

Facilitating e-Commerce in Rural areas- Intervention of Industrial Design & Cognitive Ergonomics

Rahul Promod Telgote¹, Naveen Rampal², Harsh Mohanty³

¹Associate Professor, Department of Industrial Design, Chandigarh University, India

²Visiting Faculty, School of planning and Architecture, New Delhi, India

³Assistant Professor, Department of Industrial Design, Chandigarh University, India

Abstract

There is a demand for the rapid expansion of Village e-commerce. For most e-commerce business enthusiasts and aspiring entrepreneurs, the rural Indian market offers untapped potential to become the market leader. Since independence, nothing has transpired to increase the rural distribution of commercial products inside India's geographical bounds. As a result, the immediate necessity is to expedite the establishment of commercial enterprises and e-commerce operations in rural regions.

Keywords: villages, e-business, ICT, Cognitive ergonomics, trading model

Introduction:

The project is strictly dependent on the user study. It is to understand and identify the basic trading model of the desired area, the range of services they provide to the society, and their requirement in terms of IT communication. The user interface of the online service would be a solution to the issues like their behavioral pattern, IT communication, cognitive psychology, acceptance, social behavior, etc.

Objective:

- To understand the various trading models practiced in the villages and identify the players involved.
- To identify the range of services required in such villages.
- To understand the degree of interdependence between various trades and their scalability and a means of revenue generation and employment generation.
- To understand & identify user characteristics, requirements, and the most optimum means of communication in E- & IT-enabled platforms.

Methodology:

The operational mechanism is proposed to be as follows:

- Several visits to the field and interactions with the KIOSK operators, entrepreneurs, NGO officials, and end-users (farmers, etc.) to collect needed data.
- Analysis of data to identify feasibility and recommendations for future interventions.
- Prototype testing of various means & validation.

Project outcome & schedule:

Phase I - Basic research (3-4 weeks)

- Market study of similar products.
- Identify product objectives
- Study features of user-centered design
- Literature reviews and concentrate on research methodology

Possible Outcome: Comparative analysis of features and functionality of such applications

Phase II – User study (2-3 weeks)

- Identify user groups/task analysis through (NGOs and kiosk operators)
- Identify main user objectives and user perception of interface design

Possible Outcome: Report of user study, icon generation about the region

Phase III – Analysis & Design (3-4 weeks)

- Analysis of the collected data
- Alternative solutions(2-3) for the interface and information design

Possible Outcome: Design solutions

Phase III – Testing & modification (3-4 weeks)

- User testing with C-DAC and critical users of the application.
- Analysis for further modifications.

Possible Outcome: Prototype

Phase IV – Documentation (1-2 weeks)

- The final documentation of the entire project

Possible Outcome: Final report

Introduction about e-Business-

A few years ago, we did not have that medium that could enhance communication worldwide with cost-effectiveness. However, now we can see that the increase of the internet at an affordable price has led to meeting different people of different countries without traveling long distances and can have a business, communicating via online platforms. As internet technology advanced, so did the usage and meaning of the terms 'e-Business' and 'e-Commerce.' Although these two names are interchangeable, there are some distinctions.

What is e-Business?

E-Business, often known as electronic business, refers to electronic technology, particularly web and other network technologies, for business purposes.

The Australian Government defines e-Business as "doing business electronically, both within and outside an organization, with clients, communities, and partners" (NOIE, 2002). The United States Census Bureau defines e-business as "any operation carried out by a business entity across a computer-mediated network. Any for-profit, governmental, or non-profit entity is considered a business organization. Production, customer, and internal or management-focused business processes are all part of their operations."

E-Business, like e-Commerce, encompasses various customer services such as support, marketing, communications, and collaboration with business partners. The notion of e-Service, or the provision of services and tasks through the internet by application service providers (ASPs), is frequently used in e-Business.

