

The Inverted Pyramid Approach in User Interface Design for Interactive Information Retrieval

Prof. Anirudha Joshi
Industrial Design Centre
IIT Powai
Mumbai- 400 076
91-022-25767829
anirudha@idc.iitb.ac.in

Gaurav Mathur
Media Lab Asia
KReSIT, IIT Powai
Mumbai- 400 076
91-022-25764989
gauravm@medialabasia.org

ABSTRACT

This paper extends the Inverted Pyramid approach to the design of user interfaces for systems used to deliver information on request. The focus of this paper is on speech based interfaces to answer a user's query.

The 'inverted pyramid approach' is a preferred way of writing by journalists. In brief it states: "start the article by telling the reader the conclusion". This style is known as the *inverted pyramid* for the simple reason that it turns the traditional pyramid style around. Newspapers and news based websites follow this as readers can stop at any time and can still get the most important parts of the article.

Keywords

Inverted Pyramid Approach, Information Architecture, Speech based interfaces, Interactive Querying, Menu Structuring

INTRODUCTION

Delay in delivering relevant information = failure

Dangling the carrot before the users and asking them to pass through a maze of options is no longer an optimal approach to information design. Usability studies show that users are impatient to reach the information they want. Useful information needs to be pushed upwards, towards the users from the huge information cauldron.

This needs a design effort in logical breaking of the hierarchy and suggesting a new navigation system that lets the users make choices and be in control of the parameters they need to define for reaching a piece of information.

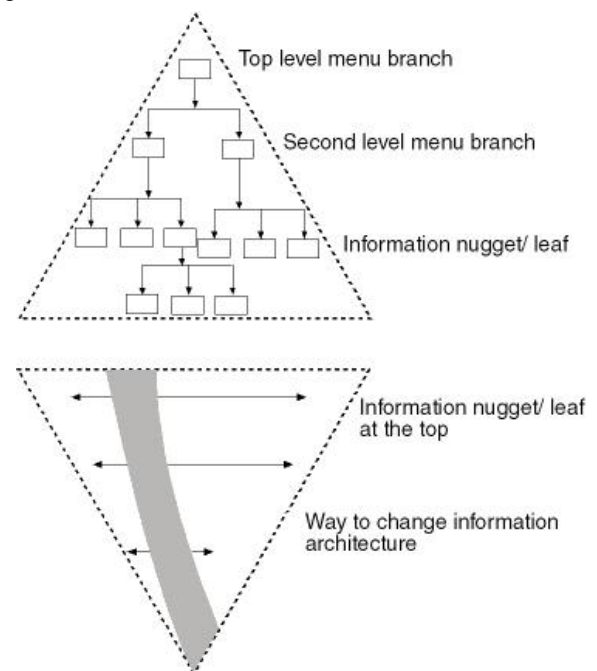
WHAT IS THE INVERTED PYRAMID APPROACH

"Journalists have long adhered to the inverse approach: start the article by telling the reader the conclusion ("After long debate, the Assembly voted to increase state taxes by 10 percent"), follow by the most important supporting information, and end by giving the background. This style

is known as the *inverted pyramid* for the simple reason that it turns the traditional pyramid style around. Inverted-pyramid writing is useful for newspapers because readers can stop at any time and will still get the most important parts of the article." [1]

Scientific, academic papers (including this one) are usually written with the regular pyramid approach: starting with an introduction, review of prior work, followed by a hypothesis, experiment results and finally the conclusion.

Jakob Nielsen had propounded the Inverted Pyramid approach in 1996 for writings on the web. Today almost all sites especially the news based ones religiously follow the approach.



Standard vs. Inverted Pyramid Approach

In the field of journalism, from where the term 'Inverted Pyramid Approach' originally emerged, it refers to a style of writing which informs the readers about the most important piece of information first and then takes them through the rest of the story. It is pertinent to explain here

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the benefits and the use of Inverted pyramids in the field of journalism to understand the implications on interface design. We can then draw analogies to our main focus-interface design.

The inverted pyramid style in journalism offers several distinct advantages in news writing, which are discussed in the following text.

