**Supplementary Materials:** Detailed summary of secondary contextual factor codes, criteria of inclusion and exclusion for each of the codes, total identified incorporations, and examples of incorporation into design processes by study participants.

Table 1. Socio-cultural contextual factors

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| --- | --- | --- | --- | --- | --- |
| **Secondary codes** | **Definition** | **Coding inclusion examples** | **Coding exclusion examples** | **Total** | **Example of incorporation into design process** |
| Cultural tradition and practices | Describes a group's beliefs and behaviors that are passed down from one generation to another; shared perceptions of how people routinely behave in a specific context. | Cultural traditions, e.g., attire and dress, norms, practices; religious practices and beliefs; includes perceptions of how people should interact with artifacts; also price perception | Related to preference of beauty (aesthetics) or symbolism (symbols) or disapprovals (stigmas) or education practices (education) or common language (language) | 12 | Integrated training programs and materials based on cultural norms and expectations (B, D, M, O) |
| Stigmas and taboos | Any social disapproval of, or discrimination against, an individual or group based on perceivable social characteristics; something that is considered inappropriate or prohibited within a cultural group | Presence of discrimination or disapproval; Regarding what is considered a private matter and what is not | Respect and approvals (cultural tradition or aesthetics) | 8 | Designed product features to be discrete, e.g., quiet and/or invisible to non-users (A, C) |
| Symbolism | Shared meaning of things that represent something else, such as a mark, character, color, or shape. | Color symbolism related to actions/functions; specific meaning of shapes and characters | Characters within a specific language (language) | 16 | Carefully selecting colors and/or symbols on the product that have meaning in target context (B, C, F, G, I, J, K, L, M, N, O) |
| Aesthetics | A set of principles concerned with the appreciation of beauty and nature of taste | Colors, styles, materials that are preferred due to appearance of beauty or broad meaning | Colors intended to represent actions/functions on an artifact (symbols) | 8 | Making product and packaging choices that are aesthetically popular in the target context (C, D, H, M) |
| Education and literacy rates | Knowledge acquired formally or informally; abilities to read and write; education and training systems | Literacy rates, education, misinformation | Institutional staff knowledge (institutional) | 11 | Incorporated graphics on product and training materials for target contexts with low literacy rates (B, C, D, F, G, I, J) |
| Language | Shared systems of communication | Prevalence of different languages in specific contexts | Relating to ability to write in local language (education and literacy) | 11 | Developed training materials in commonly-used languages within target contexts (A, B, C, F, N, O) |

Table 2. Political contextual factors.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Secondary codes** | **Definition** | **Coding inclusion examples** | **Coding exclusion examples** | **Total** | **Example of incorporation into design process** |
| Regulations and Regulatory Processes | Policies, regulations, and/or initiatives that are enacted in the context-of-use (nationally, regionally, etc.) | Technology standards, compliance, regulations, approval processes, national initiatives (e.g., health initiatives, industry/manufacturing initiatives), subsidies | Informal processes (political systems and culture) | 23 | Identifying context-specific regulations related to their product and complying with them by making design or implementation changes (A, B, C, E, H, J, M, O) |
| Stakeholder power dynamics | The ways different individuals or groups interact with each other particularly when one or more individuals/groups are more powerful than the other. | Catering to power-holding stakeholders in the context (e.g., ministry, local leaders, institutional admin); framing design problems/solutions to align with power-holding stakeholders; incorporating power-holding stakeholders into stages, processes, and decisions | Bribes or other expected processes (political systems & culture) | 23 | Incorporating design features that powerful stakeholders in the context find valuable (F, O) |
| Global Priorities | Global initiatives that claim problems in specific contexts | United Nations, East African Union, World Bank, SDGs, Gates Foundation; larger than one nation, e.g., multilateral orgs | National-level priorities (regulations) | 5 | Aligning solution with global priorities, e.g., SDGs, WHO (A, B, F, G, H) |
| Political systems & culture | Formal and informal mechanisms by which decisions are made; also a set of attitudes and beliefs that give meaning to a political process, e.g., underlying assumptions and rules that govern behavior in a political system; also can relate to political affiliation | Centralization vs decentralization, bribes or other incentives; forms of representation; includes unwritten expectations (e.g., buying dinner); political names and parties; political movements | Specific regulation/approval processes (regulations); catering to stakeholders via inclusion in decisions or framing (stakeholder power dynamics) | 10 | Not attaching a solution to a specific political party or politician (A, O) |

