This presentation explores the real-life application of AI-driven discovery in two settings - healthcare and a university library. It will describe an innovative project to explore the potential of artificial intelligence to improve knowledge discovery in a library services context.

It brings to life the voices of real users - students, researchers, clinicians and academics as they describe the 'problems' they need to solve in a context of resource discovery. It tests assumptions about the potential benefits or 'value propositions' of AI in discovery, against real world user issues and suggests the areas where an AI worked best and where it was less successful.
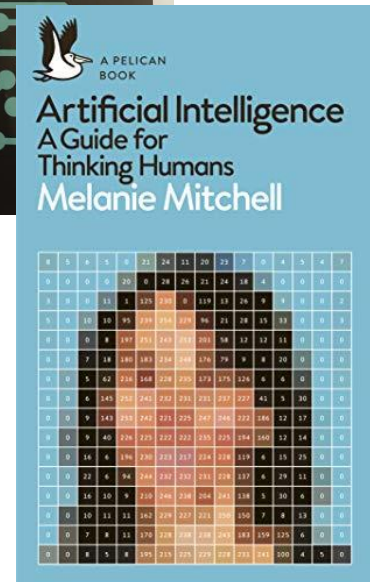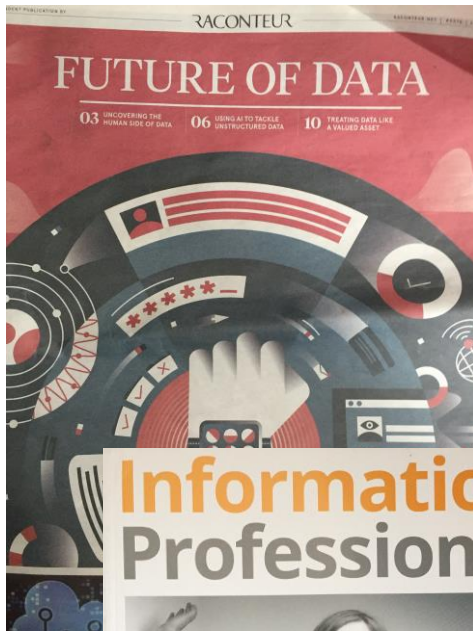
http://www.kenchadconsulting.com/

Part One: AI in context
Part two: AI applied to discovery
Part three: AI and discovery in a medical (NHS) library
Part four: Value Propositions
Part five: Ux Methodology
Part six: Findings
Part seven: Conclusion - what should we do?

Part One
AI in context

Discussion about AI seems to be everywhere

The AI bucket consists of:
- Big data
- Analytics
- Machine learning
- Natural language processing
- Data visualisation
- Decision logic

Cox, A.M. Pinfield, S. and Rutter, S. (2018) The intelligent library: Thought leaders' views on the likely impact of artificial intelligence on academic libraries. Library Hi Tech. ISSN 0737-8831 https://doi.org/10.1108/LHT-08-2018-0105
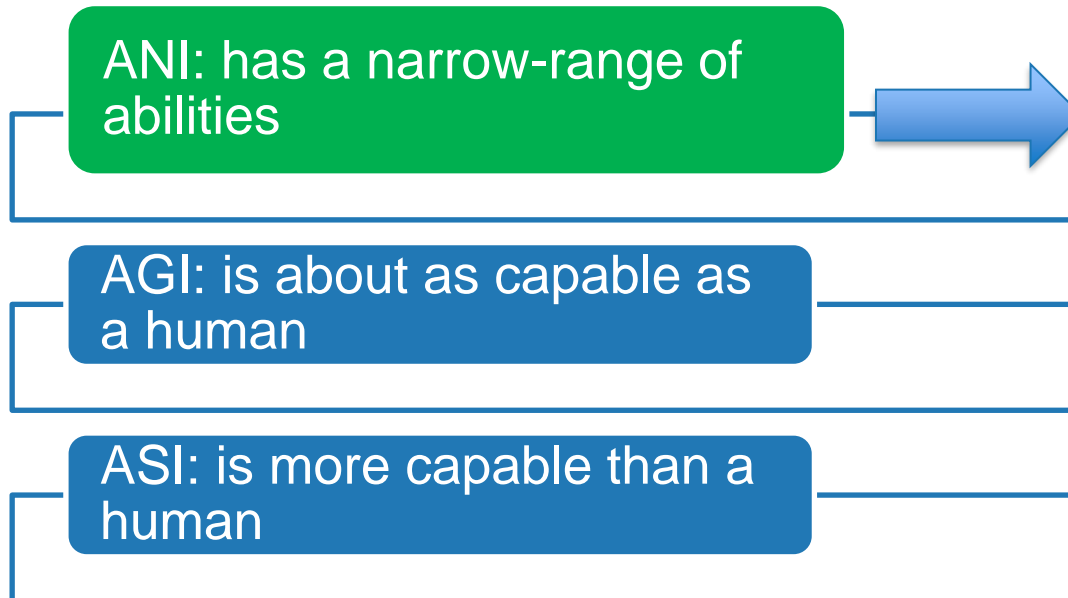
AI in the UK: ready, willing and able? HOUSE OF LORDS Select Committee on Artificial Intelligence. Report of Session 2017–19 HL Paper 100 16 April 2018