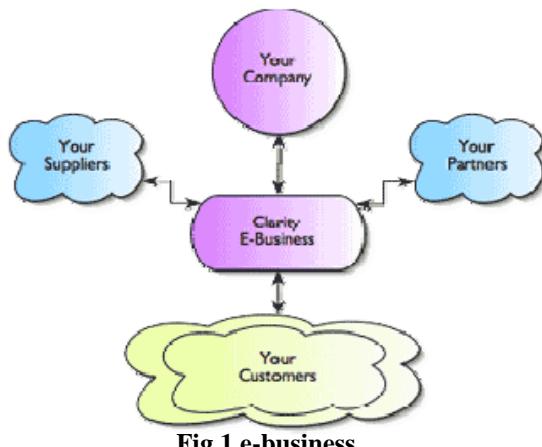


Fig.1 e-business

What is e-Commerce?

E-Commerce, often known as electronic commerce, is a byproduct of e-Business. It mainly focuses on transactions involving the electronic purchase or sale of products or services through the internet, such as email, instant messaging, shopping carts, online services, or File Transfer Protocol (FTP).

e-Business Uses

e-Business is helping large businesses, but it is also helping other small enterprises increase competition in markets and grab the opportunity for its benefit. It helps everyone to participate in the business world for their betterment. We see that everything, whether shopping, entertainment purposes, education, or government administration, has benefited from this. A growing proportion of businesses use internet and email technologies as a central aspect of their operations. Investigate how e-Business is utilized in communications, research, networking, marketing, sales, purchasing, financial management, and government contact.

- **Dealing with government**

An overview of how businesses and governments interact and trade online. There are connections to further resources on tenders, government purchasing, export, taxation, and grants.

- **Email**

Email is a formal method of communicating with a party, and it is also accepted as legal evidence, providing information on how to set up an account, store messages, and attach documents. Email etiquette rules can assist you in sending professional communications, managing incoming mail, responding to questions, and avoiding spam.

Online banking Now no one has to wait in a long line, and bankers also do their work online rather than on paper works. Financial institutions' Internet and wireless-based services can help to expedite day-to-day business transactions. Includes information on security risks, commercial banking software, and the benefits of handling accounts, payroll, and other financial operations online.

- **Online purchasing**

Considerations to make while utilizing the internet to find, compare, order, and pay for products and services. A procurement overview contains suggestions for introducing online business-to-business (B2B) commerce to employees and other vendors.

What is ICT?

The term "Information and Communication Technology" refers to the mix of computers and telecommunications. Computers enable humans to complete tasks more efficiently and faster, saving time. The addition of a communications channel, such as the Internet or other information services, significantly alters the working environment. It enables it to be more than just a low-cost communication device. It may also be used to receive education and knowledge and collaborate creatively with people beyond geographical boundaries.

Information and communication technology (ICT) is becoming an indispensable component of modern life. For all people, information is viewed as a precious asset. The capacity to create knowledge from information acquired is seen as a critical survival skill.



