

OSINT – Upwork

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## INTRODUCTION

Open-Source Intelligence (OSINT) involves gathering and analyzing publicly available information lawfully obtained from various sources. These sources include the internet, media, academic publications, and more. OSINT aids security professionals in understanding a company's vulnerabilities by accessing information accessible to potential threat actors. The goal here is to collaborate on an OSINT project to produce a report focusing on a chosen company. This entails collecting and analyzing data from online sources to provide insights, conduct risk assessments, and offer recommendations for improving the company's security.

Adhering to ethical guidelines and legal regulations, we collected data from diverse sources including corporate filings, social media platforms, job postings, domain registration records, and other online repositories. Our findings are the collaborative effort, pronounced by a critical analysis and cross-verification of data to guarantee accuracy and relevancy.

## FINDINGS

### 1. Company Profile

Upwork Global Inc., known as the world's largest freelancing platform, facilitates connections between businesses and independent talent globally. It emerged from the merger of Elance and oDesk in 2013 and was rebranded as Upwork in 2015. The platform is designed to serve a wide range of clients, from one-person startups to Fortune 100 enterprises, offering a large and diverse talent pool across more than 10,000 skills in fields such as website and app development, creative and design, customer support, finance and accounting, consulting, and operations. Upwork is comprised of over 850 employees globally as of late 2023, and the company holds 827,000 active clients out of the roughly 5 million total clients presently (Shewale, 2024).

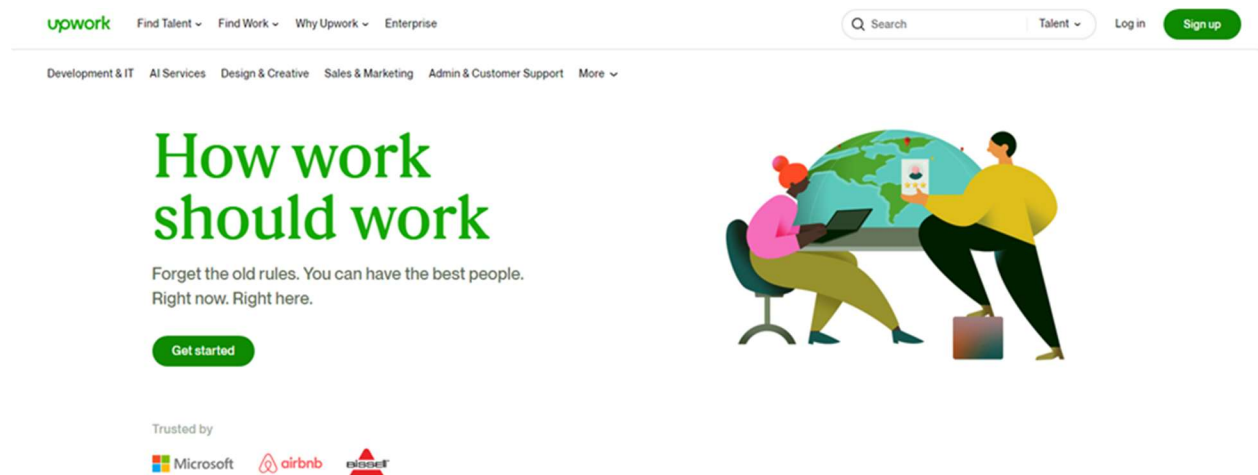


Figure 1: The home page of Upwork (Upwork, 2024).

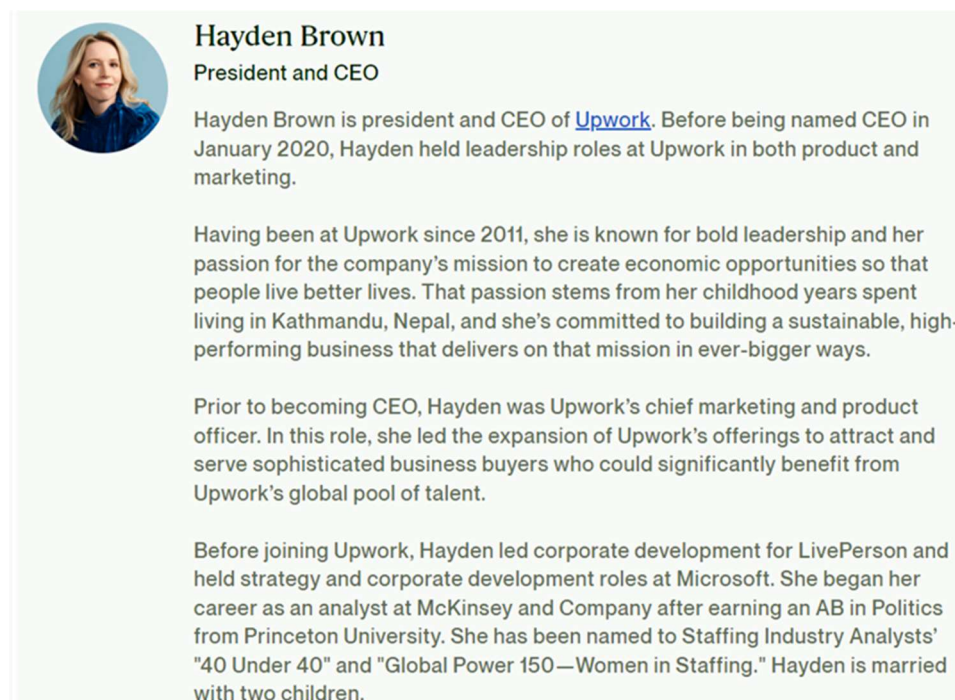
The business model of Upwork is centered around the relationship between freelancers and clients where the company takes a percentage of the freelancers' pay. Freelancers purchase

‘connects’ for the power to bid for jobs, and clients send a contract to the freelancer with job details such as pay rate and deadlines. Upwork CEO, Hayden Brown, has focused on serving the needs of larger Fortune 500 companies with higher skilled freelancers and ‘purged’ freelancers from their platform who did not have the desired skillset or experience.

Upwork's active engagement on major social media platforms, including LinkedIn, Instagram, Twitter, and Facebook, showcases its commitment to connecting with a diverse audience ranging from freelancers to enterprise clients. The company has an official blog on their website where topics such as social impacts, company news, statistics, and reports are discussed. This massive outreach on multiple platforms is meant to amplify their visibility and engagement with clients, freelancers, and prospective users, but this presence requires quite rigorous security measures in order to protect against social engineering attacks, phishing schemes, and other exploitative threats. Automated replies and scheduled posts have proven to be difficult to successfully implement and almost disastrous for some individuals and organizations. Upwork is active on all platforms they have associated with on their website: Instagram, Facebook, LinkedIn, Twitter, and YouTube.

## 2. Executive Leadership

OSINT on executive leadership is essential for evaluating leadership capabilities, decision-making patterns, and potential impacts on the company's direction and reputation. In the “Our Leaders” page on the Upwork website, they provide information about the executive leaders including previous work experience with named companies, formal education, and more. Below are some examples showcasing executive leadership with detailed information on their backgrounds.



