

Lecture Notes in Mechanical Engineering

B. B. V. L. Deepak

D. R. K. Parhi

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Advanced Manufacturing Systems and Innovative Product Design

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Lecture Notes in Mechanical Engineering

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Design for Aesthetics, Ergonomics and Sustainability

Strategies of Affective Instructional Design for Elderly



Anirban Chowdhury and Prachi Karkun

Abstract Aging poses limitations in motor skills and cognitive abilities, due to which the elderly face problems while interacting with new technology. On the contrary elderly are said to have better control of their emotion due to the self-regulation process. The learning needs of the elderly differ from young due to changes in the information processing system and the role played by affective system during the learning process. There is selective cognitive processing due to which the elderly focus only on emotionally relevant information. Therefore, the current paper proposes a framework for instructional design solution in the light of the positive affect resulting from the perception of characteristics of the instructions. The suggested framework can act as a guideline for planning and executing instructional strategies targeting the elderly.

Keywords Affect · Cognition · Emotion · Ergonomics · Instructional design · UX

1 Introduction

Advanced technologies have become an inseparable part of our daily lives. Every advancement comes with an inherent condition of learning and new ways of interaction. Ignorance or inability to learn newly introduced product or technology may pose many challenges as one being dependent on others for completion of simple tasks. In order to gain independence and efficiency in work, it becomes imperative, for people of all ages to interact with technology. Specially in order to assist and aid older adults, products specifically targeting elderly user group have been introduced in the market. However, their adoption by elderly has not been very promising

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[1]. Therefore, there is a need to have an understanding that why older adults have difficulty adapting to new technologies? Related studies have suggested that elderly attitude toward a technology is based on the product's features, convenience of its usage and learning support provided along with it [2]. Age-related declines affect this attitude toward new technology or product, as it is an established fact that aging has effect on cognition learning needs of elderly different from younger counterparts [2, 3]. Deficits on attention and memory, difficulties in recalling items encountered recently, are some of the reasons affecting the ability to learn [3]. However, due to aging better emotional regulation is observed which in turn is resultant of changes in cognitive abilities. Therefore, there is need to understand human cognitive and emotional processes in order to address learning needs of elderly. This paper aims to develop a theoretical framework on existing theories of affect and cognition of elderly people to develop effective instructional strategies which could be applied for interface design of different products and software.

2 Methodology

Initially a secondary research was conducted and data collected from online resources such as Google Scholar, Science Direct, etc. A systematic literature review has been performed to filter out important resources and data as per objectives of this study. Then the Schema Construction Method (SCM) has been applied on collected data to derive a framework which allows designers to relate their design and to develop affective instructional design strategies for elderly people.

3 Effect of Aging on Human Cognition

Cognition is the set of mental processes that take place between sensation and perception and the response [4, 5]. A human cognitive system is primarily composed of working memory and long-term memory [6, 7]. Working memory (sometimes known as short-term memory) is considered to be limited while long-term memory is comparatively unlimited [7]. Working memory is primarily used while performing tasks. However, working memory is limited to seven new elements of information at a time where only two or three items of information can be processed simultaneously [8–10]. Due to this limited working memory there is a risk to have a cognitive overload if instructions are represented as unstructured, unplanned or complex [11]. Since long time, it is established that cognitive abilities decline with age [3]. These declines are observed in the storage capacity of working memory, cognitive control, attention and information processing speed [12–14]. Decline in working memory elevates the difficulty level to perform tasks. Therefore, as compared to young elderly face more issues in performing tasks. Although, long-term memory is unaffected due to aging, recalling information existing from previous experience is not an issue for

older adults. Therefore, ability to learn instructions may be dependent on the mental models/schemata or how information is organized structured in long-term memory [10]. It is difficult to recall new information, but if information due to previous knowledge resting in long-term memory (LTM) can be accessed and utilized while performing tasks, elderly may feel motivated to adopt new technologies.

