Anticipatory Ethical Reasoning with Scenario Analysis and Design Fiction

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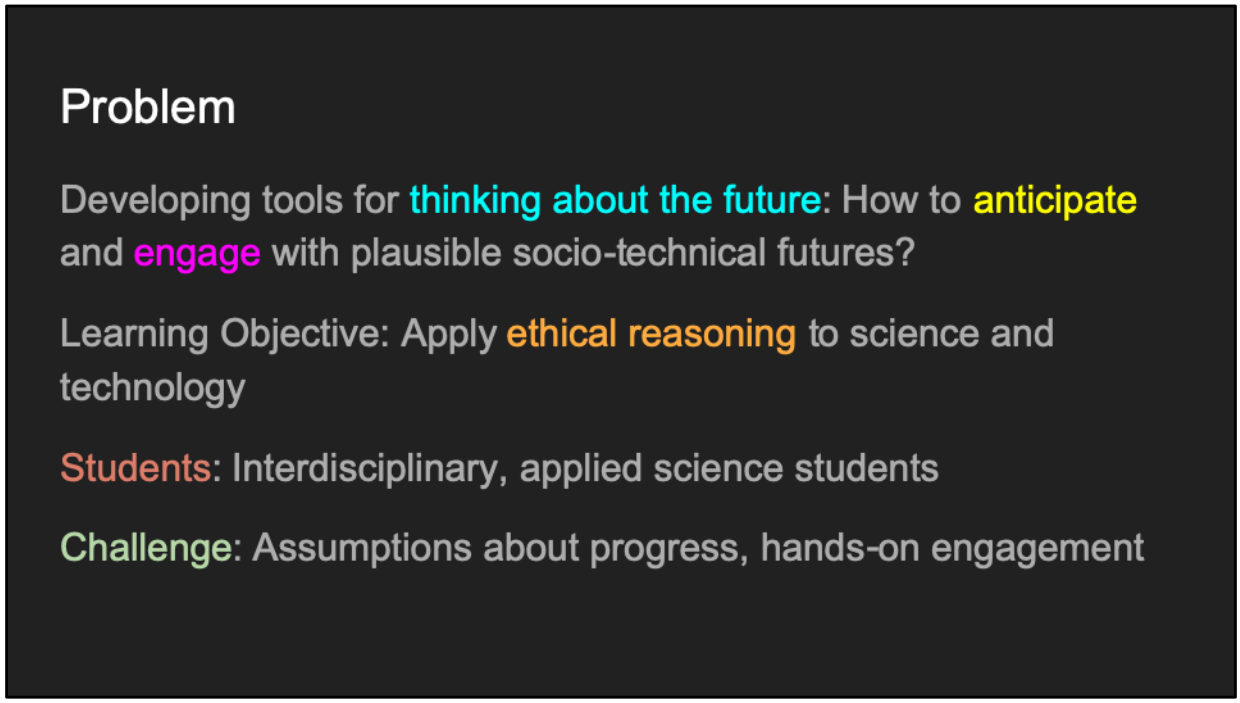


York:
We are interested in developing tools for critically thinking about the future, and helping our students to develop strategies for anticipating and engaging with plausible sociotechnical futures. Our learning objective in the course we are teaching is to apply ethical reasoning to science and technology. Our students are primarily applied science students, though it is an interdisciplinary undergraduate major. The challenge is that their assumptions about progress are deeply seated, their engagement with social sciences and humanities is often somewhat limited, and they are expecting hands-on engagement in this applied science curriculum (so often seminars that are heavily based on reading and discussion run up against student expectations).

Conley:

- We live in a fast-paced, future-oriented society
- Applying critical thinking and ethical reasoning skills to potential futures should be an explicit learning objective

- How do we know what impacts science and technology will have in the future?
  - We don't, but that is no

excuse for a wait-and-see approach
    - Uncertainty and risk: need to be transparent and proactive in anticipating and managing these futures
- Problems of speed and governance
    - Economic drivers
    - Political challenges
    - Sociotechnical change is highly contingent on a range of factors
    - Jasanoff: myth of

unintended consequences

- Not just for science and technology:
  - Immigration
  - Health care
  - Resilient communities

CRITICAL ENGAGEMENT WITH THE FUTURE

- Recognizing the role of:
  - Implicit Assumptions and Values
  - Intrinsic uncertainty and complexity

(Adam & Groves, 2007)

