

# AFFORDANCE THEORY IN USER EXPERIENCE EVALUATION

HAMNA ASLAM

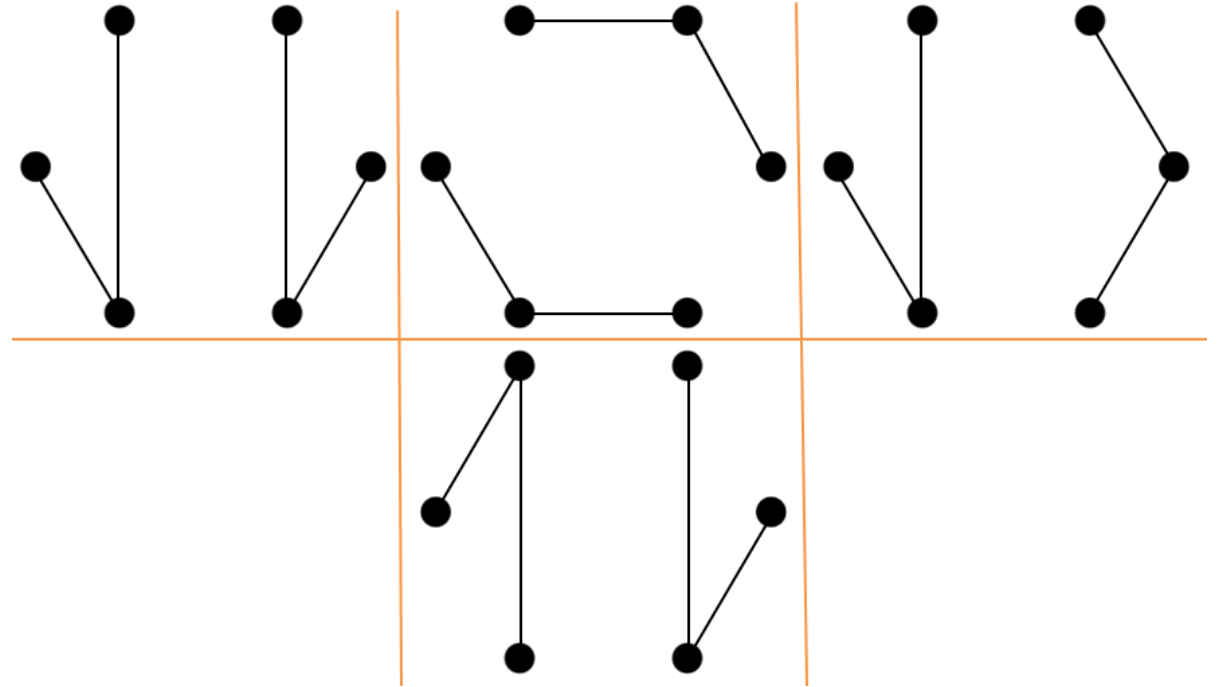
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# AFFORDANCE

All interaction possibilities



- The Google Scholar's search for the term yielded 593 results in the decade of 1980–1989
- Search for the decade 2010-2020 yielded 29,900 results

## POPULARITY

# THEORY OF AFFORDANCES

Originated in the field of ecological psychology by James Jerome Gibson

# J.J. GIBSON

Specifies affordance as **all possible interactions** between the object and the environment.

# HUMAN-COMPUTER INTERACTION



# ADOPTION IN HCI

The concept of affordance has been studied by  
D. Norman in the realm of Human-Computer Interaction  
and Graphic Design

# D. NORMAN

Norman focusses on the **design aspects** and emphasizes the need of using **signifiers** and **visual clues**

Some affordances **are perceivable**, others are **not**

**NORMAN VS. GIBSON**

**COGNITIVISM**

**VS.**

**ECOLOGICAL PSYCHOLOGY**

# ADOPTION IN HCI

1991

## TECHNOLOGY AFFORDANCES

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### **ABSTRACT**

Ecological approaches to psychology suggest succinct accounts of easily-used artifacts. Affordances are properties

developed an "ecological" alternative to cognitive approaches. The cognitive approach suggests that people have direct access only to sensations, which are integrated

