The completed project is reported in a video presentation at the end of the semester, including **what the service is, what information is needed, how information is collected, processed, analyzed, and stored, and the expected utilities and/or impacts of the service.**

**Professor’s notes.**

Regarding Amazon's recruiting algorithms, probably even most Amazon employees don't know the detailed processes and methodologies. And, unlike organizations in the public sector, Amazon has no obligations to disclose those details. So it is impossible and unnecessary to draw a detailed DFD in this case.

Regarding the recruiting activities before and after the application, certainly it is important to reduce biases in both phases. Your project can address both phases. Before application (Phase I), you can talk about the effective ways to increase the chance that disadvantaged groups apply, to increase the diversity of the application pool. After application (Phase II), you can talk about effective ways to reduce biased AI-powered screening. Even though Phase II is more interesting (and closer to your team's original interest) than Phase I, having a large, diverse application pool from Phase I may help the company get more diverse training data for Phase II. So Phase I and Phase II are not totally separate (obviously success in Phase I can be erased by biased algorithms in Phase II). I'm just hypothesizing here. What are some of the "best practices" to find more diverse training data? Over sampling? Making up the data? You can search widely to see if you can find anything in the literature. Can the lack of unbiased training data be compensated/corrected by the analysis method? Can the analyst ban inferring irrelevant attributes of the applicant (e.g., gender, age, sexual orientation...) in neural network/decision-tree/clustering analysis? You don't have to answer these questions in your project; I'm just trying to stimulate your thinking so you can proceed.

**EARLY RESEARCH**

**Victoria’s Research**

Research on that case study and create point sides

Resume bias study: <https://www.nber.org/digest/sep03/employers-replies-racial-names>

Pdf: <https://www.nber.org/papers/w9873>

Harvard study: White washing <https://www.inc.com/marcel-schwantes/why-minority-job-applicants-mask-their-race-identities-when-applying-for-jobs-according-to-this-harvard-study.html>

AMAZON’s RECRUITMENT ENGINE: <https://www.amazon.jobs/en/teams/people-technology>

Short Term Goal: Develop a better AI hiring platform

Long Term: To retrain and create a more inclusive AI resume review system that does not discriminate against any particular group of people.

BOOK RESOURCE: [*Algorithms of Oppression: How Search Engines Reinforce Racism .*](https://blogs.lse.ac.uk/lsereviewofbooks/2019/06/07/book-review-algorithms-of-oppression-how-search-engines-reinforce-racism-by-safiya-umoja-noble/)

Research into algorithms and bias to show how online search results are far from neutral, but instead replicate and reinforce racist and sexist beliefs that reverberate in the societies in which search engines operate.

**Key search terms**

* Human resource management tool
* HR applicant tracking system (ATS)
* Recruiting Engine

Case Study: **Amazon**

Global Employees: 1.3 million

a majority of its 1.3 million employees globally work outside the office and inside fulfillment centers or other parts of the company’s sprawling logistics network.

2020 Diversity Report: <https://www.geekwire.com/2021/amazon-sets-2021-diversity-goals-releases-new-workforce-data-gender-race/>

Women make up 31.4% of U.S. corporate employees, up 1.4% from 2019.

Black employees make up 7.2%, up from 5.4%.

White employees make up 47%, down from 48.4%;

Asian employees make up 34.8%, down from 36.2%; and

LatinX workers make up 7.5%, up from 6.6%.

**To do: Amazon AI RECRUITING PLATFORM**

* Analyze Amazon’s selection criteria in terms of the education, background, skills (technical and interpersonal skills) they are looking for in applicants
* Create DFD or ERG
* Create Process flow chart

Leadership

<https://www.seattletimes.com/business/amazon/amazon-data-showed-big-jump-in-diversity-among-senior-leaders-after-definition-of-executive-was-loosened/>

In 2016, A**mazon didn’t employ a single Black, Native American or multiracial executive and j**ust one Hispanic or Latino executive among its 105 senior leaders in the United States, 78 of whom were white men.

2017 - Action - Changed it’s policy to rig the numbers …> loosened its definition of executive to include every employee at the vice president and director levell, which Amazon had formerly reported as midlevel managers.Arguing it to be consistent with the Department of Labor’s Equal Employment Opportunity Commission (EEOC) job classifications.