4 Effect of Aging on Human Emotion

The affective system and cognitive system tend to work parallel to each other as depicted in Fig. 1 [15]. As experience of learning a new interface can only be explained in terms of human emotions. Studies suggest that affect is a quick, automatic natural phenomenon, occurring even unconsciously on exposure to stimulus [16]. This affect resulting due to interaction with a learning medium can be positive, negative. For example, a complex interface causing difficulty to interpret may lead to frustration disappointment, distress, anger, contempt, disgust, guilt, fear, nervousness [17], etc., which are characteristics of negative emotion. On the contrary familiarity due to similar past experience may lead to feeling of confidence, satisfaction and enthusiasm which are characteristics of a positive emotion.

Aging leads to better emotional regulation, the self-regulation of emotion, is caused due to selective cognitive processing [3]. In selective cognitive processing, most of cognitive resources are allocated to emotionally relevant information only.

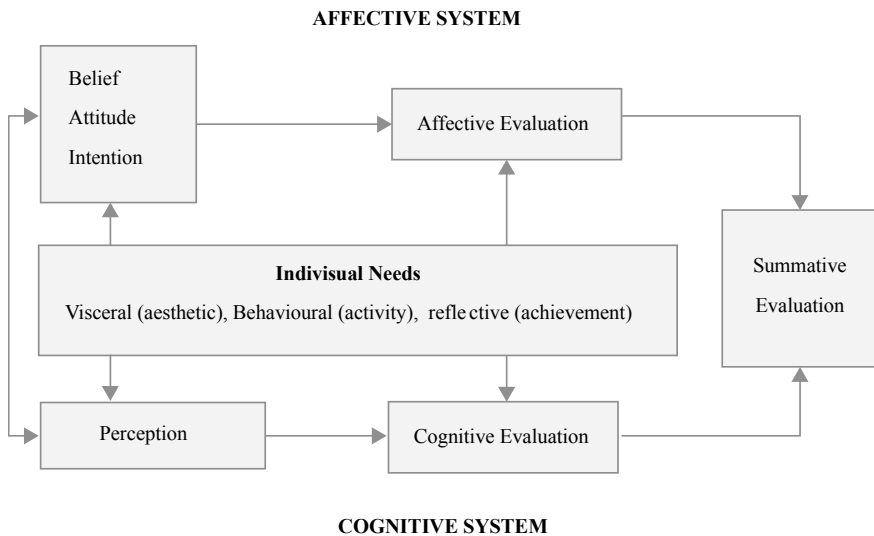


Fig. 1 Affective system and cognitive system as parallel processes (Adopted from [15])

Although which information is relevant and which is not is typically individualistic in nature. These are resultant of a person's belief, attitude, previous knowledge, intention, etc. Studies suggest that attention bias exists toward certain specific piece of information. Elderly tend to ignore information which is highly negative. It was observed that affect plays an important role in driving the elderly attention, motivation, and decision-making, e.g. a highly positive affect results in a state of high energy, full concentration, leading to engagement [15]. Therefore, the paper proposes that instructional design characteristics should reflect positivity in order to have prolonged engagement by the elderly.

5 Design Needs for Elderly

To enable affective matching of instructional designs with elderly, instructions should appear to be minimalistic in nature, as complexity may desist elderly to interact with it. Hence, the instruction environment should appear to be positive and supportive. Proposed design guidelines for elderly are that figurative representations, simple or cartoon-like characters grab the attention of elderly [18]. Visual impairment due to aging makes it difficult to read texts with small font sizes. Therefore, it is recommended that large fonts with typefaces such as 'Futura', 'Helvetica' and 'Frutiger' be utilized for improving readability under low vision conditions [19]. All Textual representations should be well organized, preferably into blocks of paragraphs of five lines or less [20] in order to enhance the readability. The differentiation between relevant/important information, a strong contrast can be used. A smooth transition between gray to white or different shades of color helps in comprehending image and text [20]. The above guidelines suggest that the tone, presentation, composition and typography are those characteristics of instructions that reflect positivity. The attention toward such instruction will allow elderly to make the first move toward interacting with the instructions.