Types of AI: Narrow (ANI), General (AGI), and Super (ASI)

There are several types of Artificial intelligence: ANI, AGI, and ASI.
For now, AGI (artificial general intelligence) **and ASI** (artificial super intelligence) **are Sci-Fi all existing AI is ANI (narrow)**

The 3 types of AI: Narrow (ANI), General (AGI), and Super (ASI). Thomas J Ackermann. 1-Apr-2019.
https://www.bgp4.com/2019/04/01/the-3-types-of-ai-narrow-ani-general-agi-and-super-asi/

ANI: has a narrow-range of abilities

AGI: is about as capable as a human

ASI: is more capable than a human

AI, or machine learning, refers to **a broad set of algorithms that can solve a specific set of problems**, if trained properly.

The success of artificial intelligence depends on data, Nick Ismail Information Age [blog] 23 April 2018
https://www.information-age.com/success-artificial-intelligence-data-123471607/

AI works best when large amounts of rich, big data are available.

AI's greatest limitation — high quality data — will become more evident. **Successful machine learning depends on large and broad data sets**.

In the next wave of AI empowerment, the **algorithms are commoditised**, but

whoever owns the data is king

The success of artificial intelligence depends on data, Nick Ismail Information Age [blog] 23 April 2018 https://www.information-age.com/success-artificial-intelligence-data-123471607/

The context within the UK's National Health Service (NHS)

NHSx

About us | Key tools & info | COVID-19 Response | News | Blogs | Contact us

The NHS AI Lab

Accelerating the safe adoption of Artificial Intelligence in health and care
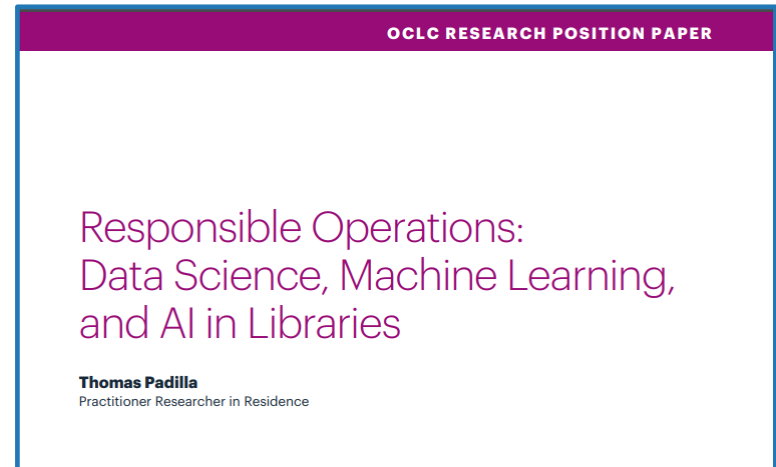
https://www.nhsx.nhs.uk/ai-lab/

Artificial Intelligence (AI) has the potential to make a significant difference in health and care settings through its ability to analyse large quantities of complex information. We're already seeing great applications of AI technology, but more needs to be done to fully harness its benefits and use AI safely and ethically at scale.

