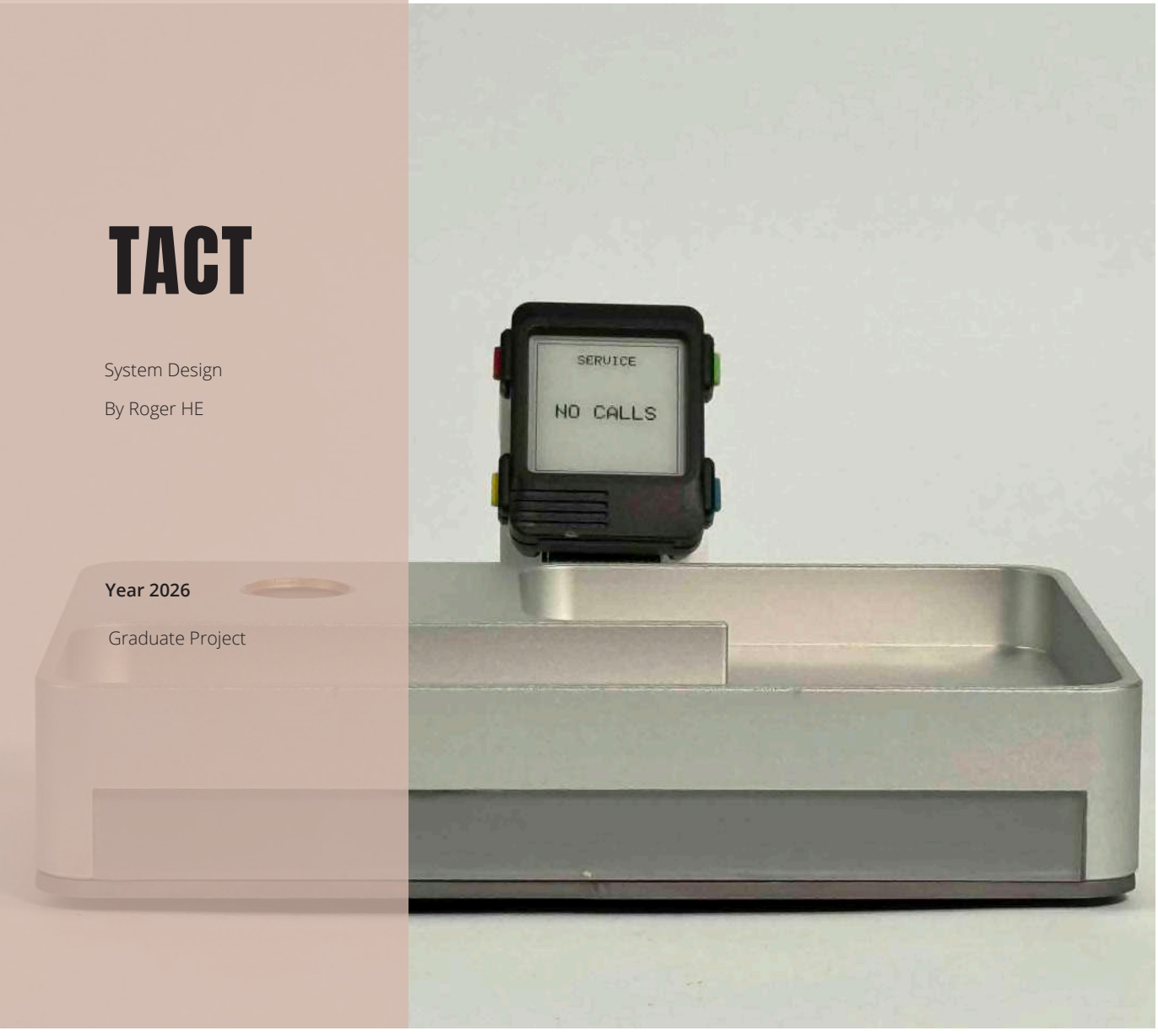
TACT

System Design

By Roger HE



Year 2026

Graduate Project

Abstract &Content

TACT is a dual-terminal service communication system designed for table-service restaurants, with a focus on the quiet friction experienced by solo diners.

The project began from a simple observation: the hardest part of eating alone is often not the meal itself, but the moment when a small need has to become visible in public. Ordering, asking for water, requesting the bill, or raising an issue can become uncomfortable when the diner must wave, look around, wait without feedback, or repeat the signal.

TACT reframes this discomfort as a service visibility problem. The system connects a table-side tray with a waiter-side wearable interface. The diner makes a discreet request through a deliberate touch interaction, while the watch translates that request into a readable staff-side queue.

Rather than replacing hospitality, TACT supports the moment before service can happen: noticing. It helps quiet needs enter the workflow calmly, without making the diner socially exposed or adding unnecessary noise to staff routines.

Solo Dining Is Ordinary, But Still Too Visible

Eating alone in public is no longer an unusual behaviour. More people live alone, study abroad, work irregular hours, or move through daily life with schedules that do not always match their friends or families. In the UK, one-person households now form a significant part of everyday living patterns, and in Scotland this shift is even more visible. Solo dining is therefore not a marginal lifestyle choice. It is an ordinary part of contemporary urban life.