**Hayden Brown**  
President and CEO

Hayden Brown is president and CEO of [Upwork](#). Before being named CEO in January 2020, Hayden held leadership roles at Upwork in both product and marketing.

Having been at Upwork since 2011, she is known for bold leadership and her passion for the company's mission to create economic opportunities so that people live better lives. That passion stems from her childhood years spent living in Kathmandu, Nepal, and she's committed to building a sustainable, high-performing business that delivers on that mission in ever-bigger ways.

Prior to becoming CEO, Hayden was Upwork's chief marketing and product officer. In this role, she led the expansion of Upwork's offerings to attract and serve sophisticated business buyers who could significantly benefit from Upwork's global pool of talent.

Before joining Upwork, Hayden led corporate development for LivePerson and held strategy and corporate development roles at Microsoft. She began her career as an analyst at McKinsey and Company after earning an AB in Politics from Princeton University. She has been named to Staffing Industry Analysts' "40 Under 40" and "Global Power 150—Women in Staffing." Hayden is married with two children.

*Figure 2: Screenshot of Upwork's President and CEO 2022 Annual Report (Upwork, 2023).*



## Brian Levey

### Chief Business Affairs and Legal Officer

Brian Levey oversees Upwork's legal, regulatory and government affairs functions globally and engages stakeholders to promote Upwork's reputation through corporate affairs initiatives.

Brian has more than 15 years of legal experience focused on the intersection of the internet and technology. Prior to joining Upwork, Brian served in a global leadership role at eBay Inc. for more than a decade, where he began as eBay's first corporate attorney and most recently served as its Deputy General Counsel. Before joining eBay, Brian served as VP, Legal with Metro-Goldwyn-Mayer Inc. and as a corporate attorney at Latham & Watkins. In 2017, Brian was named one of the world's Top 20 General Counsels by The Financial Times.

Brian holds a law degree from Stanford Law School, where he was an Associate Editor of the Stanford Law Review, and a bachelor's degree in economics, with honors and distinction, from Stanford University.

*Figure 3: Screenshot of Chief Business Affairs and Legal Officer (Upwork, 2023).*



## Melissa Waters

### Chief Marketing Officer

Melissa Waters is Chief Marketing Officer of Upwork, where she oversees Upwork's global marketing team. With more than 15 years of experience in high-growth companies, Melissa drives brand and product awareness as well as consumer engagement for the world's work marketplace.

Prior to joining Upwork at the start of 2022, Melissa was Global VP of Marketing at Meta-owned platform, Instagram, where she led brand and product marketing for the company's billions of users. Before Meta, Melissa held senior marketing leadership roles at Hims & Hers, Lyft, and Pandora.

Melissa holds an MBA from Babson College and a BA with honors in public relations and journalism from the University of Houston.

*Figure 4: Screenshot of Chief Marketing Officer (Upwork, 2023).*



## Erica Gessert

Chief Financial Officer

Erica Gessert is Chief Financial Officer at Upwork, where she oversees Upwork's global finance team and operations.

Erica has more than 20 years of finance, operations, analytics and investor relations experience supporting technology companies. Prior to joining Upwork, Erica served in a number of senior executive finance roles for PayPal, most recently Chief Transformation Officer, reporting to the CEO. Previously, Erica held finance and investor relations leadership positions at Sprint Corporation and Virgin Mobile USA.

Erica studied economics and philosophy at Reed College.

*Figure 5: Screenshot of Chief Financial Officer (Upwork, 2023).*



## Sunita Solao

Chief People Officer

As Chief People Officer at Upwork, Sunita is responsible for driving innovation in the company's workforce strategy and designing a world-class team member experience to support both its corporate employees and independent professionals from around the world that are part of the Upwork team.

Prior to joining Upwork, Sunita previously served as vice president, people at Convoy reporting to the CEO, and held several HR and people leadership positions at eBay and Airbnb, including head of people for Airbnb's Homes Business division.

Sunita holds M.B.As in Human Resource Management from the University of Wisconsin-Madison and Symbiosis International University and a B.E. in Chemical Engineering from BITS, Pilani, India.

*Figure 6: Screenshot of Chief People Officer (Upwork, 2023).*





## Dave Bottoms

GM, Marketplace

Dave Bottoms leads Upwork's Marketplace organization, a global team responsible for the core Talent Marketplace, search & discovery, ads & monetization, core mobile experiences, as well as new product innovation and analytics.

Dave brings more than 20 years of experience in Silicon Valley to Upwork. He joined the company in 2022 from Meta, where he led the Ads Manager Platform and Experiences team responsible for the flagship enterprise product used by millions of small businesses and global advertisers to drive valuable business outcomes across Facebook and Instagram. Prior to Meta, Dave led the self-service customer growth team at Dropbox, and multiple teams at Yahoo!.

Dave holds a BA in English literature from Denison University.

*Figure 7: Screenshot of GM in Marketplace (Upwork, 2023).*



## Andrew Rabinovich

VP, Head of AI & Machine Learning

Andrew Rabinovich is VP and head of artificial intelligence (AI) & machine learning (ML) at Upwork, where he leads all aspects of the company's transformation to compete in the age of AI.

Andrew has been studying machine learning with an emphasis in computer vision and multimodal AI for over 20 years. He has authored more than 100 peer-reviewed publications and patents. Andrew worked for years in R&D leadership positions at Google. In 2015, he joined the preeminent AR company Magic Leap as head of AI, focused on perception and human-centered AI for mixed and augmented reality. In 2020, Andrew co-founded Headroom, an AI-powered video conferencing platform. In 2023, Headroom was acquired by Upwork, with Andrew and the Headroom team joining the company.

Andrew holds a Ph.D. in computer science from University of California San Diego.

*Figure 8: Screenshot of VP and Head of AI & Machine Learning (Upwork, 2023).*

A lot of information is given from the executives' profiles, including names and pictures along with the varying job titles in the company.

### 3. Employee Personas

Employee personas can affect the image of a company. Whether it's online or in-person. In Upwork's case it's primarily remote and online. One of the easiest ways to find that out is by searching LinkedIn, which can be referred to as the “work” social media for jobs.