The Health Foundation

AI is powered by data. …. the NHS potentially has the best health data in the world

https://www.health.org.uk/news-and-comment/blogs/artificial-intelligence-in-the-nhs-getting-the-priorities-right

Library technology vendors are starting to engage with the AI opportunity

ExLibris
a ProQuest Company

Artificial Intelligence in the Library: Advantages, Challenges and Tradition

An Ex Libris Whitepaper

OCLC RESEARCH POSITION PAPER

Responsible Operations:
Data Science, Machine Learning,
and AI in Libraries

Thomas Padilla
Practitioner Researcher in Residence

AI and publishing

Case Studies

Using AI to solve business problems in scholarly publishing

Author: Michael Upshall

In the longer term, this AI-based technology will profoundly change the way that academic publishing works.

April 2019
https://insights.uksg.org/articles/10.1629/uksg.460/

highlights the huge importance that AI will have to the UK's publishing industry, showing that while use of AI is still in its relative infancy in publishing that the industry is at a watershed moment.

October 2020
https://www.publishers.org.uk/publications/people-plus-machines/

PEOPLE PLUS MACHINES

The role of Artificial Intelligence in Publishing

Several companies are keen to help…

IRIS.AI

Research discovery with artificial intelligence IRIS.AI

Use Natural Language Processing to review massive collections of research papers or patents: find the right documents, extract all their key data or identify the most precise pieces of knowledge.

Yewno provides Augmented Intelligence.

Yewno's mission is that of extracting knowledge from an overwhelming quantity of unstructured and structured data. Our technology helps to overcome the "**Information Overload**" problem and to research and to understand the world in a more natural manner.It is inspired by the way humans process information from multiple sensorial channels and it leverages state-of-the-art Computational Linguistics, Network Theory, Machine Learning, as well as methods from the classical Artificial Intelligence.

UNSILO

RETHINKING PUBLISHING WITH AI

UNSILO provides artificial intelligence tools and solutions for publishers to grow new business opportunities and improve customer experience and publishing workflows

Sparrho

Use Cases   Product   Contact

We lead the world in democratising science using augmented intelligence

6ricks

Who we are   How we help   Client testimonials   Our work   News & insights   Contact us

Information products for the data-driven world

Part two

AI applied to discovery

For the project we looked at a specific discovery product using artificial intelligence. *Yewno* integrates with existing link resolvers such as in EDS and Primo to provide the link to full text –' appropriate copy'

Yewno Discover

"Yewno's platform harnesses hundreds of millions of semantic connections and conceptual links from millions of scholarly articles, books, and databases across virtually all academic fields. Discover empowers users to navigate intuitively across concepts, relationships, and fields, learning from resources that might have otherwise been overlooked. This not only enhances understanding and creates more impactful work, but also saves time while ensuring comprehensive and credible coverage."

https://www.yewno.com/discover
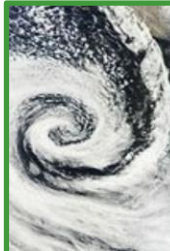
Disambiguation

Earth Sciences / Geology
Depression (geology)

A depression in geology is a landform sunken or depressed below the surrounding area. Depressions form by various mechanisms. Erosion-related:

Earth Sciences / Meteorology & Climatology
Low-pressure area

A low-pressure area, low, or depression is a region where the atmospheric pressure is lower than that of surrounding locations. Low-

Business & Economics / Money & Monetary Policy
Depression (economics)

In economics, a depression is a sustained, long-term downturn in economic activity in one or more

Business & Economics / Money & Monetary Policy
Great Depression

Great Depression, worldwide economic downturn that began in 1929 and lasted until about 1939. It was the longest and most severe

Business & Economics / Money & Monetary Policy
Long Depression

The Long Depression was a worldwide price and economic recession, beginning in 1873 and running either through the spring
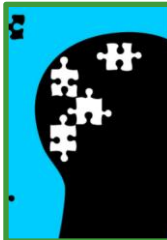
Business & Economics / Money & Monetary Policy
Depression of 1920–21

The Depression of 1920–21 was a sharp deflationary recession in the United States and other countries, 14 months after the end of World

Psychology / Psychopathology
Depression (mood)

Depression is a state of low mood and aversion to activity that can affect a person's thoughts, behavior, feelings, and sense of well-being. People with a

Medicine / Clinical Medicine
Depression (physiology)

Depression in physiology and medicine refers to a lowering, in particular a reduction in a particular biological variable or the