## FORM-GIVING: EXPRESSING THE NONOBVIOUS

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### ABSTRACT

The design of richly informative interfaces would benefit from an account of how visual forms convey information. In this paper we suggest that the study of *form-giving* in Industrial Engineering might provide a foundation for such an account. We present three studies of designed synesthesia, in which objects' forms indicate non-visible attributes such as taste or smell. These studies illustrate the rich possibilities for conveying information with form, possibilities which are routinely exploited in industrial design. We believe that similar opportunities exist for interface design, and that further studies of form-giving may help in taking advantage of them. Results of a student exercise expressing computer metaphors in 3D forms will be discussed.

information through the forms they create [11, 12]. The results suggest that this ability does not depend solely on social conventions or literal physical similarities, but also on higher-level attributes of physical structure. Finally, we point to ways that interface design may benefit from an examination of form-giving.

### Understanding Graphical Interfaces

There are few guides to the design of richly informative graphics for user interfaces. Excellent work has been done on the design of graphical displays of quantitative information and on visualization techniques for multidimensional data [e.g., 1, 9, 14], but such research is largely concerned with mapping data to the appropriate kinds of graphical dimensions (e.g., additive data should be represented by

## Paper as an Analytic Resource for the Design of New Technologies

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### ABSTRACT

We report on an examination of work practice in a knowledge-based, document-intensive organisation and describe the role of paper in that work. We show how such an examination can provide a resource for (1) the determination of system design modifications that can be undertaken in the short term; (2) the determination of entirely new systems design requiring longer term research and development; and (3) helping to specify where paper will continue to be used in future document-related work practice.

### KEYWORDS

paper, ethnography, knowledge work, diary study,

But paper does not need to be viewed this way. We contend that its continuing use can be seen not as a problem but as an analytic resource. In other words, an examination of why and how paper is used in existing work processes can be seen as a way of directing and inspiring the design of new technologies. It may do this in three ways:

1. It may show that the current digital alternatives inadequately support work process. Paper may be a means whereby users "make do" or "work around" poor design. These work arounds can indicate where remedial design improvement of a system may be made. This implies design and development over the short term.

## Squeeze Me, Hold Me, Tilt Me! An Exploration of Manipulative User Interfaces

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### ABSTRACT

This paper reports on the design and use of tactile user interfaces embedded within or wrapped around the devices that they control. We discuss three different interaction prototypes that we built. These interfaces were embedded onto two handheld devices of dramatically different form factors. We describe the design and implementation challenges, and user feedback and reactions to these prototypes. Implications for future design in the area of manipulative or haptic user interfaces are highlighted.

**KEYWORDS:** Physical, tactile, and haptic UIs, pressure and tilt sensors, UI design, interaction technology.

### INTRODUCTION

with such games as flight simulators and car racing, where the UI is controlled by steering throttles or steering wheels. Again, in these examples a specialized input device controls a separate electronic display.

These extensions to graphical user interfaces seem logical in view of the widespread support and acceptance of direct manipulation interfaces [11] and of real-world metaphors, such as trash cans and file folders [12]. We believe that such physical user interface manipulators are a natural step towards making the next UI metaphor the real world itself: real objects having real properties that are linked to or embedded in the virtual artifacts that they control. Furthermore, we conjecture that this metaphor reflects a powerful, largely unexplored user interface paradigm.

## Beyond Paper: Supporting Active Reading with Free Form Digital Ink Annotations

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### ABSTRACT

Reading frequently involves not just looking at words on a page, but also underlining, highlighting and commenting, either on the text or in a separate notebook. This combination of reading with critical thinking and learning is called *active reading* [2]. To explore the premise that computation can enhance active reading we have built the XLibris "active reading machine." XLibris uses a commercial high-resolution pen tablet display along with a

involve clumsy interactions with bulky desktop monitors.

