



# **Assembly:**

Designing and Evaluating Interfaces  
that Highlight News Coverage  
Diversity Using Discord Questions

**CHI2023**

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# Terminology

**News source:** a news organization producing news articles.  
*example: cnn.com, foxnews.com, etc.*

*For*

**News story:** an event that happens at a specific time which is covered by several news sources.  
*For example: The election of a new president in Tunisia.*

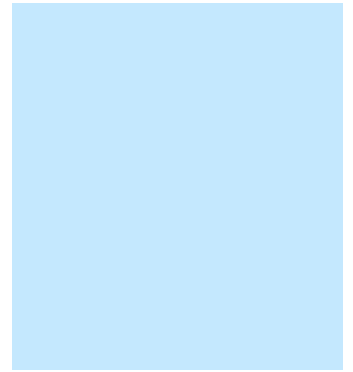
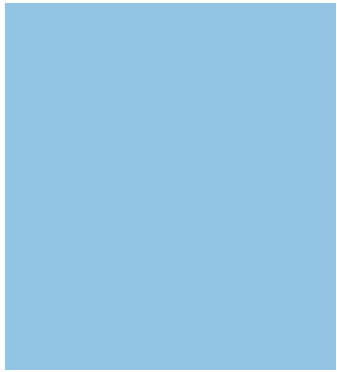
**News article:** a textual document produced by a news source that covers a news story.  
*example: A CNN news article about the election in Tunisia.*

*For*

# Questions as an Analysis Tool



Example Event: Inflation in late 2022



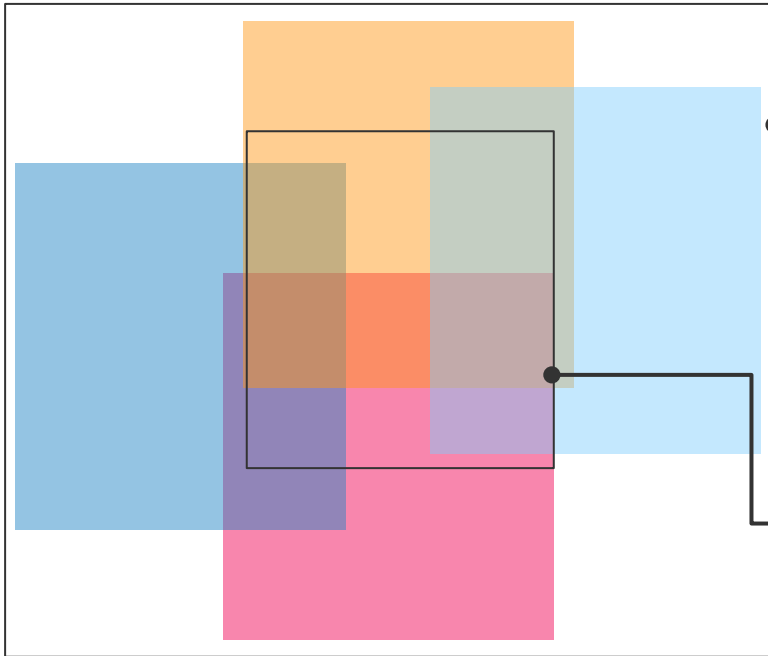
- In the news domains, many **sources** often discuss a common **story** simultaneously.