6 Framework for Affective Instructional Design for Elderly

As already stated, that affective state on exposure to stimulus drives the motivation for engagement with product or software; therefore, it becomes essential to consider how instruction through the medium is represented? The characteristics of the instructions, i.e. its presentation style should match the needs of elderly. To enable affective matching of instructional designs with elderly the following framework (please see Fig. 2) can be considered. The framework suggests that affective matching of needs of elderly is primarily dependent on the characteristics of the instructions and its suitability which leads to the motivation to initiate interaction with the design. However, the perception for the instruction is highly individualistic in nature. It is generally depending on how it is interpreted based on previous knowledge. Therefore, while

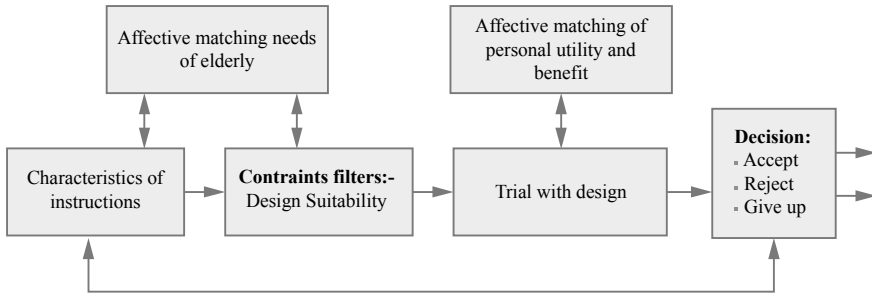


Fig. 2 Evaluation process of instructions for product/software/service use

interacting with instructions if elderly perceive it to be of use then the medium may be accepted by the elderly for future use. On the contrary if the medium is perceived to provide no benefits to the elderly then it may be rejected. The experience after interacting with instructions determines the fate of the product that is why it becomes imperative to design instructions considering the needs of elderly.

7 Practical Implications

Products like Automated Teller Machine (ATM) machines, Microwave ovens, television, etc., are used on daily basis. Most of the elderly refrain themselves to perform tasks on these products as they perceive it to be complex. Simplicity in appearance may cause elderly to have a trial with the product. The present article presented ways to get positive affect of elderly using few innovative instructional designs.

7.1 Touch-Based Interactive Interfaces

Considering the case of microwave as an example, presently all functionalities are performed using its control panel (please see Fig. 3). The instructions to use the product are explained in a separate instruction manual. The technical language and mode of representation used in manuals causes elderly to often refrain from reading them.

Therefore, it is recommended that the concept of control panel can be replaced by an interactive touch screen microwave interface, with minimal functions (please see Fig. 4). A step-by-step instruction to perform a task using functionality of microwave can be given on the screen; and thus, the complexity on the screen can be avoided. Support messages can be displayed on the screen to guide the navigation while choosing the options of these support messages requiring immediate actions can be interactive.



Fig. 3 A regular microwave with control panel

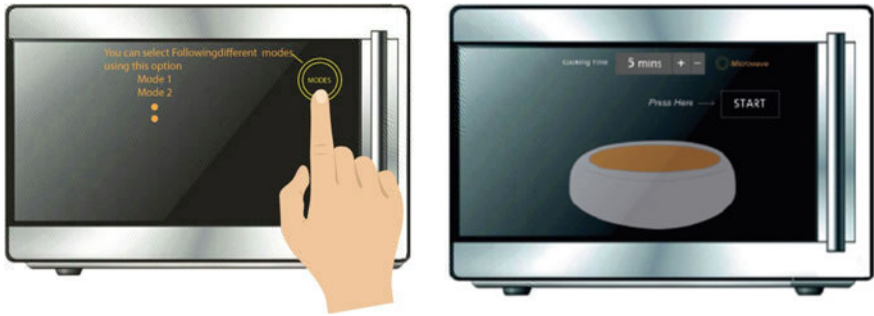


Fig. 4 Proposed microwave designs with touch-based control panel

7.2 Instruction with Emoticons

As elderly tend to show attention bias toward positive emotions; the instructions that are childlike (cartoonish) and appear to be funny can be used as instructions for guiding users for products like ATM machines or services like online payment through mobile devices/websites, etc. In this context, emoticons (please see Fig. 5)



To have a successfull transaction you need to Select 'ENTER' and thats it you are done !!

Fig. 5 Proposed emoticon-based instructions



Fig. 6 Video-based model for training elderly (Adopted from [21])

can be displayed upfront in such interfaces in order to motivate elderly to perform tasks.

