers, and the distinct table format also outlines different dining statuses. In recent years, solo dining became more common, like the pop-up store EEN MAAL in Britain, which only serves table for one; single ramen booth in

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Korea and Japan, offer small booths for people to eat ramen by themselves. However, these formats still can’t achieve enough privacy, and servers are required.

Based on these findings, the project goal is to design a solo dining restaurant that offers a private dining room with abundant space; one side of the room installed with single side glass as the window or installation like aquariums, eliminating staring or scanning by others. The room will have clean and simple design style, which makes people feel comfortable but not pitiable. The ordering process will be accomplished by interactive interfaces embedded in the environment, such as in the dining table. And the since the interactions are applied to the space, the user can use them as a dashboard, which means it is not limited to one screen, instead the user can have multiple tasks performed at the same time (e.g., food ordering and user entertainment system at the same time.) Besides, the dishes will serve by a conveyor belt; no server is required. In addition to enjoying a great meal, the room also contains a full entertainment and working system for clients to customized their dining experiences.

The final deliverables of the project will incorporate 3D modeling for the restaurant structure and interior design. Besides, user interfaces for ordering and the entertaining system will be shown as UI/UX prototypes and interaction video. A final promotion video for the restaurant will also be exhibited as an overview of the project.

**Keywords:**

Solo Dining, Private Booth, Embedded Interaction, Easy Device Connection, User Experience
Introduction

1. Background

Eating alone is always considered as an uncomfortable experience for people. There is some natural invisible social pressure in the air when you eat by yourself in a restaurant when other people around you are all accompanied. In that case, even talking to the server can be an awkward experience. Besides all those social factors, there are certain types of food people don't usually consume by one, such as Hotpot, Barbecue, and Buffet. Last but not least, in most circumstances, restaurants don't serve proper food size for solo diners, because they assume we don't eat by one.

However, due to the tight working schedules, or the different relationship goals people have, and many other social factors, solo dining still becomes a trendy thing all over the world. According to observations, 14% of adults choose to live alone in the United States. Americans spent about 57% of total eating occasions alone. (A more detailed result is that: 61% for breakfast are eat by oneself, around 55% of people eat lunch alone, and we have 34% of solo diners when it comes to diner. Besides that, in non-meal occasion, 72% of people still eat with themselves) Till 2017, China stands as the country with the most rapidly growing solo living population, which means all of these solo living people are very likely to eat by just one person. Also in Japan, 23.3% of males remained single their entire lives, many by choice. Moreover, the four countries with the highest rate of people living alone are all from Europe. These facts indicated that solo dining already became a way of living, and people need to have a well-designed place to eat by themselves, eating alone needs to be treated seriously and nicely.

2. Problem statement

Since individualize dining can be an anxious and awkward experience for many people. This project of solo dining restaurant is aiming to create a comfortable dining environment for solo diners. The idea is to incorporate 3D modeling and interior design to simulate a restaurant that has embedded interactive UX design in the physical environment. The main objectives of the dining environment for our solo guests should provide:

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• For comfort - A space with complete privacy.

• For convenience - Ordering and serving process that does not require a server.

• For fun and efficiency - An full entertaining and working system

All these objectives are intended to offer the users an enjoyable journey of individualize dining.

Project Implementation

The implementation of the project to achieve the goal is as follows:

• A diner that offers private physical space for each user to eat;

• A diner serves the proper amount of food for solo users.

• A way to order and serve food without having to interact with a waiter;

• An easy connected interactive system for personal devices;

• An embedded interactive system in the physical environment so that the dining can be fun and joyful;

According to researches and design implementations, these approaches were made and applied in the project to achieve the objectives.

1. Sharing type of food in the size of one person

The individuals who want to eat sharing types of food, such as barbecue and hotpot, which usually tend to serve in a big size, should have a chance to get a proper size meal in the Solo Diner. The food size can always be cut down into a small or mini size so that the customer can have a taste of everything they want and not have to worry about ordering too much.

2. Private booth

The individuals should each enjoy a space of their own. A board or plants were considered as a way to separate space, but those design still will not let the users have full privacy, they can again hear each other during the dining. From customers chose solo diners to eat, they indicate that they like the solo diners better if other people cannot hear their eating noises. In that case, a private booth section to eat would be an ideal solution for the users. In a booth, everyone will feel more secure and relaxing, and people are also less likely to disturb each other.

