Mass Adoption of Handwashing for Home and School Use

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Background

The COVID-19 pandemic has created a fundamental shift in the way that Americans and the global community as a whole perceive and interact with their world and one another. Many of these changes will likely remain long after the virus has been eradicated. In combating the virus, one technique is universally recognized and recommended: proper handwashing. Unfortunately, up to 97% of the general population in the United States does not regularly engage in proper handwashing techniques (USDA). Specifically, people are not washing their hands for the full 20 seconds that is recommended by the CDC. Proper handwashing techniques are estimated to reduce the number of respiratory illnesses suffered in the general population by 21% and the number of diarrheal illnesses by up to 40% (CDC).

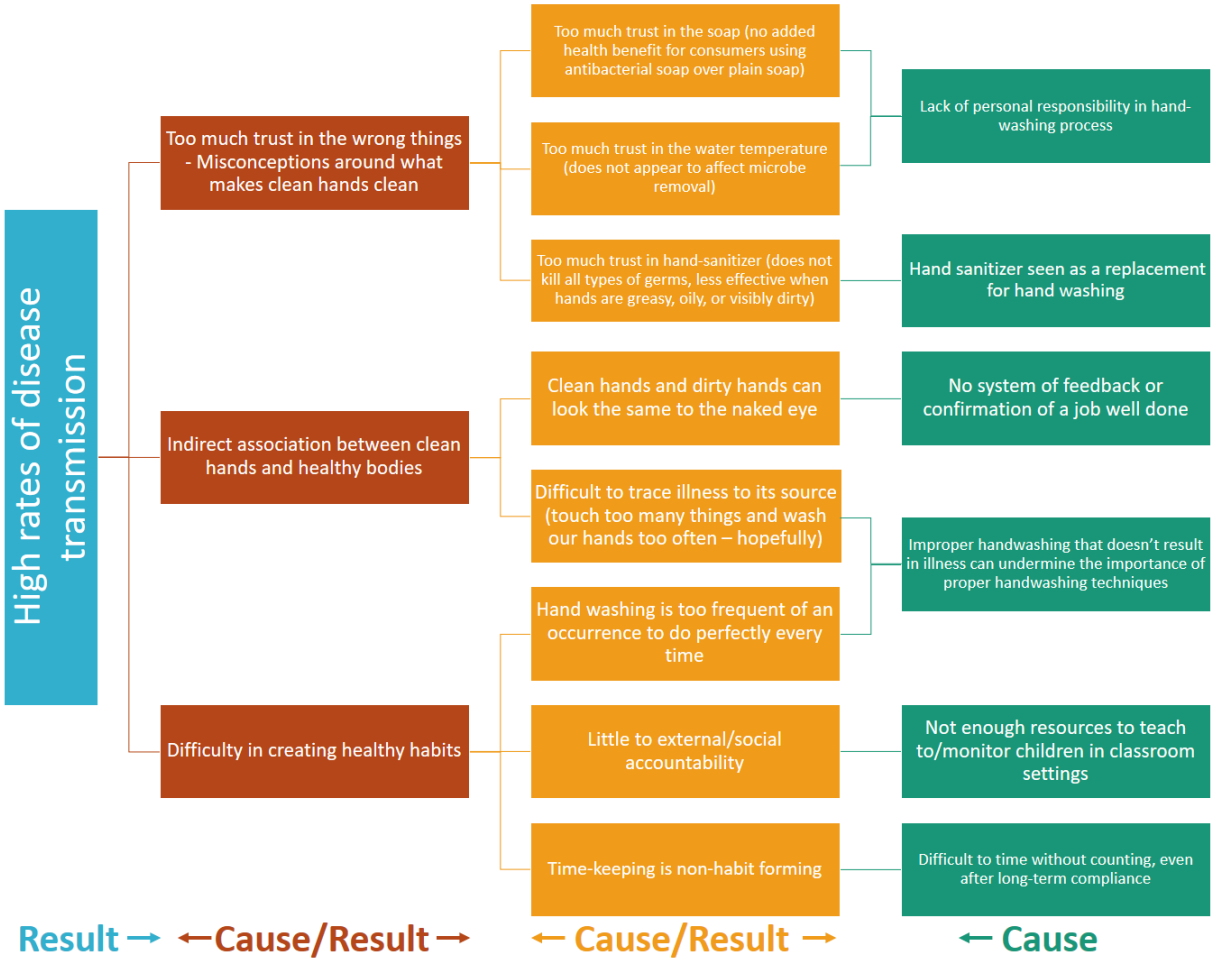
"Root Cause" Analysis

The Five Whys

Problem - High rates of disease transmission, especially during cold/flu season

- Why? People are not practicing proper handwashing techniques
- Why? Proper handwashing techniques are difficult to enforce and instill as a personal habit
- Why? Washing one's hands properly requires a person to pay more attention to the process than most people are willing to give for an action that occurs so frequently