Fig.2 Information & Communication Technology

The target of ICT-

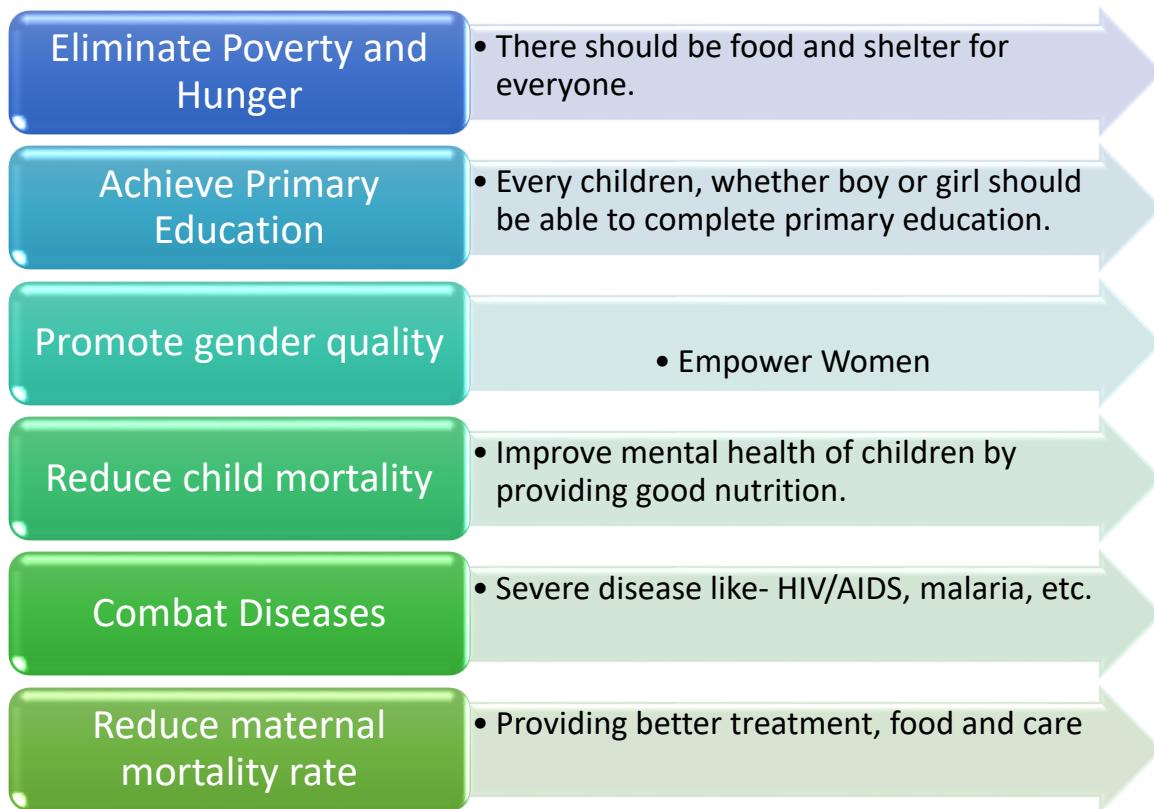


Fig.3 Target of ICT

Role of ICT-

Increase impoverished farmers' and traders' access to market information while lowering transaction costs.
<ul style="list-style-type: none"> ▪ Improve developing-country firms' efficiency, competitiveness, and market access. ▪ Enhance developing nations' capacity to engage in the global economy and capitalize on a cost-competitive edge (exceptionally skilled labor)
Increase the supply of trained teachers by providing their colleagues with ICT-enhanced and distance training.
<ul style="list-style-type: none"> ▪ Enhance the efficiency and effectiveness of education ministries and related organizations through strategic application and ICT-enabled skill development. ▪ Increase the availability of high-quality educational materials and resources via ICTs.
Using suitable technology, provide educational and literacy programs aimed at impoverished girls and women.
<ul style="list-style-type: none"> ▪ Using a variety of ICTs, influence public opinion on gender equality through information or communication campaigns.
Improve the delivery of primary and in-service health worker training
<ul style="list-style-type: none"> ▪ Increase disease and famine monitoring and information sharing

- Increase rural caregivers' access to specialized help and remote diagnostics.
- Increase access to reproductive health information, mainly AIDS prevention information, using locally relevant material.

Fig.4 Roles of ICT

Marketed Study for related Services-

e-choupal

As we know that the world is updating itself with the internet era, there are still people like farmers living in villages in India that are not connected to the internet. ITC, with other groups, has taken the lead to connect directly with the Indian farmers through the internet to buy their products like wheat, coffee, prawns, etc., and empower them. It will help them to increase their income and higher productivity.

