Switch: The (Un)necessary Evil

Quirky take on an unasked question; whether switches are required, at all?

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Abstract:

"This room is equipped with the Edison Electric Light. Simply turn key on wall by the door."; was written in buildings powered by powerplants first commercialized by Thomas Edison since 4th September, 1882.

Today, more than 140 years later, even after the advent of technologies, we are reinventing the same concept by presenting it as big black lever switch for vintage themes like old Irani bakeries or modern so called touch switches which senses the capacitance of the human finger approaching it to operate.
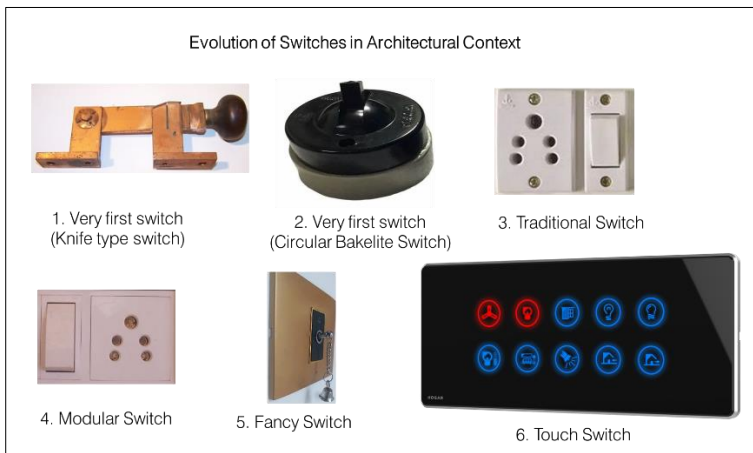
Switch's key objectives in architectural context;

1) Functionality:
   It has to make or break the contact from electric source to electric equipment
2) Safety:
   It has to protect the user and the surrounding from electric hazards like electrocution, fire. (Imagine people making and breaking contact between exposed wires to operate electric appliances!!!)
3) Interface:
   It has to act like a bridge between user interaction and operating the electric appliance.

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4) <u>Architectural Element:</u>
Since switch was assumed to be irreplaceable part of architecture, it must gel with the environment in which it is being used.

Technology as an enabler for design of times has allowed functional and safety objective of the switch to be physically separate from interface and architectural objective of the switch. Call it an opportunity, power or weapon of choice, this paper is going to delve into the depths of design of times to take a leap of faith and get rid of physical switch wherever it is not necessary.

History of switches:

Pic 1: Evolution of switches in architectural context

With use of electricity came the need of controlling its distribution at a smallest level, that is a home appliance which can be turned on and off e.g. a light bulb.

1. The very first switch to control the electricity at consumer level were knife type switch. These switches evident from

their simple function were making and breaking contact. There were inherent drawbacks

    a. The switch was having the open metal surfaces was concern of probable electrocution.

    b. The possibility of loose contact and subsequent spark or heating might cause fire hazards.

2. Then came the switch which addressed these two issues; the classic vintage circular Bakelite switch. It has insulated cover and also it had only two stable positions, either completely connected or completely disconnected even if someone intentionally tries to intent to keep in the middle.

3. The appearance was improved with ergonomic switches which needs to be mounted by making cutout on surface mount box.

4. Eventually those got replaced with modular switches to be mounted on faceplate on surface mount box with surface mount casing. Eventually concealed wiring took over with concealed boxes and concealed wiring.

5. After witnessing decades of consistent dominance of above two era's, which still continues to contend with new switches, came fancy switches which did same fundamental function of turning on and off under the hood, with different appearances. Along came silent problem of compatibility which market rulers exploited making discrete non compatibilities to ensure that the client must continue stay in there eco system, once onboard.

6. Then came the stupidity (more about this later), of replacing the passive mechanical switches with faceplates with electronics which would mimic the traditional switches w.r.t. below features

    a. They must be of similar mechanical dimensions with near compatibility to be mounted on concealed switch board boxes.

    b. They would control the output in similar way.

    c. They would need to give visual feedback about their current status for which they used small LED

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Even TV and cinema industry doesn't like switches:

TV and cinema have played key role in rewiring our brains to influence our decisions impacting our lives at a subconscious level. Introduction of carbonated soft drink / fancy cars in movies was one of the key reasons of we accepting them as a part of regular consumption. Same goes for tobacco consumption.