- Why? Keeping track of time does not phase out into a habit. i.e., initial compliance does not lead to habit formation
- Why? There's no "muscle memory" equivalent to time-keeping, nor is there any other system of feedback for determining when hands are clean

Tree Diagram



Mass Adoption for Children

Mass adoption of proper hand washing technique refers to the widespread acceptance and practice of effective hand hygiene by a large number of people. This includes washing hands frequently with soap and water for at least 20 seconds, using hand sanitizers, and avoiding touching the face. Achieving mass adoption of proper hand-washing techniques is crucial in preventing the spread of infectious diseases, especially during outbreaks such as the COVID-19 pandemic. Mass adoption of this technique requires education and awareness campaigns to inform people about the importance of effective hand hygiene, as well as access to clean water and soap, and hand sanitizers in public places. Consistent and widespread adoption of proper hand-washing techniques has the potential to save lives and protect public health. Mass adoption of hand washing techniques is most important to be targeted at children

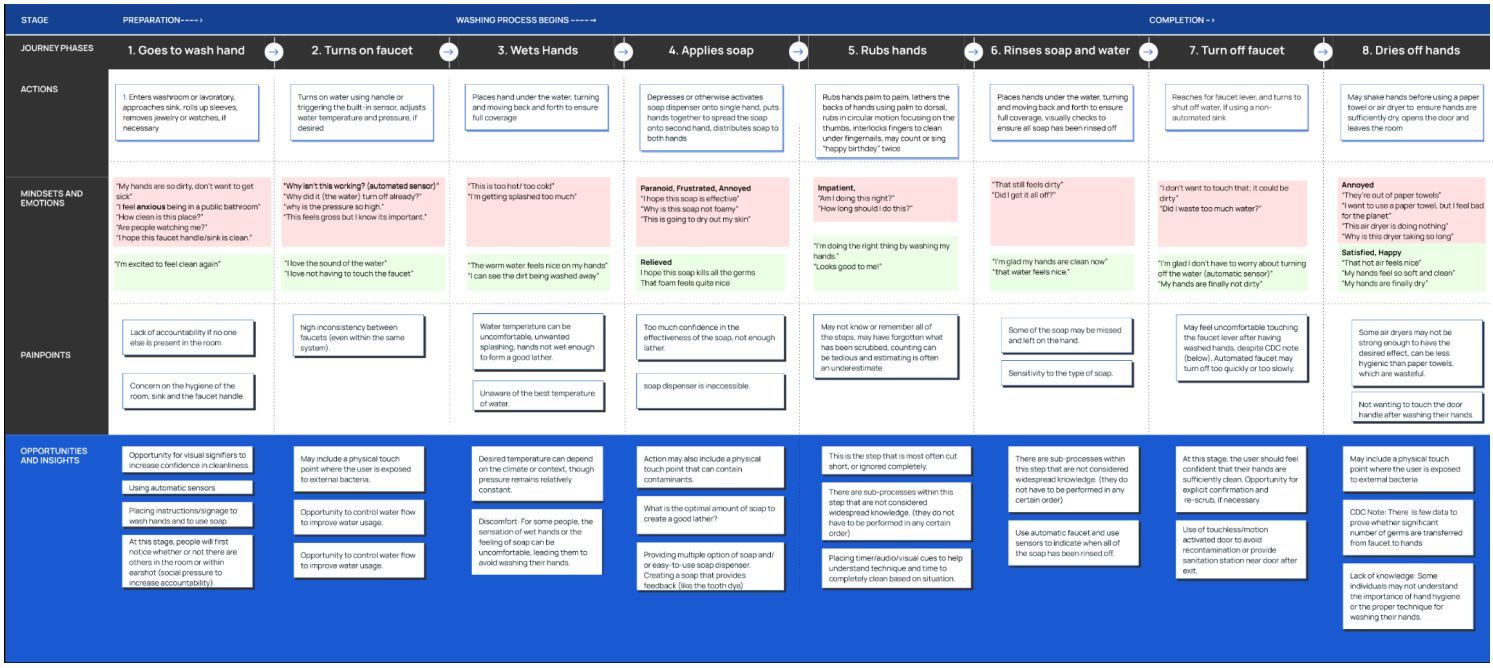
since they are most likely to not already properly wash their hands, be exposed to illness-causing bacteria, and can bring this hygiene skill into their adulthood.