7.3 Video-Based Training for Elderly

A study reported [21] that video-based training that conveys step-by-step instructions has proven to be very effective to train elderly (please see Fig. 6), as it led to a lower cognitive load. Similarly, agent-based or avatar-based virtual systems may also be employed to train elderly that explain instructions in a sequential manner.

8 Conclusion

The problem to remember and recall new information makes it difficult for elderly to adapt to new technology. This paper highlighted that there is a need to keep these limitations into consideration while designing instructional designs for elderly. The role played by the affective and cognitive systems are crucial in determining instructional design strategies. Therefore, the paper suggested a framework that highlights factors for affective matching in elderly. As the framework suggested that affective matching is dependent on the characteristics of instructions, it is recommended that the attention bias of elderly toward positively valenced emotional stimulus should

be considered as an important element for designing the instructions. Taking examples of the product used on daily basis, this paper also presented ways that can be utilized for designing instructions for elderly to use products/software fruitfully. The framework may be useful for instructional designers and human factor experts for designing strategies that motivate elderly to adopt new technologies. However, the subjective analysis can be done in future to validate the effectiveness of the affective instructions for elderly in different contexts of product and software design.

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Design of an Awareness Model to Develop Proper Sanitary Habit Among the Rural People of Jharkhand



Pallavi Rani and Amrita Bhattacharjee

Abstract Rural areas of India represent most of the population of this country. As per the census report of India 2011, about 70% Indians live in rural areas. Jharkhand is a newly formed state (2000) in eastern India that belongs to EAG. It has 24 districts among which an ethnographic study has been done in three districts, namely Saraikela-Kharsawan, Dhanbad and Godda. More precisely, the study has been conducted to understand the sanitary system in these areas. The research data has been gathered through observation and interviews with village people. It has been noticed that people of these villages are using open areas such as field, river-bank, forest and mountain areas for sanitary purpose. Though there are different schemes from Government of India for clean and healthy sanitisation (e.g. Swachh Bharat Abhiyan) however, the people of these villages are not changing their sanitary habit because they are traditionally used to it. Also, they have many cultural and social notions behind it. According to their perspective sanitisation in open area is water saving, time saving and as a whole money saving. So, they are not willing to change their habit. Eventually it has been found that though there is toilet but they are reluctant to use it for sanitisation. Therefore, a lack of awareness on hygiene and health is prevailing in these areas in spite of government initiatives. According to the Ministry of Rural Development of India, rural development implies both the economic betterment of people as well as greater social transformation. So, it can be said that there is a need to create awareness among rural people of India to socially transform India. Motivation needs to be spread among the people of rural villages to use proper sanitisation system, which is lacking in the present scenario. As the existing awareness programme arranged by the government is not effective in these villages a new model of awareness programme needs to be designed. The design

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model must be more communicative as well as interactive with the rural people of India.

Keywords Sanitation · Rural development · Jharkhand

1 Introduction

Rural areas of India represent most of the population of this country. As per the Census 2011 [1], 70% Indians live in rural areas and among them 69.3% households do not have a latrine. In rural areas of Jharkhand open defecation prevails highest among all other Indian states. UNICEF has highlighted that 92.4% of the people in rural areas of Jharkhand do not have a latrine and they practise open defecation in the field, near the riverbank and other open places. To combat with the open defecation problem, in 1990, WHO and UNICEF [2] started the Joint Monitoring Programme (JMP) 2 for Water Supply, Sanitation and Hygiene that is collectively termed as 'WASH'. The term 'open defecation' became widely used in the WASH sector from 2008 onwards. For sanitation two categories were created, improved and unimproved sanitation. Open defecation belongs to the unimproved sanitation. It has been observed by UNICEF that, in between 2000 and 2015, the number of people practising open defecation has been reduced globally from 1229 to 892 million, i.e. an average decrease of 22 million people per year. In 2015, United Nations set 17 global goals named as Sustainable Development Goals (SDGs) which is driven by WASH mission. According to SDGs Agenda, open defecation has to be shortened within 2030.

