

Supplementary material

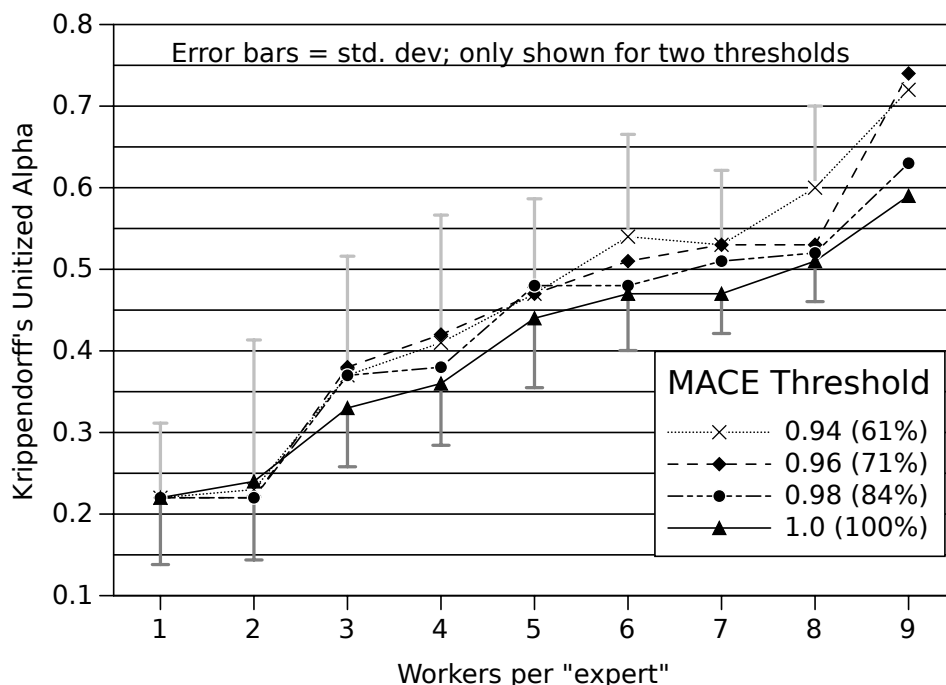


Figure 1: Agreement scores on 39 comments in reason span annotation. We chose 6 workers and 0.96 threshold which gives 0.51 Krippendorff's α_U (moderate agreement). Number in parentheses shows how many arguments were left after filtering out those with undecided reason spans.

1 Walk-trough Example

Debate title: Will 3-D Printing Change the World?

Debate info: For all the hype over three-dimensional printing, it's still unclear exactly how and when it will have an impact on our daily lives.

Original text

Economic growth requires innovation, enabled through this kind of technologies. Innovation is an integral part of prosperity of an organization which cannot occur without embracing state of the art capabilities. One important capability of 3D printing, is to enable continuous innovations. Yet, as aptly pointed out by the author, traditional manufacturing still holds an important place in the business world. Once products are developed, it is challenging for 3D printers to match the economies of scale available through traditional manufacturing. The main advantage of 3D printing is enabling of low cost rapid prototypes, as compared to traditional manufacturing, which typically requires higher volumes to lower costs.

3D printing will potentially have a greater impact on the world over the next 20 years than all of the innovations from the industrial revolution combined. There can little argument that every industry must be fast, flexible and capable to understand the implications that 3D printing will have on their businesses. Failure will mean disaster. Rival will creating market changing, disruptive innovations.

1. Annotated stance

3-D printing will change the world

Comments: Other options were: "3-D printing will not change the world", "no stance", "discusses both sides but remains neutral"

2. Reason span annotation

This write up is enlightening and sensible, dispelling some popular misconception about the breath taking 3D printing technological revolution.

[Reason \(#12536410.143\)](#): [**Economic growth requires innovation, enabled through this kind of technologies.**] [Reason \(#12536410.223\)](#): [**Innovation is an integral part of prosperity of an organization which cannot occur without embracing state of the art capabilities.**] [Reason \(#12536410.355\)](#): [**One important capability of 3D printing, is to enable continuous innovations.**] Yet, as aptly pointed out by the author, traditional manufacturing still holds an important place in the business world. Once products are developed, it is challenging for 3D printers to match the economies of scale available through traditional

manufacturing. Reason (#12536410.694): [The main advantage of 3D printing is enabling of low cost rapid prototypes , as compared to traditional manufacturing, which typically requires higher volumes to lower costs.]

Reason (#12536410.869): [3D printing will potentially have a greater impact on the world over the next 20 years than all of the innovations from the industrial revolution combined.] Reason (#12536410.1025): [There can little argument that every industry must be fast, flexible and capable to understand the implications that 3D printing will have on their businesses.] Failure will mean disaster. Rival will creating market changing, disruptive innovations.