Although reading online presents a number of problems, we will show that integrating computation with reading also presents novel opportunities for improving the reading process. Thus there is a tension between the advantages provided by computation and the advantages provided by paper: the choice depends on the reader's goals. For reading a romance novel at the beach, low weight and portability are essential, and it is unlikely that computation

## Interactive Storytelling Environments: Coping with Cardiac Illness at Boston's Children's Hospital

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## 2 The Zephyr Help Instance as a CSCW Resource

Mark S. Ackerman and Leysia Palen

### Abstract

This chapter discusses, as an example of a resource in use, the Zephyr Help Instance as used at MIT. The Zephyr Help Instance is a chat-like system that allows users to ask questions and other users to answer. The Zephyr Help Instance has the social and technical affordances for continued use as socio-technical system in its environment of use and has become a resource for its users.

# Norman's lens

## Time Affordances

### *The Time Factor in Diagnostic Usability Heuristics*

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#### ABSTRACT

A significant body of usability work has addressed the issue of response time in interactive systems. The sharp increase in desktop and networked systems changes the user's focus to a more active diagnostic viewpoint. Today's more experienced networked user is now engaged in complicated activities for which the issue is whether the system is carrying out the appropriate task and how well it is proceeding with tasks that may vary in response time from instantaneous to tens of minutes. We introduce the

portation and power industries, a wrong conclusion a delay based on insufficient information can have serious consequences. For example, an improper termination of a computer application could cause a medical operation to be suspended. A computer delay could cause a commuter train slowdown because the lack of updates could mean that conditions were unsafe. In manufacturing, inappropriate interruptions could result in loss of materials that could harden and cannot be manipulated after a delay.

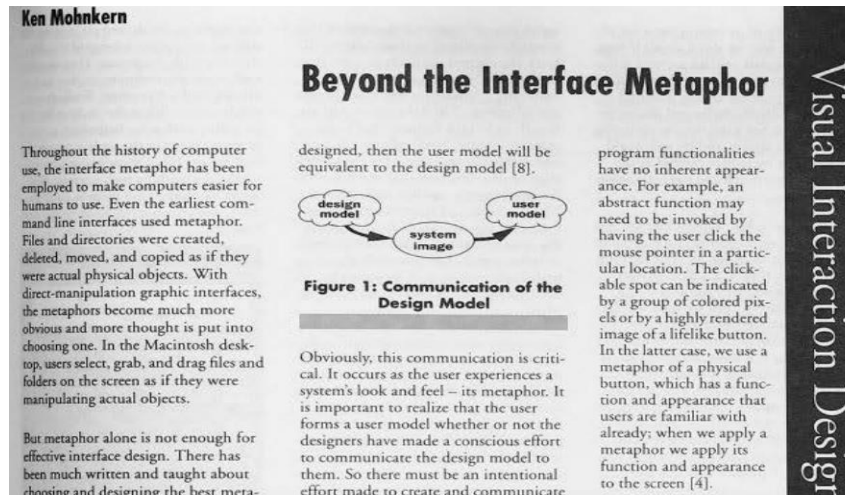
A large body of research exists on various aspects of computer response time [4, 5, 10], providing a good foundation

## A Comparison of User Interfaces for Panning on a Touch-Controlled Display

Jeff Johnson

#### Abstract:

An experiment was conducted to determine which of several candidate user interfaces for panning is most usable and intuitive: panning by pushing the background, panning by pushing the view/window, and panning by touching the side of the display screen. Twelve subjects participated in the experiment, which consisted of three parts: 1) subjects were asked to suggest panning user interfaces that seemed natural to them, 2) subjects each used three different panning user interfaces to perform a structured panning task, with experimenters recording their performance, and 3) subjects were asked which of the three panning methods they preferred. One panning method, panning by pushing the background, emerged as superior in performance and user preference, and slightly better in intuitiveness than panning by touching the side of the screen. Panning by pushing the view/window fared poorly relative to the others in all three parts of the experiment.



**METHODOLOGICAL GUIDELINES?**

**REPRODUCIBILITY?**

# Affordance Theory and How to Use it in IS Research

Olga Volkoff and Diane Strong

## Abstract

In this chapter we provide an overview of Affordance Theory, and provide guidance to IS researchers on how to use it properly and productively in their research. We start by examining the core features of Gibson's original theory and considering some of the challenges we encounter when translating it from ecological psychology to IS. We then distill these observations into six principles for appropriately applying an affordance lens for IS research, after which we discuss three unresolved issues and our views on how these might be addressed. The chapter then comments on the critical realist underpinnings of affordance theory, and how researchers who are not critical realists might utilize an affordance lens nonetheless. It concludes by identifying research opportunities enabled by the application of an affordance lens, and the observation that by finally having a tool that allows us to include the IT artifact appropriately, our theories become of real value to practitioners.