Motivating children to do things they do not want to do can be a challenging task for everyone involved. By helping the child understand the importance of the task, children can be motivated to take action. Additionally, parents can try to make the task more enjoyable by adding an element of fun to it, such as playing games or setting challenges. Another approach is to offer rewards or incentives for completing the task, such as a favorite treat or extra playtime. Ultimately, it's important to remember that each child is unique, and what works for one child may not work for another. It may take some trial and error to find the right approach that works for each child, but with patience and persistence, children can be motivated to do things they do not want to do.

Creating a system in which children are motivated to wash their hands is one that requires careful thought and many approaches before reaching the point of mass adoption. One such strategy is to make hand washing fun and engaging for children. A routine that involves singing a song or doing a dance while washing hands, or using colorful soaps and towels to make the experience more appealing can encourage children to be engaged in the experience and think of it as fun rather than a chore. It's also important to explain to children why hand washing is important and how it can help prevent the spread of germs and diseases. Parents can make sure that children understand that washing their hands is not just a chore but an important part of staying healthy.

The best way to approach mass adoption for children is through schools since most children attend regularly, and there is adult supervision most of the day to encourage positive behavior. The start of school adoption is to start at the highest level possible, whether it be county or district level, and pitch a rollout plan that leverages maintenance, renovation, and construction schedules. Once the schools know what they want, it’s time to make it easy for them to get it and largely eliminate switching costs by creating a partnership with the companies that contract to the schools. Assuming this can be done without signing any non-competes (feasible depending on how much the consumer can leverage their patronage), the process can be repeated in other large-scale markets such as stores, libraries, and government buildings. In partnering with these companies, we can ensure a smoother installation, servicing, and maintenance experience for the customer as we are able to utilize the trusted relationships that are already established and their existing infrastructure.

Journey Map



Consumption Chain

- **Awareness of Need**

The first step in satisfying a customer's needs is to make sure they are aware of their needs. One of the outcomes of the global COVID-19 pandemic was an increase in conversation and education around the importance of practicing proper handwashing techniques. The high transmissibility of the disease made individuals hyper-aware of the existence of germs and the need to take active measures to rescue the risk of catching or spreading the disease. Consumers are painfully aware of the need for proper handwashing techniques, but as the majority of the proposed techniques rely on self-regulated measures such as singing and counting, many have opted to ignore this need and live on a "good enough" model. As we discussed in the previous section around mass adoption for children, motivation is key and helping kids create awareness around the need for handwashing is important. Some of the strategies we mentioned around incentivizing and positive reinforcement can help kids realize the need for recognizing when they need to wash their hands. There also needs to be educational awareness of why handwashing is important.

- **Search for a Solution**

As we were discussing mass adoption, it is likely that kids will encounter messaging in schools, in commercial advertisements, on billboards, in supermarkets, on social media, etc. These tools can also be leveraged to improve health communication.

- **Selection of Product/Producer**

In terms of helping consumers make their final selections, the key is to provide options that don't require decision-making. What this means is providing variations that cover non-overlapping consumer markets. In the overall category of sanitation we can consider ease of use, convenience, availability and access. Pertaining to the product itself, there are options for bar soaps, liquid hand soaps, hand sanitizers, cleansing wipes, etc. Ultimately the context in which handwashing is happening will be important. For example, a school building might use larger quantities of refillable soap versus at home which is meant more for individual or family use.

- **Transaction**

Users are likely to encounter the product online, retail, and department stores. As the system begins to gain popularity, it is more likely that people will be introduced to the system through friends and family, or through visiting a public space where the system is being used. Ensuring an established presence on social media and direct links to a purchasing page will also be instrumental in securing purchases from consumers who are hearing of the product for the first time, whether it be through a friend or an online advertisement or sponsored post.

- **Financing/Payment**

Cash, credit, reward points, coupons, discount codes, shopper deals.