Figure.1 The mismatch between shared-meal norms and the growing everyday reality of solo dining.

The difficulty is that dining culture has not fully caught up with this reality. Many restaurants are still socially and spatially organised around pairs, families, and groups. Tables are arranged for sharing, service scripts assume collective eating, and the atmosphere often treats eating together as the default. Because of this, the solo diner can become more visible than they should be.

This project begins from that mismatch. The problem is not simply that someone eats alone. The problem is that a normal dining situation can become socially exposed when the diner has to wait, look around, ask for attention, or make a small need visible in front of others.

TACT responds to this gap by asking how service communication can become quieter, clearer, and less socially demanding for diners who do not want to perform their needs in public.

Solo dining is not the problem.
The problem is the moment when a private need has to become publicly visible.

COMMENSALITY / VISIBILITY / DEMOGRAPHIC SHIFT

29.5% UK ONE-PERSON HOUSEHOLDS

37.1% SCOTLAND SINGLE-PERSON HOUSEHOLDS

The Confidence Gap

The confidence gap is not a problem of loneliness. It is a problem of unconfirmed visibility.

Figure 2. The confidence gap appears between need and acknowledgement.

DESIGN IMPLICATION

A BETTER SERVICE SYSTEM SHOULD NOT FORCE THE DINER TO BECOME LOUDER.

IT SHOULD MAKE THE REQUEST QUIETLY VISIBLE, ACKNOWLEDGED, AND TRACKABLE.

Solo dining becomes difficult at the moment when the diner needs something from the service system. This need may be small: ordering food, asking for water, requesting the bill, or raising a minor issue. However, once the need appears, the diner has to make themselves visible.

For a group table, this moment is often shared. One person can talk, another can look around, and the social attention is distributed. For a solo diner, the same action is concentrated on one body. Looking for a waiter, raising a hand, or making eye contact can feel more exposed because there is no group to absorb the awkwardness.

The confidence gap is therefore not caused by eating alone itself. It is produced by a lack of feedback. The diner may know what they need, but they do not know whether staff have noticed them, whether the request is being handled, or whether they should try again. This creates a passive state: the diner is visible, waiting, and unsure what to do next.

Once the food arrives, comfort often returns. The diner regains a clear purpose: eating. This shows that the problem is not solitude as such, but the unresolved service moment before the experience becomes stable again.

TACT focuses on this moment because it is where a small design intervention can create the most emotional and operational value.

Hospitality Is Already Under Pressure

PRESSURE POINTS

LABOUR PRESSURE

FEWER STAFF ARE EXPECTED TO MANAGE MORE TASKS, FASTER SERVICE, AND HIGHER CUSTOMER EXPECTATIONS.

SEAT-TIME LOGIC

TABLES ARE TREATED AS LIMITED INVENTORY. TIME, PARTY SIZE, AND TURNOVER AFFECT COMMERCIAL VALUE.

ATTENTION OVERLOAD

STAFF RELY ON CONSTANT SCANNING, BUT QUIET REQUESTS ARE THE EASIEST SIGNALS TO LOSE.

STRUCTURAL DISADVANTAGE

SOLO DINERS MAY NOT BE UNWANTED, BUT THEY ARE EASIER TO DEPRIORITISE WHEN SERVICE IS UNDER PRESSURE.

Restaurant service is not only a social interaction. It is also a live operational system shaped by labour, time, movement, and revenue pressure. During a busy service, staff are not simply “serving tables”; they are balancing food runs, drinks, bills, cleaning, seating decisions, customer expectations, and constant visual scanning across the room.

Within this environment, quiet requests are structurally easy to miss. A solo diner who waits silently, avoids interruption, or signals subtly may appear less urgent than a larger table calling, moving, or creating visible demand. The result can feel personal to the diner, but the cause is often systemic.

A table is also not neutral furniture. In commercial hospitality, it becomes a revenue unit measured through time. Restaurants need to protect table turnover, manage labour costs, and keep larger groups moving through limited seating capacity. This can make solo diners operationally awkward, especially when one person occupies a two-seat table during a busy period.

This context changed the direction of the project. The design problem was not simply how to make solo diners feel more confident. It was how to help their needs enter the service system more clearly, without adding extra emotional pressure to the diner or extra scanning pressure to staff.

TACT therefore works between guest comfort and staff coordination. It makes quiet demand visible before it becomes frustration.

> The issue is not bad service.
> The issue is that visibility becomes a scarce resource in a busy restaurant.

What Research Revealed

The research began with solo dining as a personal and emotional experience, but it gradually became clear that discomfort was not located only inside the diner. It was produced by a wider dining situation: where the person sits, how visible they feel, how staff move through the room, and whether their small needs are noticed without effort.

Across personal journey mapping, dining diaries, observation, online stories, and informal conversations with staff, the same pattern repeated. Solo dining can feel calm when the diner has control, a clear purpose, and a protected position in the space. It becomes uncomfortable when the diner is passive, exposed, and uncertain about how to enter the service system.

This shifted the project away from designing emotional distraction or fake companionship. The problem was more precise: how can a solo diner make a request without becoming too visible, and how can staff notice that request without relying only on constant room-scanning?