Pic 2: Subconscious Level Endorsement by TV and Cinema

You would never notice switches to be part of any scene in either TV shows or any scene in cinemas unless it is part of the script, e.g. some ghost appearing or disappearing on a flip of a switch.
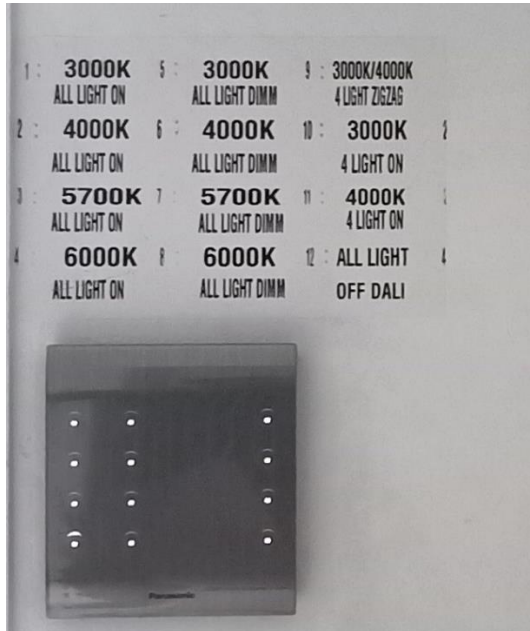
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Pic 3: No endorsement of irrelevant products

Above is one of the most captivating kitchen (More about why we chose kitchen from all possible scenes, later) scene from movie called Something's Gotta Give. The film makers have been extremely meticulous about making it one. It's rather deliberate and not unintentional to skip the switches as a part of any meticulously designed scenes including this one, which needs no switch.

So, in hindsight, the platform thriving on ability to influence us consciously and subconsciously is also neglecting the switches. As a conclusion, switch is an unnecessary devil.

What isn't next but appears to be next:

1) Touch buttons: Take a look at the demo touch buttons at one of the prominent suppliers of the so-called smart home solutions. The demo itself has pasted what those touch buttons are supposed to do in a least ergonomic manner.
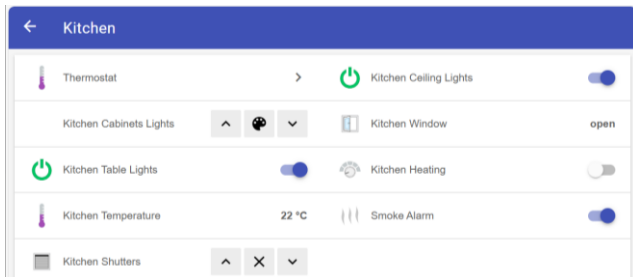

Pic 4: Experience center with labels for touch switches

To make things worse, when these switches are used in areas where they are replaced for traditional switches of shape feedback with the touch of the finger (whether you are pressing first or second switch, whether the switch is on or off etc.) e.g. inside bathroom on side walls where they are not visible to person trying to operate them, they are prone to accidental operation of some other appliance.

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Now take a look at smart phone/ wall mount tablet interface as an alternative to so called smart touch buttons. After spending considerable time, you might form a kind of muscle memory with respect to which knob/ switch is associated with which appliance. However, the revolutionary, yet imperceptible feature that these interfaces have been extremely successful at, is their configurable personalization.

These have almost removed the learning curve one has to go through when he is trying to operate appliance in new environment, especially smart home environment. The icons, the widgets and the associated label in synergy make it a lucid interface for even your guest to get them quickly acclimatize to your smart home.

Pic 5: Ideal Interface as a successor to switches

2) The switches itself:
   a. Till now, we have established the switch roll as an unnecessary evil. The intention of interior architect to play with the surface texture worsens the necessity of these switches further.
   b. Take a look at a classic dilemma one has to live through when marrying faceplates which are supposed to be flat with uneven architectural

surfaces. As Elon Musk says, "No part is the best part". Eliminating the switches is better than trying to address this.

Pic 6: Switch plates on uneven texture walls

What is actually next:

1) Immediate revolution is separating functionality and safety from interface and architectural element
   a. We are already on the path of migration where we witness widespread democratization of smart phones, sensors and smart speakers taking care of interface.
   b. Giving freedom to Architect to remove electrical work from equation of their creativity and theme.
   c. In this case, the functionality and safety is taken care by home automation accessories such as on off drivers, dimmable tunable drivers in some control panel.
   d. This can be kept in some auxiliary place away to avoid it treating as a part of interior architectural element.
2) Distant future revolution (Nudge revolution) is going to get artificial intelligence and machine learning, where the

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system would profile the individual family members to decide on behalf of that individual or group of individuals or nudge them very similar to the prompt now a days we have got accustomed to where it already predicts the context of our chat or mail to hint us with what we might have typed by ourselves.