**1. What are the** **comparable companies (find companies doing really well)**:

* In terms of retail store rivals: **Target, Walmar**t, Best Buy, and Costco
* In terms of subscription services: ,**Netflix** Apple, and Google
* In terms of web services: Oracle, **Microsoft**, and IBM

<https://fortune.com/2021/06/02/fortune-500-companies-diversity-inclusion-numbers-refinitiv-measure-up/>

According to Fortune 500, the top 20 companies with best diversity and inclusion numbers overall include **Microsoft and Target in the lead and Capital One Visa, Walmart following suit** . The rating looked at the representation of minority groups - Black, Hispanic, Asian, and other - in management and on the board.

<https://www.forbes.com/best-employers-diversity/#26d6917f9b9e>

Additionally, Forbes lists **Netflix** as one of the top 30 employers for Diversity.

**Microsoft:** [**https://www.geekwire.com/2020/microsoft-boosts-gender-diversity-sees-smaller-gains-racial-ethnic-minorities/**](https://www.geekwire.com/2020/microsoft-boosts-gender-diversity-sees-smaller-gains-racial-ethnic-minorities/)

Global Employees: 181,000 people

Comparable to Amazon, Microsoft ...

Women represent 28.6% of Microsoft’s global workforce, up from 25.5% three years ago; and 20% of the company’s executive and partner-level positions, up from 15.8% three years earlier.

Black and African American employees at Microsoft rose by 0.3 percentage points over the past year, to 4.9%; and represent about 2.9% of executive and partner-level positions, up 0.2 percentage points from the year before.

Microsoft said it would spend an additional $150 million on diversity and inclusion programs, and double its number of Black and African American managers and senior employees by 2025 in the United States.

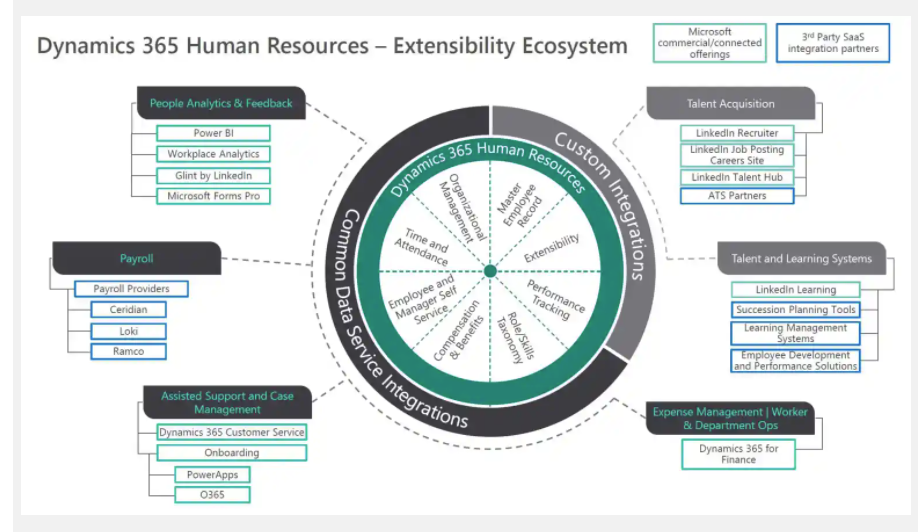
**To do: Microsoft AI RECRUITING PLATFORM**

**Application:** Apply through sign in with Microsoft account, gmail, linkedin, and facebook

MS is the Owner of Github and LinkedIn --- 2 great places for sourcing candidates

<https://www.tlnt.com/microsoft-now-owns-the-worlds-two-most-important-recruiting-platforms/>

1. **The Dynamics 365 HR system** is all Microsoft based, so it has the interfaces and microservices architecture to be accessed from Teams, Outlook, or any other Microsoft platform.[**https://joshbersin.com/2019/12/microsoft-formally-enters-the-hr-tech-spac e-and-the-strategy-is-compelling/**](https://joshbersin.com/2019/12/microsoft-formally-enters-the-hr-tech-space-and-the-strategy-is-compelling/)