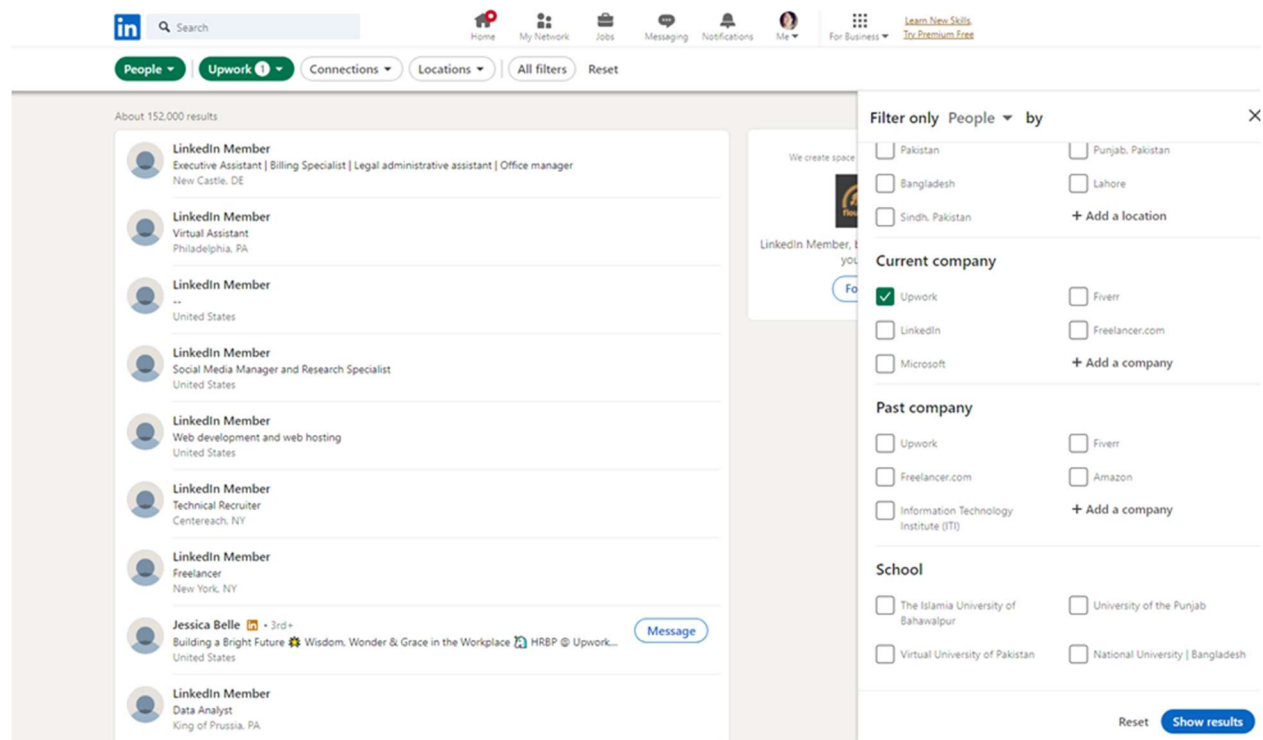
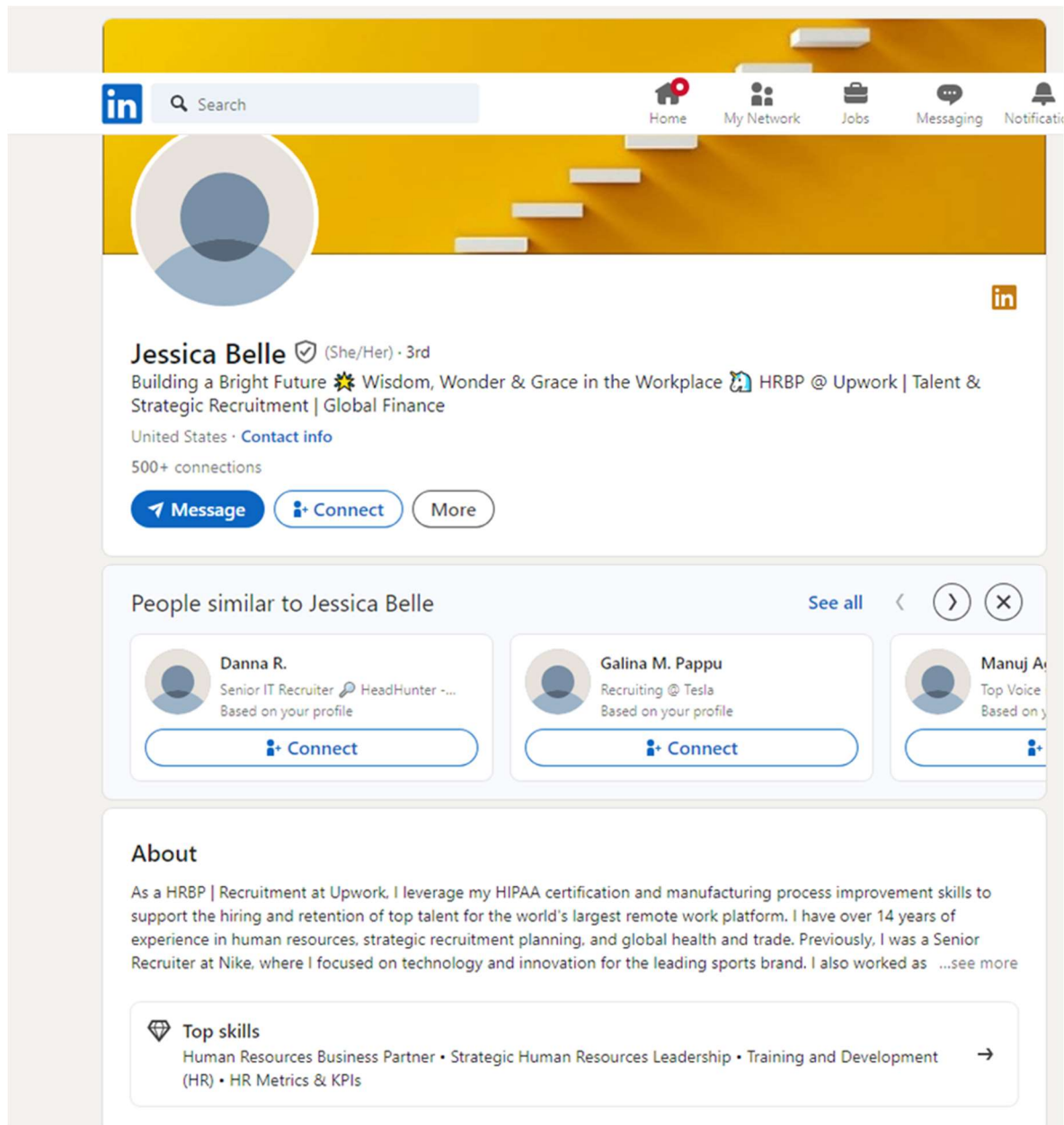


Figure 9: A quick LinkedIn search for Upwork with filtered results (LinkedIn, n.d.).

By narrowing some search results, it's quickly found who currently works for Upwork. Note the search results above on the right side and how they can be filtered. On the left side of the image, some names are hidden, but it shows the titles and locations. Another interesting note from clicking through the results is how there are no employee pictures displayed. There's still enough information to still search. Let's investigate further by using one of the names above.



*Figure 10: Continuing the employee persona search, we have a further look into this employee at Upwork relating to their position and a generalized location (Jessica Belle, n.d.).*

It was a bit difficult to find, but Upwork has this employee listed on their home site as well. After doing a simple Google search, there were no social media accounts tied to this name, however, in the next instance we find a closer location. Such information gathering is a form of social engineering tactics.



The image shows a screenshot of an Upwork profile for Jessica B. The profile includes a profile picture, a verified badge, and a location of Puyallup, WA. It also displays a 100% job success rate and a 'Top Rated' status. The main section of the profile is titled 'Human Resources Professional and Virtual Assistant' with a rate of \$45.00/hr. A bio describes her as a detail-oriented virtual admin with extensive experience in human resources, including benefits, employee relations, talent acquisition, recruitment, and training. The 'Work history' section shows 11 completed jobs and 2 in progress. One specific job listed is '401k Payroll Template Uploads' from March 6, 2024, to the present. The profile also shows a 'View profile' button, an 'All work' button, and a 'Sign up' button for clients. A sidebar on the left shows '12 Total jobs' and '2 Total hours'.