# Questions as an Analysis Tool



Example Event: Inflation in late 2022



RESEARCH QUESTION

*How can we help a reader easily access coverage diversity (“the full picture”)*

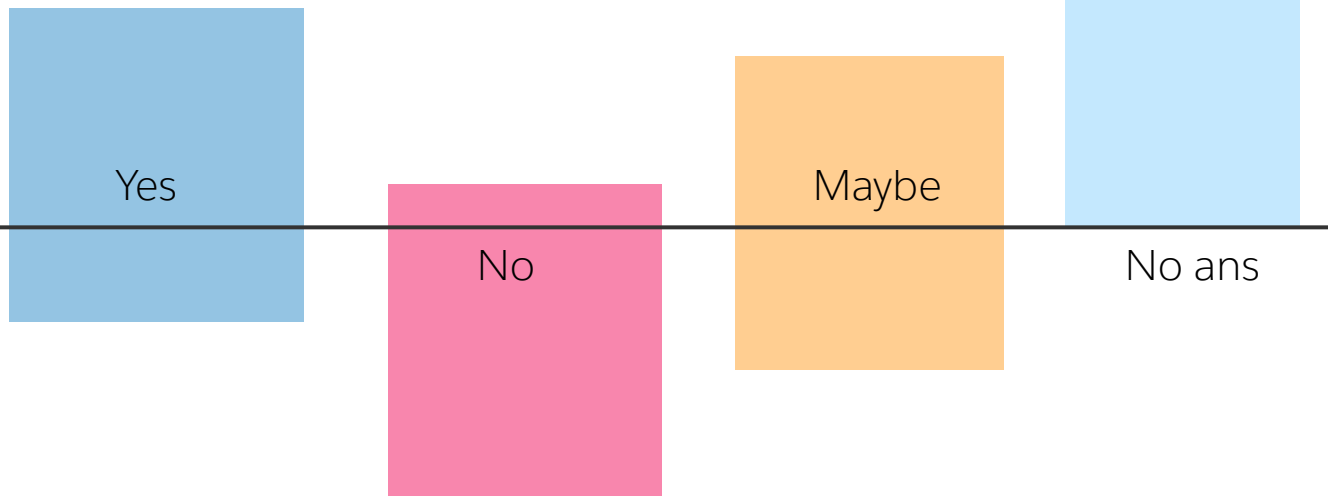
*while minimizing search/redundant reading?  
(having to read 4 documents fully)*

# Questions as an Analysis Tool



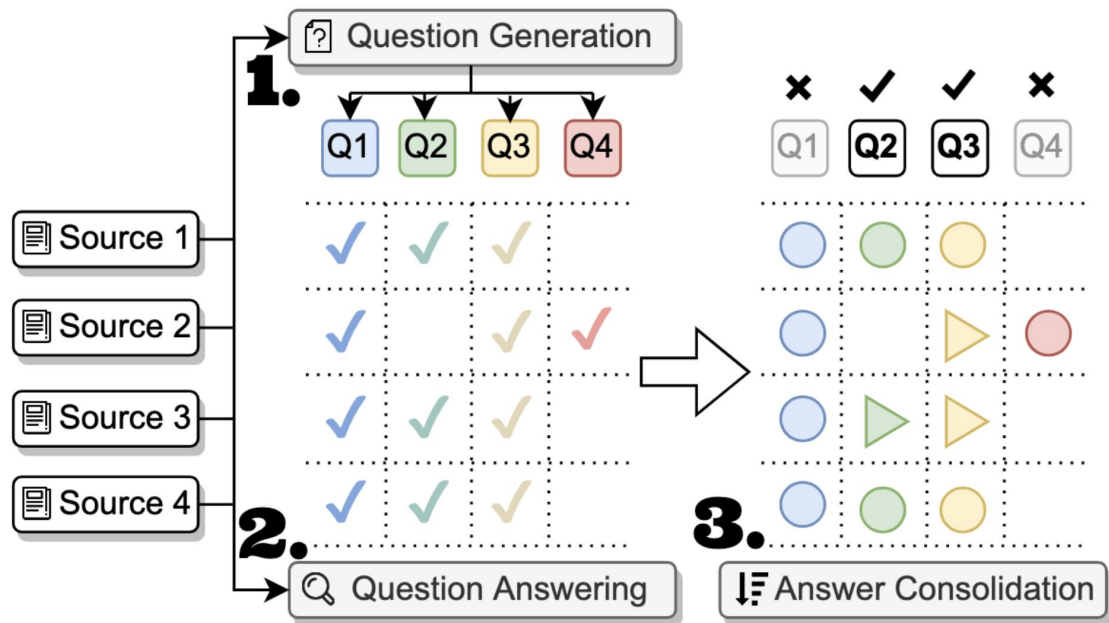
What if we use **questions** as a tool to surface **coverage diversity**? Similar to how debates can be framed around a question.

Will there be a recession in 2023?



... a question, and its answers can align the documents on a focused issue and **surface coverage diversity**.