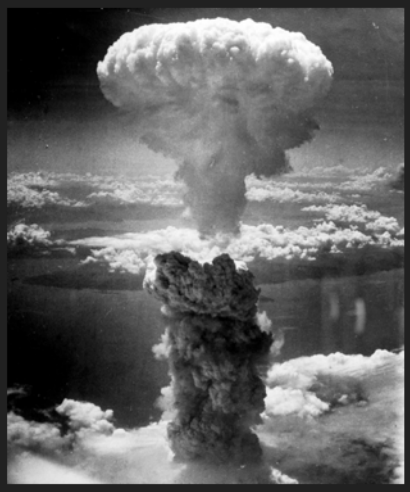
http://theconversation.com/alternative-currencies-are-the-future-why-it-matters-for-development-80036

https://www.theatlantic.com/magazine/archive/2008/07/is-google-making-us-stupid/306868/

York:
When we say ‘critical engagement’ with the future, we’re talking about helping our students to recognize their implicit assumptions and values with respect to science, technology, and the future; to recognize the intrinsic uncertainty and complexity of sociotechnical world-building; and to recognize and critique dominant narratives about science, technology, and progress.

OUR LACK OF IMAGINATION

- Industrial Revolution and environment
- Manhattan Project
- Investing in automobiles and highways
- The Internet / ICT and globalization
- Nuclear Power and Fukushima



https://upload.wikimedia.org/wikipedia/commons/e/e0/Nagasakibomb.jpg

Conley:
We also believe that despite a lot of promissory visioning, history has shown too many failures at imagining what could go wrong.

ANTICIPATORY GOVERNANCE

- How can we anticipate technological trajectories in a meaningful way?
- How can we engage ethical reasoning about things that have not yet happened?
- How can we do our best to think through the social, ethical, political, legal, environmental implications of something before there is so much technological momentum or economic investment that we cannot influence its trajectory?

Conley:
Developing capacities for anticipatory governance can be part of a more responsible approach to sociotechnical world-building.

Approach

Pilot anticipatory ethical reasoning module across 5 sections of class

Scenario Analysis

http://imagination.lancs.ac.uk/sites/default/files/imagecache/single632_image/news_images/ex-machina-ava.jpg

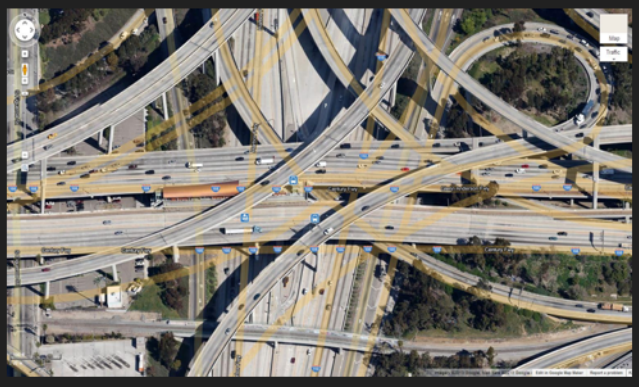
Design Fiction

8 Key Questions

York:
Our approach blends scenario analysis, design fiction, and an ethical reasoning framework developed at James Madison University called the Eight Key Questions.