Presents Pertinent Facts First

Most readers have neither the time nor the desire to read every word of every story in a newspaper. By using the summary lead, the journalist focuses the reader's attention on the news, arouses the reader's interest and allows the reader to swiftly skim important facts. In other words, he/she spills the whole story in the first paragraph. The reader can decide whether to continue reading the details or to go on to something else. But even if the reader stops there, the inverted pyramid form of writing has provided the essential facts. The primary objective of a news story then is not to withhold information, but to present the facts with rapid, simple directness. [2]

Facilitates Headline Writing

Headlines for news stories tell the main facts in the briefest form. If a story is written in the proper inverted pyramid style, it becomes easier to coin the headline as well.

The Lead

The opening paragraph of a news story is referred to as the lead (pronounced "lead"). The lead is the first and most important paragraph of any news story. It attracts the reader and states the important facts first.

A good lead written for a straight news story, normally answers six basic questions about the event. Known as the five Ws and H questions, they are as follows: who, what, where, when, why and how.

INVERTED PYRAMIDS IN INTERACTION DESIGN

One of the goals of Interaction design is to reduce the stress and time associated with the use of a tool. Journalism as mentioned earlier has widely accepted the Inverted Pyramid approach. This paper seeks to extend the possible areas of application of this approach to interface design.

EXAMPLES

A comparison

It is imperative here to demonstrate how the inverted pyramid approach affects the usability and efficiency of a site where the user has to interactively select or customize options to retrieve desired information. We take the example of two websites that facilitate booking or reserving rooms in two separate hotels. The first example illustrates the typical approach in designing such systems where the user selects certain options present in hierarchical fashion on a screen. After submitting the preferences, the user is led to another screen where he is asked to make some

secondary level preferences. Finally, after making all the choices the user is presented with the information. If he/she desires to change a parameter then the entire process needs to be repeated. Technical limitation, on the web, of continuously exchanging data between client and server was the primary reason in favor of such an approach.

Technologies present today allow us to overcome such limitations and produce efficient interfaces. The second example of room reservations from Broadmoor, a chain of hotels, does exactly that. The interface has compressed the multi-stepped, multi-screen approach in to a single dynamic screen solution. All customizable parameters are displayed in one screen and changing any parameter leads to an instant change in the output. This gives the user complete control over the proceedings.

Hotel Booking using the 'standard pyramid' approach in Information architecture

https://www.trustinternational.com/cgi-oberoi_in/tBooker/2B

Hotel Booking using the 'inverted pyramid' approach in Information architecture

<https://reservations.ihotelier.com/onescreen.cfm?hotelID=2054&languageID=1>

Bhav Puchiye:

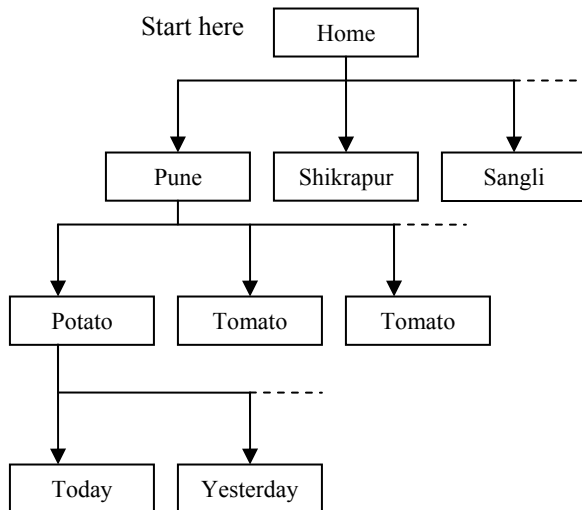
The inverted pyramid approach will be illustrated using a small application called 'Bhav Puchiye' developed for farmers in rural India by Media Lab Asia. To ensure deeper penetration in rural India the application is proposed to be made available online, accessible through kiosks in villages or through telephone at PCO/STD booths.

Bhav Puchiye is an online application for getting the price information of agrarian products at the nearby *mandis* or wholesale markets.