3. Serves food without meeting with the customers

To avoid any factor that may bother the solo dining experience, a waiter walk around the booth is not the best way to serve food. However, let the users pick the food up themselves would be an annoying process, but using a conveyer belt to deliver the food and dishes to the users would be a more reasonable design thinking.

4. Touchable interactive system embedded in booth

A touchable interactive system should be embedded in the booth so that the user interaction is not just to a device screen but to a physical space. In this case, a window or a wall would be helpful for users to look at, but those surfaces would still be too far to reach. An interactive table would be in a reachable distance for both look and touch, and also could serve the function of the embedded interactive screen.

5. Simple connection with personal device

The interactive system should be connected with personal devices easily. However, as the devices may vary, a plug-in cable connection can fail to adapt to different devices. And a Wifi or Bluetooth connection is wireless, but it will need the user to either enter pair codes or log in to an account, which does not meet the requirement of a quick connection. Technologies like Airdrop, which uses Bluetooth to create a peer-to-peer Wi-Fi network between the devices. Each device creates a firewall around the connection and files are sent encrypted. And AirDrop will automatically detect nearby supported devices. Technologies like Airdrop leads to the idea of a lay-on connection, which can be an effective solution for this situation. The user’s device will automatically connect with the system when the device on top of the table. And the data on that device can be transferred on the interactive screen so that the user’s hands are free from holding things during the dining. Although the lay on connection technology is still in the developing stage, other technology indicates that this is the direction that the industry is working towards and very likely to be succeed.

Methods-Design Process

1. Define the Problem Analysis

The primary concept of the project is to simulate a real restaurant with a private booth and also embedded the interactive system in the physical environment to give the user a better experience of solo dining.

One of the challenges is for having no-waiter service; each booth will need a way for food to come in and plates to come out. Another issue is that the interactive system needs to connect with the personal device easily since people usually stick to their devices during solo meals. Furthermore, since the interactive system is embedded in the

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physical environment, all the touchable design should be in a reachable distance, so that users and get to features conveniently.

2. User Research and Competitive Analysis

The target audiences of the project are users who eat hot pot alone, but still, want to have a quality meal. In order to understand the individual dining situation better, the data found shown that on all meal occasions, 57% of Americans eat by themselves. And when we break the meal occasions into breakfast, lunch, dinner, and non-meal occasions, the percentage of Americans eat by themselves is 61%, 55%, 34%, and 72%. (Figure 1)\(^{13}\) The online restaurant reservation company OpenTable reports that for the past 24 months till October of 2015, single reservations in America increased 62%, which is higher than the rate of group dining.\(^{14}\) And together, these numbers show that solo dining is nearly becoming a national scene. According to the research, we can see that there is a large group of users in solo dining. Moreover, it is time for the users to seek for a quality experience in solo dining.

After defining the gear group, competitive research (Figure 2\(^{15}\) and Figure 3\(^{16}\)) about the current solo diners brands on the market were made to analyze the strength, weaknesses, and improvements. The results showed that the existing solo dining is either failed at a real private space, or the user still have to contact the waiters. Therefore, users cannot fully embrace the time of solo dining. Moreover, the interactive system in the current market is either not able to connect to the user's device, or it is too complicated for the user to adapt. In most situations, users need to spend much time learning and adjusting to the content in the system.


3. Design Goals and Ideation

The design goal of the project is to provide a full package of enjoyable solo dining experience to the users.

Food like hot pot is commonly known as the sharing type of food, which people don’t usually eat by one. And for that, the dishes always seem to serve in a large size. In Solo Diner, smaller size hot pot is offering so that one can still have many different categories of food in the pot, but not causing any food wasting. And hot pot is just an example in this case, the ultimate goal is to serve all kinds of food with reasonable size dishes to be a starting point of relaxing solo dining.

Next to that, a private eating space is an essential demand when people eat by themselves. For that, an individual booth will be an effective solution to fulfill the need. The booth will also make eating hot pot alone in a restaurant a comfortable thing for every customer.