Psychology / Psychopathology
Major depressive disorder

Marked depression appearing in the involution period and characterized by hallucinations, delusions, paranoia, and agitation
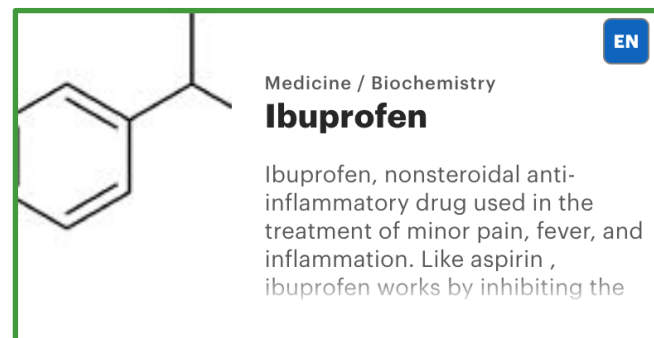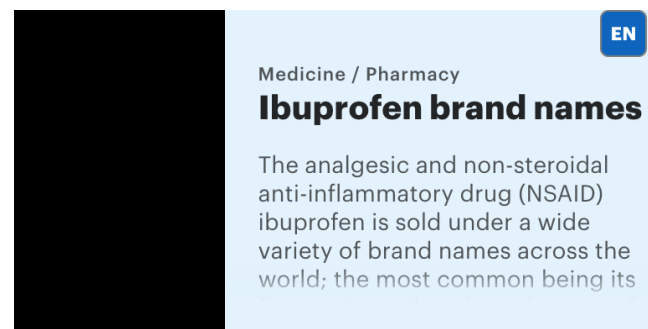
Concepts not keywords

- Terms change over time

- A concept/keyword must be attached to a definition

Nurofen

Brexit

Political Science / Democracy
United Kingdom withdrawal from the European Union

Brexit is the popular term for the United Kingdom's intended

Medicine / Pharmacy
Ibuprofen brand names

The analgesic and non-steroidal anti-inflammatory drug (NSAID) ibuprofen is sold under a wide variety of brand names across the world; the most common being its

Medicine / Biochemistry
Ibuprofen

Ibuprofen, nonsteroidal anti-inflammatory drug used in the treatment of minor pain, fever, and inflammation. Like aspirin , ibuprofen works by inhibiting the

Understanding context and meaning

Routes to plastic models and prototypes using the SLS selective laser sintering process

2004 - SPIE

13 minutes

For the production of real technical prototypes injection mould inserts can be produced by the RapidTool process that can be employed for the production of up to 80,000 parts depen on the injected material and part geometry. By changes in the chemical composition and by new processing parameters, average cycle time could be reduced from 4 to 5 days down to 2 to 3 days. Keywords: Rapid Pototyping, Rapid Tooling, Selective Laser Sintering, plastic parts, tooling inserts, injection moulding elastomer, Free Form Fabrication 1. INTRODUCTION The SLS process was developed in 1989 at the University of Texas in Austin. The principle of SLS is illustrated in Fig Layers of fine powdery materials with a specific geometry and specific surface features are applied to a work platform can be positioned accurately in the z-direction. The part to be build is sliced into layers of typically 0.05 to 0.3 mm thickness based on a 3D-CAD-file that describe closed volume (.STL-format).

Selective Laser sintering = 3D printing

- The term '3D printing' isn't mentioned in the text itself
- Algorithms understand meaning - what is being written about
- They can also understand context

What difference can AI make to Discovery?'

Finding 'hidden content - "Gender equality" is one on the UN's *Sustainable Development Goals* set up in 2015 but the term '*Gender Equality*' isn't mentioned in this (1989) text

AI can read the full text to accurately disambiguate and show the relevant section ('snippet') of text

What difference can AI make to Discovery?

Visualise relationships

Kenchadconsulting helping create more effective libraries…..