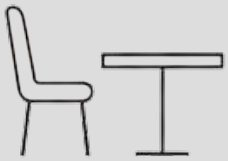
Solo-diner discomfort is not only a social anxiety problem.

It is a coordination problem between a quiet diner and a busy service system.

1

Solo dining is not one emotion

Eating alone can feel restorative when it is chosen, but uncomfortable when it is forced by schedule, fatigue, budget, or social absence. The design cannot assume that all solo diners want company.



2

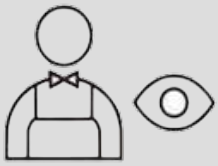
Space changes confidence

Corners, counters, window seats, and wall-backed tables can protect the diner. Central tables can feel like a stage. Confidence is partly spatial, not only psychological.

3

Waiting creates exposure

The strongest discomfort often appears before the meal becomes stable: entering, ordering, waiting, and paying. These moments require the diner to look, signal, or wait without feedback.



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Service pressure is a hidden layer

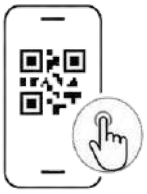
Staff do not necessarily dislike solo diners. The issue is that low-key requests are harder to notice when staff are balancing multiple tables, time pressure, and visible demand.

Existing Systems Are Not Enough

Restaurants already use different systems to reduce service friction, but most of them are designed around operational convenience rather than the emotional and spatial reality of dining alone. They allow a diner to place an order, press a button, or send a signal, yet they often fail to support the more delicate moment between needing service and feeling recognised.

For solo diners, this gap matters. A service request is not only a functional message; it is also a public action. If the system feels too visible, too digital, too crude, or too detached from the atmosphere of the restaurant, the diner may still feel exposed. If the system gives no clear feedback, the diner is left in the same uncertain waiting state.

This review clarified that TACT should not simply become another call button. It needs to sit between three demands: the diner's need for quiet acknowledgement, the waiter's need for readable task flow, and the restaurant's need to preserve ambience and service rhythm.



QR Code

Efficient, but screen-dependent.

QR systems are discreet and multi-functional. They let diners browse menus, order, or request help through their own phones. However, they shift the dining interaction onto a personal screen. This can make the meal feel more transactional and less hosted. It reduces interruption, but it does not always create a sense of human acknowledgement.

Electronic Service Bell

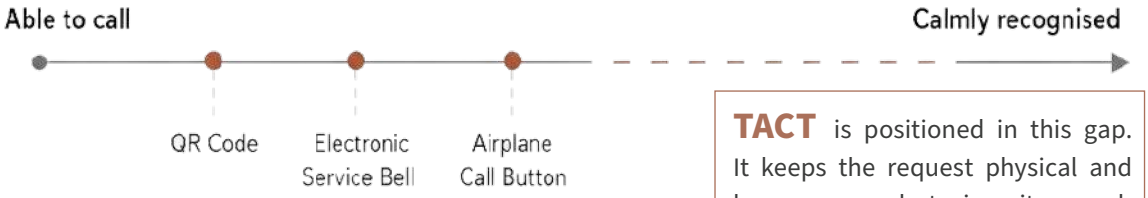
Immediate, but too narrow.

Table bells create a direct signal between diner and staff. They are simple, quiet, and easy to understand. However, many systems reduce service to a single call state. They often do not explain what the diner needs, whether the request has entered a queue, or how staff are managing it. They call attention, but they do not structure the service journey.

Airplane Call Button

Acknowledged, but too standardised.

The airplane call button is the strongest reference for quiet, seat-based requests. It gives the passenger a visible sense that the request has been recognised. However, it works inside a highly controlled environment with fixed seats, predictable service roles, and a narrow request script. A restaurant floor is more fluid, social, and atmosphere-sensitive.



TACT is positioned in this gap. It keeps the request physical and low-pressure, but gives it enough structure to become visible within the staff workflow.

Design Opportunity

From hiding the diner to quietly surfacing the need

Early in the project, the problem seemed to be about the solo diner's visibility. If eating alone felt uncomfortable, one possible response was to reduce that visibility: protect the diner, distract them, or help them retreat into a more private experience.

However, the research showed that this was only a partial reading of the issue. Solo diners do not always want to disappear. In many cases, they want to remain part of the dining environment, but without having to perform small needs in public. The more precise opportunity is therefore not concealment, but controlled visibility.

A service request needs to become visible, but the diner does not. This distinction became central to TACT. The design should allow a quiet need to enter the restaurant's workflow without forcing the diner to wave, call out, repeatedly look around, or return to a phone-based interface.

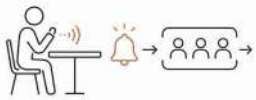
This also reframes the role of staff. The system should not monitor waiters or replace their judgement. Instead, it should support attention at the exact point where service breakdown often begins: the moment when a quiet request has not yet been noticed.

TACT is built from this opportunity. It transforms a private need into a calm, structured service signal.

Not this

A device that helps solo diners hide from the room.

But this



A system that helps quiet needs become visible within the service flow.

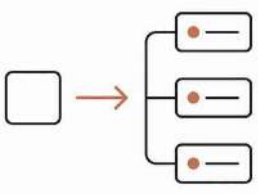
Design Principles

1. Discreet, not invisible

The interaction should reduce public awkwardness, but still keep the diner connected to the dining environment.