Figure 11: A further in-depth look at an Upwork employee on their home site. It shows the same name with a photo and a more precise location (Upwork, n.d.).

After searching, only one result came up on Facebook of the same possible person in Washington state, but the details were private. It's safe to say that employees of Upwork either change their name to protect themselves or change their location. But enough information is given about certain employees that it can be a little easier for social engineering tactics, as demonstrate in these findings.

#### 4. Financials

Financial analysis is vital in OSINT for understanding an organization's stability, growth, and strategy. By examining financial statements and metrics, analysts can assess health, detect risks, and support decision-making. It provides insights into fraud, resource allocation, and business direction, aiding stakeholders in forming a complete picture of the organization's performance and prospects. Upwork has public annual reports which will be showcased below. The data ranges in operational metrics, stockholders' equity, and cash flows.

### Key Financial and Operational Metrics

We monitor the following key financial and operational metrics to evaluate our business, measure our performance, identify trends affecting our business, formulate business plans, and make strategic decisions.

Our key metrics were as follows as of or for the periods presented:

	As of or for the Year Ended December 31,					
(In thousands, except GSV per active client and percentages)	2022	% Change	2021	% Change	2020	% Change
GSV	\$ 4,104,891	16 %	\$ 3,546,774	41 %	\$ 2,523,649	21 %
Marketplace revenue	\$ 566,623	23 %	\$ 462,340	37 %	\$ 338,152	26 %
Marketplace take rate	14.0 %	0.8 %	13.2 %	(0.4)%	13.6 %	0.5 %
Net loss	\$ (89,885)	(60)%	\$ (56,240)	(146)%	\$ (22,867)	(37)%
Adjusted EBITDA <sup>(1)</sup>	\$ (4,029)	(121)%	\$ 19,127	36 %	\$ 14,022	89 %
Active clients	814	6 %	771	22 %	633	17 %
GSV per active client	\$ 5,045	10 %	\$ 4,599	15 %	\$ 3,989	3 %

Figure 12: Screenshot of key financial metrics of 2020 to 2022 from the 2022 Annual Report (Upwork, 2023).

## Results of Operations

The following table sets forth our consolidated results of operations for the years ended December 31, 2022, 2021, and 2020:

(In thousands)	2022	2021	2020
Revenue:			
Marketplace	\$ 566,623	\$ 462,340	\$ 338,152
Managed services	51,695	40,457	35,476
Total revenue	618,318	502,797	373,628
Cost of revenue <sup>(1)</sup>	160,402	135,508	104,267
Gross profit	457,916	367,289	269,361
Operating expenses			
Research and development <sup>(1)</sup>	154,553	119,083	83,471
Sales and marketing <sup>(1)</sup>	246,882	183,294	133,225
General and administrative <sup>(1)</sup>	123,952	113,081	71,518
Provision for transaction losses	25,153	6,048	3,555
Total operating expenses	550,540	421,506	291,769
Loss from operations	(92,624)	(54,217)	(22,408)
Interest expense	4,483	2,180	778
Other income, net	(7,758)	(279)	(469)
Loss before income taxes	(89,349)	(56,118)	(22,717)
Income tax provision	(536)	(122)	(150)
Net loss	\$ (89,885)	\$ (56,240)	\$ (22,867)
<sup>(1)</sup> Includes stock-based compensation expense as follows:			
Cost of revenue	\$ 1,356	\$ 794	\$ 779
Research and development	26,881	16,232	9,783
Sales and marketing	11,511	5,923	4,440
General and administrative	35,753	30,643	10,506
Total	\$ 75,501	\$ 53,592	\$ 25,508

Figure 13: Screenshot of consolidation results of operations (Upwork, 2023).

**UPWORK INC.**  
**CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY**  
For the Years Ended December 31, 2022, 2021, and 2020

(In thousands, except share amounts)	Common Stock		Additional Paid-in Capital	Accumulated Other Comprehensive Loss	Accumulated Deficit	Total Stockholders' Equity
	Shares	Amount				
Balances as of December 31, 2019	113,604,398	\$ 11	\$ 431,333	\$ 37	\$ (171,957)	\$ 259,424
Issuance of common stock upon exercise of stock options and common stock warrants	9,115,947	1	31,027	—	—	31,028
Stock-based compensation expense	—	—	25,677	—	—	25,677
Issuance of common stock for settlement of RSUs	1,590,225	—	—	—	—	—
Tides Foundation common stock warrant expense and other	—	—	1,153	—	—	1,153
Issuance of common stock in connection with employee stock purchase plan	484,652	—	4,913	—	—	4,913
Unrealized loss on marketable securities	—	—	—	(18)	—	(18)
Net loss	—	—	—	—	(22,867)	(22,867)
Balances as of December 31, 2020	124,795,222	12	494,103	19	(194,824)	299,310
Issuance of common stock upon exercise of stock options and common stock warrants	2,085,698	1	7,176	—	—	7,177
Stock-based compensation expense	—	—	53,671	—	—	53,671
Issuance of common stock for settlement of RSUs	1,865,444	—	1	—	—	1
Tides Foundation common stock warrant expense and other	—	—	749	—	—	749
Issuance of common stock in connection with employee stock purchase plan	384,114	—	4,789	—	—	4,789
Purchase of capped calls related to convertible senior notes	—	—	(49,393)	—	—	(49,393)
Unrealized loss on marketable securities	—	—	—	(547)	—	(547)
Net loss	—	—	—	—	(56,240)	(56,240)
Balances as of December 31, 2021	129,130,478	13	511,096	(528)	(251,064)	259,517
Issuance of common stock upon exercise of stock options	412,171	—	1,642	—	—	1,642
Stock-based compensation expense	—	—	75,618	—	—	75,618
Issuance of common stock for settlement of RSUs	2,553,300	—	—	—	—	—
Tides Foundation common stock warrant expense and other	—	—	750	—	—	750
Issuance of common stock in connection with employee stock purchase plan	272,316	—	3,794	—	—	3,794
Unrealized loss on marketable securities	—	—	—	(2,557)	—	(2,557)
Net loss	—	—	—	—	(89,885)	(89,885)
Balances as of December 31, 2022	132,368,265	\$ 13	\$ 592,900	\$ (3,085)	\$ (340,949)	\$ 248,879

The accompanying notes are an integral part of these consolidated financial statements.

Figure 14: Screenshot of stockholder equity (Upwork, 2023).