The Indian government has started to promote rural sanitation since 1986. Under the Central Rural Sanitation Programme (CRSP), subsidized hardware was given to households for building latrines [3]. Later, CRSP (Department of drinking water supply Ministry of rural development GOI) was reframed as the Total Sanitation Campaign (TSC) with the target to end open defecation [4]. To inspire communities to reach full sanitation coverage, Clean Village Awards (Nirmal Gram Puraskar) [3] were announced in 2003 which offers cash prizes to villages that attained open-defecation free status. The Indian Government has been continuously providing a massive budgetary allocation and priority to the issue. In 2012, the GoI started Nirmal Bharat Abhiyan (NBA, 'Clean India Campaign') to succeed the TSC with an aim to achieve 100% sanitation access to all rural households by 2022. This new campaign aimed to quicken rural sanitation coverage by continuing the 'community-led' and 'people-centred' strategies of the TSC, with amplified importance on community mobilization, collective and sustainable behaviour change, information, education and communication (IEC) activities. Financial incentives continued for building latrines and were offered to more households belonging from BPL as well as above poverty line (IAPL) [5, 6]. In October 2014, GoI introduced NBA as Swachh Bharat Mission (SBM) [7] that targets to eradicate open defecation by 2019. The SBM has got unprecedented support from Government, the private sector and civil society. The

rural programme endorses pour-flush twin-pit toilets; those are intended to contain wastes in situ until they are safe to handle. The programme targets behaviour change and community approaches to sanitation are being adopted throughout the country. However, after all these efforts also, through field study conducted in 2018–19 in rural Jharkhand area it has been observed that there is lack of awareness regarding open defecation problem and the practice is still going on. Therefore, there is need for modifying existing strategies to eradicate the problem of open defecation. The present study aims to develop a feedback-based awareness model that will help to improve the existing scenario by digging up to the root of the problem. The novelty of the study is not to come up with a new strategy, but to understand the cause of the failure of the existing strategies by incorporating the behavioural activities of people into the model. It is expected that the proposed awareness model will augment the process of abolition of open defecation from rural India through the continuous modification of the strategies by analysing the feedback received from the local people.

2 Ethnography Study

An ethnography study has been conducted in three administrative divisions of Jharkhand named as Santhal Pargana (Godda district), North Chotanagpur (Dhanbad district) and Kolhan (Saraikela-Kharsawan district). In these areas, the field study has been done in rural villages like Raghunathpur and Mansa, of Godda district; Baghmara, Lawadih and Bandhdih of Dhanbad district and Govindpur, Bagarasai and Murumdih, of Saraikela-Kharsawan district. Unstructured interview (Fig. 1) has been conducted among children, women, men and elderly of these rural villages. From the interview, it has been found that there are many reasons, which is hindering the government initiatives to eliminate open defecation. The findings of interviews are as discussed below.

- **LACK OF INFRASTRUCTURE:** Most of the households in rural villages of Jharkhand do not have the concept to construct a latrine in the house. The standard house infrastructure of these households consists of bedroom, kitchen and courtyard. There is no concept of bathroom and toilet within the house premises. Eventually there are lack of toilets in their houses, or in nearby localities where they live. Toilets situated at far places from houses (e.g. schools or in the farms) lead people to defecate in the open space. Absence of water supply inside or next to toilets is also a reason to defecate in open area near riverbanks. It is tedious for them to collect water from a distance place before using the toilet. So, the whole architectural infrastructure needs to be revised to mitigate the problem.
- **MONETARY ISSUE:** Most of the people in these areas are afraid of cost-effectiveness of latrine system. According to them, latrines are too expensive to purchase and instal. So, this in turn forces them to defecate in open spaces.



Fig. 1 Interview with village people

- **HABITUAL PREFERENCE:** In rural areas, early in the morning people go outside to defecate in the fields or bushes. They prefer to defecate in nature than in a closed space like toilet. There is habitual preference for defecating ‘in the open air’. Even, in some villages, toilets are found to be used for other purposes, such as storing household items, animals, farm products or used as kitchens.
- **SOCIAL PREFERENCE:** Some people especially women in rural villages consider open defecation as a social activity. In the conservative societal norms, this is the time when they can go out of their home and can take some time to interact with the neighbour women. Also, they can take care of their animals and farms on their way to the fields for open defecation.
- **SOCIAL TABOOS:** Open defecation is an ancient practice and a part of social norms. In some cultures, there are social taboos for daughters-in-law to not to use the same toilet with the other male in-laws.
- **SOCIAL STIGMA:** People are scared of cleaning their toilet pits as cleaning garbage may stigmatized as impure or ‘untouchable’. In the society, where casteism is still an alarming issue, people do not like to be stigmatized because of pits cleaning. Therefore, they prefer to go out to delay the toilet pit filling up.
- **CONSERVATIVE BELIEVES:** According to some age-old scripture valued by the societies, people should not defecate in their household area. It encourages people to defecate away from their locality to maintain ritual purity. Due to lack

of educational enlighten people still obey this age-old misconception and practice accordingly.

