

**Smart Documents**  
**Timely Information Access For All**

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## Outline

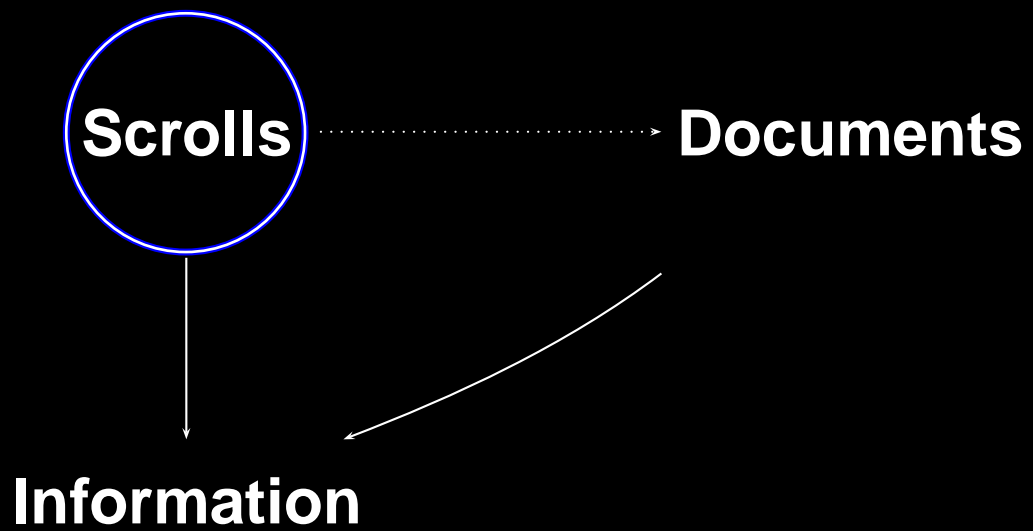
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- **The Information *REvolution*.**
- **Information is not *just* for viewing!**
- **Interactive multimodal interfaces.**



# Information Evolution

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# The Written Word

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## Represents:

- The repository of information.
- The vehicle for information exchange.



## Availability

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- **More information is available.**
- **Information is available to more.**

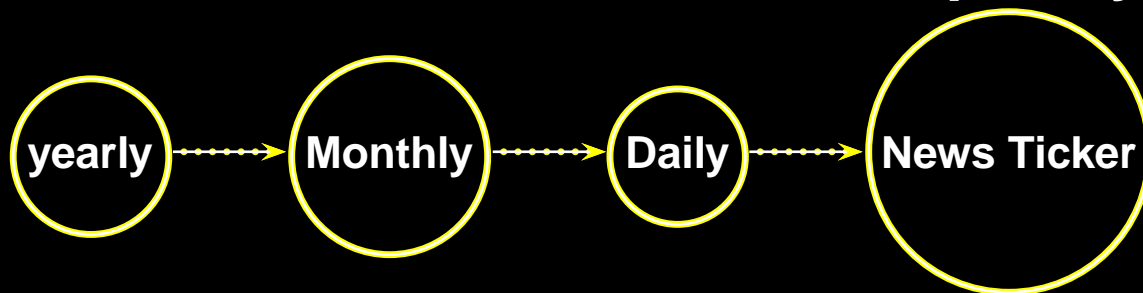
**A level playing field!**



## Half-Life Of Information

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Publications increase in frequency:



**Information goes out of date faster.**



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## Printed Documents

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- **Rely on a passive intermediary.**
- **Store and convey content.**



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## Electronic Documents

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Information exchange is:

- Mediated by an active agent.
- Separates repository and agent.

**Information Is Display Independent!**





## The Digital Age

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- **Information originates digitally.**
- **Print is *only* one display.**
- **Information remains *live!***



# Smart Documents

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**Profound impact on information:**

- **Generation, Archival, Retrieval**

**Produce, consume multimodal content.**



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# Computable Information

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**Electronic Information Is Computable!**



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## Electronic Information

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**Documents not just for printing!**

<b>Electronic</b>	<b>Printed</b>
<b>Logical Structure</b>	<b>Layout Structure</b>
<b>Dynamic</b>	<b>Static</b>
<b>Customizable</b>	<b>Fixed</b>
<b>Interactive</b>	<b>Non-Interactive</b>
<b>Active</b>	<b>Passive</b>

**Information Comes Alive!**



## Formatting Structure

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- Lists, Mathematics, Tables, . . .

### Formatted output:

- Permits direct perception.
- Reduces cognitive load.



## Example

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**a, plus the fraction  
whose numerator is,  
b plus c, end  
numerator, and  
whose denominator  
is, d plus e, end  
denominator, plus x.**



## Example

a, plus the fraction  
whose numerator is,  
b plus c, end  
numerator, and  
whose denominator  
is, d plus e, end  
denominator, plus x.

$$a + \frac{b + c}{d + e} + x$$



**ASTER**

**Information is display independent.**

**Document**

**(L<sup>A</sup>)T<sub>E</sub>X**

**ASTER**

**Print**

**Audio**





**Spoken Access**

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**Speak Information,**

**AND NOT**

**Screen Contents!**



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## Screen Access

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User explores visual display to:

- **Construct mental model of the interface.**
- **And interpret intent of the UI.**

**Aural output from visual display.**



## Screen Access Design

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- **Encapsulate display in off-screen model.**
- **Present this model aurally.**
- **Enable navigation of this model.**

**Feedback is application independent.**



## Available Screen Access

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Character-based interfaces . . . GUI.

**Richer layout of GUI**



**Harder to build OSM**



**But richer OSM**



**Enables possibly richer feedback**



## Screen Access Innovations

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- **Speak specific areas of the screen.**
- **Attach meaningful labels to icons.**
- **Navigate window hierarchy.**

**Access separate from application.**



## What Is UI?

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1. Obtain user input,
2. Compute on the information, and
3. Display the results.

**UI = Input + Output.**



## Speech Enabling Applications

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- **Treat speech as a first class medium.**
- **Application produces its own feedback.**
- **Exploit features of the spoken medium.**

**Independent Audio and Visual Output.**



## Contrasting Approaches

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<b>Read Screen</b>	<b>Speech Enable</b>
<b>Speak display</b>	<b>Speak information</b>
<b>No context</b>	<b>Full context</b>
<b>Independent</b>	<b>Integrated</b>
<b>Global scope</b>	<b>Local context</b>
<b>Uses display</b>	<b>Uses environment</b>



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## Advantages

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- **Produce intuitive feedback.**
- **Provide a simpler user model.**
- **Reduces users cognitive load.**

***One –not two– applications.***



## Example

March 1996

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

Easy to see relevant information.



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## Global Digital Libraries

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- **Structurally rich content,**
- **Mediated by an intelligent agent,**
- **Enable smart documents.**



# Client Server Systems

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**Information is accessible**

- **where the user wants,**
- **when the user wants, and**
- **the way the user wants!**



# Speech And Audio

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**A New Dimension In UI!**

**Enrich Our Information Experience!**



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