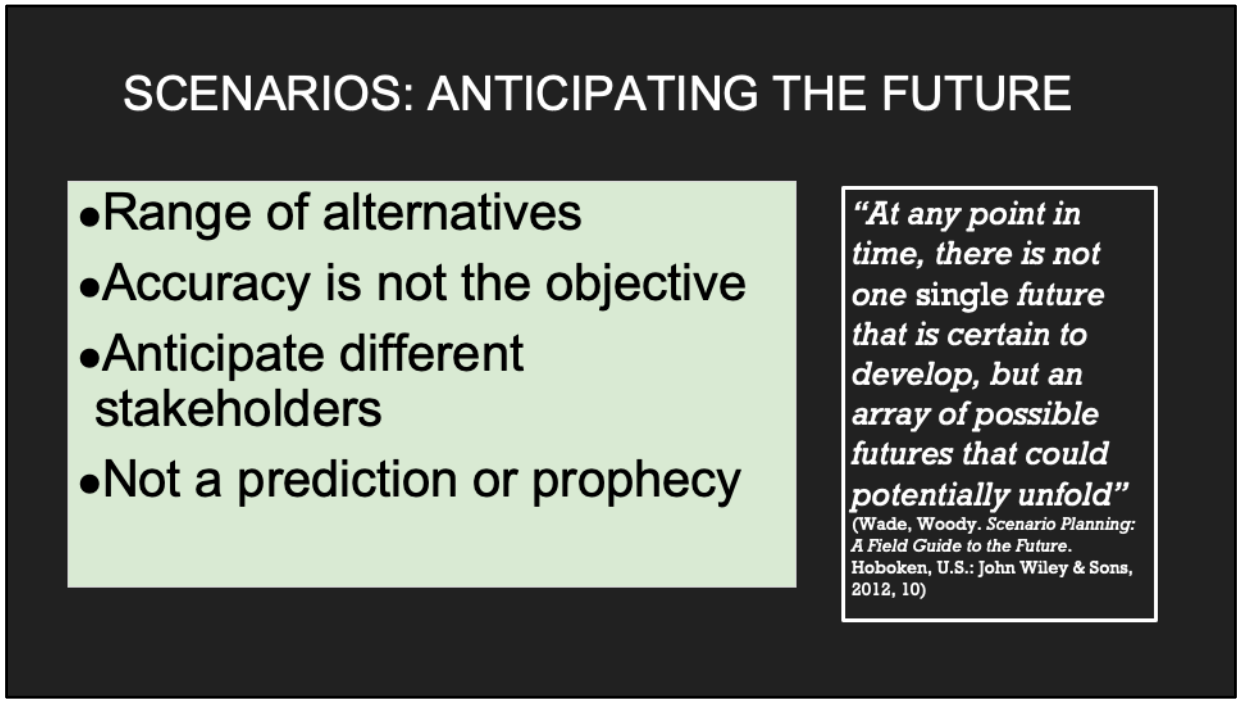
SCENARIO ANALYSIS
PLAUSIBLE FUTURES

By User Minesweeper on en.wikipedia - Minesweeper, CC BY-SA 3.0,



By Mark Hogan, Los Angeles Freeway Interchange, CC BY-SA 2.0

- Not just one future, but many possible futures
- Planning can't assume linear extrapolation
- What assumptions are we making when we focus on this variable or that variable?



Range of alternatives

Accuracy is not the objective

- Preparation
- Flexibility
- Responsibility

Anticipate different business, competitive, market, regulatory, stakeholder landscapes and actors

Not a prediction or prophecy

SCENARIOS

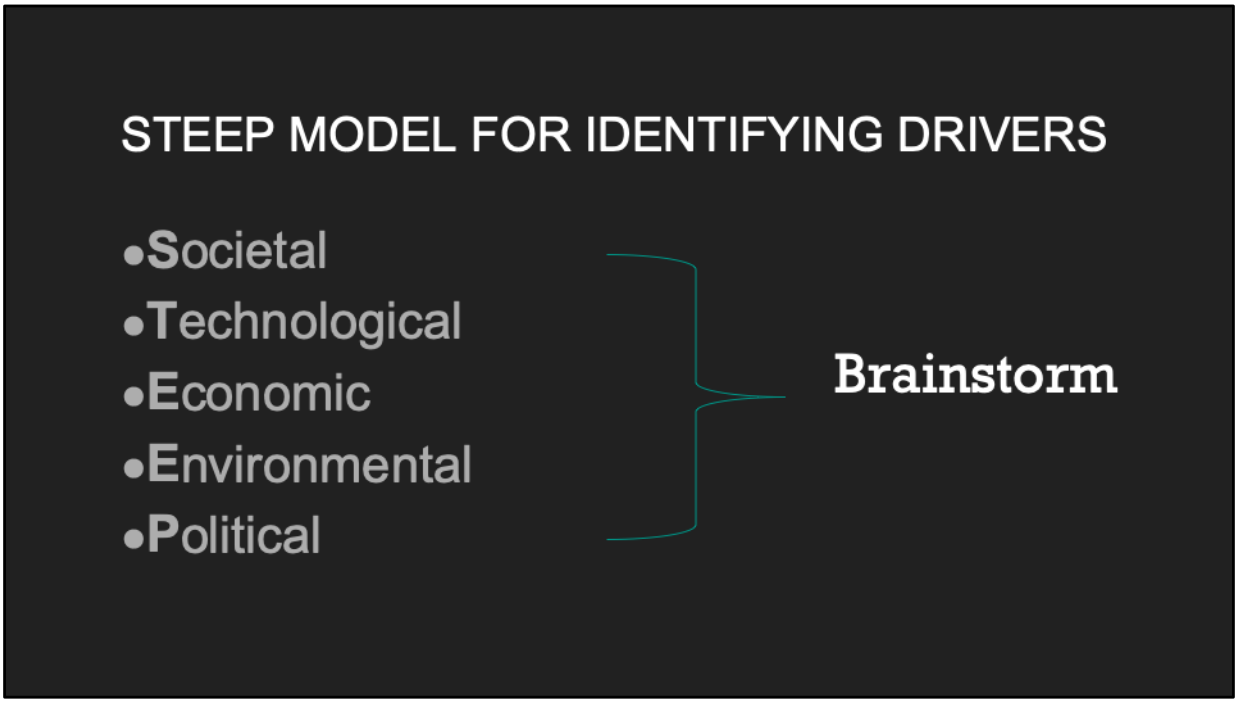
"Stories that reveal how a certain future constellation of market and environmental factors would look and feel" (Wade, 15)

- **Not predicting, but planning for potential futures**
- **Improving decision-making**
- **Thinking holistically**