****

**ATS is an online tool to manage jobs and resumes giving you matched candidates.**

**Dynamics ATS/CRM Applicant Tracking System is Staffing & Recruiting software**

**Features:**[**https://appsource.microsoft.com/en/product/dynamics-365/dynamics-ats.04c4b07e-6e91-45a0-9ef7-bcb2a3ecf997?tab=overview**](https://appsource.microsoft.com/en/product/dynamics-365/dynamics-ats.04c4b07e-6e91-45a0-9ef7-bcb2a3ecf997?tab=overview)

Candidate Relationship Management

Company and Client Relationship Management

Opportunity Pipeline Management

Boolean, Relevance, Ranking and Radius Search

Intelligent Talent Matching

Email Tracking and Analytics

Relationship Tracking and Analytics

Marketing Campaigns

Candidate Sourcing Tools

Resume Parser

Job Portal

Client Portal

Candidate Portal

Office 365 Integration

Outlook Integration

Teams Integration

Website Integration

Social Media Integration

LinkedIn Integration

Broadbean Integration

Job Board Integration

Search Integration

Custom fields and workflows

Custom Reporting Dashboards and Analytics

Mobile App

API Access

**How Dynamic works:** [**https://dynamicsats.com/**](https://dynamicsats.com/)

**MS Automated Recruiting Process using Flow and Office 365 Services**

[**https://powerusers.microsoft.com/t5/Power-Automate-Community-Blog/Automate-New-Candidate-Recruiting-Process-using-Flow-and-Office/ba-p/65762**](https://powerusers.microsoft.com/t5/Power-Automate-Community-Blog/Automate-New-Candidate-Recruiting-Process-using-Flow-and-Office/ba-p/65762)

Microsoft Flow, Forms, Teams, SharePoint, and Outlook.

* Interested candidates fill out the form that was created in under 20 minutes using Microsoft Forms.
* When they submit the form the information gets added into fields in a SharePoint list item.
* A discussion message is then posted in a HR Team channel with a link to the new candidate SharePoint item.
* If an email is entered into the Referrer Email field, the person will be sent an approval email to approve or reject the candidate's referral. The approval response will then be posted in a second message in the HR Team channel.

Prior to creating this Flow you will need to have: A new candidate form created with Forms, A SharePoint list that has fields to correspond with your form, an HR Team in Teams

**After receiving resume automated submission**

**Résumé screening process used by the Microsoft Flow**

The three advanced capabilities we are going to focus on are:

Approval steps

Conditional branching

Chaining several actions together

Step 1: The first step or “trigger” is based on when I receive an e-mail from the automated résumé submission system inside of Microsoft. This automated e-mail has a particular Subject line (i.e. starts with “Internal Resume Submission”) and is always marked as High Importance

Step 2: Send approval email with different options to choose from : “Screen” and “Ignore”

Step 3: "Screen" and "Ignore" as buttons appearing inside the e-mail. If I click the "Screen" button, the candidate should advance to the next step in the process and start a tech screen. If I click on the "Ignore" button, we would send the candidate our regrets. These buttons work in Outlook, iPhone or in OWA.

Step 4: configure a “condition” in the flow. The condition will allow us to run one set of actions if it is “Screen”, and another set of actions for “Ignore.”

**Follow additional instructions to create a wireframe:** [**https://powerautomate.microsoft.com/en-us/blog/advancedflow-processingresumes/**](https://powerautomate.microsoft.com/en-us/blog/advancedflow-processingresumes/)

**Targe**t: <https://www.diversityinc.com/target-2021/>

Global Employees: 355,000+

2020 DiversityInc Top 50 Ranking: No. 13

No. 7, Top Companies for Talent Acquisition for Women of Color

No. 4, Top Companies for Board of Directors

**Target’s AI RECRUITING PLATFORM**

<https://www.retaildive.com/news/target-taps-workday-cloud-system-to-streamline-operational-processes/440403/>

Outsources it human resources processes to a cloud-base service, Workday. It is the most used applicant tracking system by Fortune 500 companies.