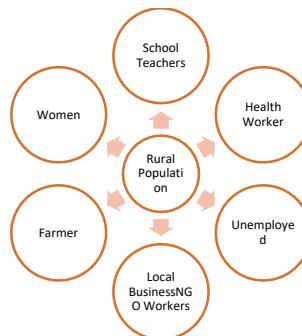


Fig.5 Figure showing connection directly with e-choupal via e-choupal

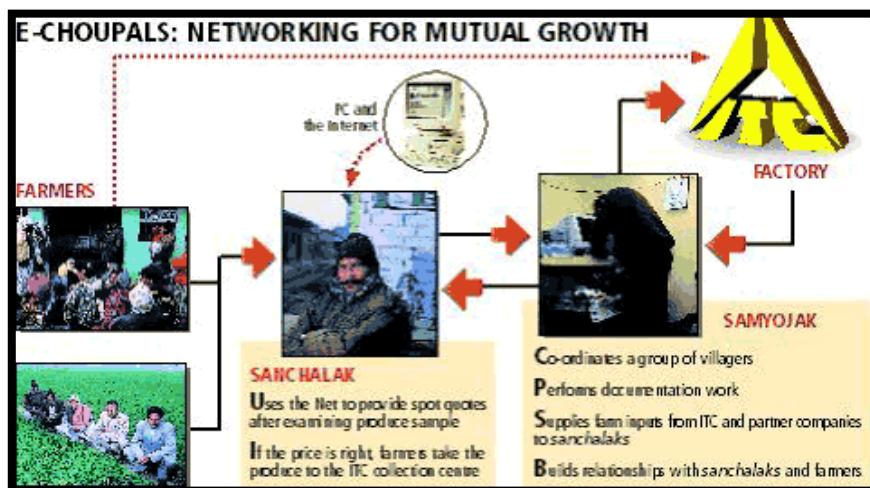


Fig. 6 An ITC Model

e-Choupal' liberates an Indian farmer caught in a vicious cycle of low risk-taking ability > low investment > poor productivity > weak market orientation > low-value addition > low margin > low risk-taking ability. Despite its wealth and numerous natural resources, this rendered it globally uncompetitive. This market-led business model has the potential to boost Indian agriculture's competitiveness by increasing production, income, and farmer risk management capability.

Rural people would profit as well; their rural income will help unlock the latent demand for industrial goods required for the Indian economy's continuing expansion.



Fig.7 Hindi version of e-choupal

Drishtee

- Drishtee is an organizational platform for providing IT-enabled services to rural populations via a kiosk-based revenue model. Drishtee encourages the development of rural networking infrastructure through a tiered franchise and partnership model. With villages, districts, states, and national nodes.
- Drishtee provides access to global information and local services using its patented cutting-edge technologies.
- Drishtee's business model is powered by a local entrepreneur who serves as a conduit for villagers to vital information and services. Drishtee enables this entrepreneur to run a self-sustaining, successful kiosk that offers various services at low prices. Drishtee has successfully proved its idea in over 300 kiosks across six Indian states in less than four years. The following are the numerous services offered on the Drishtee portal: -

i.Government: Government Schemes, Online Applications, Stamp Vendor License, Public Grievances, Certificates, Ration Card, and Driving licenses.

ii.Private: Rojgaar, Training, Gram Haat, Gram Mandi, Vaiavahiki, E-commerce.

iii.Corporate: Rural Employment, Computer Education, Insurance, and Agri-Business.

Drishtee, on the other hand, notes the following model constraints: -

- a. Connectivity.
- b. Lack of rural focus of corporates.
- c. Delay due to backend processes of Government.
- d. Limited Research.



Fig.8 Dristee Service Portal

The N-Logue Model

Introduction: n-Logue Communications Pvt Ltd

The Telecommunications and Computer Network (TeNet) Group of the IIT in Madras was founded by a group of like-minded professors to create and transmit information and new ideas and inexpensive communication technology to developing nations' rural poor. TeNet is dedicated to solving the technological demands of emerging nations such as India. Its research has resulted in the design and development of suitable technologies for these areas, with the assistance of Midas Communications and Banyan Networks. It is less expensive and easier to communicate with than traditional technology. WLL systems are now effectively used in India and several other nations worldwide, including Brazil, Argentina, Madagascar, Fiji, Yemen, Kenya, Tunisia, and Iran.

N-Logue also helps LSPs provide Internet and phone services. These Access Centers are tiny in size and scope, and anyone can handle them. Each Access Center contains:

- Leased Internet access to the closest Internet Gateway
- A 60' tower with multiple CBSs to transmit the correct signal
- A DIU and RAS for Internet and voice data routing

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- Radius, NAT, and DNS servers
- Software for billing customers every month and tracking payments

Each kiosk costs around Rs 53,500 (USD 1200) to start up and comes with the following equipment:

- A wireless wall set that gets the proper signal
- Branded PC with 15" color monitor
- Computer peripherals including the speaker, microphone, CD-ROM, digital camera, inkjet printer, and sound card
- The UPS with battery offers 4 hours of backup power for the computer.
- All required cabling
- A software package includes word-processing, browsing, and email tools in English and local languages.