Moreover, complete privacy means no direct contact with the waiter as well. So if the user is in diving in their thoughts and feast, no one will come around and interrupt that experience. And A conveyer belt for food serving at each booth was proposed. However, a conveyer belt in the room will be kind of disturbing for the dining experience and also takes up extra space in the booth. A solution to hide the conveyer belt properly from people’s sight will be needed.

Last but not least, for having a touchable interactive system embedded on the table, user interactions can be performed in a comfortable reaching distance. And being able to project on the window screen also brings excellent visibility of the contents.

4. Information Architecture and User Story Scenarios

The information about the architecture demonstrates the overall structure of the diner. There are five significant parts of the restaurant: private booth, self-ordering and conveyer belt serving, device connection, interactive system.

These five features construct the user scenario of dining in The Solo Diner.

Design Solution: Physical Environment

1. Restaurant Floor Plan

Solo Dining Restaurant intended to offer private space for each customer. In that case, the restaurant will be divided into many individual dining booths. These booths will either have a window with an outside view that has natural light coming in; or have an exquisite artificial landscape feature (depending on the room type and interior, the landscapes can vary, such as an aquarium, tropical creatures, garden view).
For that, all the booths will be arranged along the restaurant walls. A rounded shape floor is preferred so that a broader and better view can be offered in each booth. (Figure 4) However, considered the fact that most of the buildings were designed with the squared floor, an adjustment floor plan for a squared shape floor is also available. (Figure 5) In both floor plans, the restaurant kitchen is located at the center of the restaurant so that none of the window sites is wasted. The Final designs would be required to comply with applicable jurisdictional codes. For this particular research, the minimum two egress gates are used. The kitchen will also have two doors for safety and a more convenient service for food. Four restrooms are each located at different sides/corners of the restaurant so that there is always a closer one to use for all the customers.
Besides that, corridor widths and egress (entry/exit) would be determined by jurisdictional building codes but not to be less than 66” (Figure 6\textsuperscript{17}), so that all of the paths are wheelchair-friendly.

For a more direct point of view, a 3D version of the restaurant is provided. (Figure 7) In the 3D version, a more transparent version of the general layout of booths, kitchen, restrooms, entrances/exits, and hallway is displayed.

2. **Individual Booth**

a. **Inside The Booth**

Inside the booth is where the user experiences all the fun parts of solo dining. Each cabin has a dining table with an interactive surface, an adjustable seat connected to the ceiling, and a window glass for outer view/artificial view that could also be turned into a display screen. Two booths next to each other will shared a conveyer belt for food serving (in and out), so that no server is required in the booth during the meal, and the user will still enjoy their own time. As you can see in the floor plan of the room, only what’s necessary for the users were installed, so the furnishings in the room are clear and straightforward to users. (Figure 8-9)

b. **Conveyor belt for food serving**

To avoid the awkwardness of talking to a waiter, and the waiter coming in to serve food as the disruption of individual time. All the dishes will be served through a conveyer belt. For a more economical way of belt uses, two booth will share a belt for food serving. The belt will be

\textsuperscript{17} 2010 ADA Standards for Accessible Design. Accessed December 1\textsuperscript{e} 2010ADAstandards.htm.
places between the wall of two rooms, so that the noise of the belt can be isolated, and also the belt will not have to be revealed in the sight. A waiter will only be serve the food on the belt platform in the hall way, and the belt will take the dish to users from the platform. (Figure 10)

b. Food Type
The type of food solo dining restaurant serves hot pot for one. Hot pot has always been a sharing type of meal that usually no one eats alone, for that the meal size tends to be oversized (Figure 11). And on a social aspect, people consider going to a hot pot restaurant by oneself an action of lonely and weird. However, this doesn’t mean people don’t crave for hotpot when they are alone, and there is absolutely nothing wrong with enjoying your hot pot. For that, The Solo Diner offers people who want to eat hot pot by themselves not only the pot should be in a more proper size, but also each of the add-in dishes should offer less amount of food so that solo diners can have a taste of more kind of food. (figure 12)

![Figure 11: Usual Hot Pot Food Serving](image1)
![Figure 12: Individual Hot Pot Food Serving](image2)