2. Acknowledged, not ignored

The diner should receive a clear sign that the request has entered the system.



3. Structured, not noisy

The request should not simply demand attention. It should carry enough information to help staff decide what happens next.

4. Supportive, not surveillant

The system should help staff coordinate service, not measure or police their behaviour.

KEY INSIGHT

THE DESIGN OPPORTUNITY IS NOT TO REMOVE VISIBILITY.

IT IS TO DECIDE WHAT BECOMES VISIBLE, TO WHOM, AND AT WHAT MOMENT.

From Visibility to Communication

The prototype journey did not move in a straight line towards the final product. Each prototype tested a different interpretation of the solo dining problem. At first, I treated discomfort as a problem of being seen. Later, I tested whether waiting could be made more active. Only after these routes showed their limits did the project settle on a more precise direction: service communication.

The early head-based prototypes explored whether reducing peripheral visibility could make a solo diner feel calmer. They worked in one limited sense: blocking the surrounding view made the table feel more private. However, they also created a stronger problem. The diner became even more visually unusual. The prototype reduced exposure internally, but increased spectacle externally.

The scent puzzle then shifted attention from visibility to waiting. It asked whether a small sensory task could make waiting feel more engaged and connected to the meal. This was useful because it showed that waiting time could be designed, not just endured. However, hygiene, fragility, storage, and repetition made it unsuitable as the main direction for a real restaurant context.

The service signal prototypes were the first moment where the project became more focused. Instead of trying to distract the diner or hide them, these objects allowed the diner to express a need quietly. Testing showed that both diners and staff valued this direction, but it also exposed a critical weakness: a signal is only useful if it is clear, readable, and connected to a response.

This led to the final shift. The project could

Head Visor

Question tested:
Can reducing visual exposure help solo diners feel less watched?
Learning:
It created privacy, but also made the diner look more unusual. Hiding the person was not the right answer.

Scent Puzzle

Question tested:
Can waiting become more active, sensory, and connected to the food?
Learning:
It made waiting more engaging, but hygiene, storage, fragility, and repetition made it difficult for restaurant use.

Service Signal

Question tested:
Can a diner ask for water, help, or the bill without waving or calling out?
Learning:
Quiet signalling was valuable, but the message had to be readable from a distance and meaningful to staff.

Connected System

Question tested:
What happens after the request is made?
Learning:
The strongest direction was not a single signal object, but a complete request journey: input, acknowledgement, queue, response, and closure.

Final Concept: TACT

A quiet service communication system for table-side requests and staff-side coordination.

TACT is a dual-terminal restaurant service communication system designed for moments when diners need help, but do not want to perform that need publicly. It connects a table-side tray terminal with a waiter-side wearable interface, creating a calmer route between private need and service response.

The tray gives the diner a discreet way to request support through a deliberate touch interaction. Instead of waving, calling out, scanning the room, or returning to a phone, the diner presses and holds on the tray surface. A brief light response confirms that the request has entered the system.

The watch translates that request into a staff-side queue. It allows the waiter to see that a table needs attention, preview the service category, confirm the task, and close the request once it has been handled. In this way, TACT does not replace hospitality judgement. It supports the moment before judgement can happen: noticing.

The system is designed around one simple principle: service should not depend only on who is loudest, most visible, or easiest to notice. Quiet needs should also have a clear route into the workflow.

System Definition

TACT is a dual-terminal, low-disruption restaurant service system for:

- **Table-side request signalling**

A diner can make a small service request through the tray without drawing public attention.

- **Waiter-side request visibility**

The request becomes readable on a wearable interface rather than relying only on room-scanning.

- **Acknowledgement and closure**

The system confirms that a request has been received, then returns to rest once the service loop is complete.

Two Linked Terminals

- **Tray Terminal**

The tray is the diner-side interface. It combines table function, touch input, light acknowledgement, and status feedback in one object.

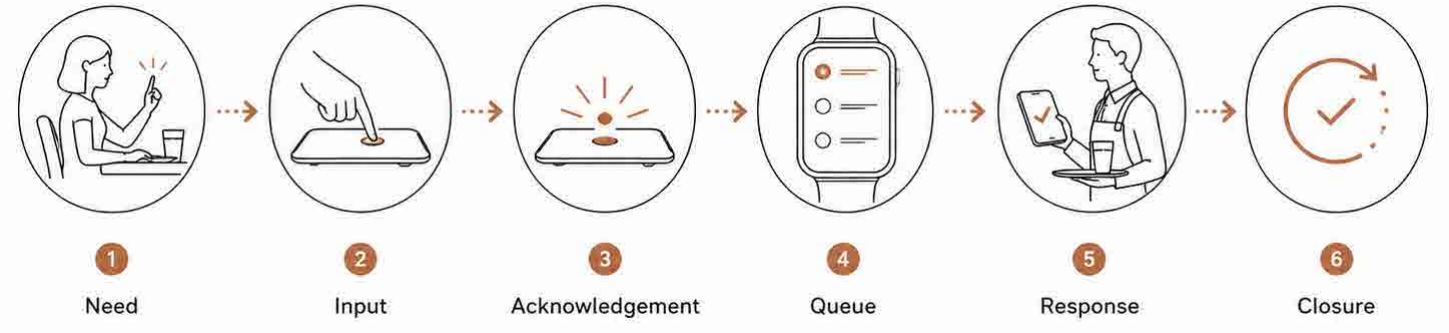
Role: To let the diner make a request quietly, intentionally, and without using a phone.