- **LACK OF AWARENESS:** In some areas of Dhanbad and Godda it is observed that people of some communities have no idea about the health benefits of using toilets. They are not even aware of the government policies and initiatives in this regard. The government campaigns to spread awareness are not reaching them properly. Some villages still do not have electricity, so, they are not able to view awareness advertisements broadcasted through televisions or any other e-media. Due to lack of literacy rate, they are not able to read awareness posters. Therefore, awareness through print media is also not effectively communicating with them. In addition, they are not aware of the harmful effect of open defecation on health. In 2015 WHO [8] has pointed open defecation as a leading cause of diarrheal death. An average of 2000 children under the age of five die every day from diarrhoea. So, a proper awareness model needs to be designed to develop proper sanitary habit among the rural people of Jharkhand.

Therefore, through the ethnography study it is understood that there is a communication gap between the existing awareness programme arranged by the government and the behaviour of people. In addition, lack of awareness among them is not forcing to change their habitual practices. Therefore, a model needs to be designed to motivate people of rural villages to use proper sanitisation system that is lacking in the present scenario. The design model must be more communicative as well as interactive with the rural people of India.

3 Literature Survey for Designing Awareness Model

To change the practice of open defecation it is needed to focus on three major segments: effective communication, awareness creation and behavioural modification. All these three segments are interlinked and intersecting with each other. So, to design the proposed model it is necessary to understand the methodologies which already exist in these segments.

- **EFFECTIVE COMMUNICATION:** A well-developed communications strategy [9] must be comprised of a communications objective, the audience's current attitude towards the issue, and the best ways to reach the target audience. The most effective communications approach will consist of face-to-face contacts of strategic organizations with target audience. Food and Agriculture Organization of the United Nations (FAO) [10] produced a document concerning the Communication for Development (ComDev). ComDev is a communication approach based on the systematic use of participatory methods and tools. In this approach, stakeholders are integrated with the system to make all the strategic decisions communicative and effective for the target people. This will engage and empower target people and rural stakeholders by ensuring equitable access to information, knowledge sharing and inclusive decision-making. The integration of local knowledge

and communication systems with the media (e.g. rural radio, mobile phones) will help to give rural stakeholders, more power to take initiative to change their lives for betterment.

- **AWARENESS CREATION:** A study has been conducted by earlier researchers [11], in village of Haryana to find out the most effective method for creating awareness among the rural population regarding sanitation. The study has mentioned that there is lack of electricity in most of the villages whereas most of the awareness campaigns are done through electronic media. The study suggested that the agencies associated with any sanitation programme should create awareness for sanitation among the rural people through street play, folk shows, etc. which will communicate with them in their own way.
- **BEHAVIOURAL MODIFICATION:** Behaviour change is a process of modification of human behaviour. For changing behaviour, many processes have been adopted. To make an ODF (Open Defecation Free) community a community-mobilization model named as Community-Led Total Sanitation (CLTS) [12], which works as community mapping tool. It encourages communities to come up with their own solutions to their sanitation problems through a facilitated discussion.

Water and Sanitation Program (WSP) [13] of the World Bank has done research studies among households, which informed the development of behaviour change communication (BCC) and other demand-creation strategies and tools. Conceptual framework called SaniFOAM (Sanitation Focus, Opportunity, Ability, and Motivation) has been developed to design formative surveys to understand barriers and drivers of improved sanitation and monitor progress of the effectiveness of its behaviour change programme [14].