## Six Principles for Using Affordance Theory in IS Research

Several key points flow from the above definition of affordances and the analysis that led up to it. We articulate these points as six principles for using Affordance Theory in IS research (Strong and Volkoff, 2016).

*Principle 1: Remember that an Affordance arises from the user/artifact relation, not just from the artifact.*

While already discussed several times, it is important to remember that affordances arise from the relation between the technology and the actor. It is very easy for authors writing about affordances to slip into language and arguments that treat affordances as though they are the same as features of the technology. A technical artifact does not have any affordances except in relation to a goal-directed actor. That said, it does not have to be a specific actor (until we move to actualization), but can be thought of as an archetypal actor with a set of defined tasks related to a specific goal.

*Principle 2: Maintain the distinction between an Affordance and its Actualization.*

The definition above highlights the critical distinction between an affordance and its actualization. The affordance, as the potential for action with respect to an actor's goals, refers to function (what the affordance is useful for or the purpose of the action), i.e., an affordance is

# GUIDELINES

Operationalization?

How to collect data?

# RESEARCH

DATA COLLECTION

DATA ANALYSIS

# RESEARCH

DATA COLLECTION?

DATA ANALYSIS



What users do and How users act

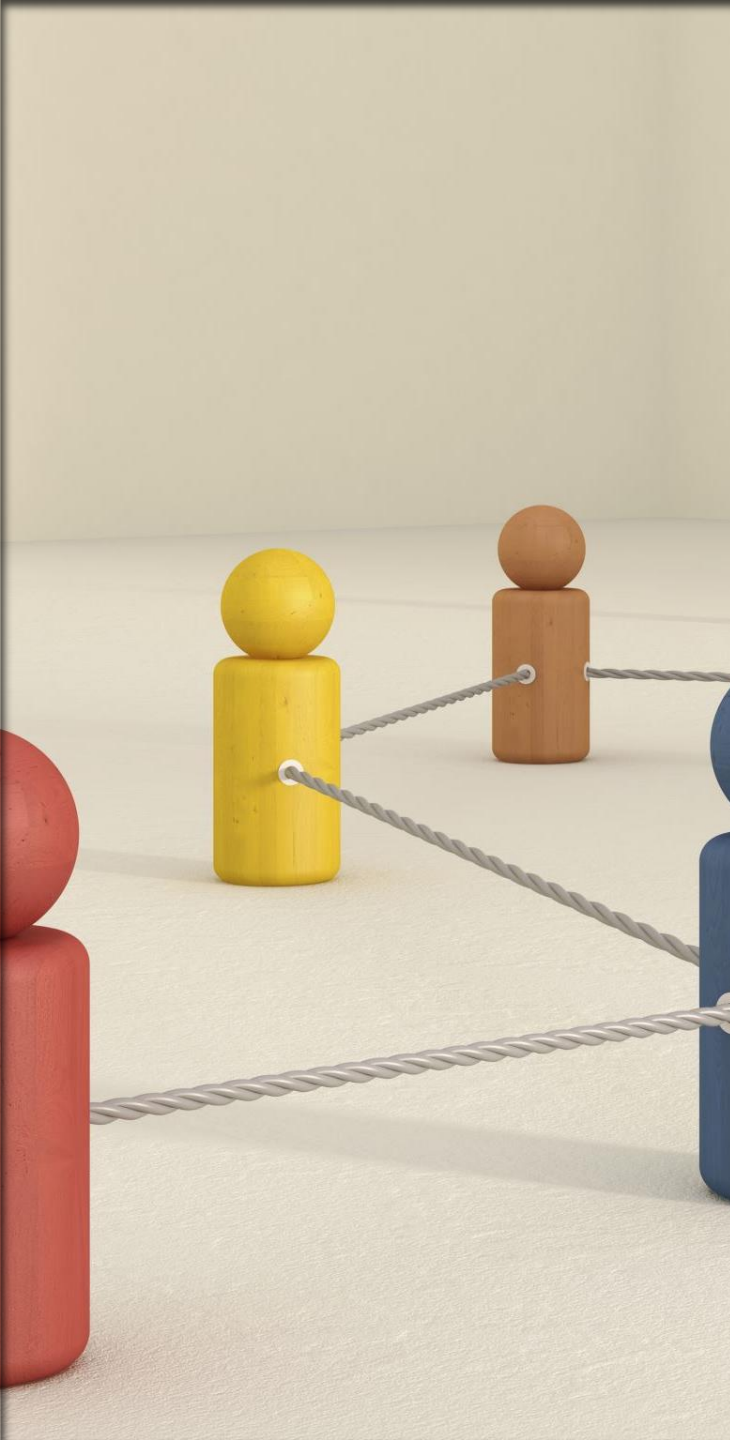
Why they interact in a certain way?