- **Watch**

The watch is the staff-side interface. It receives requests, displays queue order, supports service-category confirmation, and helps the waiter act without losing the rhythm of service.

Role: To turn hidden demand into a readable task flow.

Core Service Loop



Diner-Side Journey

A request should be easy to make, but not easy to trigger by accident.

From the diner's side, TACT is designed to feel almost invisible until it is needed. The tray sits as part of the table setting, not as a separate electronic device asking for attention. This matters because a solo diner should not feel that they have been given a "special tool" for being alone. The request function is present, but visually quiet.

When a need appears, the diner does not have to wave, call across the room, stare at staff, or reopen a phone screen. They simply press and hold the tray's touch point for two seconds. This small delay is deliberate. It makes the action feel intentional, while filtering out accidental touches from wiping, glass placement, resting hands, or normal table movement.

The first response is immediate and restrained: a brief white light and a short sound. This feedback is not decorative. It closes the most uncomfortable gap in the solo dining journey — the uncertainty of not knowing whether the request has been noticed. Once the tray responds, the diner can stop repeating the action and return to the meal.

Importantly, the diner does not need to classify the request at this stage. They are not asked to choose from a menu of service types or explain the issue through a screen. The first action only says: "I need service." The specific need is clarified later by staff, preserving the human judgement of hospitality while reducing the awkwardness of asking for attention.

This makes the diner-side experience simple, calm, and socially protected.

1. Need Appears

A small service need emerges: water, ordering, bill, or assistance.

2. Quiet Input

The diner presses and holds on the tray for two seconds.

3. Immediate Confirmation

A brief white light and short sound confirm that the request has entered the system.

4. Human Response

A staff member arrives, understands the need, and handles the request.

3. Return to Rest

Once the service is completed, the tray returns to a calm inactive state.

The diner-side interaction intentionally avoids asking the user to choose "water", "bill", "order", or "issue" at the first touch.This keeps the action fast, low-pressure, and socially neutral. It also prevents the tray from becoming another ordering interface. TACT does not replace conversation; it makes the first moment of asking easier.

Staff-Side Journey

The watch does not replace service judgement.

It protects the moment before judgement: noticing.

From the staff side, TACT is designed to reduce missed requests without turning service into surveillance. In a busy restaurant, the main breakdown often happens before action: not at the moment of delivering water, taking payment, or answering a question, but at the moment when a quiet need has not yet been seen.

The wearable interface gives staff a small, glanceable queue of active tables. It does not ask the waiter to read dense messages or manage a full digital dashboard during service. Instead, the watch shows only the information needed to decide where attention should go next. The current priority is made visually dominant, while other waiting tables remain visible in smaller form.

Once the waiter reaches a table, the system does not assume the request type automatically. The waiter still speaks to the diner, reads the situation, and then confirms the category on the watch. A short press previews the service type, while a one-second hold confirms it. This slows the interaction down at the correct point, preventing accidental classification while keeping the process fast enough for live service.

After confirmation, the tray updates into the matching service state. This creates a shared status between table and staff: the diner knows the request has progressed, while the waiter can continue serving without holding everything in memory. When the task is completed, the request is cleared and the queue updates.

TACT therefore supports service attention without over-controlling staff behaviour. It makes demand legible, but leaves hospitality human.

A wall screen or fixed terminal could show requests, but it would pull attention away from the floor. The watch keeps the signal close to the person who acts on it. This makes the queue mobile, glanceable, and tied to the rhythm of service.

The aim is not to make staff constantly look down. The aim is to reduce the need for constant room-scanning when quiet requests are easy to miss.

The Tray as Interface

The request function is not added to the table. It is absorbed into an object that already belongs there.

The tray became the diner-side interface because it already fits the language of table service. It can hold condiments, menus, flowers, or small shared objects, so the technology does not appear as a separate call device.

This matters because TACT should not make the diner feel singled out. A service bell can feel too direct, while a phone-based system can make the meal feel detached and screen-led. The tray creates a quieter middle ground: physical, familiar, and close to the service relationship.

The interaction also stays low. Instead of raising a hand or looking around for staff, the diner makes a small gesture within the table setting. The request becomes visible to the system, while the person remains socially protected.

Its material language supports this role. The aluminium body, softened corners, recessed surface, and front light diffuser allow the tray to feel like hospitality infrastructure rather than consumer electronics.

Condiment Tray Language

The object borrows from familiar tabletop service items, allowing it to sit beside sauces, seasonings, and small accessories without feeling alien.

Recessed Top Surface

The top surface creates a contained zone for table objects and prevents the product from reading as a flat electronic pad.

Integrated Touch Point

The brass-toned touch area gives the diner a clear point of interaction while keeping the gesture small and controlled.

Front Light Diffuser

The front diffuser allows the tray to communicate status through light without requiring a screen or loud notification.

Aluminium Body

The metal body gives the product visual weight, durability, and a more premium table presence than plastic prototyping forms.