Workday Human Capital Management (HCM) system, which includes its Workday Learning, Workday Payroll and **Workday Recruiting tools**

Youtube: <https://www.youtube.com/watch?v=J6Mct4DTJcs>

Examples **Workday Recruiting Process, data mitigation, and Recruiting hub**

Time: 10:40 -39:00

Time: 48:00 -52:00 More on the tracking applicant

PDF version of workday process: <https://www.fgcu.edu/workday/files/jobaids/Recruitment-Process.pdf>

AI and data storage in Workday - Workday Prism Analytics

* <https://www.thirdrepublic.com/blog/ai-workday>
* <https://www.workday.com/en-us/products/analytics-reporting/data-hub.html>

[**Workday addressing diversity tool:**](https://searchhrsoftware.techtarget.com/news/252485468/Workday-admits-to-Black-diversity-problem-pledges-to-improve)

Mask Recruiting, which is "the process of removing any and all identification details from candidates' resumes and applications.” The idea behind **Mask Recruiting**, which is getting industry adoption, is to remove identifying features of a candidate, such as name and photo, to limit unconscious bias in decision-making.

<https://blog.workday.com/en-us/2020/guiding-principles-belonging-diversity-workday.html>

“This will allow us to mask personal information on candidates' profiles during screening stages to help reduce unconscious bias during the hiring process. Masked candidate screening is just one example in our continued investment and commitment to support our customers’ diversity efforts with actionable insights, real-time measurement, and the ability to mitigate bias.”

[**Workday Automated Diversity Process**](https://www.workday.com/en-us/solutions/role/enterprise-hr/diversity-inclusion-belonging-solutions.html#!)

Recruiter side

* Able to see the gender and ethnicity distribution on the dashboard (analytics)
* Mask recruiting (mask identifying details from resumes) so recruiters can see the skills and experience that matter
* Has a pay equity dashboard that shows avg. compensation ratio by age and ethnicity (analytics)
* Helps to find diverse talent for leadership pipeline

Applicant side

* Recommends career opportunities for applicants

**Workday commitment to Ethical AI:** <https://www.workday.com/en-us/products/analytics-reporting/data-hub.html>

**Walmart**: <https://www.diversityinc.com/walmart-2021/>

Global Employees: 2.2 million+

2020 DiversityInc Top 50 Ranking: No. 32

No. 6, Top Companies for LGBTQ

No. 10, Top Companies for Mentoring

No. 8, Top Companies for Talent Acquisition for Women of Color

No. 14, Top Companies for Veterans

No. 13, Top Companies for Asian American Executives

No. 10, Top Companies for Black Executives

**Walmart AI RECRUITING PLATFORM**

<http://panmore.com/walmart-human-resource-management-recruitment-selection-employee-retention>

Walmart’s uses different types of **internal recruitment sources**.

* Current employees
* Trainees
* Transfers

Walmart’s human resource management supports the promotion of hourly sales employees to managerial positions. About 70% of the company’s managers started as hourly sales employees and were promoted to their current positions. Walmart uses current employees as the biggest internal recruitment source.

**External recruiting source**

* Respondents to job advertisements
* Campuses
* Previous applicants

**Selection Criteria.** Walmart’s selection criteria depend on the job position. Basic criteria include education and training background and results of criminal background checks. For hourly sales positions, Walmart uses knowledge retention (e.g. on product details) and interpersonal skills. Interpersonal skills are essential for these positions because sales personnel directly communicate with customers. Walmart’s human resource management also uses analytical and problem-solving abilities and conflict management skills for supervisory and managerial positions. Supervisors and managers are expected to analyze and solve problems, and resolve conflicts in the workplace.

Walmart’s Human Resource Management Portal is **WORKDAY!!!! ( see info above, same as Target)**

**Netflix**

[**https://jobs.netflix.com/inclusion**](https://jobs.netflix.com/inclusion)

[**https://about.netflix.com/en/news/netflix-inclusion-report-2021**](https://about.netflix.com/en/news/netflix-inclusion-report-2021)

Employees: approximately 9,400 full-time workers

Women 47.9% , Men 43.8%, Black or African American : 10.4%, Hispanic or Latinx 8.5%

Asian 23.8%, White 42.9%

15 ERGs serving Latinx, veteran, Black, and disability communities

Leadership:

Women: 47.4%, Men 45.2%

Two or More Races 4.9%| Black or African American 13.3%, Hispanic or Latinx

4.9% | Asian 16.3%

White 54.4%

**Netflix AI RECRUITING PLATFORM**

**Lever** : <https://www.lever.co/?ssrid=ssr>

Lever allows hiring teams to collect applicants and move them through the interview and offer stages.