At the community level participatory approaches have found to be an effective method in shifting sanitation behaviours by encouraging latrine adoption in many areas of different countries. In 2000, Bangladesh developed Community-Led Total Sanitation (CLTS) [15] to transform sanitation behaviours in communities explicitly to end open defecation. The success of this participatory approach led to its implementation in other communities of Asia and Africa. It underlines that an understanding of behaviour alone provides insufficient clues on which to base effective processes for changing behaviour. Therefore, for effective behaviour change proper communication and awareness creation is needed at a time.

4 Proposed Design for Awareness Model

From the above discussion, it can be said that there is a lack of connection among effective communication, awareness creation and behavioural modification. As per knowledge, none of the awareness strategies has considered all these factors at a time. Therefore, an awareness model (Fig. 2) has been designed to conglomerate all the factors for developing a proper sanitary habit among the rural people of Jharkhand.

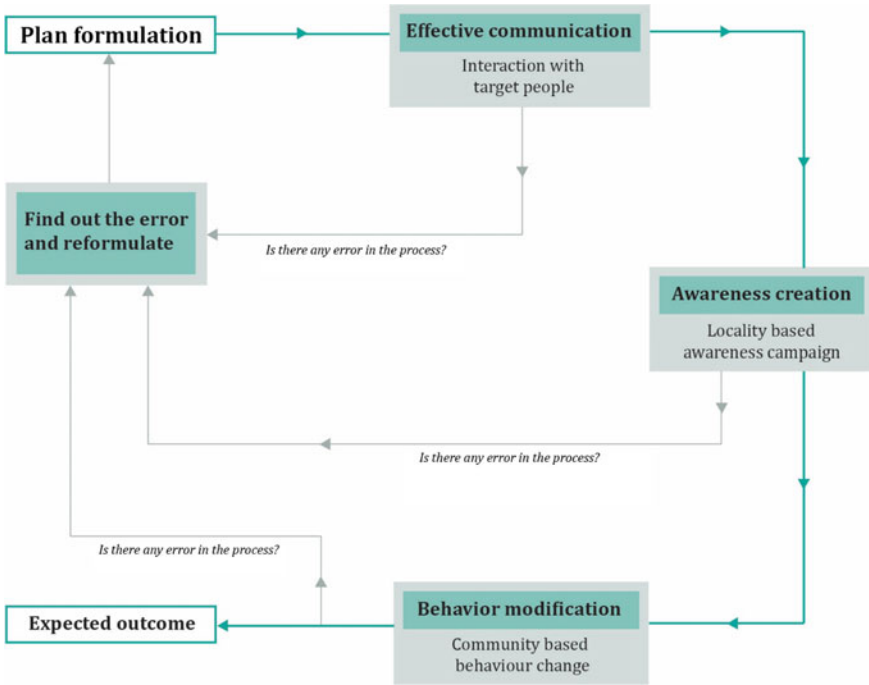


Fig. 2 Awareness model

The awareness model is a self-feedback system where in each step the system can verify the error of the system and can modify the plan accordingly. The system has broadly three steps named as effective communication, awareness creation and behaviour modification. The effective communication can be done by face-to-face interaction with the target people. Also, local communication systems such as TV, radio, mobile can help to be communicated with the local people. In rural village areas panchayat-based meeting and discussion can be a useful communication tool to propagate formulated plan. If all these communication methods are effective then only the system will proceed to the next step, else, error needs to be found out and the plan has to be reformulated accordingly. If the communication method is effective then through its locality-based awareness campaign can be generated with the help of cultural activities by engaging target people in the campaign process and by influencing them through local leaders/dignified persons. If in these ways, awareness can be generated properly then the process will move to the next step, else, again by finding out the error of the plan it has to be modified accordingly. If the awareness process is successful then it is mandatory to sustain the changed habit of target people. Therefore, the process should be recursive to make behaviour change of the whole community.