Why a Tray?

- ***1. It already belongs on the table***

A tray can exist in the dining environment without needing explanation. It can hold condiments or small service items, so the technology does not appear as an extra object.

- ***2. It keeps the action low***

The diner does not need to wave, raise their hand, or use a phone. The interaction happens within the natural reach of the table.

- ***3. It avoids the "service bell" problem***

A bell can feel crude, demanding, or too direct. The tray softens the request by embedding it into a calmer object.

- ***4. It gives the system physical presence***

Because the tray remains on the table, it becomes a stable service anchor: a place where request input, acknowledgement, and status feedback can all happen.

Tactile Threshold

A restaurant tray is not a neutral button. It is a live surface.

The tray surface is touched throughout the meal: glasses are placed down, hands rest on the edge, staff wipe the table, and condiments are moved around. In this context, a single tap would be too fragile as an input method. It might feel fast, but it would also make the system vulnerable to accidental activation.

For this reason, TACT uses a 2-second press-and-hold. The delay creates a clear threshold between casual contact and intentional request. It asks for enough commitment to prove that the diner means to call for service, but not so much effort that the action becomes awkward or visible.

This interaction also changes the emotional tone of the request. A tap can feel like pressing a bell. A hold feels quieter, slower, and more deliberate. It gives the diner a small moment of control before the request enters the system.

Tap

fast, but easily accidental

2-second hold

slower, but intentional and reliable

Why Not a Tap?

- ***1. Too easy to trigger***

A tray is constantly touched during eating and cleaning.

- ***2. Too ambiguous***

The system cannot easily distinguish a request from casual contact.

- ***3. Too demanding for staff***

False alerts would add more noise to an already busy service floor.

Why a 2-Second Hold?

- ***1. Intentional***

The hold confirms that the diner really wants support.

- ***2. Quiet***

The gesture stays low and does not draw attention from the room.

- ***3. Reliable***

The delay filters out wiping, glass placement, and accidental touch.

The threshold is not just a technical delay.

It is a way of making the request feel deliberate, quiet, and trustworthy.

Light Semantics

Light is not used to decorate the tray.

It is used to make service status quietly readable.

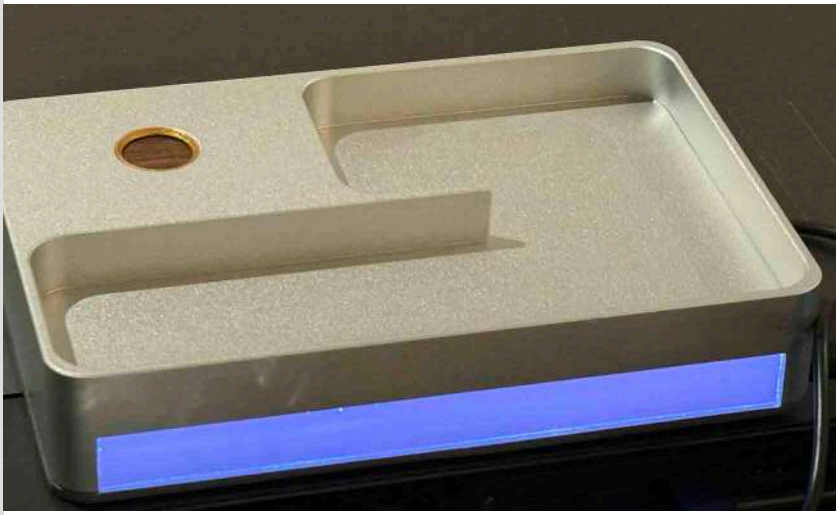
TACT uses light as a restrained service language. In a restaurant, visual feedback must be clear enough to be noticed, but quiet enough not to disturb the dining atmosphere. For this reason, the tray does not use flashing alarms, bright screen displays, or aggressive colour changes. Its light output stays low, peripheral, and embedded into the front diffuser.

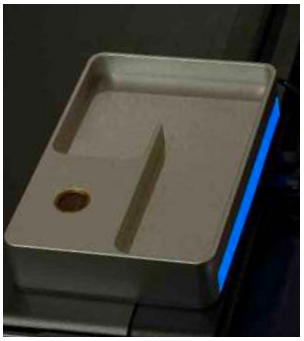
The first light response is white. This appears only after the diner completes the 2-second hold. Its role is simple: to confirm that the request has entered the system. It does not describe the service type yet. It only closes the uncertainty gap by telling the diner, “your request has been received.”

After staff check and classify the request through the watch, the tray can shift into a service-state colour. Each colour corresponds to a category that staff can understand quickly from the floor. The aim is not to make the table loud, but to create a shared status between diner and staff.

This makes the tray more than an input device. It becomes a quiet feedback surface: one that reassures the diner, helps staff read table needs, and keeps the service loop visible without turning the restaurant into a digital dashboard.

Stage 1 — Customer acknowledgement





Blue — Water

Yellow flowing light —

Red — Issue / Complaint

Green — Bill

Why Restrained Light?

It protects the atmosphere

The tray should not look like an emergency device or a cheap service bell.

supports peripheral noticing

Staff can read the table state without staring directly at the object.

reassures the diner

The diner receives feedback without needing to repeat the request.

creates shared status

Both sides can understand whether the request has been received, classified, or closed.