Table 3. Institutional contextual factors.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Secondary codes** | **Definition** | **Coding inclusion examples** | **Coding exclusion examples** | **Total** | **Example of incorporation into design process** |
| Institutional financial capacity | The financial resources available within the institution. | Institutional budget, capacity | Navigating institutional admin needs (political), price perception (socio-cultural) | 9 | Scoped to be low-cost based on target institutions’ financial capacity (B, F, H, O) |
| Institutional resources | The facilities and technical resources available within the institution. | Available space, available materials (e.g., cleaning products, sheets, oxygen, machines), storage capacity | Financial (financial capacity) and staff resources (capability/capacity of staff); anything that has to do with processes or practices (existing practices and procedures) | 8 | Designed the solution to function without unavailable equipment at the institution (equipment that is typically available in HICs) (G) |
| Indoor environment | The conditions within the physical institution (i.e., building) in which people and artifacts operate. | Lighting, temperature, humidity | Outdoor environment (environmental) | 5 | Including features to improve usability (A, B, F), e.g., readable screen in the dark (A) |
| Existing practices and procedures | Methods and established ways of completing functional tasks within the institution. | Cleaning procedures, training procedures, procurement processes, presence of clutter, amount of patients, staff practices/expectations for specific procedures, typical uses of technology | Related to staff ability due to quality of their training or number of staff available (capacity/capability of staff); related to types of resources available (institutional resources) | 19 | Designed the product to function with institution’s storage and cleaning procedures (F, I, K, M) |
| Capacity and capability of institutional staff | The maximum or expected amount of work that can be completed by institutional staff; also the quality, efficiency, knowledge, and extent of ability of tasks to be completed | Related to the number of available staff at a given time; staff available hours; knowledge and education level of staff | Related to expected practices when capacity isn't reached (existing practices and procedures) | 11 | Embedded training materials (C, M, O) |

Table 4. Industrial contextual factors.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Second- ary codes** | **Definition** | **Coding inclusion examples** | **Coding exclusion examples** | **Total** | **Example of incorporation into design process** |
| Supply & Manufacturing | Processes and materials involved in the production of the artifact; their availability, quality, and accessibility within a particular context | Raw materials, suppliers, manufacturing processes | Any processes after the artifact is ready for distribution, implementation, or use during its lifetime (distribution) | 26 | Making detailed design changes based on available manufacturing capabilities and materials (C, D, L, N) |
| Distribution | Processes and materials involved in supplying the finished artifact to buyers, users, or institutions. | Shipping and delivery logistics and constraints | Any processes before the artifact is finished and ready to be used. (supply & manufacturing); bribes/political norms or approvals (political) | 7 | Changing size and/or weight of product or packaging based on distribution (A, B, C) |
| Maintenance | Types and availability of functional servicing and repairing; also availability of replacing components | Availability of customer support, customer service, methods for repair/servicing, access to replaceable components when parts malfunction | Consumables which are designed/intended to be replaced often during a product's lifetime (technological); institutional-based cleaning practices or maintenance staff (institutional) | 10 | Increasing durability of solution to reduce potential maintenance (A, D, F, H, M, N) |

Table 5. Technological contextual factors.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Secondary codes** | **Definition** | **Coding inclusion examples** | **Coding exclusion examples** | **Total** | **Example of incorporation into design process** |
| Available technologies in the context | Functions, performance, availability, accessibility and other attributes of technical solutions in a particular context. | Types and functions of existing solutions; prevalence of specific forms of technology (e.g., phones); proxy technology (products with similar functions in context) | Technologies in which the product requires to function in context (compatibility) | 17 | Making design choices such that users in a target context are familiar with the primary features and interface (A, F, M, O) |
| Compatibility with the technical context | Mechanical compatibility; digital and physical interoperability. | Technologies that are required for the planned artifact to function, charging apparatuses (e.g., cables, charging stations); units used in context (e.g., Celsius vs Fahrenheit); Technologies that are required to function near or next to the planned artifact and must work in tandem | Type or availability of grid power or telecommunications service (utilities) | 15 | Designed product features to integrate existing and available technology in target context (A, C, D, F, H, J, K, M) |
| Availability of consumables | Access to components that are intended to be used up relatively quickly and replaced by the end user during the usable lifetime of the product. | Replaceable batteries, lightbulbs, wipes, etc. which the user is expected to replace | Consumables during manufacturing or distribution (supply & manufacturing or distribution) | 9 | Incorporated spare parts and/or reduced components to minimize need for consumables in target contexts where these were limited (A, B, F, G, H, I, K, M) |