SELECT A TIME HORIZON

- What are the goals?
- What time frame is relevant?
- Any special considerations?
- Newspaper industry in 2008: 2020

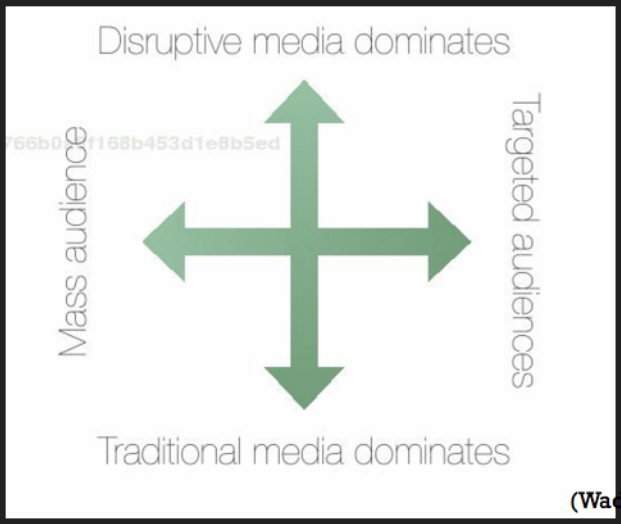
Should be farther out than immediate future,
but not so far in the future that we can't make plausible assumptions about trends



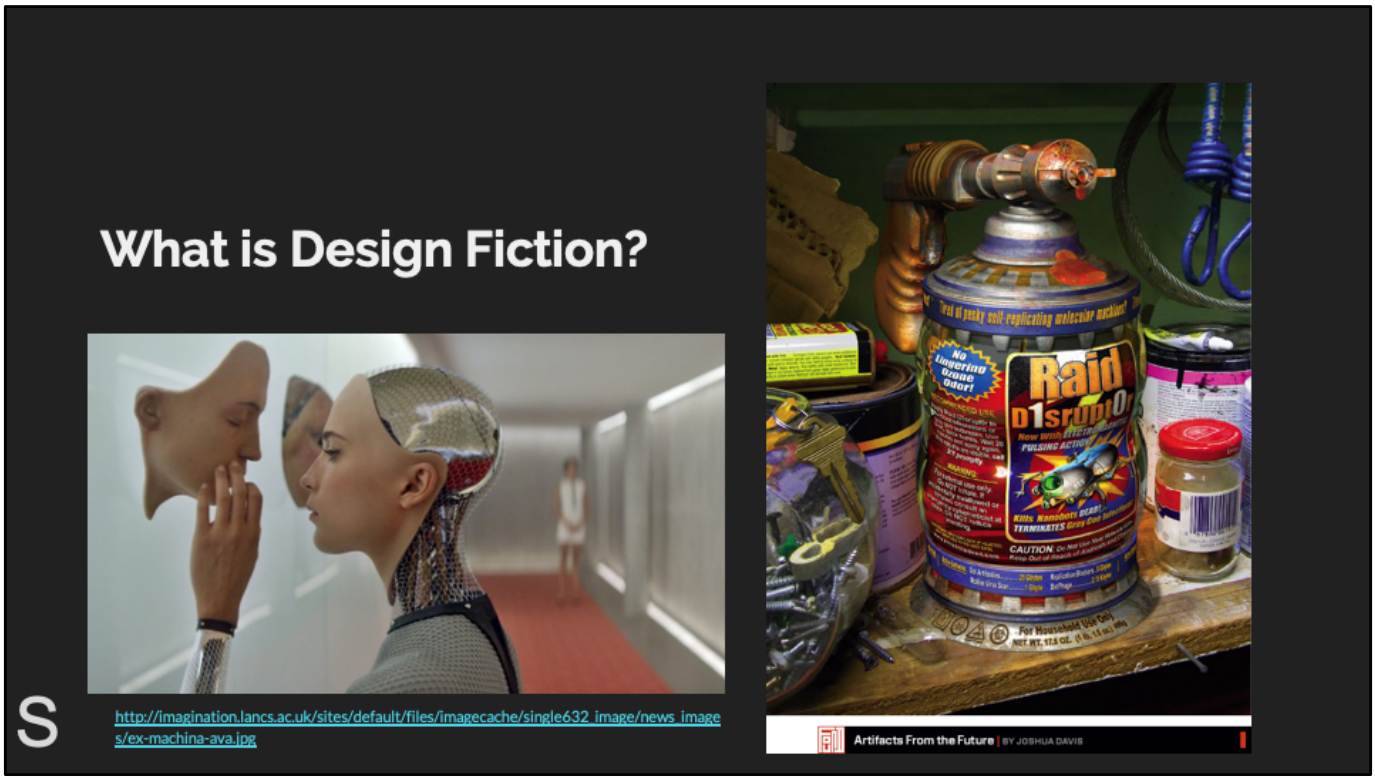
- Driving forces:
  - Trends
  - High-impact variables
- Methods for identifying them:
  - PEST (political, economic, societal, technological)
  - STEEP (social, technological, economic, environmental, political)
- Define critical uncertainties:
  - Highly uncertain +
  - High-impact
- (Identify clusters of related ones, patterns of interaction between them)