Wearable Staff Interface

The watch is not a smartwatch.

It is a small triage surface for service attention.

The waiter-side interface was designed for quick understanding during live service. Staff do not have time to read long messages, open apps, or navigate layered menus while carrying plates, moving between tables, and responding to visible demand. The watch therefore shows only what is needed: which tables are waiting, which one needs attention first, and whether the request has been confirmed.

The interface uses a simple queue logic. Up to three active tables are shown at one time. They are read from left to right, and the current priority is displayed in the largest type. This allows the waiter to understand direction immediately without adding more visual clutter to the service floor.

The watch also keeps human judgement in the loop. It does not automatically decide whether the diner needs water, ordering, the bill, or issue support. The waiter first approaches the table, checks the real situation, and then confirms the category through the side buttons.

This preview-and-confirm logic makes the watch slower at the right moment. A short press previews the service type. A one-second hold confirms it. This prevents accidental classification while keeping the interaction fast enough for restaurant work.

Technical System

The prototype was built to prove one thing:
a quiet request can move from table to staff without becoming a public performance.

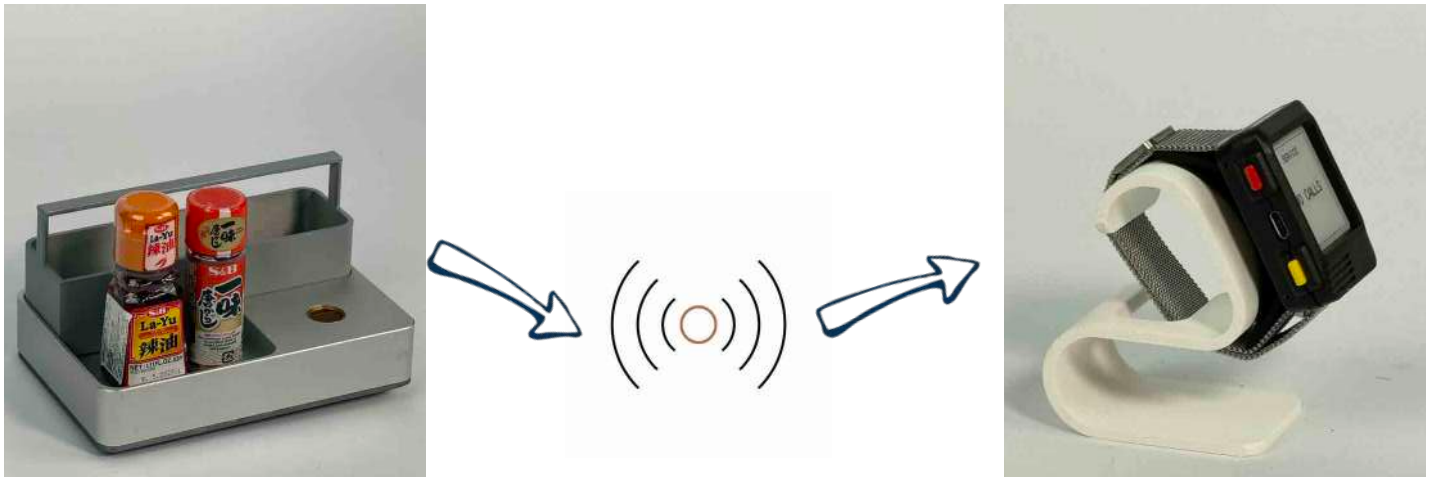
TACT works through two linked terminals. The tray captures the diner's request, while the watch turns that request into a readable staff-side queue.

The system is intentionally simple at this stage. It does not try to become a full restaurant platform. Its purpose is to prove the core service loop: input, acknowledgement, transmission, prioritisation, confirmation, and closure.

On the tray side, a hidden capacitive touch sensor reads the two-second hold. Once accepted, the controller triggers local light feedback and sends the request to the watch.

On the staff side, the Watchy e-paper display shows active table requests in a low-glare queue. The side buttons allow staff to preview and confirm service categories without using a touchscreen or phone.

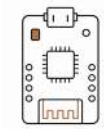
The prototype uses local wireless communication, so it can demonstrate the interaction without relying on restaurant Wi-Fi, POS systems, or cloud infrastructure.



Component Logic

Capacitive Touch Sensor

Chosen to keep the diner action low, discreet, and embedded into the tray surface.



ESP32 Controller

Used as the tray-side control unit for touch reading, LED behaviour, and wireless communication.

WS2812 LED Strip

Used to create restrained status feedback through the front diffuser.

Watchy 2.0

Used as the waiter-side wearable terminal because its e-paper display supports low-glare, glanceable information.

Side Buttons

Used for preview-and-confirm interaction, so staff can select service categories without a touchscreen.

Tray

Role: diner-side input and feedback

Capacitive touch input, Two-second hold threshold, LED status feedback, Local request transmission, Physical integration inside the tray body

Watch

Role: staff-side visibility and confirmation

E-paper queue display, Up to three active table requests, Priority shown through scale, Side-button preview and confirmation, Task clearing after

Material and Manufacturing

The object had to feel less like a prototype,

and more like something that could stay on a restaurant table.