Table 6. Infrastructure contextual factors.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Secondary codes** | **Definition** | **Coding inclusion examples** | **Coding exclusion examples** | **Total** | **Example of incorporation into design process** |
| Utilities | Public or private supply of services such as light, power, water, sewage, etc. | Electricity, telecommunications (e.g., broadband), street lights, water, swage, gas | Bacteria/mineral content in water (environmental), general indoor conditions based on household norms (cultural tradition) or institutional practices, e.g., keeping the lights off (indoor environment) | 15 | Included features so that fluctuating power input does not damage components (A, G, I) |
| Distance | The time or length between places or resources. | Short or long distances between services or users. | When the mode of transportation is the greater concern (transportation) | 5 | Scoping their target users based on location accessibility (C, O) |
| Transportation & Road quality | Systems or modes of transportation available or commonly used, including fixed infrastructure (e.g., roadways, terrain, railways) and mobile modes (e.g., types of cars, buses, bikes) | Cost of transportation, traffic levels, types of modes available, quality of roads, cars, etc. | When the length of time or distance is the greater concern than the modality (distance) | 6 | Making detailed design choices such that users could carry on common transportation modes (G, K, M) |
| Attributes of the built environment | Man-made structures and environments, including materials and features. | Common construction and building materials (e.g., wall material, roofing); common design features of homes and buildings (e.g., size of doorways); features related to building zoning, size, height, etc. | Individual technology in which the artifact must perform/operate with that is also within the built environment (technological) | 1 | Making detailed design choices based on common components, e.g., type of door handle common in context (H) |

Table 7. Public health contextual factors.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Secondary codes** | **Definition** | **Coding inclusion examples** | **Coding exclusion examples** | **Total** | **Example of incorporation into design process** |
| Health demographics | Health data relating to a population and particular groups within it, including physical and physiological traits and data, as well as disease burden. | Prevalence of disease, e.g., malaria; mortality rates; average sizes/weights; skin pigmentation | Race as a social construct (socio-cultural: tradition, stigma, or aesthetics) | 8 | Detailed design to accommodate local health demographics, e.g., average sizes (B, J, N) |
| Healthcare system and practices | The broader organization of people, institutions, and resources that deliver health care services; also the health practices, methods, interventions, procedures or techniques that are common in a region, state, or nation | Care coordination, level of trust, norms related to at-home care, availability of specialty clinics, capacity of overall health system, expected health practices broadly, accessibility of treatment/therapy | Distance between resources (distance); institutional-level practices (existing practices and procedures); national health priorities and policies (regulations) | 16 | Narrowing target context, choosing between rural or urban hospital networks (A, D) |

Table 8. Environmental contextual factors.

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| --- | --- | --- | --- | --- | --- |
| **Secondary codes** | **Definition** | **Coding inclusion examples** | **Coding exclusion examples** | **Total** | **Example of incorporation into design process** |
| Weather | The state of the atmosphere with respect to heat, dryness, sunshine, wind, rain, etc. | Temperature, humidity, rain levels, sunshine radiation | Non-atmospheric conditions and features of the earth (natural environment) | 16 | Selecting materials that withstand local temperature, humidity, and rain (A, B, C, D, F, G, H, I, K, L, M, N, O) |
| Natural environment | Ecological units in within a natural system; geographical features | Dust, vegetation, soil, water quality, natural physical features | Man-made environment, units related to supply & manufacturing (industrial) | 5 | Including protection from dust particles (I, J, N) |

Table 9. Economic contextual factors.

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| --- | --- | --- | --- | --- | --- |
| **Secondary codes** | **Definition** | **Coding inclusion examples** | **Coding exclusion examples** | **Total** | **Example of incorporation into design process** |
| Individual and household characteristics | Income earned at the individual or household level | Salaries, wages | Tax, policies related to income (political) | 8 | Scoped to be low-cost based on income levels (C, D, H, J, L, N, O) |
| Regional and national characteristics | Economic characteristics at a regional or national level; economic capacity and performance | Broad metrics, e.g., GDP; country-level classifications (e.g., LMIC) | Country-wide individual/household income statistics (individual/household characteristics) | 6 | Developing pricing strategy for implementation in different countries, i.e., different prices in different contexts (F) |
| Labor market characteristics | Relating to the market for wage labor, i.e., the way individual work is bought and sold | Costs, culture, and general practices within a labor market | Policies and regulations associated with labor (political) | 3 | Early-stage identifying a primary goal to use local labor to produce the product (D) |