FOR EACH SCENARIO, A STORY

- **Create a narrative**
- **Create a character**
- **Create a title**



(Wade, 2012: 72)



- Science, fiction, and science fiction
- **2D or 3D**
- **Imagines a common place future—so the focus is not just on a device, but on what the world is given that this is a commonplace part of it**

introduced to this concept by an image of a rusting can of nanobot pesticide featured in Wired Magazine's artifact of the future. The implication of this image is that in the world of this can nanotech has advanced to the point that it can affect everyday life and that it has become a nuisance, either from malice or carelessness. Design fiction is a great tool for thinking about forms of life, allowing us to focus on the world rather than just the devices.

Doesn't have to be great art

AN ETHICAL FRAMEWORK: USING THE 8 KEY QUESTIONS

https://www.jmu.edu/mc/8-key-questions.shtml

8 KEY QUESTIONS

Fairness - How can I act equitably and balance legitimate interests?
Outcomes - What achieves the best short- and long-term outcomes for me and all others?
Responsibilities - What duties and/or obligations apply?
Character - What action best reflects who I am and the person I want to become?
Liberty - How does respect for freedom, personal autonomy, or consent apply?
Empathy - What would I do if I cared deeply about those involved?
Authority - What do legitimate authorities (e.g. experts, law, my religion/god) expect of me?
Rights - What rights (e.g. innate, legal, social) apply?

https://www.jmu.edu/mc/8-key-questions.shtml

York's Sections: Pre-Assessment

Pre-Assessment Question: How would you define **responsibility** in the context of science and technology?

Student A: Responsibility in the context of science and technology is the ethical understanding of those in the field to make, promote, and do things that are of the public's and Ecosystem's good.

Pre-Assessment

Pre-Assessment Question: What does it mean to conduct scientific research or to create technologies **ethically**?

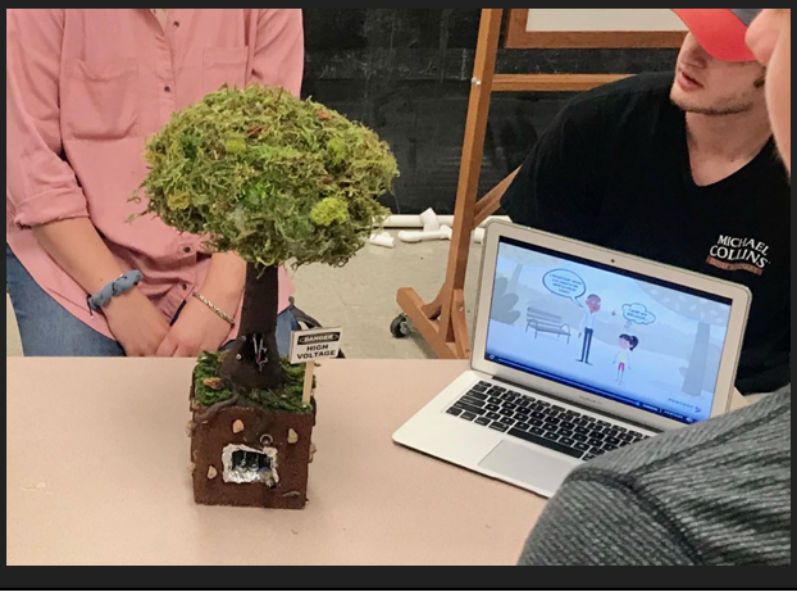
Student A: That research and technologies should be made for the public/world's good, and that follow the morals of the culture and times they are in.

Design Fiction Plan

Conceptual Description:

"Climate Change continues to degrade our environment, and our government isn't doing anything to stop these devastating changes. On top of that, political unrest around the world has caused another world war, even furthering the destruction of the environment. **Our technology, artificial nature (plants and animals) were created to help sustain people to continue living on earth.** These technologies were created as exact replicas of their real counterparts (plants take in CO2 and release O2, etc.)." (emphasis added)

York's Sections: Design Fiction Poster Session



Design Fiction Statement

Student A: "The ethical framework of **utilitarianism** was used when these technologies were first being researched and designed, because it provides the **best outcome for the most** (only thinking about the human population), to be able to have the world's population to continue to breath and live. It was also designed in the beginning that everyone would have the **right** to free oxygen, and to all of these technologies **equally**. *Once the technology became ordinary, there seemed to be a disparage between the wealthy and poor, growing the gap even more, due to that the wealthy started to have parks builty of these artificial trees and plants, providing free oxygen for the community. While, the poorer communities, weren't given these parks, and have to go to oxygen stores, to refill tanks and carry them around with all day, to make sure they get enough oxygen.*" (emphasis added)

Design Fiction Statement

Student A: “-Rights: Who has the right to oxygen, and these technologies? Doesn’t everyone? Do animals have right to oxygen also? What about the environments rights in the first place?
-Outcomes: What is the outcome of these technologies? More energy needed to power these technologies? What about the rest of the environment?”