3. Reason gist summarization

Comments: Some reasons from the previous step might have been marked as "not a reason"

Reason id: 12536410.143

Original text: Economic growth requires innovation, enabled through this kind of technologies.

Gist: Economic growth needs innovation.

Reason id: 12536410.223

Original text: Innovation is an integral part of prosperity of an organization which cannot occur without embracing state of the art capabilities.

Gist: It embraces state of the art capabilities.

Reason id: 12536410.355

Original text: One important capability of 3D printing, is to enable continuous innovations.

Gist: 3D printing allows for many innovations.

Reason id: 12536410.694

Original text: The main advantage of 3D printing is enabling of low cost rapid prototypes , as compared to traditional manufacturing, which typically requires higher volumes to lower costs.

Gist: 3D printing allows for low cost rapid prototypes and does not require high volumes as traditional manufacturing does.

Reason id: 12536410.869

Original text: 3D printing will potentially have a greater impact on the world over the next 20 years than all of the innovations from the industrial revolution combined.

Gist: 3D printing will be one of the most innovative inventions throughout the next few decades.

Reason id: 12536410.1025

Original text: There can little argument that every industry must be fast, flexible and capable to understand the implications that 3D printing will have on their businesses.

Gist: 3D printing has the power to change all industries.

4. Reason disambiguation

Reason id: 12536410.143

Disambiguated stance: ORIGINAL

Reason id: 12536410.223

Disambiguated stance: BOTH_POSSIBLE

Reason id: 12536410.355

Disambiguated stance: ORIGINAL

Reason id: 12536410.694

Disambiguated stance: ORIGINAL

Reason id: 12536410.869

Disambiguated stance: REPHRASED_ORIGINAL

Reason id: 12536410.1025

Disambiguated stance: ORIGINAL

Comments: Only those labeled as ORIGINAL are used in the consecutive steps

5. Alternative warrant

Comments: Four alternative warrants per each $R \rightarrow \neg C$ pair were collected; some might have been marked as impossible

ReasonID: 12536410_694

AW: major manufacturers going out of business would destroy the economy.

ReasonID: 12536410_1025

AW: industry can't change the world

ReasonID: 12536410_143

AW: it can be done by more than just 3d printing

ReasonID: 12536410_143

AW: 3-D printing is not a major innovation

ReasonID: 12536410_143

AW: there is no innovation in 3-d printing since it's unsustainable

ReasonID: 12536410_355

AW: some innovations are lost amongst others

6. Alternative warrant validation

Comments: For each alternative warrant, workers had to choose between the original reason and a distracting reason

Comments: Two scores were also assigned (0, 1, 2): (a) Complexity: How hard was to infer the correct reason? and (b) Logic: How logical is the argument given the highlighted explanation (alternative warrant)? Average value displayed.

ReasonID: 12536410_694

Complexity: 0.25

Logic: 2.0

Distracting reason: Economic growth needs innovation.

ReasonID: 12536410_1025

Complexity: 0.0

Logic: 0.84

Distracting reason: Economic growth needs innovation.

ReasonID: 12536410_143

Complexity: 0.25

Logic: 1.27

Distracting reason: 3D printing technology will evolve and grow, just like cell phones have.

ReasonID: 12536410_143

Complexity: 0.16

Logic: 1.0

Distracting reason: 3D printing technology will evolve and grow, just like cell phones have.

ReasonID: 12536410_143

Complexity: 0.12

Logic: 1.88

Distracting reason: 3D printing technology will evolve and grow, just like cell phones have.

ReasonID: 12536410_355

Complexity: 1.0

Logic: 1.0

Distracting reason: 3D printing technology will evolve and grow, just like cell phones have.

7. Writing warrant for original claim

ReasonID: 12536410_694

AW: major manufacturers going out of business would destroy the economy.

W: major manufacturers going out of business would benefit the economy.

ReasonID: 12536410_1025

AW: industry can't change the world

W: industry can change the world

ReasonID: 12536410_143

AW: it can be done by more than just 3d printing

W: it cannot be done by more than just 3d printing

ReasonID: 12536410_143

AW: 3-D printing is not a major innovation

W: 3-D printing is a major innovation

ReasonID: 12536410_143

AW: there is no innovation in 3-d printing since it's unsustainable

W: there is much innovation in 3-d printing and it is sustainable

ReasonID: 12536410_355

AW: some innovations are lost amongst others

W: some innovations stand out amongst others

2 Other examples of Reason Gist Summarization

For example, consider this argument on longer school days: 'I know—with moral certainty—that so many people are underperformers (including me) when they don't get enough sleep.' It was simplified to 'Many people, including me, underperform without an adequate amount of sleep.'

Similarly, the argument on taxing capital gains 'From a strict economic viewpoint, all income should be taxed equally. This would avoid the huge incentives - and wasted, non-productive investments - in gaming the system, that firms and investors routinely make.' was rewritten as 'Equality in taxed income would eliminate risky investment by firms and investors.'