Part three

AI and discovery in a medical (NHS) library

kenchadconsulting Ltd

Health Education England (HEE) funded an **innovative project to explore the potential of artificial intelligence (AI) and machine learning to improve knowledge discovery.** HEE worked with Ken Chad Consulting and Yewno on a pilot implementation of an advanced AI research solution – Yewno Discover. A key strand of the project, led by Ken Chad Consulting, was an analysis of the user experience (Ux) using a variety of Ux methodologies. Working with the Library and Knowledge Services team at University Hospitals of Derby and Burton NHS Foundation Trust (UHDB) – one of the largest NHS trusts in the country – a range of user 'problems to be solved' were investigated and analysed in a busy and complex user environment.

https://www.kenchadconsulting.com/recent-projects/

University Hospitals of Derby and Burton NHS Foundation Trust Project funded by Health Education England (HEE)

What we did

- Established potential value propositions
- Use the "Jobs to be done" Ux methodology for
    - Focus groups February and March 2020 (16 participants)
    - One-on-one interviews March 2020 before any exposure to Yewno
- (Then COVID-19 intervened)
- User familiarisation on Yewno July-September 2020
- Second interviews October –December to test/validate the VPs
- Report (January 2021)

Part four
Value Propositions

Value Propositions

How did we *think* Yewno might help? We first set out what we thought its value might be. This would be tested with users later

'A value proposition is a short statement that clearly communicates the benefits that your potential client gets by using your product, service or idea.
Your value proposition must focus closely on what your customers really want and value

Creating a Value Proposition
http://www.mindtools.com/CommSkll/ValueProposition.htm

Mapping out potential VPs

What problems does it solve for users? –what 'job' does it help get done?	Who are the users who benefit	How is the VP actually delivered?	How distinctive/competitive is the VP – the product /service/function?

I want to better understand an area of research

I want to ensure my search uncovers relevant material with related terms If I search by one term can I see all the relevant variants?

I want get new ideas - explore knowledge across interdisciplinary fields

I want to hypothesize - I don't know if concepts are connected and I don't know how to find out if they are or aren't connected

I want to explore new issues and the terms relationships around them -e.g. Vaping

Part five
Ux Methodology

Analysing (potential) solutions focus on the following….

what outcomes can it address? ('gain creators')

what barriers does it overcome? ('pain relievers')

for what *jobs* is the solution applicable?

How?

Gains/Outcomes-what (measurable) criteria does the user consider in order to decide if the job has been successfully accomplished?

Product /solution -delivers the VP

Gain enhancer

Pain reliever

Gain/ outcome

Pain/ barrier

Job/ Problem to solve

How?