## **USUAL INQUIRIES**

- METHODOLOGICAL GUIDELINES?
- WHY USERS ACT A CERTAIN WAY?



# PROBLEMS



User's perceptions and responses that result from the use and/or anticipated use of a system, product or service

ISO 9241-210

# USER EXPERIENCE

- METHODOLOGICAL GUIDELINES?
- WHY USERS ACT A CERTAIN WAY?



# USER EXPERIENCE RESEARCH



Any design analysis or a user evaluation **process** must consider user affordances both from Gibson and Norman's point of view

## **PROPOSED SYNTHESIS**

- **METHODOLOGICAL GUIDELINES?**
- **WHY USERS ACT A CERTAIN WAY?**



# **USER EXPERIENCE RESEARCH**

# METHODOLOGY

# KOLB'S EXPERIENTIAL MODEL

Kolb's model is a four-stage cycle consisting of:

- Experience, observations
- Reflections on the experience
- Formation of abstract concepts/generalizations (thinking)
- Followed by experimentation (acting)

# ROSS'S LADDER OF INFERENCE

Ross's ladder of inference includes:

- Observable data and experiences
- Selection of data
- Adding meanings to it
- Making assumptions based on meanings
- Drawing conclusions
- Adapting beliefs
- And taking actions based on beliefs

# METHODOLOGY



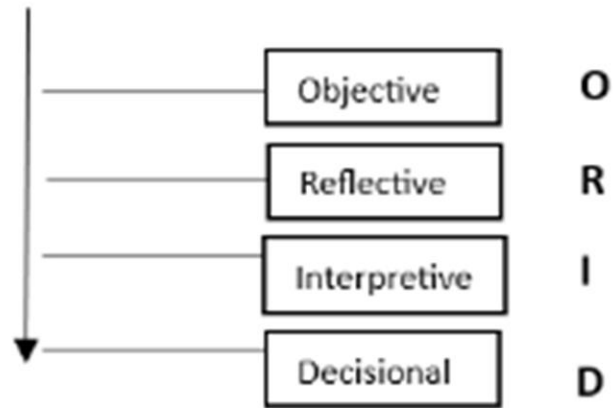
## Absence of Guidance Books

# CARD MODEL

**C** Context - Stating the rationale for the process to the user

**A** Activity - User interaction with the device

**R** Reflection – Focused Conversation Method (FCM)



**D** Documentation – Recording User's feedback

# CONTEXT

The facilitator starts with the context. The user is given a brief overview of the study objectives, depending on the format.

# ACTIVITY

After establishing the user test context, the user engages in the activity of product interaction

# REFLECTION

The reflection follows four categories of questions, Objective, Reflective, Interpretive, and Decisional (ORID)

# OBJECTIVE QUESTIONS

The objective questions identify facts, such as the facilitator/interviewer clearly understanding what happened in the process.

Examples of objective questions include:

what you noticed

What your task was

What was done

# REFLECTIVE QUESTIONS

The reflective questions identify emotions associated with what happened during the process (of product interaction).

Examples of reflective questions include:

What caused the confusion

Where you felt anxious

What was understandable and easy

What was difficult

# INTERPRETIVE QUESTIONS

Interpretive questions identify the implications and the significance of informed events in context to the objective and reflective questions.