Poster Session Reflection

One thing you hadn't thought about that emerged through poster session interactions:

Student A: "One thing I didn't think about is if these technologies do the exact processes, do they have to look like real trees? I guess technically we could make these technologies look like absolutely anything."

Post-Assessment

How would you define ‘responsibility’ in the context of science and technology?

Student A: “Responsibility is[in?] the context of science and tech.” [ambiguous answer]

Post-Assessment

What does it mean to conduct scientific research or to create technologies ethically?

Student A: “To think about the complete impact of the technology and possible futures it could create.”

Pre and Post

Do Good

Responsibility

Pre: Responsibility in the context of science and technology is the ethical understanding of those in the field to make, promote, and do things that are of the public's and Ecosystem's good.

Post: Responsibility is[in?] the context of science and tech. [ambiguous answer]

Ethical Conduct

Pre: That research and technologies should be made for the public/world's good, and that follow the morals of the culture and times they are in.

Post: To think about the complete impact of the technology and possible futures it could create.

Context and Impact, "possible futures"

Nano Camo: Clothing Revolutionized

Overview

The concept of our technology is to make clothing temperature adjusting, color changing, waterproof, tear proof, and potentially bulletproof. The technology will have two different versions, one that can be produced and sold to the general public, and another version that is made and used by soley the military. Climate change and rising war tensions are the main scenarios that have caused the production of the technology as the temperature adjusting will keep those who may lose their homes or have changing climates where they live comfortable, and it will also allow those people to reduce their carbon footprint since their clothes will last longer. The military will be able to utilize all aspects of the clothing which will keep soldiers safe, and more comfortable.

Ethical Considerations

A few ethical concerns that may be raised are who will be able to afford it, the differences between the clothing the military wears compared to what the general public will be allowed, international travel with the technology, harm to the environment from nanosilver, and the potential risk of the nanotechnology making people sick.

Use

Civilian

- Temperature adjusting
- Waterproof
- Tearproof

Military

- Bulletproof
- Color changing
- Temperature adjusting
- Waterproof and tearproof

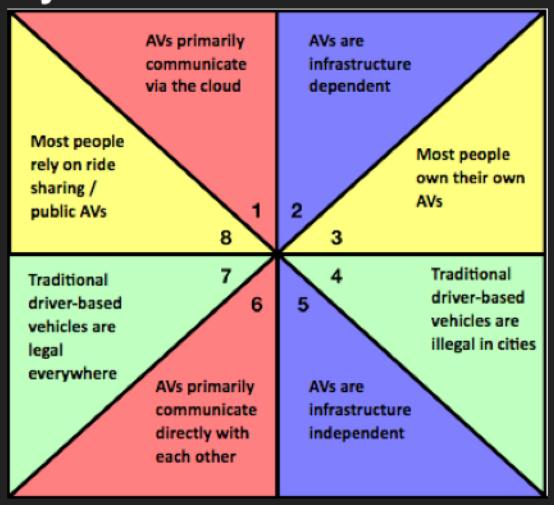
"One of the most important ethical concerns is who can afford this technology. This is the most important concern because in our world, where things are falling apart in areas, climate change has turned people's lives around, and there are rising war tensions, the question of who gets the technology and why is easily raised. The future is envisioned as it is hard to live and go outside without Nano Camo, but what will the people who are not able to afford it do? Will this lack of supplies by the less fortunate lead to a new type of homeless shelters and will the people who may be easily able to afford it care enough to help even with all that is going on in their lives? Another ethical consideration is the harm the technology may do to the environment. In our world, the environment is already deteriorating, so it is likely that people would be more concerned with their impacts. With this technology where would we draw the line between what is necessary for human life, and what is necessary to make sure that humanity is still thriving in the far future." (emphasis added)

Scenario analysis and design fiction in Conley's ISAT 131 sections

- Part of a larger multi-week case study in which student teams served as consultants to a fictional policymaker who wanted a briefing in a variety of "knowledge domain" areas related to autonomous vehicles, including:
  - Policy
  - Technology
  - Social
  - Economic/legal
  - Environmental/infrastructure