Fig.9 n-Logue Portal

Comparative analysis of market products

	E-governance	Agro business & e-commerce	Agro Information/ Q&A Forums	Agro market	Weather	Bullion Prize	News & Events	Education	Matrimonial	Employment/ Classified	Chat & Mailing	Documentation	TV Programs
E-choupal													
Dristee													
N-louge													
E-sagu													
ECKO & Vyapar													

Note: Filled boxes represent features present in the application

INDIA'S BROADBAND ECONOMY: VISION 2010 EXECUTIVE BRIEF

This document summarizes the key results and suggestions regarding the fundamental questions addressed at the start of this study.

- What is India's projected Broadband Vision?
- What is the purpose of such a Vision?
- What is the plan for realizing this Vision?

The study's coverage is depicted in the following display.

Coverage of the Study

Source: IT ministry office report **India's Broadband Economy: Vision 2010**

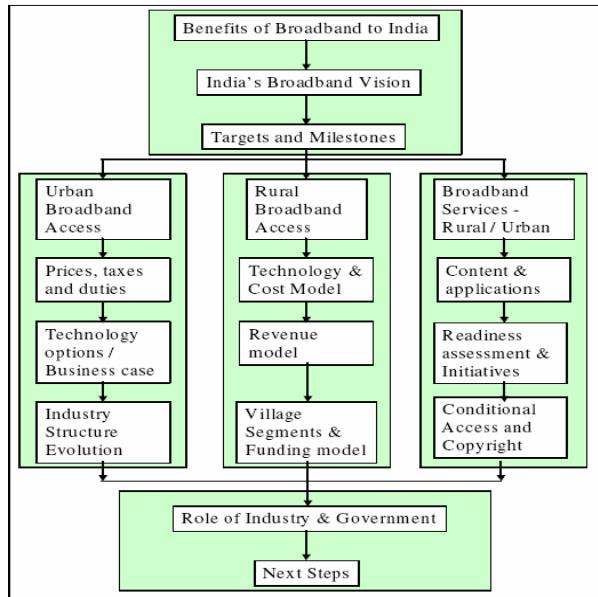


Fig.10 Coverage of Study

	Investments required by 2006 (USD mn)	Investments required by 2010 (USD mn)
Urban networks*	1100	2100
National / International bandwidth	150	500
National Content Delivery Networks	100	250
Rural Networks	250	500
Content and Applications	1000	2000
TOTAL	2600	5350

* Based on incremental costs on existing networks; fresh rollouts could double the investment requirements for rollout of urban networks

Fig. 11 Rollout Network

Feasible Output:

1. Software interface
2. A communication device that could be
 - A computer, TV, telephone, or digital VCR is a standardized and mass-produced product.
 - A kiosk could be placed in places of social gatherings where these could be used most frequently.
 - Initially, this could be made to serve the middle persons in business, matrimony, classified/jobs, etc., and slowly the villagers can come into the picture.

An Approach to User Study

Type of Survey for Present Topic

a) Ethnography

It is simply a subset of human-computer interaction, and it is a means of studying everything linked to a human being, including his behavior, interactions with others, and social gatherings. Similarly, there is a working culture in a business where we can see the relationships between workers and managers and the business practice.

Why should the user interface designers care about user culture? There are various reasons why ethnography is critical to successful interface design, including the following:

- ❖ **An ethnographic study is a thorough examination of the demands of users:** Its primary purpose is to view the user interface via the user's eyes. This viewpoint helps design a user interface that meets the end user's demands.