# Discord Questions: Pipeline Overview



See our [EMNLP 2022](#) paper for more detail.

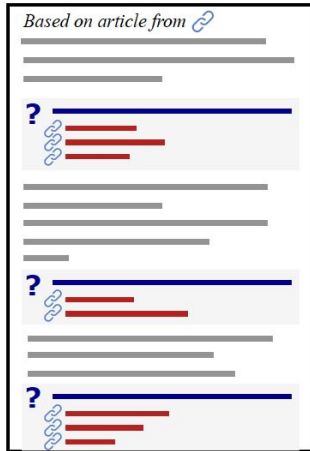
# Challenge:

How do we integrate discord questions into news reading interfaces?

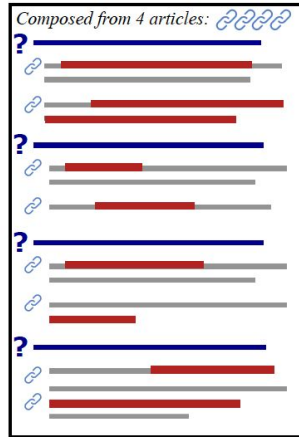
# Assembly Interfaces

We propose three interface designs:

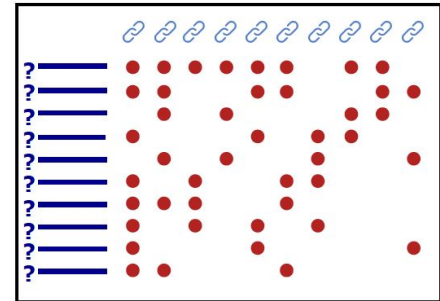
## Annotated Article



## Recomposed Article



## Question Grid



Discord Question Source Attribution Source Answer



# Assembly:

## 1. Annotated Article

A single **basis article** is used the core of the interface.

Annotations are inserted between paragraphs that introduce discord questions and multi-source answers.

### Inflation vs recession

#### Inflation Hits New 40-Year High of 8.5%: Why Prices Keep Climbing

Published by [cnet.com](#)

From your purchases at the grocery store to the dollar tag of rent across the US, consumer prices are soaring across the country. Your dollar doesn't have the purchasing power it used to, and that's a problem.

Inflation climbed by 8.5% through March, according to the Consumer Price Index. The CPI is a key indicator of inflation, defined as the sustained rise in the cost of living. The increase marks inflation's fastest annual rise since December 1981. Core inflation, which measures all items minus food and gas, rose 6.5%. This kind of sustained and increased inflation may point to something more enduring.

What does this mean for you? Here are some key things you need to know about inflation, how it can impact **your budget** and how it impacts your spending power.

MORE CONTEXT

#### ▼ Who does inflation affect?

American people - [missoulian.com](#)

Americans - [missoulian.com](#)

both consumers and businesses - [azbigmedia.com](#)

Peaked - [mishtalk.com](#)

housing markets - [capital.com](#)

medical device company market - [ryortho.com](#)

investors - [seekingalpha.com](#)

Typically, we see a 2% inflation rate from year to year. It's **when the rate rises above this percentage in a short period of time** when inflation becomes a concern.

MORE CONTEXT

#### ► How does inflation become a concern? - [Click to open](#)

# Assembly:

## 2. Recomposed Article

A question/answer format article is composed from scratch using content from multiple sources.

The article is composed algorithmically, with an objective to maximize coverage diversity.

### Inflation vs recession

Story assembled with content from: [cnet.com](#), [theweek.com](#), [marketwatch.com](#), [mishtalk.com](#), [kornnews.com](#), and 41 other sources · [Open Grid View](#)

#### Story Summary:

To combat the highest inflation rate during the height of "stagflation" in 1981, the Federal Reserve on Wednesday announced yet another increase to the central bank's overnight interest rate, hiking it 75 basis points. Overall, the Fed has gradually increased interest rates from near 0 to between 2.25 and 2.50 percent in just four months, the fastest tightening of monetary policy since the Fed's attempt to battle stagflation in the early 1980s.