3. Interior Styles
Solo Diner intended to create a peaceful environment during the stay, and also a visual style that is easy to rebrand or renovate in the long run. The interior style of the restaurant will stick to clean and simple designs, and unnecessary decorations will be avoided in the booth. And the color choice of the interiors will be subtle and plain, like white, gray, and wood colors. Since these kind of colors are light and neutral, they can easily match with different outer views. And also, these colors are basic and gentle so that they will less likely to cause any visual discomfort for the users when use as interior colors. In order to fulfill different preferences, here are two interior style plans offered: White Marble style and Natural Wood style.

a. White Engineered Marble Style
The white engineered marble style interior is clean and straightforward. The primary colors of the booth are white and gray. White engineered marble, white glass, and white paint will be used for construction like items of furniture

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and floor. Gray Textile will be applied for walls and ceiling to isolated the sounds from one room to the other. (Figure 13)

b. Natural Wood Style

The interior style of the Natural is also a clear and minimum design style. Comparing to the white marble plan, this one emphasizes more on a sustainable feeling. The primary colors of the booth are going to be wood colors. Walnut wood and other wooden material will be used for construction like items of furniture and floor. The tabletop, which is also the interactive touch screen, will still use white glass. Dark Beige textile will be applied for walls and ceiling to isolated the sounds from one room to the other, (Figure 14)
Design Solution: Food Ordering & Interactive System

1. Table Dashboard

Inside the booth, the user will be using an interactive dining table. The table will be not only a piece of furniture that serves for dining but also a touchable digital screen for food ordering, personal devices connecting, entertaining, and working. For better use of the touch screen table, the table will use fog prevent glass to avoid cover by moistures, and also napkins will be offered in the booth to wipe out any drips that might happened during the dining. Figure 15 shows the full flow of how the table works.

![Figure 15: Interactive system user flow](image)

In order to achieve a global design solution, the visual system (color system, icon set, font choices) needs to be defined. Color plays a major part in the correctly expression of the design, it is far obvious subtle color use has a positive impact on the way a product is perceived the users. Figure 16 is a demonstration of the color and buttons of the design, showing that the primary colors of the interface design are gray gradient and gold gradient. The gradient of the color gray is to deliver peaceful and relaxing feeling, and it also goes well with the white table surface, gray will be visible and readable to the users, but won’t be a too
outstanding color for eyes during the meal. The gradient of the color gold is to present luxury and delicacy. The assist color is white as it shows the hierarchy. Icon set (Figure 17) is also a significant part of the application, and it ought to match the style of the visual design, color palette, and common sense of well-known app logos. In order to maintain a consist visual style, Helvetica is the ideal choice for the design. For a more user friendly look of the design, the buttons are made in rounded corner or round shape so that everything looks less sharp but more kind.

Figure 18: Food Ordering System

Figure 19: Food Ordering User Scenario

a. Food Ordering System
The users can order food directly through the interactive table. A full set of the menu is embedded in the interactive system. (Figure 18) The entire ordering process can be completed on the table, including choosing the pot type (mandatory), add-ins, drinks, and checkout. (Figure 18-19) In case the user might not know what the pot is by the text on the menu, pictures of different kind of pot is displayed above the pot name so that the users can get a more direct view about the pot.

b. Easy connection with personal devices
The smart table can easily connect to personal devices (such as smartphones and pads) by putting them on the table surface. In that case, no cable or account needs to be set up. It will automatically access the data on the device and show them on the table surface. (Figure 20) The user can access and interact with contents and applications on their devices through the table and avoid having to hold the device in hand and staring at a small screen during the meal.

c. Access to all applications on the table: entertainment & work
After the device is connected to the interactive system on the table, applications on the devices will pop up on the screen (table surface). These applications will be transformed into versions that are easier to use on the table screen.

For instance, all the applications on the devices will line up in the app bar on the bottom of the screen (Figure 21), which is also the closer edge of the interactive table to users so that everything will be in a reachable distance. The app bar can also be hidden by swipe it down, It can also pop up back by swipe the bar up. (Figure 22)

To access applications from user’s personal device, just tap the app icon in app bar, and the content of the selected application will automatically pop up at an available space on the screen for user to use. (Figure 23)
For email and chat type of applications, the user won’t have to worry about missing anything. When there is a new message received, the system will pop up a notification with a brief content of the message. The notification will pop up around the area of the application that is currently in use, so that the user will not miss the alert. (Figure 23)