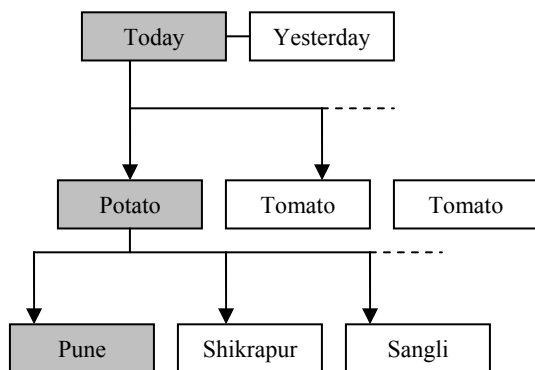
A typical interface designed for such an application with various parameters to be controlled might have designed the interface in a three stepped manner

- select a produce,
- select a place (mandi) and
- select a date

But this leads to at least three interactions before the first bit of useful information is seen by the user.



Standard pyramid approach



Inverted Pyramid approach

The visual interface of the product tries to minimize this effect. For example, it pushes information up the hierarchy by showing the 'most probably asked venue' at the village, for 'most probably asked items' on the 'most probable dates'. The interface further gives the user a method to 'navigate' by changing the venue, item or date.

Visual Interface

The visual interface is designed to provide as many visual clues as possible. The interface provides information about the selected vegetable produce at most of the nearby *mandis*. The farmer then depending on the prices indicated and on the distance of the mandi from the originating place can decide where to sell his produce to get the maximum profit. The price information for many *mandis* is provided to the user at the beginning itself. At the same time the user has the option of changing the query by changing the date and the commodity parameters.



'Bhav Puchiye', © Media Lab Asia

VOICE USER INTERFACE (VUI)

Speech based interfaces have become one of the most intimate communication, interaction devices in the modern world due to some of the inherent advantages of speech. Some advantages are listed below:

- **Natural:** Speech interfaces enjoy the benefit of being a natural paradigm for interaction and therefore score high on the learnability chart.
- **Literacy:** Speech eliminates the need to write or read thereby enabling the illiterates and the semi-literates to use the system equally well.
- **Technology available:** The growing demand for information to be available anytime, anywhere and device independency coupled with technological developments in the field of text-to-speech and speech recognition are putting speech as a major contender for future interaction paradigms.
- **Penetration:** Telephones which have a deeper penetration than computers in most places can be

used easily to interact with a system using DTMF (Dual Tone Multi Frequency) or speech recognition technology.

A traditional computer based interface is two-dimensional. The user is able to look at any part of the information displayed on the screen at will. Highlighting, fonts, location and other visual clues convey structure and relative importance to different elements of material on the screen. In contrast, an auditory interface is serial, rather than two-dimensional. Only one word can be heard at a time, and the order in which material is delivered is therefore very significant. Ben Shneiderman summarizes the drawbacks of speech based human-machine interactions as:

“Natural-language interaction usually provides little context for issuing the next command, frequently requires clarification dialog, and may be slower and more cumbersome than the alternatives.” [3]

Due to the ephemeral nature of speech all VUIs rely on the short term memory of the users. This limits the number of commands to seven in number [4]. All efficient VUIs try and reduce the cognitive load on users by arranging their options in such a manner that users don't have to remember more than seven options.

Yet, all of us have probably been frustrated with some inefficient VUIs at some time or the other. Voice UI of a particular private bank begins by asking the users to press star (*) to proceed. This first step itself puts off many users as they do not gain any information by performing the aforesaid action. Many other inefficient VUIs make it difficult for users to return back to the main menu or to the last command to change their option. This forces the users to repeat the entire cycle of menus.

Voice User Interface for Bhav Puchiye:

Weighing the advantages and disadvantages of voice user interfaces, a voice interface for Bhav Puchiye was proposed for the farmers of the country. The audio interface was proposed to be made available through telephones at PCO/STD booths or through an interactive radio. The voice user interface was also designed according to the inverted pyramid approach. The application in local language begins by greeting the user and then providing him with one of the most commonly enquired query results for the latest date available. The user is then given a choice to change any of the parameters and customize his query.