#### Q. How does inflation affect the economy?

- With the economy facing headwinds thanks in part to soaring inflation, **both consumers and businesses will see an erosion of their finances and ability to plan for the future.** [azbigmedia.com](#)
- Simply put, inflation is a **sustained increase in consumer prices. It means a dollar bill doesn't get you as much as it did before**, whether you're at the grocery store or a used car lot. [cnet.com](#)

[Show more answer groups](#)

#### Q. What does the Federal Reserve do?

- To combat the highest inflation rate during the height of "stagflation" in 1981, the Federal Reserve on Wednesday **announced yet another increase to the central bank's overnight interest rate**, hiking it 75 basis points. Overall, the Fed has gradually increased interest rates from near 0 to between 2.25 and 2.50 percent in just four months, the fastest tightening of monetary policy since the Fed's attempt to battle stagflation in the early 1980s. [lobserveateur.com](#)
- The Federal Reserve also **plays a significant role in slowing down inflation.** It should continue to raise the Federal Funds Rate and pay interest on reserves while simultaneously reducing the assets on its balance sheet. The Fed will need to pursue a more neutral plan focused mainly on curbing inflation. Unfortunately, the Fed has placed itself in a challenging position to do these things. It procrastinated tightening for too long. [missoulian.com](#)

[Show more answer groups](#)



# Baseline 1: Single News Article

The user is presented with the content of a single news article.

This baseline helps establish how much coverage diversity there is for single-source readers.

U.S. inflation data hit a multidecade high last month as gas prices and rents skyrocketed, climbing to 8.5 percent, the Bureau of Labor Statistics reported Tuesday.

A survey by the financial data group FactSet had predicted that the inflation reading for March would come in at 8.4 percent year over year – the highest rate since December 1981 and an increase from February's 7.9 percent.

Although gas prices have begun to trend downward recently, the change was not reflected in the inflation reading for March – when [prices at the pump reached record highs](#). Gas prices jumped by 48 percent year over year, the BLS said, and climbed by 18.3 percent from February.

Meanwhile, rental rates have increased for eight consecutive months, and they are now above the pre-pandemic trend. Rents climbed by 5.1 percent in March year over year, compared with 4.2 percent in February. The average rent for a two-bedroom home in the U.S. [is about \\$2,000, according to research from Rent.com](#) – up by 22 percent year over year basis.

Other categories that hit at or near record highs in March included groceries, up by 10 percent year over year; new cars, up by 12.6 percent; and home furnishings, up by 10.8 percent.

# Baseline 2: Headline List


The user is presented with a list view of the headlines for the given story.


This intentionally imitates existing news aggregator interfaces such as the


 Full Coverage


view of Google News.


## Inflation vs recession

Inflation Hits New 40-Year High of 8.5%: Why Prices Keep Climbing  
 cnet.com


Economy: As inflation booms, does recession loom?  
 theweek.com


'Peak inflation' trade is driving financial markets as investors brace for U.S. economic slowdown  
 marketwatch.com

Unleaded Gasoline Futures Declined 26 Percent, Has Inflation Peaked This Economic Cycle?  
 mishtalk.com


LISTEN: A recession may be the only way to stop inflation  
 komonews.com


The Inflation Picture Darkens  
 forbes.com


Jesse Ramos: The solution to the inflation crisis  
 missoulia.com


Here's why inflation may have peaked -- but a recession could still loom  
 businessinsider.com

The 2024 Recession  
 247wallst.com

Editorial: Fed has no good choice between inflation and recession  
 herald-dispatch.com

Hiltzik: Inflation is starting to come down  
 nationaldastak.com

A Fed-induced recession is a medicine worse than the disease  
 ft.com

Will hiking interest rates tackle inflation and recession? Even the Fed is confused.  
 [economicstimes.indiatimes.com](https://www.economicstimes.indiatimes.com)

**We performed to  
usability studies**

**to understand  
interface differences.**

# Study 1: Journalism Experts

We asked 10 journalism experts about potential use cases and target audiences of the Assembly interfaces.

Participants read stories in the three Assembly interfaces, as well as two baselines: Headline List and News Article.

# Study 1: Journalism Experts

The 10 expert participants used each interface for a total of 10 minutes, reading through 2 events.