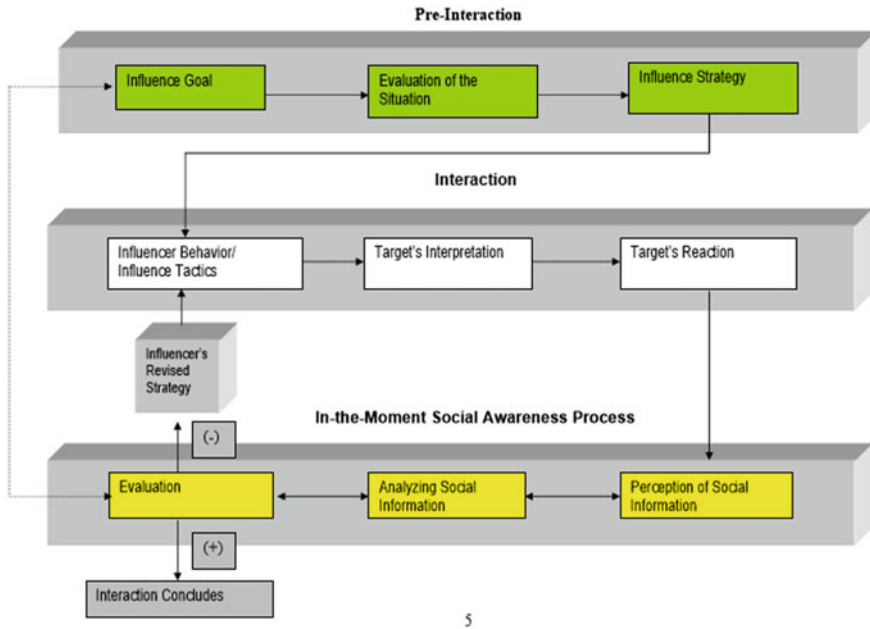
To make behavioural change there should be intervention of both external and internal bodies in the system. External body consists of government officers/staffs

who can motivate and monitor the expected outcome by economically supporting the process. Whereas internal body consists of local people (who have already adopted habit of proper sanitation through awareness creation) need to make strategies towards behaviour modification by understanding their own community mindset and act accordingly. In India, each community has different cultural and ritual beliefs and strategies for behaviour change must be built by understanding their notions. Consequently, people belong to that particular community can only make proper strategy for modifying any cultural and ritual beliefs. However, external and internal body must be two-way interactive and will give continuous feedback to each other while making any strategical movement. After monitoring for a long-term period if it is found that behaviour of target people is not modified towards proper sanitary habit, then error of the process needs to be found out and plan has to be formulated accordingly, else, the process can be terminated. In the whole process, each step is recursive based on feedback of the expected outcome. Therefore, to develop proper sanitary habit among the rural people of Jharkhand it is necessary to have an awareness model, which will continuously reformulate its planning based on positive or negative feedback of the whole system.

5 Discussion

An awareness model has been designed to develop proper sanitary habit among the rural people of Jharkhand. The designed model is an attempt to fill up the lacuna of the existing awareness model found through literature survey. Different fruitful awareness processes have been integrated in this design. For example, participatory approaches like CLTS has been recommended in a more interactive way so that people can make strategies for themselves to end open defecation. As per knowledge, none of the existing awareness process has tried to incorporate the feedback-based modification system to generate awareness in a proper way. As an example, the concepts of influence and leadership is shown in Fig. 3. In this figure, social awareness and influence process in the context of leadership interactions with a wide range of other individuals has been explained. In the context of an influence attempt, the social awareness process described below would occur during the interaction between the influencer and the target of the influence which is lacking feedback system [16].

It is found in literature that an understanding of behaviour alone provides insufficient clues on which to base effective processes for changing behaviour. Thus, a feedback-based model has been designed to find out the error in each step and modify the whole process accordingly. Therefore, there is no provision for modification of planning within the process. It is expected that this proposed model will fulfill the existing lacuna and will help to develop a proper sanitary habit among the rural people of Jharkhand.



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Fig. 3 A model of social awareness and influence

6 Conclusion

It has been found that lack of sanitation is statistically linked with extreme poverty. Therefore, elimination of poverty will certainly help to eliminate open defecation. Also, the lack of safe, private toilets makes women and girls vulnerable to violence and is a hindrance to girls' education. All these issues need to be considered while making planning to develop healthy sanitation habit. According to the SBM Gramin (2018–19) [17], among 35 states and union territory, 18 states had reported themselves to be open-defecation free. According to report, Jharkhand has achieved 62.51% ODF status. It is expected that the proposed design model will help to formulate the planning in the right way so that a healthy sanitation habit can be generated not only in rural Jharkhand but also for the rest of India. In addition, it can be said that the proposed design model might be applicable for other social awareness programmes as well.

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