- **Receiving/Delivery**

This will largely be directly from suppliers in larger-scale deliveries and shipments. Retailers may do business-to-consumer shipping as well. Websites such as Amazon, CVS, Walgreens, etc.

- **Installation**

Installation will vary depending on the application. For household use, any required installation should be easy to do and require no additional tools or training. For commercial installations such as in schools or museums, it may be necessary to uphold any relationships that the purchaser has in place.

- **Storage and Moving**

Generally, handwashing products tend to be fairly portable and can come in different sizes depending on what the needs are. Storage is at room temperature and no special care required.

- **Use**

Generally, user friendly and intuitive. Smaller children may need some assistance at times, or guidance through the handwashing process.

- **Repairs and Returns**

With respect to returns, repairs, and disposals, it will be useful to have a convenient pathway for sending back unwanted or broken products, which will then be repaired, refurbished, resold, or recycled, depending on the situation. Establishing a good relationship with a major shipping company such as USPS, UPS, or FedEx will be useful in ensuring this step is frictionless for consumers.

- **Servicing**

If there is a refillable option, then that would need to be dealt with appropriately when it arises. It is important to ensure that the client is well informed of any routine maintenance (though when designing a solution, it should be made such that this is kept to an absolute minimum), as well as what to do should any issues arise. There should be established relationships with service providers, whether that be internal or external will depend on the size and scope of the company at that time. In any case, it should be easily serviceable and should not require the need for any proprietary tooling or training. It is important that the entire consumption chain be aligned with the core values of transparency and sustainability.