Switch; the necessary devil:

No matter what might be the successor for the traditional switch, there are niche areas, where the switch is almost irreplaceable.

1) All the emergency switches, the person in kitchen is always in the state of emergency. There it is stupid to introduce even touch switches. (Still the upper picture from movie and almost any other movie scene, where it would have been present in normal real life, lacked the switches)
2) Places with need of very high MTBF (Mean Time Between Failure) e.g. very frequently operated switches such as inside Indian express trains.
3) The cost is superseding all the aspects of the choice whether to use switch or not. Nothing can beat the classic traditional switch to achieve the functionality in minimal way.
4) The need for maintaining the state of the output and immediately resuming in the same state immediately on power restoration. Traditional switches are like the ink on the pen. It doesn't need any external means to maintain the state. Whereas electronic successors of the traditional switches might have their own sweet time to get powered up and restore the state before power loss.

Conclusion:

Based on our own experience of leveraging technology for interior architecture, the use cases of where traditional switches are imperative, are getting extinct, making it seems like an unnecessary

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devil. However, it would always to remain for niche areas making it seldom necessary evil.

References:

My experience at VAAHAA Tech LLP, which is a home automation hardware company with indigenously developed products, is the inspiration for writing this topic.

The new lifestyle of more than 8 years of our early adapter techno-savvy clients living in their homes mostly without switches is the greatest reference and proof for the hypothesis of this research paper.
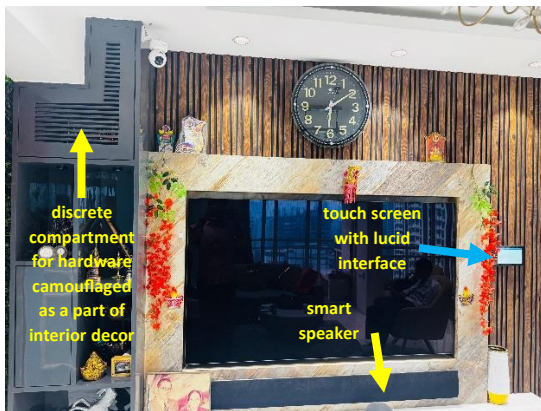
In attached "Switchless Walls.jpeg" you can get a glimpse lifestyle in state-of-the-art home of one of our prestigious clients. It has already won runner up award for system integrator at Smart Home Expo 2024 held at Jio World Convention Centre, Mumbai. And one of the key aspects that I believe was radical approach of no switch design. The hardware responsible for making traditional switches unnecessary is tucked away in cozy, discrete, camouflaged compartment at top left mirrored L shaped door which was be easily considered spared from personnel use. (Attached: "Under the hood.jpeg")

This client like every other client decided to take a leap of faith and upgrade their lifestyle with switchless homes. In picture, you would notice that there are no switches. There is a touchscreen with lucid interface as shown in picture 5. This screen is seldomly used as client has already adapted to using smart speaker prompts to operate his home appliances.
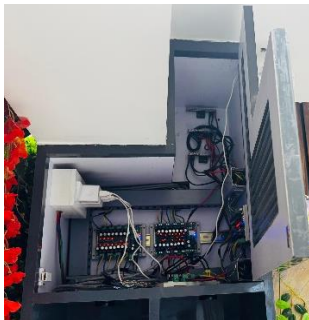
For elderly person bedroom, hybrid approach is adapted. The room does have traditional switches to make elderly non techno savvy person also feels at home. The switches at first feel seems to operate the appliances as if they were traditional switches wired in traditional way. However, unlike of traditional wiring, they are used only for prompting the system to convey intention of the elderly person to

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operate the appliance. In turn, the system does the same activity of operating the appliance without making elderly person miss the classic switches. Because, the signal is looped through the system, it is also possible to operate it through the other interfaces, such as smart phones, smart speakers and rules such as overriding the switch in case the room is sensed to be empty by presence sensor.

To conclude, I have solid backing of proven track record of customer testimonials to assert the hypothesis of this paper to call the switches mostly unnecessary evil.

Pic 7: Switchless home walls

Pic 8: Under the hood where magic happens

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