**UPWORK INC.**  
**CONSOLIDATED STATEMENTS OF CASH FLOWS**  
For the Years Ended December 31, 2022, 2021, and 2020

(In thousands)	2022	2021	2020
<b>CASH FLOWS FROM OPERATING ACTIVITIES:</b>			
Net loss	\$ (89,885)	\$ (56,240)	\$ (22,867)
Adjustments to reconcile net loss to net cash provided by operating activities:			
Provision for transaction losses	23,306	5,178	2,919
Depreciation and amortization	8,057	10,261	10,172
Amortization of debt issuance costs	2,961	1,182	61
Amortization of premium (accretion of discount) of purchases of marketable securities, net	(1,486)	298	(320)
Amortization of operating lease asset	3,079	3,545	3,860
Tides Foundation common stock warrant expense	750	750	750
Stock-based compensation expense	75,501	53,592	25,508
Impairment expense	—	8,741	—
Loss on disposal of fixed assets	—	—	44
Changes in operating assets and liabilities:			
Trade and client receivables	(20,230)	(24,610)	(20,000)
Prepaid expenses and other assets	(630)	(6,960)	(1,198)
Operating lease liability	(5,389)	(1,163)	(1,851)
Accounts payable	2,579	(1,445)	5,822
Accrued expenses and other liabilities	3,689	10,253	15,438
Deferred revenue	4,257	7,454	4,027
Net cash provided by operating activities	6,559	10,836	22,365
<b>CASH FLOWS FROM INVESTING ACTIVITIES:</b>			
Purchases of marketable securities	(581,887)	(525,343)	(107,281)
Proceeds from maturities of marketable securities	521,152	102,500	117,500
Purchases of property and equipment	(1,248)	(1,027)	(6,320)
Internal-use software and platform development costs	(7,485)	(5,110)	(8,045)
Net cash used in investing activities	(69,468)	(428,980)	(4,146)
<b>CASH FLOWS FROM FINANCING ACTIVITIES:</b>			
Changes in escrow funds payable	645	25,771	26,321
Proceeds from exercises of stock options and common stock warrant	1,643	7,177	31,028
Proceeds from employee stock purchase plan	3,794	4,789	4,913
Proceeds from borrowings on debt	—	—	18,000
Repayment of debt	—	(10,750)	(25,621)
Proceeds from issuance of convertible senior notes	—	575,000	—
Payment of debt issuance costs	—	(14,855)	—
Purchases of capped calls related to convertible senior notes	—	(49,393)	—
Net cash provided by financing activities	6,082	537,739	54,641
<b>NET CHANGE IN CASH, CASH EQUIVALENTS, AND RESTRICTED CASH</b>	<b>(56,827)</b>	<b>119,595</b>	<b>72,860</b>
Cash, cash equivalents, and restricted cash—beginning of year	352,058	232,463	159,603
Cash, cash equivalents, and restricted cash—end of year	<u>\$ 295,231</u>	<u>\$ 352,058</u>	<u>\$ 232,463</u>

<b>SUPPLEMENTAL DISCLOSURE OF CASH FLOW INFORMATION:</b>			
Cash paid for interest	\$ 1,541	\$ 373	\$ 764
<b>SUPPLEMENTAL DISCLOSURES OF NON-CASH INVESTING AND FINANCING ACTIVITIES:</b>			
Property and equipment purchased but not yet paid	—	22	37
Internal-use software and platform development costs incurred but not yet paid	73	106	286

Figure 15: Screenshot of cash flow statements (Upwork, 2023).



## 5. Network

By utilizing CentralOps' domain dossier tool, we were able to find information regarding Upwork's DNS information. Upwork.com's domain is registered under MarkMonitor Inc., a reputable entity known for guarding brand names against cyber threats. The domain's Whois records unveil multiple security directives such as clientTransferProhibited and serverUpdateProhibited, which serve as safeguards against unauthorized domain transfers or modifications.

### Domain Whois record

Queried [whois.internic.net](https://whois.internic.net) with "dom upwork.com"...

```
Domain Name: UPWORK.COM
Registry Domain ID: 83168418_DOMAIN_COM-VRSN
Registrar WHOIS Server: whois.markmonitor.com
Registrar URL: http://www.markmonitor.com
Updated Date: 2023-12-29T09:03:53Z
Creation Date: 2002-01-30T13:10:35Z
Registry Expiry Date: 2026-01-30T13:10:35Z
Registrar: MarkMonitor Inc.
Registrar IANA ID: 292
Registrar Abuse Contact Email: abusecomplaints@markmonitor.com
Registrar Abuse Contact Phone: +1.2086851750
Domain Status: clientDeleteProhibited https://icann.org/epp#clientDeleteProhibited
Domain Status: clientTransferProhibited https://icann.org/epp#clientTransferProhibited
Domain Status: clientUpdateProhibited https://icann.org/epp#clientUpdateProhibited
Domain Status: serverDeleteProhibited https://icann.org/epp#serverDeleteProhibited
Domain Status: serverTransferProhibited https://icann.org/epp#serverTransferProhibited
Domain Status: serverUpdateProhibited https://icann.org/epp#serverUpdateProhibited
Name Server: FAY.NS.CLOUDFLARE.COM
Name Server: JIM.NS.CLOUDFLARE.COM
DNSSEC: unsigned
URL of the ICANN Whois Inaccuracy Complaint Form: https://www.icann.org/wicf/
>>> Last update of whois database: 2024-03-25T02:03:35Z <<<
```

Figure 16: Upwork.com Domain Whois record (CentralOps, n.d.).

Queried [whois.markmonitor.com](https://whois.markmonitor.com) with "upwork.com"...

```
Domain Name: upwork.com
Registry Domain ID: 83168418_DOMAIN_COM-VRSN
Registrar WHOIS Server: whois.markmonitor.com
Registrar URL: http://www.markmonitor.com
Updated Date: 2023-12-29T09:03:53+0000
Creation Date: 2002-01-30T13:10:35+0000
Registrar Registration Expiration Date: 2026-01-30T00:00:00+0000
Registrar: MarkMonitor, Inc.
Registrar IANA ID: 292
Registrar Abuse Contact Email: abusecomplaints@markmonitor.com
Registrar Abuse Contact Phone: +1.2086851750
Domain Status: clientUpdateProhibited (https://www.icann.org/epp#clientUpdateProhibited)
Domain Status: clientTransferProhibited (https://www.icann.org/epp#clientTransferProhibited)
Domain Status: clientDeleteProhibited (https://www.icann.org/epp#clientDeleteProhibited)
Domain Status: serverUpdateProhibited (https://www.icann.org/epp#serverUpdateProhibited)
Domain Status: serverTransferProhibited (https://www.icann.org/epp#serverTransferProhibited)
Domain Status: serverDeleteProhibited (https://www.icann.org/epp#serverDeleteProhibited)
Registrant Organization: Upwork
Registrant State/Province: CA
Registrant Country: US
Registrant Email: Select Request Email Form at https://domains.markmonitor.com/whois/upwork.com
Admin Organization: Upwork
Admin State/Province: CA
Admin Country: US
Admin Email: Select Request Email Form at https://domains.markmonitor.com/whois/upwork.com
Tech Organization: Upwork
Tech State/Province: CA
Tech Country: US
Tech Email: Select Request Email Form at https://domains.markmonitor.com/whois/upwork.com
Name Server: fay.ns.cloudflare.com
Name Server: jim.ns.cloudflare.com
DNSSEC: unsigned
URL of the ICANN WHOIS Data Problem Reporting System: http://wdprs.internic.net/
>>> Last update of WHOIS database: 2024-03-25T02:03:47+0000 <<<
```

Figure 17: Whois.markmonitor.com with upwork.com—DNS whois (CentralOps, n.d.).