Pain points and barriers to getting the job done
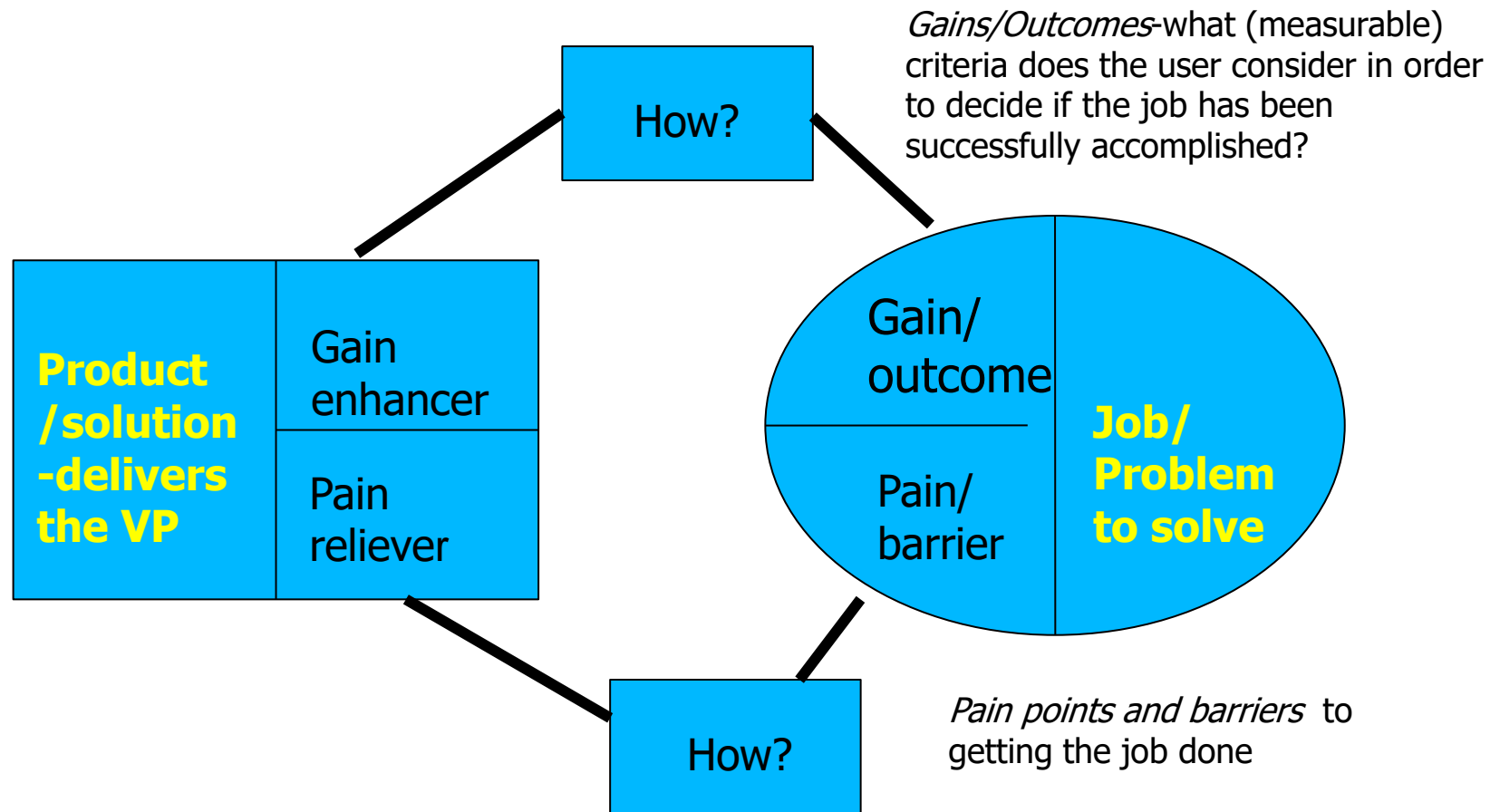
Flikr Texas A&M University-Commerce Marketing Communications Photography
14284-educational technology 3535.jpg

What about the end user?

14284-educational technology 3535.jpg

Kenchadconsulting helping create more effective libraries…..

"paradoxically the literal voice of the customer does not translate into meaningful inputs"

a 'jobs' and 'outcomes' based approach produces meaningful outputs that can be acted upon
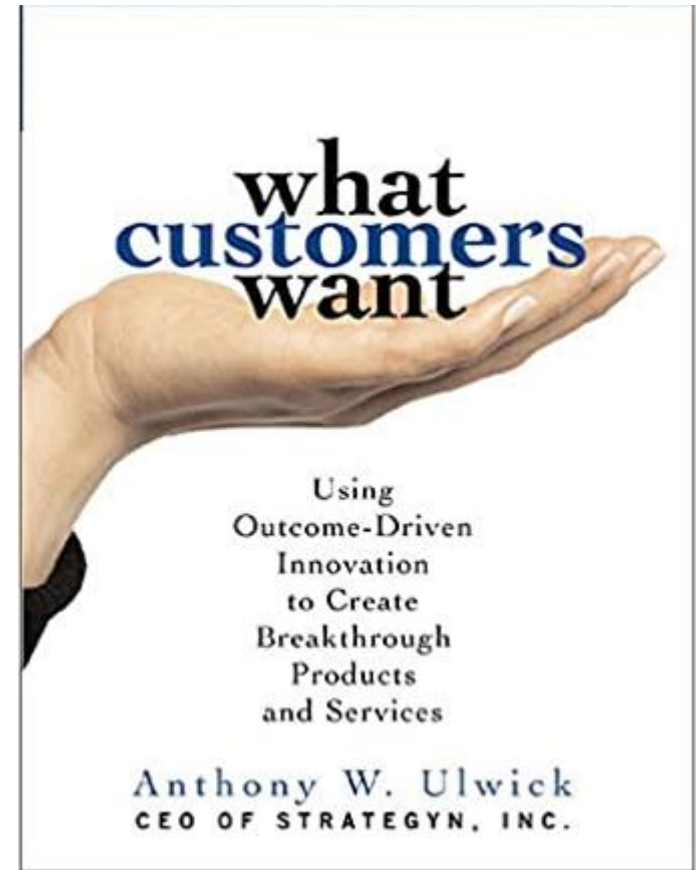
'What customers want.' Anthony W Ulwick. McGraw Hill 2005

#JTBD

What is the *job* -problem that needs to be solved?