In order to let the users to finish their work in the most efficient way, the interactive system provides a full keyboard for typing so that there is no more struggling with small phone keyboard. (Figure 24) And also, the window of the booth (in the front of the user) is not just a simple piece of glass for view, but also a digital screen that can project what is on the interactive system. When your table is full of dishes, you can always project content on the table screen to the window screen. (Figure 25)

d. **Comfortable control**
The interactive table allows user to have full control of the entire dinning booth. When you projected everything on the window screen, and the users have nothing to worry about that the window is too far to reach for any further interaction. A smash touch and control pad area will pop up on the table, with this pad you can use your finger to interact with what is projected on the window just like a mouse. (Figure 26) Sometimes, the dinning environment is not completely satisfying (such as the screen brightness, volume and room light), the user can always adjust the room controls in the interactive system to make the booth a more customize place. (Figure 27) Moreover, the seating of the booth can also be adjusted by the control buttons on the seats height, and left or right.

A full demonstration video can be view at:  https://youtu.be/XmpGw3P9lb8

### Results and Design Iteration

Since the solo diner is a futuristic and fictional project, there is no way that we can do a one hundred percent real usability testing. For that, users simulated the booth environment with a tv screen as the interactive table to see if the interactive system actually works. Many attempts and improvements were made based on the testings to accomplish the final design goal. During the process of developing the project, multiple user feedbacks have impacted changes and design iterations.

For instance, during the test on the first version of interactive table screen, the user suggests adjusting icon size and the font size into a smaller scale, because when the interface becomes into a real size screen, the readability actually would be more comfortable if these contents are more modest. In that case, the second version had reduced font size and button size. Later, an app bar that put all applications together was suggested. The user indicates a feature that makes all the applications more gathered in one place on the screen, so they can always know where to look for the applications. To fulfill this need, An app bar is added to the design, and also for it to be in the most convenient reaching distance, the app bar is placed at the closest edge of table to the user. Last but not least, in the final round of the design updating, a touchpad is also a more logical design solution inspired by the observations of the usability test process. Since every laptop has a touchpad today, it will also be a feature that the user can quickly adapt. The interactive system been through many stages of improving and iterating to become into the final design results.

### Conclusion

The solo diner restaurant is a futuristic design for solo users. It is not only considered how users would feel on a single aspect during the meal, such as interfaces or eat without accompanying but focus more on all aspects of user experiences in an actual physical space of eating.
The project started with an existing real-life situation that troubles people and then developed into a full package solution for ultimate solo dining. The project has been designed to be an idea for the users to be able to embrace their dining with themselves experience.

To solve the issues mentioned in the problem statement. A booth section is designed for each user to seek privacy so that they don’t have to experience the awkwardness of expose in public. Dishes served in proper size allows the users eat share-type food by themselves and also have diversities in food choices. The interactive food ordering system and conveyer belt between rooms ensured that they can avoid face-to-face communications with waiter in the serving process. And finally, the friendly device connecting system and the interactive embedded environment provide the quality experience of entertainment and work so that eating by one can still be fun and worthy.

User Experience is the entire set of attitudes and emotions a user has from using a product, service or system. This project is an expression of care about all the single users’ feelings and needs, to show all the solo users that they can have a delicate and beautiful lifestyle, and being alone is not the same as being lonely. One of the essential results of the thesis project is that it is possible for them to have a hot pot for one in private space without bothering, and the project also conveys a enhanced environment for them to experience the entertainment and work applications on their devices. Moreover, the project will help the user to build confidence and fall in love with solo dining.

A designer should be responsible for solving all kinds of users’ problems and bring attention to neglected issues. It is always part of our duty to create delightful solutions. For the current research, the author has put herself in many solo dining experiences to learn what makes the user feels when dining out alone, along with treatment sessions of mild depression (caused by personal reasons). As a result, the author learned the importance of embrace oneself, and there is no reason people should not treat themselves well just because they are not accompanied. This is also proof of how design with care can help people build a better life and love themselves more. In the future development of solo dining, the author wondered if there is a more economic way that can make the diner happened so that this design can benefit more solo living people. And more, Although we enjoy the solo lifestyle, maybe there is a way that we can gather solo people into a community and let them socialize with each other through solo diners.

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