A great aspect of Upwork's network infrastructure is its use of Cloudflare's services, as indicated by its two different DNS servers (Fay.ns.cloudflare.com and Jim.ns.cloudflare.com). Cloudflare is widely known for its DDoS protection and content delivery network services, which are key for enhancing website performance and protection against cyber-attacks. The IP addresses (104.18.90.237 and 104.18.89.237) assigned to Upwork.com are part of Cloudflare's network as well. (CentralOps, n.d.). The domain registration of upwork.com expires in early 2026 and was last updated late 2023 with two IP addresses listed: '104.18.89.237' and '104.18.90.237'. This domain was registered in early 2002, which may indicate the use of a complex legacy system infrastructure. The domain is registered with MarkMonitor Inc., a reputable domain registrar known for its focus on corporate brand protection. DNSSEC is not explicitly mentioned for the initial WHOIS scan. The domain uses Cloudflare's nameservers (fay.ns.cloudflare.com and jim.ns.cloudflare.com), showing that Upwork utilizes Cloudflare's DNS and CDN services. The domain's status codes, including "clientDeleteProhibited", "clientTransferProhibited", and "clientUpdateProhibited", as well as "serverDeleteProhibited", "serverTransferProhibited", and "serverUpdateProhibited", exhibit restrictions placed on the domain to prevent unauthorized changes.

## Network Whois record

Queried [whois.arin.net](https://whois.arin.net) with "n 104.18.90.237"...

NetRange: 104.16.0.0 - 104.31.255.255  
CIDR: 104.16.0.0/12  
NetName: CLOUDFLARENET  
NetHandle: NET-104-16-0-0-1  
Parent: NET104 (NET-104-0-0-0-0)  
NetType: Direct Allocation  
OriginAS: AS13335  
Organization: Cloudflare, Inc. (CLOUD14)  
RegDate: 2014-03-28  
Updated: 2021-05-26  
Comment: All Cloudflare abuse reporting can be done via <https://www.cloudflare.com/abuse>  
Ref: <https://rdap.arin.net/registry/ip/104.16.0.0>

OrgName: Cloudflare, Inc.  
OrgId: CLOUD14  
Address: 101 Townsend Street  
City: San Francisco  
StateProv: CA  
PostalCode: 94107  
Country: US  
RegDate: 2010-07-09  
Updated: 2021-07-01  
Ref: <https://rdap.arin.net/registry/entity/CLOUD14>

OrgAbuseHandle: ABUSE2916-ARIN  
OrgAbuseName: Abuse  
OrgAbusePhone: +1-650-319-8930  
OrgAbuseEmail: [abuse@cloudflare.com](mailto:abuse@cloudflare.com)  
OrgAbuseRef: <https://rdap.arin.net/registry/entity/ABUSE2916-ARIN>

OrgTechHandle: ADMIN2521-ARIN  
OrgTechName: Admin  
OrgTechPhone: +1-650-319-8930  
OrgTechEmail: [rir@cloudflare.com](mailto:rir@cloudflare.com)  
OrgTechRef: <https://rdap.arin.net/registry/entity/ADMIN2521-ARIN>

OrgNOCHandle: CLOUD146-ARIN  
OrgNOCName: Cloudflare-NOC  
OrgNOCPhone: +1-650-319-8930  
OrgNOCEmail: [noc@cloudflare.com](mailto:noc@cloudflare.com)  
OrgNOCRef: <https://rdap.arin.net/registry/entity/CLOUD146-ARIN>

OrgRoutingHandle: CLOUD146-ARIN  
OrgRoutingName: Cloudflare-NOC  
OrgRoutingPhone: +1-650-319-8930  
OrgRoutingEmail: [noc@cloudflare.com](mailto:noc@cloudflare.com)  
OrgRoutingRef: <https://rdap.arin.net/registry/entity/CLOUD146-ARIN>

RNOCHandle: NOC11962-ARIN  
RNOCName: NOC  
RNOCPhone: +1-650-319-8930  
RNOCEmail: [noc@cloudflare.com](mailto:noc@cloudflare.com)  
RNOCRef: <https://rdap.arin.net/registry/entity/NOC11962-ARIN>

RAbuseHandle: ABUSE2916-ARIN  
RAbuseName: Abuse  
RAbusePhone: +1-650-319-8930  
RAbuseEmail: [abuse@cloudflare.com](mailto:abuse@cloudflare.com)  
RAbuseRef: <https://rdap.arin.net/registry/entity/ABUSE2916-ARIN>

Figure 18: *upwork.com* network Whois records (CentralOps, n.d.).

As for the DNS records, they indicate how internet traffic is routed to *upwork.com* and how the services associated with this domain are managed. The HINFO type records are used to specify host and server type, but the CPU is named as RFC8482. This placeholder references RFC 8482 guidelines, in which they're being adhered to by hiding the real CPU name and OS information. DNS resolution is hosted by Cloudflare's infrastructure with 'kevin.ns.cloudflare.com' and 'cruz.ns.cloudflare.com' being the nameservers for the reverse DNS of the IP address.

## DNS records

name	class	type	data	time to live
upwork.com	IN	HINFO	CPU: RFC8482 OS:	3600s (01:00:00)
upwork.com	IN	NS	jim.ns.cloudflare.com	86400s (1.00:00:00)
upwork.com	IN	NS	fay.ns.cloudflare.com	86400s (1.00:00:00)
237.90.18.104.in-addr.arpa	IN	HINFO	CPU: RFC8482 OS:	3600s (01:00:00)
18.104.in-addr.arpa	IN	NS	kevin.ns.cloudflare.com	39852s (11:04:12)
18.104.in-addr.arpa	IN	NS	cruz.ns.cloudflare.com	39852s (11:04:12)

## Traceroute

Tracing route to upwork.com [104.18.90.237]...

hop	rtt	rtt	rtt	ip address	fully qualified domain name
1	1	2	0	169.254.158.58	
2	1	1	1	169.48.118.162	ae103.ppr04.dal13.networklayer.com
3	4	3	0	169.48.118.134	86.76.30a9.ip4.static.sl-reverse.com
4	*	2	2	169.45.18.40	ae16.cbs02.dr01.dal04.networklayer.com
5	1	1	1	169.45.18.101	65.12.2da9.ip4.static.sl-reverse.com
6	2	*	*	206.223.118.145	111100.dal.equinix.com
7	8	5	9	141.101.74.100	
8	2	2	2	104.18.90.237	