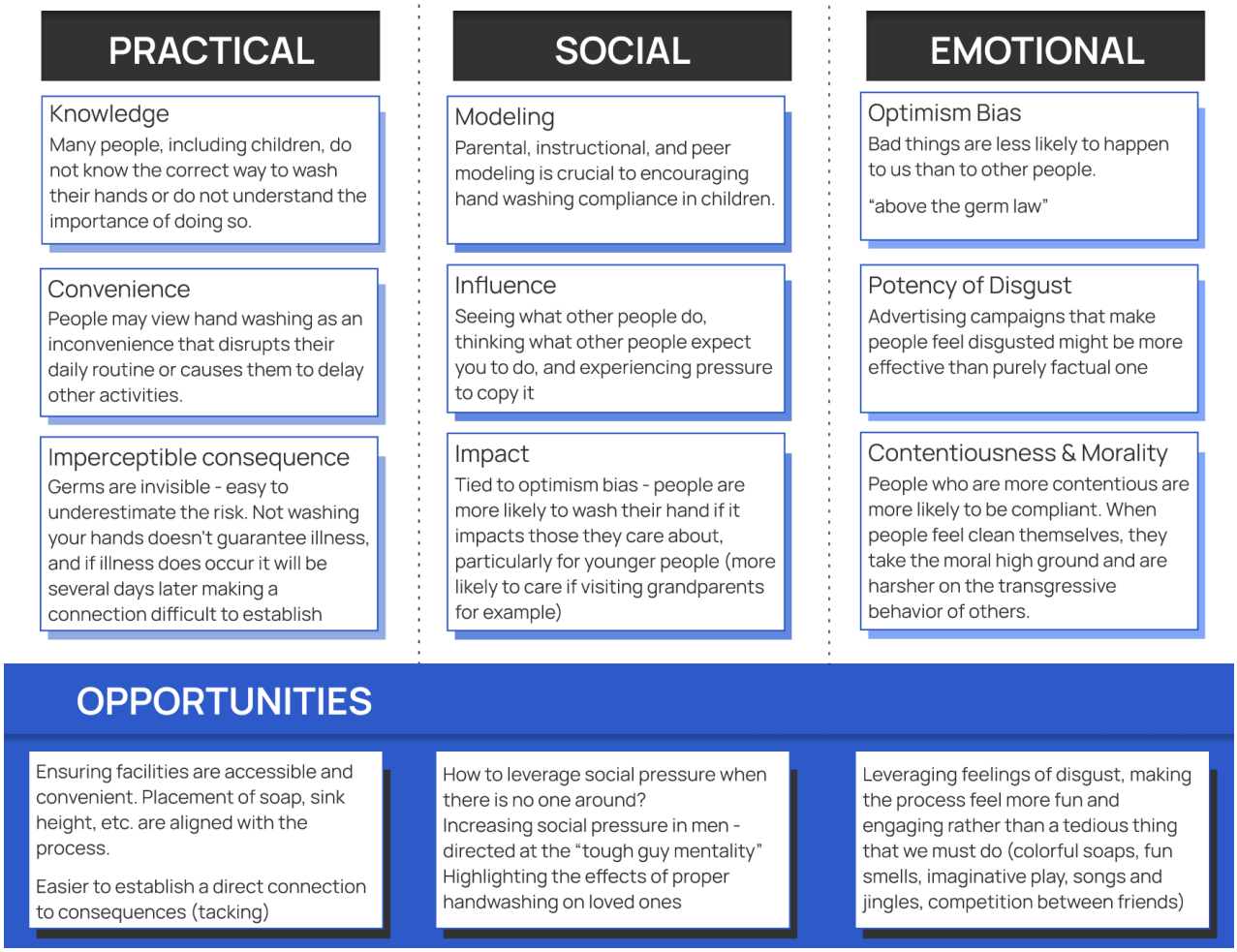
- **Disposal**

Depends, might be recyclable but also possibly disassembled into landfill waste. The solution should prioritize long term environmental safety and be comprised of materials that are compatible with that goal.

Barriers to Compliance

Compliance can be defined by three main parameters; length of time washed (recommended is 20 seconds), thoroughness of scrub (reaching all parts of both hands), and whether or not soap nor water were used (note that neither antimicrobial soap nor the temperature of the water has been proven to have an effect on microbial removal). In order to understand how to encourage compliance, it is necessary to

explore the practical, social, and emotional reasons for non-compliance. Practical reasons for non-compliance tend to be the most direct to address and deal with the accessibility of knowledge and facilities. It is important to ensure that the general public (and children in particular) are aware of the need to wash their hands properly as well as what proper hygiene practices look like and how to implement them. Furthermore, proper hygiene cannot be practiced if the environment is itself unsuitable (visibly dirty or lacking in soap, running water, etc.). While these factors can and should be addressed by schools, facilities, and parents, the hope is to create an intervention that addresses the more complex social and emotional factors that can lead to non-compliance. Particularly with respect to the emotional interventions for children, it is important that the overall well-being of the child be the top priority; that is to say, children should not be traumatized or otherwise made to live in an unreasonable state of fear as a result of any interventions that are put in place.



Compliance Tracking and Enforcement

Understanding the risks associated with data tracking compliance is important in ensuring that the intervention system is positively adopted by the general population. Several pieces of information can be taken from the system and used to paint a picture of compliance for that particular system. While some may be tied to individual identity, this is not necessarily true.

It is important to draw a distinction between the need for tracking compliance within professional settings such as hospitals and other healthcare settings and amongst the general population. As data tracking increases, trust decreases, and therefore, the need for system transparency at every level becomes more important. Privacy concerns are even greater in situations where the data collected is linked to young children. It is important to understand how that information would be collected, stored, and used and whether or not it is even necessary to do so.

While it is true that tracking compliance can help organizations identify areas of low compliance and put in place further interventions to address that disparity, this may not be useful information in areas where system usage is tied to a large population. For example, in most schools, bathrooms are shared by all members of the same gender, regardless of grade or age, making it difficult to pinpoint exactly what is the cause of the lower recorded compliance. In public settings, such as parks, shopping malls, or airports, there is too great of a population turnover in the system's users that any interventions put in place may not reach their target audience.

Then comes the issue of compliance enforcement. Who is responsible for enforcing compliance, and should it be enforced on an individual or community level? These questions are extremely important to address ahead of time, as an improper enforcement effort can lead to a culture of blame which can, in turn, lower compliance and increase resentment towards the system and the enforcers of that system. Due to the fact that this system is intended to target the general population, it is best that compliance not be enforced on an individual level but rather that the system should aid in the development of newer, stronger social norms related to hand hygiene.

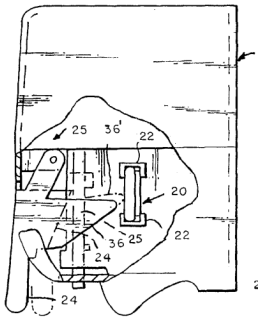
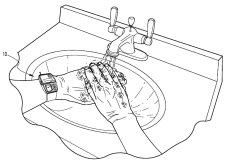
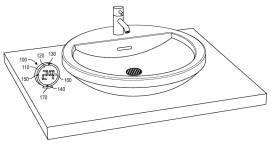
In order to create this social enforcement system, compliance must be publicly and immediately identifiable. That is, when a user interacts with the system, it should be readily apparent, not only to the user but also to those around them, whether or not a satisfactory level of compliance was reached. Due to the fact that this would inevitably single out non-compliant individuals, it is important that the system put in place measures to discourage a culture of blame. This means that rather than actively signaling noncompliance (ex., through a flashing light or emitted noise), the system should signal (in a celebratory manner) compliance. Therefore, noncompliance would be identified through the lack of a positive compliance signaling method.