Who needs to get the job done/solve the problem?

What is the particular *circumstance* of the problem?

What is the actual process?

Gains/Outcomes - what (measurable) criteria does the user consider in order to decide if the job has been successfully accomplished?

Pain points and barriers to getting the job done
http://www.kenchadconsulting.com/how-we-can-help/innovation/

#JTBD

Focus groups can be especially good at shaping longs lists of jobs that come out of ideation sessions. Focus group can also be helpful in identifying jobs which have most promise and to get feedback on specific ideas. However be very wary about getting *solutions* from customers. Customers do tend to latch on to existing solutions so may not see the 'gaps' for innovative products and services. Indeed customers are often not a good source for telling you what they 'need'. That why it's important to frame the questioning around the overall JTBD approach.

http://www.kenchadconsulting.com/how-we-can-help/innovation/

Focus groups-first step in understanding the 'problem' users need to solve

User	Problem (Job-To-Be-Done)	Desired Outcome how do you decide the job is done successfully - what criteria do you use?	Constraints (to be overcome) Pain points
Undergrad	Assignment	A feasible assignment for which I can get good information and a good grade	• Finding something that is feasible • Can be overwhelming to find information • I know the information is out there but it's a challenge to locate it in the best way • Lots of irrelevant material – so much research, where do I start? Waste time looking at things which aren't useful • At uni books are spread out, even when all on the same topic.

#JTBD

One-on-one interviews

http://www.kenchadconsulting.com/how-we-can-help/innovation/

Devise a questionnaire to evaluate (hand) treatments
Setting up study to find a questionnaire that can capture meaningful data to enable treatment, evaluation and follow up. What operations have clinical value?—we need numbers/data/evidence

Keeping up to date with a major health topic -currently COVID-19
What I should, and should not, be doing -both socially and professionally

Research : AI based assurance
How do we assure an autonomous AI system is accountable?

Researching nutritional products/supplements as requested by senior dietitians
Creating a better diet regime for patients

Creating a health-related quality of life questionnaire (for lipoedema care)
Validate the questionnaire for other people/organisations to use within research and a clinical setting.

Specific point of care - Dealing with wounds
Establishing a wound care plan

University Course Assignment
Case study of (theoretical) patient with respiratory disease -need to work out treatments

Writing course work
Practical write up of lab report

Service development
Working on an audit to enable standardisation of practise and language and delivery of measurable outcomes.

Job/Task/Problem to be solved/job-to-be-done
Specific point of care - Dealing with wounds – establishing a wound care plan
It's a big issue

User/customer (their specific attributes/experience)
Experienced -been at the Trust for over 20 years -started as health care assistant and worked up. Did OU course. Currently doing Masters on health and leadership

Circumstance Where is the user? What are the relevant attributes of the environment they find themselves in when they are trying to get this job done?
Computer availability very limited in wards. PCs limited and locked down so can't access many resources. So, I do some work on phone but there is pressure not to use phones as this is viewed as doing personal stuff. Also do work on phone at home

There can be hundreds of Job/User/Circumstance scenarios

scoring them helps you focus....

Importance 1=not important; 5=critical	Frequency 1=rarely 5=very frequent	Frustration 1=very happy 5=very frustrated	Score (importance+frequency) X frustration = a score 2 to 50
4	3	5	35

kenchadconsulting Ltd

JTBD interviews

Analysing the 'job' (1)

Why is the specific job important? Why does the user *care*?
What is the *fundamental* problem the user is facing?

- If no-one has the time to investigate it the patient will be told they can't eat something they might be ok with
- Reputation - want to do a good job. The more you do jobs competently the more interesting things you get to do
- It's interesting
- Fundamental problem - patient safety and avoiding unnecessary restrictions. I work in renal dietetics where there are lot of fluid restrictions to manage. Keeping things in range e.g. potassium - keeping a balance of quality of life

Analysing the 'job' (2)
Motivations, barriers, solutions and opportunities

What objectives do customers use to evaluate the solution to getting their job done?
E.g. Ease of use, available at home etc.