Trace complete

Figure 19: upwork.com DNS records and ping traceroute records (CentralOps, n.d.).

```
Service scan
FTP - 21      Error: Timeout
SMTP - 25     Error: Timeout
HTTP - 80     HTTP/1.1 301 Moved Permanently
              Date: Mon, 25 Mar 2024 02:03:54 GMT
              Connection: close
              Cache-Control: max-age=3600
              Expires: Mon, 25 Mar 2024 02:03:54 GMT
              Location: https://www.upwork.com
              Set-Cookie: __cf_bm=fp12V7800STEF7FX12aTE2e4WseIa7FC2ep8-1711332235-1.0.1.1-HoVYue2_38c2U0etpYk0deW0G1dQ111Eha20e99CH8E0CEEF8F0A102r2_3hiv9vuIzF80q9vryL33GA; path=/; expires=Mon, 25-Mar-24 02:03:54 GMT; domain=.upwork.com; HttpOnly; SameSite=None
              X-Content-Type-Options: nosniff
              Server: cloudflare
              CF-RAY: 66b3b28fda778-CPN
              alt-svc: h3="443"; ma=86400
POP3 - 110    Error: Timeout
IMAP - 143    Error: Timeout
HTTPS - 443    Certificate validation error: None
              Signature Algorithm: sha256RSA
              Public key size: 2048 bits
              Issuer: CN=DigiCert Global G2 TLS RSA SHA256 2020 CA1, O=DigiCert Inc, C=US
              Subject: CN=*.upwork.com, C=Upwork Global Inc., L=San Francisco, S=California, C=US
              Subject Alternative Name: DNS Name=*.upwork.com, DNS Name=upwork.com
              Serial number: 072E2408E938C53C2F871C073A2F2
              Not valid before: 2023-04-24 00:00:00Z
              Not valid after: 2024-03-23 23:59:59Z
              SHA1 fingerprint: 0660041F4C8E728FD47C139C8C3C8A01398C8D62
              HTTP/1.1 403 Forbidden
              Date: Mon, 25 Mar 2024 02:03:55 GMT
              Content-Type: text/html; charset=UTF-8
              Content-Length: 13527
              Connection: close
              Accept-CH: Sec-CH-UA-Bitness, Sec-CH-UA-Arch, Sec-CH-UA-Full-Version, Sec-CH-UA-Mobile, Sec-CH-UA-Model, Sec-CH-UA-Platform-Version, Sec-CH-UA-Platform, Sec-CH-UA-Bitness, UA-Arch, UA-Full-Version, UA-Mobile, UA-Model, UA-Platform-Version, UA-Platform, UA
              Cross-Origin-Embedder-Policy: require-corp
              Cross-Origin-Opener-Policy: same-origin
              Cross-Origin-Resource-Policy: same-origin
              Origin-Agent-Cluster: ?
              Permissions-Policy: accelerometer=(),autoplay=(),background=(),camera=(),clipboard-read=(),clipboard-write=(),geolocation=(),gyroscope=(),hid=(),interest-cohort=(),magnetometer=(),microphone=(),payment=(),publickey-credential-get=(),screen-wake-lock=(),serial=(),sync=(),usb=()
              Referer-Policy: same-origin
              X-Frame-Options: SAMEORIGIN
              cf-chl-vart: 5BqyV9wG2Guew32Qv4dGdg7YU7gWVC7kTpb74d8e8odU13o-118YEP8dyYNS80fw0Dk78ETwPV-09003gde4dF9LNGqivFv0R0112oVW5e1aHd6L78h/iC9C1N8R8uFc1P61a=412pnd8d8topdMxf4X3ACA=
              Cache-Control: private, max-age=0, no-store, no-cache, must-revalidate, post-check=0, pre-check=0
              Expires: Thu, 01 Jan 1970 00:00:00 GMT
              Set-Cookie: __cf_bm=2mCeyEBC5d3.Jad7W6A07urTszgguDu97h31jvUT0-1711332235-1.0.1.1-0t3M69..7Yoc8OTpi8I2VwVW07Y8pp9_8f3l30xal1maEagq8H6Vj49AhdgprFFN0Uq3qFh3022v0tr7wq; path=/; expires=Mon, 25-Mar-24 02:03:55 GMT; domain=.upwork.com; HttpOnly; Secure; SameSite=None
              Strict-Transport-Security: max-age=31536000; includeSubDomains; preload
              X-Content-Type-Options: nosniff
              Server: cloudflare
              CF-RAY: 66b3b28fda778-CPN
              alt-svc: h3="443"; ma=86400
```

Figure 20: upwork.com service port scan results (CentralOps, n.d.).

A scan of service ports (e.g., FTP, SMTP, POP3, IMAP) revealed that these were not openly accessible, indicative of good security practices to minimize the attack surface. Furthermore, the automatic redirection from HTTP to HTTPS emphasizes the importance of balancing integrity, confidentiality, and integrity of company/client data by enforcing secure connections, thereby safeguarding user interactions from potential eavesdropping or data tampering. The HTTP result shows a 301 Moved Permanently status, hinting that any HTTP traffic is redirected to HTTPS. The certificate details reveal the issuer (DigiCert), the subject (common name \*.upwork.com, and additional DNS names), and the validity period, indicating a properly secured communication channel.

## 6. Social Media

Social media is a powerful tool for any business, artist, freelancer, or creator of some kind. Upwork does just that by selling the dream of schedule flexibility, working from anywhere in the world, and mostly working for yourself with an array of skillsets. Upwork has multiple platforms and apps for both clients and freelancers. Below is their Instagram social media page with bright colors and variety for their Instagram presence. There are smiling faces and posts that seem to cater to modernized living while engaging with the audience.