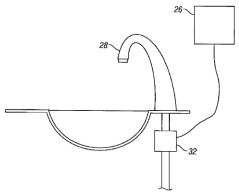
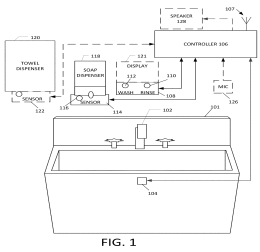
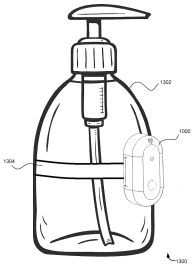
Lay of the Land

There are few comparable products out on the market and none that address the needs of all stakeholders. These can be divided into a few distinct categories. The first is wearable devices, the second is secondary timer devices that are either placed on the counter or mounted to a surface such as a mirror or a wall, and the third is devices that make use of existing bathroom infrastructure. The main issue with wearable devices is that it requires a larger buy-in for widespread social compliance; too many people need to make the decision to purchase and use the device in order to create a society where proper handwashing is standard practice. This type of system also tends to be rather costly and incorporated into or merged with existing technology (ex-Apple Watch) as a wearable device whose sole purpose is to time hand-washing seems rather convoluted. The high price combined with the individual action makes the product inaccessible to a large group of people. Secondary-mounted devices are the largest in the product category. This includes everything from hourglass timers to kitchen timers to dedicated, water-proof timers that sport suction cups and stands. There is little variation between them (some play music, and most have a combination of audible and visual timing methods). The majority require manual activation through physical contact (pushing a button, turning a knob, etc.). While these are cheaper and can be left near the sink for anyone to use, they tend to lack displayability, either featuring bright colors and child-friendly designs or are drab and lacking in visual appeal. Moreover, they rely too heavily on the sink area itself, assuming that it will have a space to be placed, and are not made for use outside of the bathroom. Products that make use of the existing infrastructure (this is where the white space opportunity would fit in) work really nicely for commercial applications where a higher initial investment (either due to the cost of the item itself or the trouble of installation) is not a limiting factor for customers. However, they can be too intimidating or impractical for use in the home. The major recurring points of friction with these devices are that they either require manual activation or involve complex changes to the existing infrastructure. Many automated sensing devices can be unreliable in certain environments (loud, poorly lit rooms). Additionally, many of these devices are targeted either at a specific consumer group, such as children, or are made for commercial or healthcare applications and aren't easily integrated into the home.

Comparison of some of the most relevant patents stemming from parent patent (*)

Product	Description	Friction Points	Areas of Inspiration (if any)

 US5771925A *	A soap dispenser/timer that is triggered by the mechanical dispensing of soap and provides audible cues for the start and conclusion of a hand-washing cycle	Requires physical contact with the system, cues are audible only - not accessible	Incorporation into existing bathroom ecosystem
 US 20120002510A1	A wearable device that assists in keeping track of time when hand-washing. It is set to a predetermined time (20s) and uses an audible alarm as well as a numerical indicator	Requires manual user activation - users have to press a button for the countdown to start	Combination of visual and audible cues
 US 20220284793A1	A timer that includes a sensor and a display screen. Timer starts when the sensor picks up the sound of running water	Doesn't fit into the current infrastructure; requires counter space to be made available; sound-based sensor could run into problems in a noisy environment or if placed too far from the source	Using other senses and displaying information to user