- ❖ **It reveals the genuine nature of the work of the system user:** An ethnographic research seeks to identify all tasks and connections that contribute to a user's employment. It is common for users to accomplish work and communicate in ways that are not part of their formal job description.
- ❖ **The ethnographer can act as the end-user:** An ethnographer's ability to achieve a high degree of user comprehension through fieldwork can be a great asset. When "actual" end-users are challenging to obtain, the ethnographer might function as the end-user in participatory design.
- ❖ **The unbiased and open-ended character of ethnography enables discovery:** To provide quantifiable findings, other HCI research methodologies, such as task analysis and controlled testing, must codify, categorize, and/or hypothesize how users engage with a system. The unassuming character of ethnography can frequently provide unexpected insights into how a system is used.

b) *Contextual Survey*

Know your users, their goals, and the circumstances of system use.

Reference: [1] - <http://www.charm.umd.edu>

[2] - Usability Context Analysis: A Practical Guide Version 4.04 Edited by Cathy

Thomas and Nigel Bevan

The usability of a product is influenced not only by the product's features but also by the users' characteristics, the tasks they perform, and the technological, organizational, and physical environment in which the product is used.

Context analysis is a must before beginning any work on usability. During development, a continuous cycle of user-based evaluation is required to:

- comprehend the Use Context
- set usability standards
- provide a solution that can be tested
- Test the solution with typical end-users.

Interviews, subjective judgments, laboratory observations, and other methods have traditionally been used in usability research and website design. Eye-tracking has evolved as a valuable technology for closely monitoring users' interactions with computer interfaces. [3]

c) **Application of User Survey to the Present Problem**

Contextual surveys & ethnographic studies could provide a significant outcome to the present situation. Also, what could be designed by the designer considering Users' Future use?

So for the present problem survey would not be filling out paper questionnaires, but the surveyor shall live with the users and consciously observe their needs, shortcomings, and positive points. What problems do they face in their businesses, who are the persons they go to for advice to satisfy these problems, whom they trust the most, are they exploited by the same, what practices are accepted by their culture, rituals, etc.? This could also be done with open-ended interviews (face-to-face interviews), on-hand observations, etc.

For doing this, the surveyor should have a draft questionnaire in his mind. The questionnaire prepared for the present problem is as follows:

i. **Survey Questionnaires**

Family background

1. father side
2. Own family

Reference: [3] - Teaching User Interface Design using a web-based Usability Tool; by Ernesto Arroyo, Ted Selker (MIT Media Labs) & Willy Wei (Brown University)

How did you come into this business?

- Family
- Got an opportunity from a friend
- By Your insight
- Your profession (studied about this)

Can you give some Positive Points about your business?

- Negative points
- Monthly earning
- Seasonal variation in earning Are you a bank account holder?

If yes,

How do you transact?

What kind of payment do you make, And how

Computer literacy

Do you know anything about e-mails? If yes,

1. About how many years have you been using the service?
 2. How many hours do you spend per week on the web or the computer
 3. Have you used any e-commerce site for any transactions/business?
 - If yes, the medium of payment used by you
 - If not, have you heard of it & why don't you sue it?
-
4. If you do not use the internet, what are the tools you use to do your business?
 - Middle man
 5. What is the most critical/frequent task you use on the internet apart from e-mailing?
 6. Tell me the steps involved in doing the same.
 7. Do you find any problem performing the task...? what kind of problems- describe them.
 8. Which site has been the most frustrating experience to handle
 9. Do you carry mobile
 10. How do you interpret mobile is for?
 - A communicating device
 - An interactive device
 - A computer-based application-related device
 11. How do you interpret ATM
 - for money transactions only
 - to get account updates
 - to surf the internet

Research on page layout

Cognitive Ergonomics

Cognitive ergonomics is concerned with the fit between human cognitive talents and limits and machines, tasks, environments, and so on [4]. It all comes down to how we interpret things and make decisions.

Cognitive ergonomics applications include, for example, developing a software interface to be "simple to use," as well as designing a sign such that most people will comprehend and behave in the desired manner.

Where do Users Look

- Users Do not Go to the Bottom

Users seldom looked directly above the browser's notification center at the Study Area. Users frequently discovered what they were looking for before arriving at this section. Interestingly, individuals scrolled to bring information from this region higher on the

screen instead of gazing at the bottom.

- Users expect everything big to start in the middle.
- Users seldom glanced straight at the scrollbar; instead, their sight was drawn to its left. This demonstrates that people do not look at the scrollbar when using it. Peripheral vision was beneficial.
- Ads drew users only when relevant to the present task—even if the content was interesting (but irrelevant to the work).