## Objectives

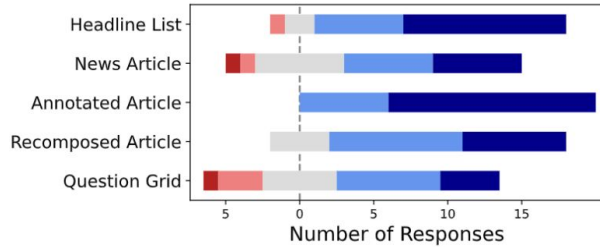
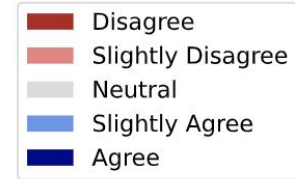
### 1.

Compare Assembly interfaces  
to baseline interfaces for:

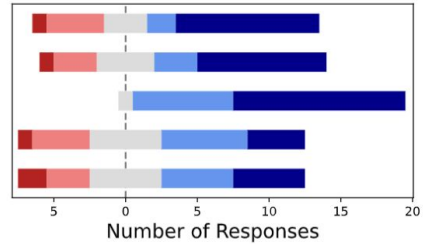
- (a) ease of use
- (b) coverage diversity



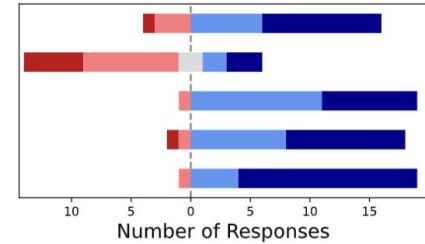
# Study 1: Journalism Experts



**Gives good overview of story**



**Information is in coherent order**



**Reveals coverage diversity**

Each expert completed two comparison questionnaires to evaluate the different interfaces.

# Study 1: Journalism Experts

The 10 expert participants used each interface for a total of 10 minutes, reading through 2 events.

## Objectives

**1.**

Compare Assembly interfaces to baseline interfaces for:

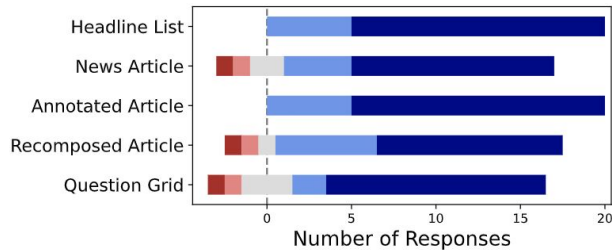
- (a) ease of use
- (b) coverage diversity

**2.**

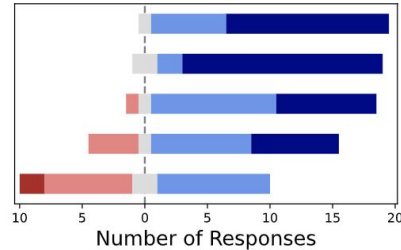
Assess which interfaces are suitable for use by:

- (a) experts
- (b) novice news readers

# Study 1: Journalism Experts



**Is easy to use for media experts**



**Is easy to use for novice readers**

Each expert completed two comparison questionnaires to evaluate the different interfaces.