Some examples include:

What you recommend

What is the significance of each feature in the interface/product for you

What are your insights in this regard

# DECISIONAL QUESTIONS

Decisional questions state the conclusions, further actions, and further plans.

Examples of decisional questions include:

How you see the product

What you will change

What you learned, the next step, etc.

# DOCUMENTATION

The documentation is the **outcome** of the user test process

The data is further categorized under **Gibson and Normans' approach to affordances**

**1- Context** is related to focusing attention and stating intention

**2- Activity** Users engaging with the product

**3- Reflective activity (interview with the participant):**

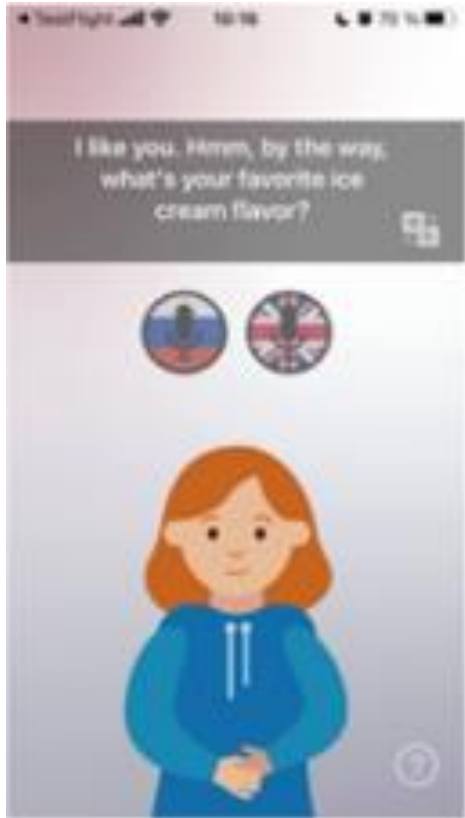
- What happened?
- How did it feel?
- What is your interpretation?
- Why did you associate these mechanics with these design elements?

**4- Documentation:** Facilitator's Notes and data



# **Empirical Studies**

# DIGITAL INTERFACE





# DIGITAL INTERFACE

UI/UX Element of the Interface	Gibson's affordances (Exploratory Actions)		Norman's affordances (Correct Usability)	
	Action	Which users experienced this	Action	Potential signifiers and modifications considering the affordance synthesis

Interaction with a tutor on tap	Users tapped on Lisa multiple times to see what will happen	2, 9, 11, 23, 24, 26, 7, 10, 12	textual hint and taps on Lisa to finish recording the message and get a response from her	Animation, List starts conversation first with some introductory phrase
	Users tapped on Lisa to get a question from her	4, 7, 10, 11, 13		
The first interaction with the app	Randomly press on the screen because there were no buttons.	4, 23, 24, 7, 10, 12	The user pressed any other parts of the interface with signifiers to generate an interactive reaction (buttons and tabs)	Highlight buttons and other reactive areas of the app to differentiate them from common app layers
The button with transcript and translation	Users pressed on the translate button to get a tutorial/hint (because it was the only button)	1, 2, 5, 8, 11	The user saw the translate button and presses it if they could not understand what the tutor said	The application might now be highly intuitive at the start. As the user utilizes the app more, it becomes more comprehensible
	Users pressed on the translate button to listen to the audio translation of the response (because it was the only button)	1, 11		
Instruction hint	Users read instructions while trying to understand how to use the application	11, 12		
The score with a star icon	Users pressed on the star icon to get more information about the score because they did not understand the meaning of the element	2, 3, 7, 12, 5, 8, 12	The user saw the star icon and understood that the number next to it is the score of the user	Implement a self-competition mode, where the user can beat themselves as they use the app
Leaderboard tab	The user presses on the leaderboards tab and is eager to know what functionality this tab presents	4, 10, 12	The user saw the "Leaderboards" tab and pressed on it to see their current position or score of other users	As a signifier, the user wants to see how their progress is in comparison to others. A good point for gamification

# WHY DOES THIS THESIS MATTER?

- Merits of affordance theory
- Enables a perspective of mutual recognition of behavior and environmental potential
- Provides a concrete methodology

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# BOOK