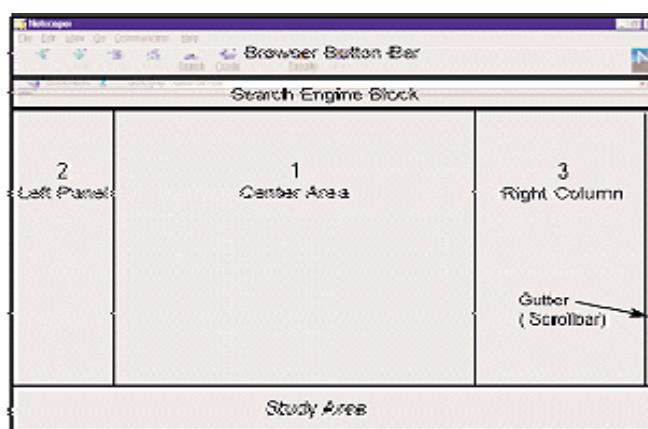
Reference: [4] – <http://www.ergoweb.com/news/>

Results- User Interface

i. Field Observations

The present scenario of information exchange:

In the villages, people usually rely on teachers, doctors, or some essential and educated person for information. Moreover, it happens not through electronic media, just by exchanging it by mouth. People like to gather in a public place like shops or a fixed place where meetings can be held and exchange information. In Indian rural villages, people communicate via telephones and postal services, and these have been the oldest means of communication in India for a very long time. Even the form fillings like insurance or any other government forms are not filled by illiterate intermediaries or agents who benefited from those people.



The interaction:

The user-kiosk interaction was evaluated using the following criteria:

- Motivation
- Interface
- Media
- Content

Motivation:

People in rural areas usually fear new technologies and hesitate to use them. To get users started with the kiosk, they must be motivated and persistent.

Interface:

1. Visual interface: When viewers first watch television, they have difficulty distinguishing the many icons for different purposes. Square and circular buttons are used, but it causes problems understanding their function when something changes in shape.

2. Navigation: The tree structure navigation was difficult for users to grasp. Many users noticed the back and forward buttons that supported linear navigation, but the branching structure, drop-down menus, and scroll bars were challenging to operate. It is also challenging to come up with a search query.

3. Mouse-based interaction: Users learned to operate the mouse by associating its button with "something to be pressed," but they were unsure about the timing of the clicks. Some individuals clicked 7-8 times in three seconds, while others made a single click last 10-14 seconds.

i) Media:

The kiosk uses a variety of media (video, image, and text) to provide information to the user.

- Text and images: Most users found using hyperlinks in graphics and text challenging.
- Content/Application:

Most rural apps struggle to find relevant, helpful, and trustworthy content. Users have difficulty understanding and relating to the information. Currently, the English material available on the web is also text-intensive, making it inaccessible to rural users.

Watching videos of others like them showing their efforts inspired the users. It was envisioned that users connect through discussion forums and email. After a few days, when most users returned to the kiosk, they found it difficult to remember their passwords. Furthermore, the analphabetic users could not enter their login name, making the process very hard for them. Furthermore, many women were reluctant to have their names made public.

ii. Mental model & village lifestyle of farmers

- Busy at season time.
- Non-season afternoons- spent sleeping.
- Non-approach to an urban lifestyle
- A level of competitiveness
- Seek information and be interested in collecting information if it is commercially viable.

Design directives-

1. It shall be highly durable & be able to withstand extreme temperatures.
2. Economical in manufacturing.
3. The instrument shall provide visual & speech feedback. The tactile qualities of the keys shall give sound after pressing for first-time users.
4. It shall be easily transportable. Thus, opt for either dismantled transportation or one-piece transportation.
5. The keyboard shall be specially designed for the masses as the requirements differ. No use in providing unnecessary keys. Looking at a multimedia function keyboard.

iii. Mandi/Market Study (business Model)

Agricultural Products

The break-up of Market in Cereals like Wheat, Rice, Paddy, Maize, Jowar, Bajra, Ragi, Soji, etc.