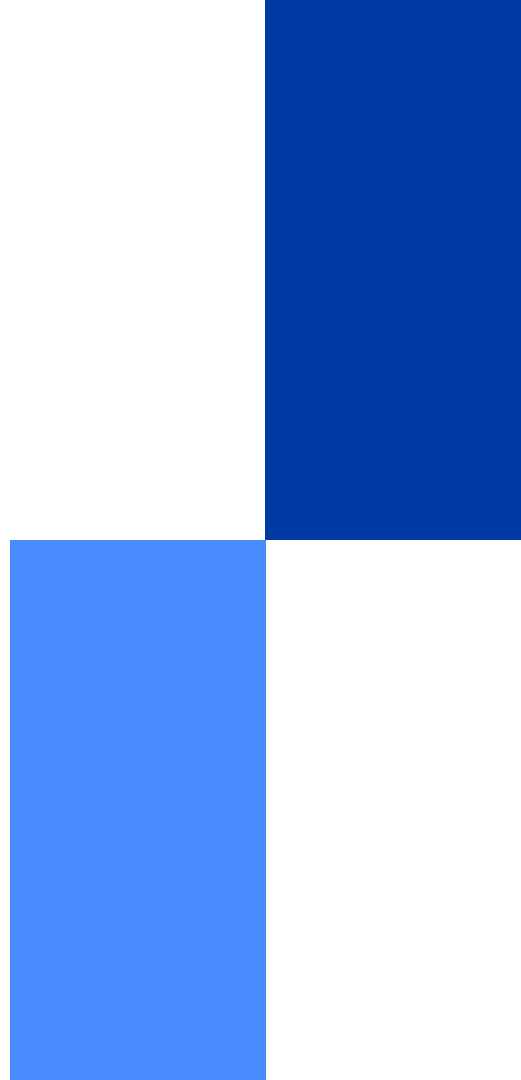
# Study 1: Journalism Experts

## Findings:

1. The three Assembly interfaces all successfully highlight coverage diversity, when compared to the baseline interfaces.
2. The two more advanced interfaces (Recomposed Article / Question Grid) are judged to be too complex for novice users, and are expected to be more useful in advance use-case scenarios for professionals.

[See paper for more detailed findings](#)  
(including use cases for the Question Grid in the newsroom).

# **Study 2: Novice Readers**



# Study 2: A News Reading Exercise

## **Research Question:**

Does the Annotated Article interface help improve access to coverage diversity a realistic news-reading scenario for novice news readers?

## Challenge:

How do we realistically measure access to news coverage diversity?

We designed a reading news reading exercises, and implemented it with 95 crowd-worker participants.

# News Reading Exercise

- Overall Exercise: 6-minute to read in 1 interface & answer 4 open-ended comprehension questions
- Story selection: participants complete 1 exercise in each 3 interface. Pick from 5 stories.
- Careful Question Selection: Experts crafted the questionnaire in unbiased way. Participants answer in bullet-list form.
- Manual scoring: to assess coverage of provided answers.

**RQ:** Does using Annotated Article lead to higher questionnaire scores?

## Story 1: US Inflation / Recession

### Inflation vs recession

**Inflation Hits New 40-Year High of 8.5%: Why Prices Keep Climbing**  
Published by [cnet.com](#)

From your purchases at the grocery store to the dollar tag of rent across the US, consumer prices are soaring across the country. Your dollar doesn't have the purchasing power it used to, and that's a problem. Inflation climbed by 8.5% through March, according to the Consumer Price Index. The CPI is a key indicator of inflation, defined as the sustained rise in the cost of living. The increase marks inflation's fastest annual rise since December 1981. Core inflation, which measures all items minus food and gas, rose 6.5%. This kind of sustained and increased inflation may point to something more enduring. What does this mean for you? Here are some key things you need to know about inflation, how it can impact **your budget** and how it impacts your spending power.

MORE CONTEXT

▼ Who does inflation affect?

- American people - [missoulian.com](#)
- Americans - [missoulian.com](#)
- both consumers and businesses - [azbigmedia.com](#)

### Questions

*Use the interface on the left to answer questions as thoroughly as possible. Use **bullet-point** format. If you don't find any answer, write down: "No answer".*

What are the reasons for the inflation?

- Answer 1
- Answer 2
- ...

What products have been affected by inflation?

- Answer 1
- Answer 2
- ...

Is there going to be a recession?

- Answer 1
- Answer 2
- ...

What does the government do to reduce inflation?

- Answer 1
- Answer 2
- ...

Submit

2-column interface used for reading exercise

# Study 2: A News Reading Exercise

Interface	Score ↑
News Article ♣	0.96
Headline List ◇	1.37 ♣
Annotated Article ♥	<b>1.61</b> ♣◇
Upper-Bound	7.58

- The **Score** is the average number of answer aspects provided by participants using each interface, on average, per question.