As explained in the visual interface, a VUI designed in accordance with the standard pyramid approach might have attempted to make this a stepped approach by first asking the user to select a *mandi*, then a single produce and finally a date. This would not only have increased the interaction time before providing any information but also would have made it difficult to change one parameter while retaining the other previously selected parameters.

Transcripts of some of the options generated are provided below in English:

Scenario- DTMF based system:

Trigger: User calls

System: Greets the user. “At Pune mandi the price of Alu, Grade B, was Rs. 450 per quintal, onion was Rs. 230, per quintal and rice was Rs. 1700 per quintal on 7th March. To change the mandi press 1, to change the produce press 2 to change quality of produce press 3 and to change the date press 4.”

User: Presses 1

System: “For Shikrapur press 1, for Ahmednagar press 2, for Sangli press 3, for Kolhapur press 4,

for Jalgaon press 5, for Solapur press 6, for Mumbai press 7, To go back press 8

User: Presses 2”

System: “You selected Ahmednagar. At Ahmednagar mandi the price of Alu, Grade B, was Rs. 550 per quintal, onion was Rs. 300, per quintal and rice was Rs. 1800 per quintal on 7th March. To change the mandi press 1, to change the produce press 2 and to change the date press 3.”

Scenario- Voice Recognition based system:

Trigger: User calls

System: Greets the user. “At Pune mandi the price of Alu, Grade B, was Rs. 450 per quintal, onion was Rs. 230, per quintal and rice was Rs. 1700 per quintal on 7th March. To change the place, speak out the name of the ‘mandi’, to change the produce say the name of produce and to change the date, speak out the date with reference to today’.”

User: “Potato, grade C at Ahmednagar, last monday”

System: Confirms the selection. “You selected Ahmednagar and potato grade C, but the date was not understood. Kindly speak the date with respect to today, for example two days back.”

This approach reduces the interaction time considerably by cutting down on the reading of the available options by the system. Such systems are programmed to look for or catch certain keywords from what the users speak. These systems that respond to user speech are also known as Interactive Voice Responses or IVRs.

HEURISTICS FOR VUIs:

The above background brings to forefront the importance of information architecture in speech based interfaces. Inverted Pyramids can provide heuristics for rearranging the information in a speech based interface.

1. **Provide some information at the beginning as the user is interested in the leaf.** Don't start with options; rather give some information that prompts the user to change some parameters and reach their desired goal. Relevant information should be pushed up the hierarchy. The users must enter at the bottom of the pyramid but at the same time should enjoy the flexibility of navigating and changing certain options.
2. **Give control** of what parameters the user would like to change rather than a rigid navigation.
3. **Provide feedback.** Feedback though an important factor in visual interfaces is even more significant in Voice UIs as the user needs to know what is happening.
4. **Know thy users:** The user interface of a system needs to cater well for the majority of users while still being useable by all users. If a specific user group is clearly targeted then certain assumptions can be made and tested about their abilities and preferences.
There may be 1000 options that can probably be changed but there may be only 100 that are actually available and then there may be only 10 that are really relevant to a majority of the users. The designer's job is to identify the few most relevant options that most users are likely to use.
5. **Assume that users are already busy:** Adopt as your credo fast, driven interactions. "Writing short, tight prompts is one way to encourage quick interactions; another is remembering in error correction situations that your goal is not necessarily to give users all their options, it is to get them going in the right direction as soon as possible. Always put the application with the highest usage first in the prompt; conversely, never put a seldom used application first with the

rationale that it will encourage people to use it (it won't - it will infuriate them)." [5]

ADVANTAGES

The advantages of inverted pyramid approach in user interface design for interactive information retrieval can be summarized as follows:

- Users don't begin a search clueless.
- Multiple parameters can be changed at a time right in the beginning, instead of just one. User is in control of what parameters he would like to change first.
- Information that users are most likely to select are presented first, rather than presenting all.
- Users have already entered a menu structure.
- Precious user time is saved.

Future Work

- Testing of the proposed interfaces needs to be carried out in the field to verify assumptions and judge the efficiency of the interface.
- Application of audio interfaces for very large and complex systems needs to be tested.

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