Thus,

- The broker can be invited to initiate the conversation and get competitive rates.



Site conversation between broker and farmer (bargaining) Place: Mallur, Karnataka

Results – 3D Product Outcome

a) *Kiosk Design consideration*

1. Understand the Public User
 - Completely untrained
 - The program must be basic and user-friendly.
 - The best kiosks focus on a particular application or transaction.
 - Kiosk use is optional
 - It must catch their attention.
 - Must maintain their interest
 - Never frustrate the user.
 - It is critical to offer desired information as soon as possible.
 - Will walk away for the slightest reason
 - Must be satisfied or will never return
2. Software Tips (Excellent software is a requirement for success)
 - Limit choices
 - As much as possible, direct the user.
 - Also, provide simple navigation buttons such as Back, Forward, and Start.
 - All of this avoids dissatisfaction, which leads to walkouts or vandalism.



- Use a straightforward point-and-click interface.
- Large buttons
- “Rule of Thumb”-sized buttons
- No double-clicking
- No pull-down menus

- No scrolling or scroll bars
- No dragging
- Bright background colors
- Avoid black, which shows reflections
- Avoid solid colors
- To cover reflections and fingerprints, use a textured background fill or halftones.
- They retain the audience's eye on the image's plane rather than the reflections.
- Limit Amount of Text
- Consider Digitized Speech
- Digitized speech can talk users through your application
- The brain can process visuals and audio simultaneously
- Sound cards are free
- But hire a professional announcer
- Multilingual versions are a plus

3. Hardware choices

- Mouse
 - It is inexpensive, but it takes up space, is easily stolen, and not everyone can use it.
- Keyboard
 - Fast data input, yet daunting, especially when combined with a touch screen

"Keyboards immediately scare away many potential users afraid of computers."
 - Trackball
 - Cheaper and takes up less space, yet less intuitive and familiar
 - Touch Screens

ii. CRT or LCD?

1. Size and Weight

- With the same visible area, a 15" LCD takes up just 40% of a 17" CRT space.
- LCD screens may be wall-mounted.
- Smaller LCDs may result in a smaller kiosk overall.
- LCD weight is significantly less than CRT weight, resulting in lower shipping costs.

2. Image Quality

- LCDs are frequently inferior to high-quality CRT displays.
- CRTs are ideal for ultra-high-resolution applications.
- Some users may disagree with the dithered color palette on LCD.
- Full Motion Video—not all of today's LCDs are up to the task.
- CRT has a considerably wider viewing angle than LCD, which may entice more users.
- LCDs are approximately twice as bright as CRTs.

3. Cost

- A 17-inch LCD touch display costs around twice as much as a 17-inch CRT monitor with the same viewing area.
- If you can live with the extra size, true flat CRTs appear just as attractive and contemporary as LCDs.
- CRTs are often repairable by local TV shops, but LCDs are not - this is essential in outlying areas.

4. CRT Life vs. LCD Backlight Life

- CRTs and LCD backlights will ultimately fail and require replacement.
 - Unlike desktop monitors, kiosks operate 24 / 7
 - Typical CRT life (half-brightness) is 10,000 to 20,000 hours (416 to 833 days)
 - Typical LCD backlight fluorescent lamps last 20,000 to 30,000 hours
 - Phosphor aging and cathode aging are the two principal causes of CRT aging.
 - Brightness loss
 - Color balance change
 - Loss of focus
- LCD backlights are more accessible to replace than CRTs.

5. LCDs and Touch Applications Other Strengths vs. CRTs

- Less power consumption
- About 1/3 of comparable CRT
- Typically run on +12VDC
- Cooling in kiosk applications requires less heat and a more specific form factor.
- Magnetic fields do not affect it.
- Degaussing metal kiosks (using CRTs) is a severe issue.
- Fans and loudspeakers can damage CRTs.
- Magnetic fields may be found in a variety of public and industrial settings.
- LCDs are preferred in any situation where the display is moved.
- LCDs can be shipped worldwide with no video geometry issues
- LCD setup is virtually flawless and everlasting.

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