Gamified scenario analysis

- Developed by STS lab member Chase Collins
- Student teams progress through a series of steps, selecting scenario components using a random number generator



Gamified scenario analysis

choose a scenario

1 Driving to work	2 Going on a cross country camping trip	3 Managing multiple farms in Virginia	4 Socializing / partying with friends	5 Living in your vehicle to avoid big city rent	6 Optimizing mobility for someone with disabilities

select a stakeholder perspective

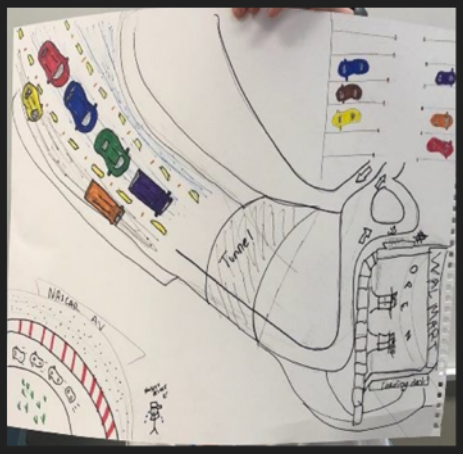
1 **A professional driver**	2 **Auto manufacturer**	3 **Pedestrian/ Cyclist**	4 **Advertiser**

ethical reasoning

1	Fairness: How can I act equitably and balance legitimate interests?
2	Outcomes - What achieves the best short- and long-term outcomes for me and all others?
3	Responsibilities - What duties and/or obligations apply?
4	Character - What action best reflects who I am and the person I want to become?
5	Liberty - How does respect for freedom, personal autonomy, or consent apply?
6	Empathy - What would I do if I cared deeply about those involved?
7	Authority - What do legitimate authorities (e.g. experts, law, my religion/god) expect of me?
8	Rights - What rights (e.g. innate, legal, social) apply?

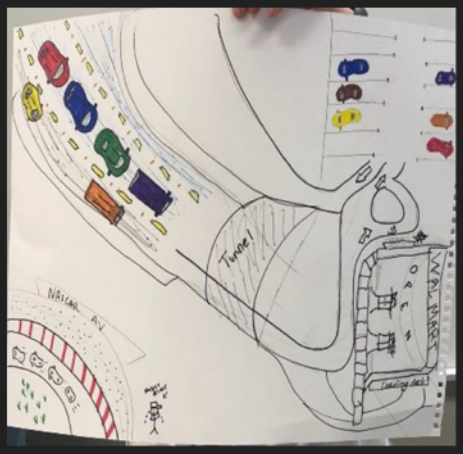
Scenario 1 - Empathy for stakeholders

"...we chose to create a society that used AVs to optimize mobility for disabled persons of the community. In this ideal world, people with disabilities would have more independence, more companies would have customer service personnel specifically for serving those with disabilities, and more advanced assistance technologies would be readily available for those who need them."



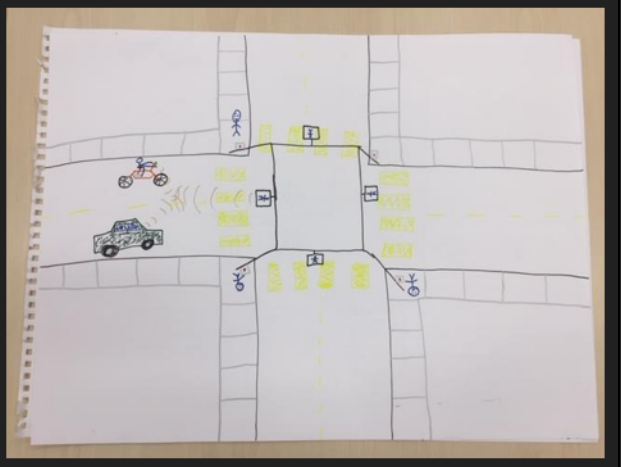
Scenario 1 - Empathy for stakeholders

"The most important piece of this analysis are the ethical considerations that come into place when developing our design fiction. Specifically, the two questions of the Madison Collaborative's Eight Key Questions that we chose were responsibility and empathy. [...] Outside of the disabled community, we also want to establish empathy for truck drivers who are at risk for losing their jobs with the rise of AVs by creating jobs that involve watching over the widespread AV system."



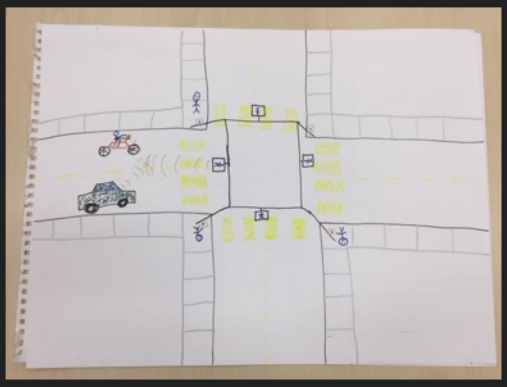
Scenario 2 - considering the perspectives of non-driver stakeholders

"Our scenario was based on a future where autonomous vehicles are dependent on infrastructure, they primarily communicate with each other, and most people own their own autonomous vehicles."