**Feature to deal with bias:** [**https://www.lever.co/blog/how-to-hit-your-diversity-goals-with-lever/**](https://www.lever.co/blog/how-to-hit-your-diversity-goals-with-lever/)

**Diversity Insight**s, a new feature to help you measure your demographic metrics, track your progress toward diversity goals, and create a more equitable recruiting process.

* customizable and automated demographic surveys that collect and structure diversity metrics. This empowers them to make data-driven decisions about the best ways to eliminate bias and hit diversity goals with confidence.
* Diversity Insights asks about gender, age, and ethnicity veteran, status, college education, and any other demographic metrics that are important to your organization.
* Additionally, you can automate the process by setting an email to be sent to candidates at a specific stage in the process.

Diverse pipeline: <https://www.lever.co/diversity-inclusion-video/>

1. Using sourcing tools to seek out people from diverse backgrounds to build a pipeline of diverse candidates
2. Automates candidates outreach
3. Minimum unconscious bias with lever’s interview kits (rid of candidates photo). It specifics teams roles and questions and ensure a fair process by hiding feedback until everyone on the team has submitted their reports
4. Measure your results: Track efforts with diversity survey and reports, using demographic data and diversity metrics to adjust your DEI strategy

**BEST PRACTICE EXAMPLE (Additional research)**

**Capital one:** <https://www.diversityinc.com/capital-one-financial-2021/>

**Global Employees: 52,000**

According to 2020 DiversityInc Top 50 Ranking, Capital one is #50

No. 4, Top Companies for People with Disabilities (PwD)

No. 1, Top Companies for LGBTQ

No. 9, Top Companies for Employee Resource Groups (ERG)

No. 13, Top Companies for Veterans

**Capital One AI RECRUITING PLATFORM**

**Capital one/ Visa: i**s using **Eightfold**

Eightfold is a talent intelligence platform powered by AI. Central focus on DEI

<https://eightfold.ai/why-eightfold/diversity-and-inclusion/>

Eightfold’s Talent Intelligence Platform™ builds on existing DE&I efforts with bias-reducing features, employee tools, and real-time data.

* A personalized career site focused on candidate’s skills, while highlighting near term potential for tomorrow: <https://eightfold.ai/resources/hiring-for-potential-elevates-inclusion/>
* Anonymize candidate profiles to prevent unconscious bias. **Anonymous profiles hide personal information such as evidence of gender and ethnicity**, so talent decisions are based on the skills and potential of each candidate.
* Diversity analytics offer actionable insights and support equity. **Diversity analytics update daily to flag potential bias anywhere in the hiring process**, so the organization can investigate and resolve any cause. Diversity analytics also measure the need for, and impact of, equity policies
* **Equal Opportunity Algorithms prevent AI bias and boost trust**.Uses Algorithms method to ensure every recommendation uses only relevant data, and never uses factors such as age, race, gender, or disability status. With Explainable AI, Eightfold shows how each recommendation is based on relevant data and builds trust in all talent decisions.
  + uses **deep-learning AI** to help each person understand their career potential, and each enterprise understand the potential of their workforce.
  + deep learning AI uses neural networks that learn from 1 billion+ profiles, billions of global data points and 1 million+ unique skills to deliver bias-free, data-driven insights.

**Oracle** is using **HireVue**

**Diversity stats**

HireVue case study: [Unilever](https://www.hirevue.com/case-studies/global-talent-acquisition-unilever-case-study), HireVue AI-driven assessments and achieved £1M annual cost savings, a 90% reduction in time to hire, and a 16% increase in hiring diversity.

HireVue assessment in reducing bias

* 1. <https://www.hirevue.com/blog/hiring/hirevue-assessments-and-preventing-algorithmic-bias>
     1. **process is finding and eliminating factors that cause bias.** For every model built, the HireVue team undergoes these steps:
        1. Auditing the performance data that is being used to train the model. We actively look for any bias in the input that can lead to a biased output.
        2. Carefully testing for the presence of adverse impact in the predictions of the model.
        3. Removing any factors that are proven to be contributing to biased results.
        4. Retraining the model.
        5. Iterating until adverse impact is addressed.
  2. Algorithms: <https://www.hirevue.com/blog/hiring/hirevue-assessments-and-preventing-algorithmic-bias>

Along with voice and facial recognition software, HireVue has a proprietary algorithm to determine which candidates are ideal for a specific job by analyzing their vocabulary, speech patterns, body language, tone, and facial expressions.