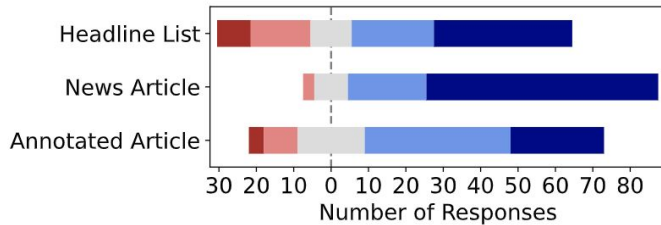


# Study 2: A News Reading Exercise

Interface	Answer Scores			
	Score ↑	%No Ans ↓	%S0 ↓	%S2+ ↑
News Article ♣	0.96	22.1	36.5	22.9
Headline List ◇	1.37 ♣	6.0 ♣	20.3 ♣	39.4 ♣
Annotated Article ♥	<b>1.61 ♣◇</b>	7.6 ♣	<b>15.0 ♣◇</b>	<b>48.4 ♣◇</b>
Upper-Bound	7.58	–	–	100

- **%No Ans** is percentage of questions left unanswered by the participants in each interface configuration.
- **%S0** is the percentage answers that received a score of 0 (no correct answer aspect), in each interface configuration.
- **%S2+** is the percentage of answers that received a score of 2 or more (multiple aspects identified), in each interface configuration.

# Study 2: But is it easy to use?



(a) Is easy to use



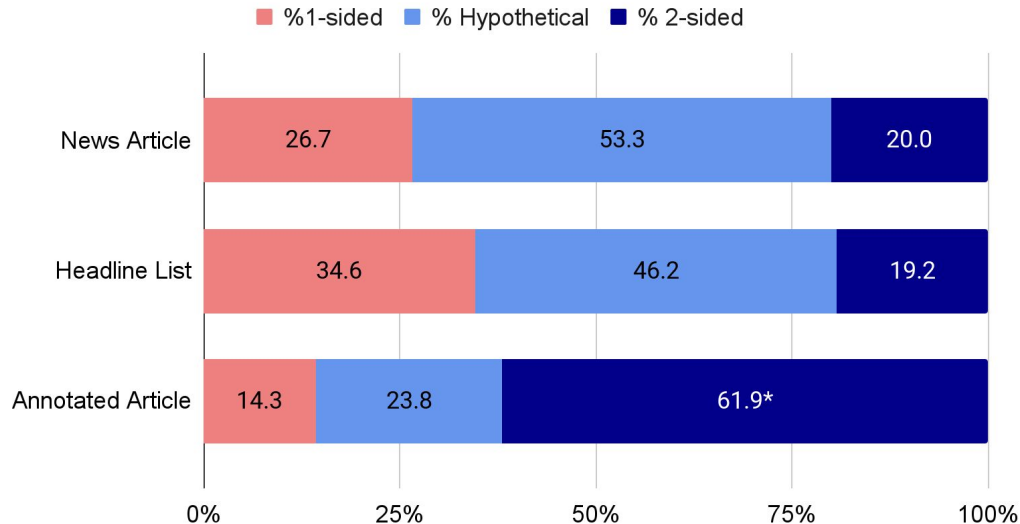
In terms of ease of use, the Annotated Article is on-par with baseline interfaces.

(while giving access to broader coverage diversity...)

Success!

# Study 2: From Exposure to Persuasion

Prediction Question: Is there going to be a recession?



Looking at **prediction questions** we can indirectly see the effect on reader persuasion. Users of the Annotated Article have a significant increase in 2-sided answers.

# See the paper for:

More technical  
detail on the  
interface designs

Usability Study  
Recruitment and  
Protocol Details

Qualitative  
Feedback in both  
Usability Studies

Limitations,  
Discussion,  
and Future Work

“Discord Questions”  
*EMNLP 2022* paper  
for NLP details

Live demo (news):

[assembly.salesforceresearch.ai/](https://assembly.salesforceresearch.ai/)

# Resources

Check out the papers:

[EMNLP 2022] [Discord Questions: A Computational Approach To Diversity Analysis in News Coverage](#)

[CHI 2023] [Designing and Evaluating Interfaces that Highlight News Coverage Diversity Using Discord Questions](#)

# Call to Action



Code + Data + Experiments on Github:

[github.com/salesforce/discord\\_questions](https://github.com/salesforce/discord_questions)

Live Demo on Google News stream:

<http://assembly.salesforceresearch.ai/>

Reach out:

[plaban@salesforce.com](mailto:plaban@salesforce.com)