- Something very simple and easy to apply - e.g. visual
- Useful context -e.g. Some data on what worked - numbers, factors/consideration linked to wound care (e.g. if they are not well or at an end of life stage healing is slower or may not take place

What barriers limit the current solutions to getting the job done?
(typically, functional thing like skills required, time, cost, accessibility)

- Inability to easily access information beyond the basic (printed) handbook/guidelines
- Time barriers/ward commitments

What opportunities exist for innovative solutions?
(Where are there gaps for (innovative) solutions?)

- App on a portable easy to use, accessible device (e.g. iPad) " wound care at its best"—
- Something that takes staff through - step by step - a checklist
- Staff just enter the information and they get a result. This would give especially newly qualified staff the confidence and re-assurance they need
- Result would be safe consistent and the *best* care (would reduce time effort in post harm reviews)

Part six
Findings

Pilot project for the deployment of AI approaches for information discovery for research

FINAL REPORT

kenchadconsulting Ltd

for
Health Education England

Revised after discussion with HEE

27th January 2021

The project succeeded in its aims to:

- Increase the overall understanding of the value and potential of AI based information/discovery solutions within HEE/NHS

- Test and validate use cases for NHS users (clinical staff, researchers etc) and understand those that could benefit from an AI based approach

- Demonstrate HEE/NHS's understanding and capability to work with innovative technology

- Provide a model for implementation more widely

The project delivered clear outputs that have long term value and include:

- A better understanding of exactly how a Yewno based AI approach can help in a real-life NHS environment and be integrated with existing HEE/NHS infrastructure and policies

- Clear definition of the user research/discovery needs that this approach meets best

- A 'toolkit' for successful deployment. This will inform how the solution can be implemented more widely, including such issues as integrating technology (e.g. with existing library and knowledge services solutions, local browsers etc) and the resources needed for implementation etc.

All the users interviewed saw *potential* in the Yewno approach even if it didn't meet their particular needs.

A UHDB member of staff involved in the Yewno training/ familiarisation of users reported. 'All my piloteers were quite excited by the technology and in particular liked the visual layout'.

In the one-to-one interviews some loved the visual interface whereas others found it confusing. A student's first impression was, 'good god what is this! Looked confusing at first. Spider diagram looked chaotic'. But they went on to say, 'once you get the initial diagram – [I] liked that I can link topics –get an image of topic. I'm a visual learner.

A student creating a health related quality of life questionnaire said, 'great for looking at broad topics. Good for first time topic -getting the overall landscape. Liked the layers. I could do independent searches and then layer them - so much better than Google Scholar'

When asked what their reaction would be if access was stopped….
An interviewee commented, 'quite sad -fallen in love with it.'
Another had considered taking out an individual subscription.
A nurse said, 'very disappointed—I think it will be helpful for my final year of my Masters.'

A research and postgraduate manager working on a questionnaire to evaluate hand treatments noted the, 'lack of precision'. They went on, '[it's] good for [an] overview but not so good at drilling down in the detail—or a focussed question -e.g. bones in the fingers and not the back of the hand'.

Others were happy with their existing solutions, typically Google/Google Scholar. A community dietitian commented, 'overall I'm happy with alternatives so not having access to Yewno would not be a serious gap. It might have some value as a complimentary tool for looking at a very broad landscape.'

The key finding is that Yewno was rated highly for providing a general overview/exploring a topic area but was did not meet user's needs where precision was an important factor. This theme was consistent across the interviews.

Part seven

Conclusion

So what should we do?

The impact of AI, machine learning,
automation and robotics
on the information professions

A report for CILIP

https://www.cilip.org.uk/page/researchreport

It is in its impact on knowledge discovery that AI will have the greatest impact

Probably the most important application of AI arises from the way it creates potential for information services to support new ways to analyse content.

Report recommendations

For CILIP to articulate the relevance of the profession's skills, values and ethical principles, to **identify pathfinder organisations and people who encapsulate these possibilities, and to promote knowledge sharing within the profession.**

For individual information professionals and information organisations to **explore the use of AI tools and share what they learn with others across the profession.**

For the **profession to use the technologies in their own work and to support information users** in engaging productively and safely with them for social good.

Video –views from the user