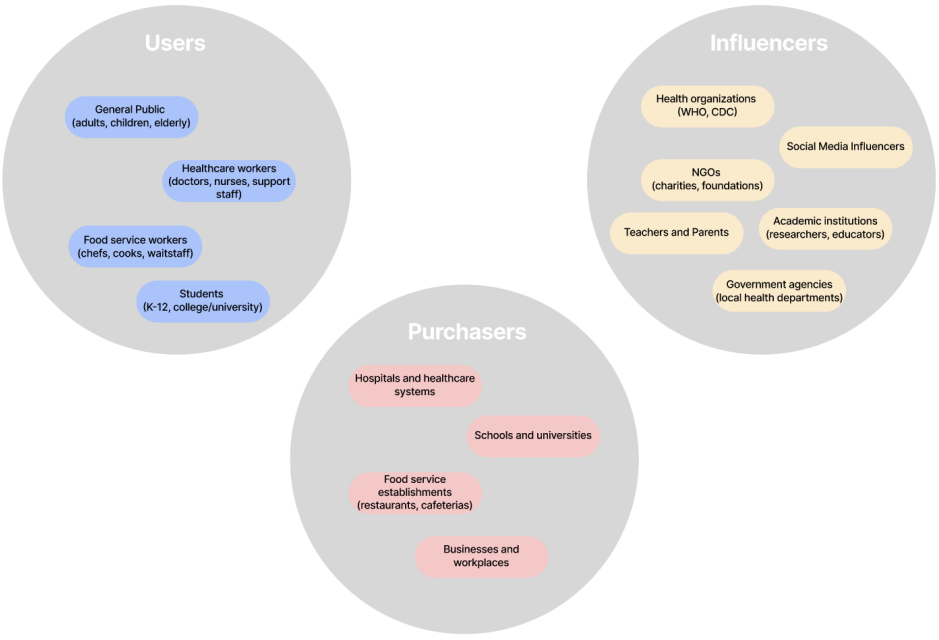
 [US7819136B1]	A device that is installed onto the current system and is triggered by the flow of water. Patent mentions the possibility of including a solenoid valve to control the flow of water.	Complex installation is likely to intimidate potential customers, no clear location for where the display box is to be placed	Control of water flow
 FIG. 1 [US103323]	This system includes a motion detector near the faucet and a wearable smart device that would detect continuous hand scrubbing motions for a determined set of time. The patent describes being able to detect the application of soap.	Requires the user to wear a device. The entire system aims to detect all stages of hand washing, from soap application to hand drying. This means that more than one device would have to be set up hence taking up more space.	Monitoring each step of the hand washing process
 [US202103351]	Similar to the parent patent, this device is attached and triggered by the soap dispensing device. This device would detect when a person is nearby and use both audio and visual cues to promote proper hand washing	Requires the user to interact with the dispenser first physically otherwise, it can be ignored	Using both audio and visual cues. Adaptability to different soap dispensers

Stakeholders & Their Needs

Developing a well-defined understanding of the key stakeholders and their needs is instrumental in creating a successful product. On the side of in-home consumers, the primary stakeholders include parents, children, homeowners, landlords, and renters. When it comes to schools, this expands to include janitors, teachers, principals, and superintendents. On the commercial side, it will also be important to consider business owners and commercial landlords. In terms of partnerships, we will also need to consider all of the stakeholders identified in the previous exploration of the consumption chain, including current relationships with leading faucet manufacturers, large-scale retailers such as Amazon (online) and Target/Walmart (in person), and parcel delivery companies.

It is clear from mapping the competitive landscape that there is a need for a product that promotes compliance on a grander scale. This means creating a product that is made for everyone and usable by anyone. There is a need to create a cohesive system that can be used both in the home and in commercial applications to promote compliance in every context. Products made for children tend to be rather unsightly and do not fit in well with the aesthetics of traditional bathrooms.

In contrast, those made for commercial applications do not translate well to residencies. Apart from adaptability in adoption, there is also a need for a product that, once purchased and installed, does not require the user to make the decision to interact with the device and that is tied to the use case rather than the purchaser. This means creating a system where compliance is the default action while defiance requires intentional decision-making.



Opportunities

There are many opportunities in this area both in terms of features that can be incorporated into the product to increase efficacy and to the business and marketing model. Currently, there is no easy way of verifying the cleanliness of hands, and soaps don't always get everything. For this reason, a device that also features a disinfecting UV light could be a good way to increase confidence as well as compliance. There is an opportunity in terms of form factor to create variations that suit different decoration styles as well as bathroom finishes. On a grander scale, there is an opportunity to create a fully closed system that is powered by the flow of water coming out of the faucet and can turn on or off the flow to conserve water. Additionally, while water temperature does not have a statistically significant effect on microbial removal, a system that controls the temperature of the water could be a great feature in certain (mostly commercial) environments. Both from a comfort and a water conservation standpoint, being automatically set to a preferred temperature that could ideally be set depending on factors such as outside temperature or context of usage (children, adults, both) could be quite beneficial. In certain applications, such as schools and hospital settings, the ability to gather metrics on compliance could provide some useful feedback. Being able to set the length of the timer could also allow for its incorporation into the healthcare system, where handwashing typically requires a longer scrub time (and even longer for surgeries).