Best practices

* AI practitioners like OpenAI and the Future of Life Institute is already putting forth a set of design principles for making AI ethical and fair. One key principle is that AI should be designed so it can be audited and the bias found in it can be removed. <https://futureoflife.org/ai-principles/?submitted=1#confirmation>

Articles

Amazon’s system compared to others

1. <https://www.reuters.com/article/us-amazon-com-jobs-automation-insight/amazon-scraps-secret-ai-recruiting-tool-that-showed-bias-against-women-idUSKCN1MK08G>

Amazon Hiring Tool Sources:

<https://www.reuters.com/article/us-amazon-com-jobs-automation-insight/amazon-scraps-secret-ai-recruiting-tool-that-showed-bias-against-women-idUSKCN1MK08G>

<https://www.aclu.org/blog/womens-rights/womens-rights-workplace/why-amazons-automated-hiring-tool-discriminated-against>

<https://www.talentlyft.com/en/blog/article/414/the-ai-recruitment-evolution-from-amazons-biased-algorithm-to-contextual-understanding>

**Sagar**

1. How does AI-based screening work in various settings? (What tools are they using to post jobs and review resumes, internal or external systems)

Key details common throughout:

* Screening work anonymizes/masks key demographic details
  + Details such as age, gender, race...etc.
* AI screening interface interacts with HR platforms and staff
* Built in scanning and filtering of resumes to rank each candidate
* AI chatbots used to gather information from applicants to create relevant list of applicants
* Since AI screening cannot fully work without human interaction, some company hiring preferences tend to be picked up by the AI
* Some tools used
  + Candidate Screening
    - RecruiterBox
    - Ideal
    - Vervoe
  + Candidate Sourcing
    - Hiretual
    - Appcast
    - Shapr

Some Unique Processes:

* Some AI based screening occurs while candidate is utilizing the application portal
  + Information about candidate is being gathered through dashboard and the candidate’s interactivity with the application platform
  + Data analytics from this and advanced matchmaking techniques are then used to identify different attributes in candidates

Interviewing Process:

* New Digitized AI screening process
  + AI monitors key details such as speech pattern, word choices, facial expressions
* Some cases of AI only interviews where prompts are given to the interviewee and AI analyzes response using augmented intelligence

Source:

<https://ideal.com/ai-recruiting/>

<https://www.hrtechnologist.com/articles/recruitment-onboarding/4-essentials-of-an-ai-powered-candidate-screening-software/>

<https://vervoe.com/ai-recruitment/>

**Ruthwik**

1. What biases exist and where do biases come from?

<https://hbr.org/2019/05/all-the-ways-hiring-algorithms-can-introduce-bias>

<https://curiousthing.io/blog/insights/bias-in-ai-recruiting-technology>

<https://thrivemap.io/hiring-bias/>

Types of Biases:

* Institutional biases
* Historical biases
* Amplifying disadvantages in data points (like low GPA)

Sources of Bias:

* Limited amount of data - If the data that is being fed into the AI hiring system doesn’t represent a diverse set of candidates with a wide variety of attributes, the model will only focus on the limited number of attributes and think of them as desirable in candidates applying for a job.
* Biased data from prejudiced manual hiring practices - If a company already has some bias towards a particular group of people in their manual hiring practices and this data is used to train the model, the model will also give preference to this group since it believes these candidates will be successful in the job.

**Kristian**

1. What are some of the main methods to reduce biases in this particular setting? (Technical and general best practices)

<https://appen.com/blog/how-to-reduce-bias-in-ai/>

<https://hbr.org/2020/11/a-simple-tactic-that-could-help-reduce-bias-in-ai>

<https://techcrunch.com/2018/11/06/3-ways-to-avoid-bias-in-machine-learning/>

https://www.brookings.edu/research/algorithmic-bias-detection-and-mitigation-best-practices-and-policies-to-reduce-consumer-harms/