Tray Manufacturing Logic

Metal Fabrication

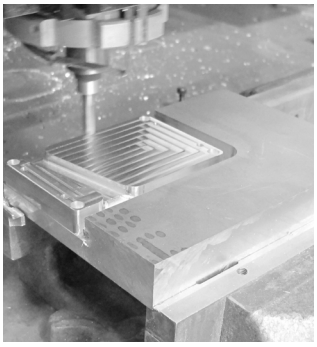
Confirmed that metal was the right material direction, but welding made fitting and finishing too difficult.

CNC Aluminium Alloy

Chosen for precision, strength, clean grooves, and a more credible restaurant-grade surface.

Sandblasting + Anodising

Used to soften the surface, improve durability, reduce fingerprints, and make the tray easier to clean.



Frosted Acrylic

Spreads the LED output and reduces visible hotspots.

Grey Vinyl Layer

Softens the surface appearance and helps the diffuser match the aluminium body.

Controlled Glow

The light should feel embedded into the tray, not attached as a visible electronic strip.

Watch Manufacturing Logic

3D Printed Shell

Used for fast iteration of the housing, buttons, internal fit, and wrist curvature.

Multi-Part Assembly

Allowed the screen frame, rear body, button caps, and support structure to be adjusted separately.

Wearable Fit

The curved rear support was tested to make the watch sit more naturally on the wrist during service.

TACT needed two different material strategies. The tray had to feel stable, clean, and table-compatible. The watch had to be light, wearable, and precise enough to hold electronics and side buttons. Because the two objects live in different parts of the service system, they could not be made with the same manufacturing logic.

For the tray, early PLA models were useful for testing scale and layout, but the material felt too light and temporary for the final context. Metal fabrication moved the project closer to the right direction, but welding separate parts created problems with fitting, rounded corners, and internal tolerances. This made the tray difficult to finish cleanly.

The final direction became CNC-machined aluminium alloy. This gave the tray a stronger body, cleaner edges, more accurate grooves, and a finish that felt closer to hospitality equipment than desktop electronics. Sandblasting softened the machined surface, while anodising improved durability, corrosion resistance, and cleanability.

The diffuser was developed through optical testing. The goal was not maximum brightness, but a soft and controlled glow. Frosted acrylic helped spread the light, while a grey vinyl layer made the illuminated strip feel more integrated with the aluminium body. This prevented the LEDs from looking harsh or technical.

For the watch, the final form was developed through repeated 3D printed shell tests. This allowed the case, button openings, internal supports, and curved wrist contact to be adjusted physically before committing to a more refined production route. The watch needed to feel task-specific, not like a generic smartwatch.

Real Context Simulation

The final test was not only whether TACT works.

It was whether it belongs.

After developing the tray and watch as functional prototypes, I tested the tray in a real restaurant context. The aim was not to create a polished commercial photoshoot, but to understand whether the object could sit within an existing hospitality environment without feeling visually forced.

The test was carried out in a daytime gastropub setting in Edinburgh. This was a useful stress condition: if the light feedback and object presence remained readable in bright daylight, they would be less likely to fail in dimmer evening service. The setting also matched one of TACT's intended contexts — a restaurant type where seated dining, drinks, fast movement, and casual atmosphere overlap.

In the table setting, the tray worked best when it behaved as a familiar tabletop object first. With condiments placed inside it, the product did not immediately read as a digital device. Its aluminium body, recessed storage area, and controlled front diffuser allowed it to blend with existing tableware while still holding a clear interactive function.

This simulation also showed why restraint matters. If the tray was too bright, too colourful, or too visually technical, it would break the dining atmosphere. If it was too invisible, the interaction would become unclear. The current balance places TACT between object and interface: quiet enough to belong, but legible enough to support service.

A restaurant product is judged not only by its function, but by whether it can survive the atmosphere around it.

Reflection and Future Development

TACT began as a project about solo dining.

It ended as a project about service visibility.

At the beginning of the project, I understood solo dining mainly as an emotional experience: feeling watched, waiting awkwardly, or not knowing where to look. Through research and prototyping, this reading became more precise. The hardest moment was not eating alone itself, but trying to make a small need visible in a public service space.

This changed the design direction. Earlier prototypes tried to protect, distract, or comfort the diner. TACT instead focuses on the communication layer between diner and staff. It does not ask the solo diner to hide, and it does not ask staff to work harder. It creates a calmer route for quiet needs to enter the service workflow.

The final prototype proves the core interaction: a diner can make a deliberate request through the tray, receive immediate acknowledgement, and allow that request to appear in a staff-side queue. The system is still a prototype, but it demonstrates a clear principle: hospitality can be made more considerate not by adding more attention, but by organising attention better.

Future Development

- ***Pilot test in a real venue***

Run a small pilot in a gastropub or high-end casual dining context to test how diners and staff use the system during live service.

- ***Refine hardware enclosure***

Develop a more sealed tray body, improved internal cable management, and a cleaner charging or power strategy.

- ***Improve staff interface logic***

Test queue limits, priority rules, category confirmation, and whether different staff roles need different watch views.

- ***Evaluate service value***

Measure whether TACT reduces missed requests, repeat signalling, waiting anxiety, and staff scanning pressure.