Commonality Strategy

The easier it is to adapt to using a new product, the more likely it is that someone will adopt it and endorse it. And if a product requires no conscious adaptation, the emotional switching cost (which oftentimes carries more weight for the individual consumer than the financial switching cost) is zero. For this reason, the ways in which the user actually interacts with the handwashing ecosystem (sink, faucet, soap dispenser, etc.) should not change at all. The only difference is that the user is made aware (without their input) of whether or not they have washed their hands for the allotted time. Great care should be taken to integrate the device into existing systems. Residential models should not make any permanent or semi-permanent changes to the existing system and should be as universal as possible. Commercial models should leverage and incorporate existing methods of flow control and human detection. There should be no question about how they are used because they should be entirely passive. Their incorporation should neither be an eye sore nor a visual distraction; when in use,

they should stand out, but when not in use, they should blend into their environment as though they were never there.

The Whitespace Opportunity:

Handwashing is a crucial practice for maintaining good hygiene and health. Despite its importance, today, children tend not to adhere to proper habits. Hence looking ahead, there are several opportunities for handwashing to be widely adopted. The main way to create value is to address existing knowledge gaps and prioritize accessibility and adoptability. Rather than creating something that helps out a few or one specific group of people, we need to create an ecosystem –not just a product. The idea is that through widespread adoption, the potential solution should make compliance second nature. In order to do so, one needs to create a system that can be easily adoptable as part of their routine.

Reinforcing: Another element of the model that could be unique is the role of social pressure in influencing compliance. Parents and teachers play a fundamental role in educating children. Simultaneously, leverage the power of role models, celebrities, or fictional characters that children admire. While many devices are concerned only with the immediate user, the unmistakable and easily identifiable visual cues can create a sense of external accountability anytime one is washing in a public space. Apart from the internal sense of accountability and the common human tendency to follow conventions (namely the red-yellow-green means go coloring system), there's an added component of shame that comes from the fact that anyone else that has a line of sight to or is within earshot of the device will know if someone is non-compliant.

Social Influence: Additionally, along with building familiarity and following conventions, the system should encourage peer-to-peer motivation and accountability by designing features that allow children to share and encourage each other. Having a shareable feature could foster a sense of collective responsibility to learn from one another.

Gamified: Additionally, targeting children, the system could differentiate itself by incorporating additional features that can make the experience more enjoyable and convenient such as scents and easy access to soap and water.
Today many educational programs and systems are increasingly integrating gamification to motivate and make tasks less overwhelming. This can be potentially implemented in the handwashing process to make adoption more appealing. Having pleasant sounds while washing and different interactive components can enhance the

experience of the handwashing process. Another opportunity to consider could be incentivizing handwashing through rewards/stickers to create a sense of accomplishment and motivation for users.

Feedback Tracking While today many systems are currently tracking wash times, giving children real-time feedback and data can improve and educate children's hand hygiene habits. The system hence needs to integrate data tracking and feedback system with existing hand washing devices. It isn't about building fear, the system needs to provide reassurance that their hands are clean and give them one less thing to worry about.
One thing, however, to keep in mind when devising a handwashing system is privacy. Many people, particularly parents, may be uncomfortable with the idea of data being collected and stored, so creating a system that addresses these privacy concerns can be a USP. By incorporating privacy features such as anonymous data collection or user-controlled feedback, it could appeal to a wider range of users.
By creating a unique yet recognizable convention, the system must brand itself and impact society on a larger scale. Simultaneously tackling both the residences and the schools, we can boost recognition in a way that eventually leads to expectation. If families see it out in the community and find that there is an alternative system that works exactly in the same way but is cheap and easy to install, they're going to be more likely to adopt it in their homes.
Similarly, if children are accustomed to using the system at home and they see that it could easily be adopted elsewhere, there will be greater calls for its adoption in public spaces, even if the general public is unaware that there is a version made specifically for commercial application. This competitive advantage lies in universality and accessibility – it's cheap, it's easy, and it's everywhere.

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