Scenario 2 - considering the perspectives of non-driver stakeholders

"We also chose to consider the perspectives of pedestrians and cyclists in a world of autonomous vehicles. [...] we took great consideration into the safety of people not in an autonomous car. We came up with the idea to have it regulated so that all cyclists that are on a road must have a sensor, [...] so that even when it is dark out, autonomous vehicles can still sense [...] and can properly avoid an accident with any cyclist on the road. For pedestrians, we implemented a system that would have the crosswalk signs broadcast a signal to all vehicles nearby to make sure that the vehicles stop for the pedestrian. "



Scenario 3 - autonomous ridesharing on a college campus

Scenario: "Most people rely on ride sharing/public AV's, AV's are infrastructure independent, and AV's primarily communicate via the cloud."

Scenario 3 - autonomous ridesharing on a college campus

"[We] discussed that autonomous vehicle ride sharing may have been urged by the expensive prices of the vehicles when they first came out; therefore, many companies (such as Uber or Lyft) flourished as they encouraged the use of ride sharing and public transportation of autonomous vehicles, which would provide a cheaper option for individuals looking to get around. In addition, the future world of autonomous vehicles means that full automation has been encouraged; therefore, no vehicles on the road are conventional cars and there is no need for conventional infrastructure of roadways."

Scenario 3 - autonomous ridesharing on a college campus

"How will duties/obligations apply and what rights apply? With this restructuring of the transportation industry, the responsibilities of the driver, technology, car manufacturer, and/or pedestrian all need to be reconsidered because this society still wants to hold people accountable. In addition, if the user is living in their vehicle, they will want their privacy to be protected from the technology and still hold some sort of personal autonomy from the automated world."

Scenario 4 - “Car Suburbs”

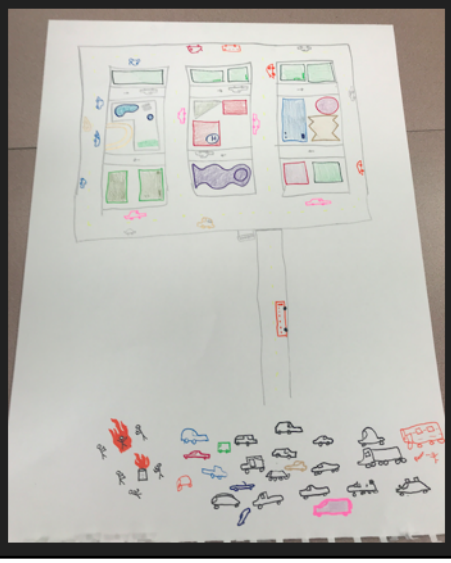
“The government made driver-based vehicles illegal so driver-based vehicles wouldn’t interfere with the new infrastructure, as the new infrastructure would not be able to accommodate for driver-based vehicles. Roads were also safer by only allowing autonomous vehicles to run on them.

A future of living in your own vehicle to avoid city rent is highly possible in a society with autonomous vehicles. Car suburbs would be made possible by allowing cars to park in designated lots overnight.”

Scenario 4 - “Car Suburbs”

“People are entitled to the principle of liberty, which may become violated when they are driven out of their homes to allow more infrastructure and are forced to park in car suburbs. They also must work around the infrastructure's clock, and do not have the liberty of leaving at any time they please; instead, they must wait for a car to pick them up.

On our poster board we decided to depict this scenario in the best way we visually were able. We have drawn the main city off to one side with many autonomous vehicles travelling the roads getting pedestrians around the city. Leaving the city there is one road that leads to the “Car burbs” where everyone who cannot afford expensive city life live with their personal cars. They must take the bus into the city, because they no longer can drive into the city.”



CONCLUSION

- We need more robust tools for imagining and assessing the societal dimensions of emerging technologies
- Critically engaging the future requires creative problem-solving
- We have to shift our perspective

ACKNOWLEDGEMENTS

- This work was conducted with the support of the James Madison University Accelerating Creative Teaching (ACT) grant.
- STS Futures Lab: Our students Chase Collins and Charles Boyd have been wonderful collaborators in experimenting with scenario analysis and design fiction with autonomous vehicles, and have also contributed some of these slides.
- JMU's Madison Collaborative has supported our endeavors.
- Department of Integrated Science and Technology, JMU

FURTHER READING

- Design Fiction
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THANKS

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https://sites.lib.jmu.edu/stsfutureslab/