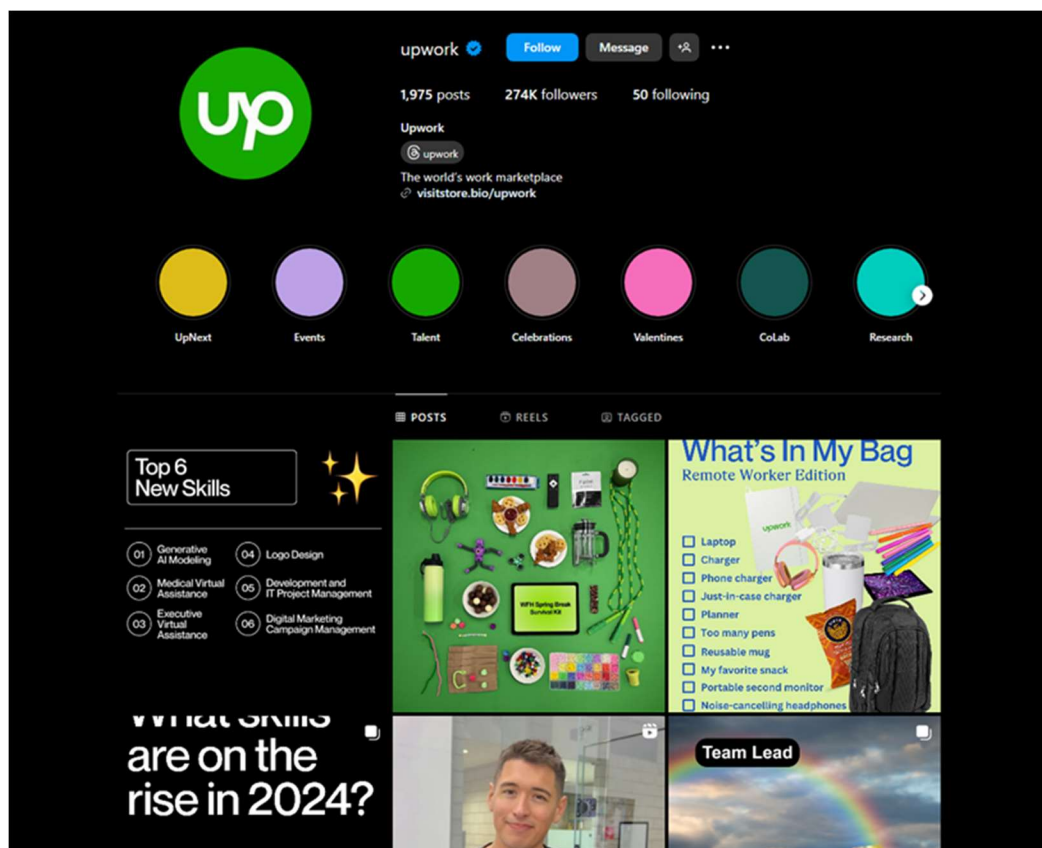


Figure 21: Upwork's social media presence on Instagram (Upwork, n.d.).



To continue with the image on social media via Instagram, let's take a closer look at a post not pictured above. This post shows engagements from a variety of people to cater to modern living with freedom and schedule flexibility while using some familiar song lyrics from a popular musician.



*Figure 22: Upwork on Instagram showcasing the remote work-life balance lifestyle. The comments are also engaging as it tailored to those who want the work lifestyle (Upwork, n.d.).*

By using modern technologies and platforms at hand, Upwork caters to unique lifestyles working from home or anywhere with internet access, and tries to market that strategy. Additionally, Upwork continues with that image on Twitter and Facebook. Twitter follows a similar style to their Instagram page.



*Figure 23: Upwork's social media presence uses Twitter and showcases freelance work and recently their 2024 In-Demand Skills (Upwork, n.d.).*

Continuing the social media path, Upwork's YouTube presentation utilizes a similar but different approach and provides multiple video representations of their brand beginning with some humored video shorts where decades ago a 9-5 is industry standard for jobs, but Upwork is changing the game.

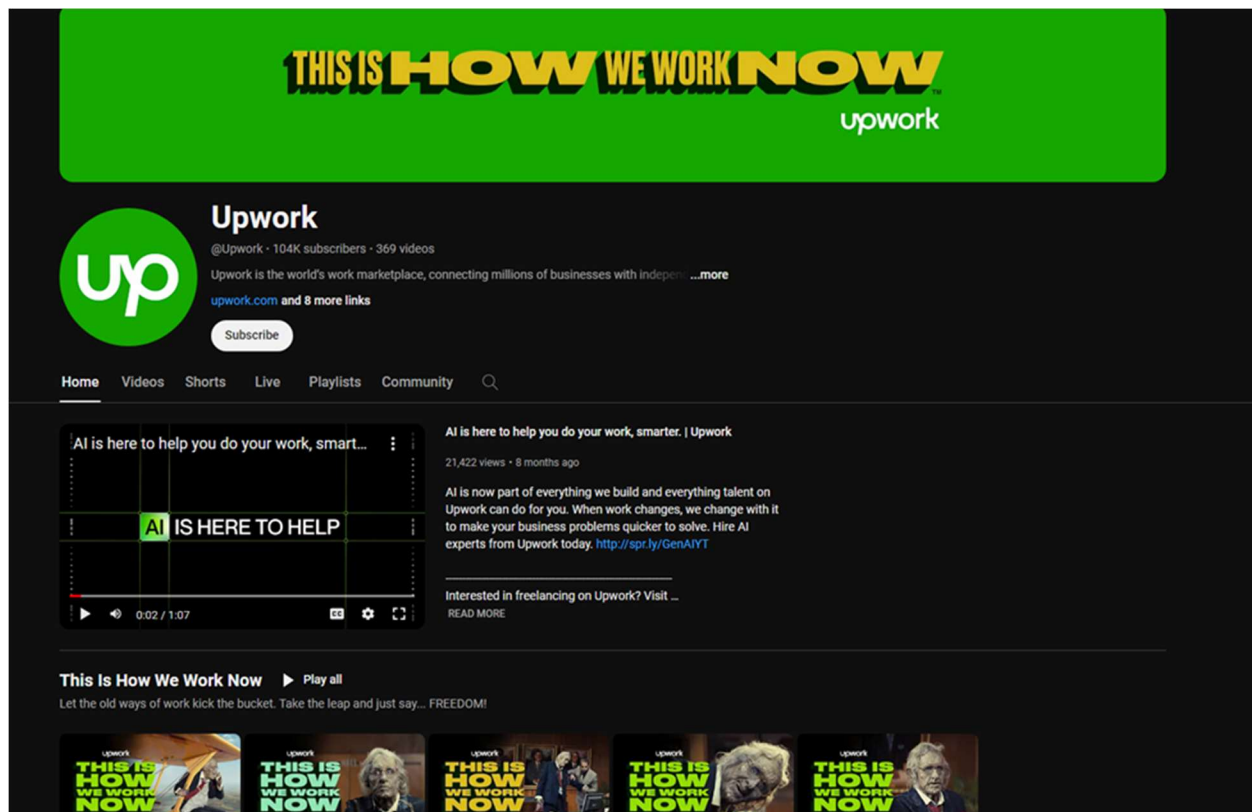


Figure 24: Upwork's social media presence on YouTube (Upwork, n.d.).

“This is how we work now,” is the slogan used on their YouTube channel which caters to modern day living and trying to stray from outdated working conditions allowing for more flexibility to each individual’s lifestyle.

## RISK ASSESSMENT

The risk assessment for Upwork will be used to identify potential issues with the investigated six categories of Company Profile, Executive Leadership, Employee Personas, Financials, Network (website, connectivity, technologies, etc.), and social media. The information assessed was done using simple Google searches, free-use tools, and looking through what is available to the public. In the six categories, there are enough risks that can prove to be either a network threat, insider threat, or a social engineering threat.

Looking at the Company Profile section first, it holds a strong online presence and has public records that can be viewed online. The risks that come with being platform heavy hold concern as those records and social media accounts will require more awareness strategies, other than for marketing tools.

Next with the Executive Leadership and Employee Personas, there is personal information on positions in the company with names, locations, background information, and some photos used which poses a risk for social engineering and insider threats making it easier for attackers to use tactics of exploiting employees or consumers through use of persuasion,

urgency, and manipulation. Following similarly in the Employee Personas section, to demonstrate how easy it is, a simple search was conducted on those employed on LinkedIn for Upwork, and while no photographs were displayed, there are still names and job titles shared. Take an example name of a random employee from the LinkedIn list, after searching on Google, a match was found on the Upwork website, only this time there was a picture. A simple reverse Google image search led to no real results, and the profile wasn't found through any social media outside of Upwork's website and LinkedIn. However, it could've been easy for a social engineer to easily message the employee and pretend to want services or garner more information from them. A very convincing spear-phishing campaign could easily be launched with access to all of the above information, potentially gaining access to sensitive company systems and data.

The Financials section for the public records in Upwork's annual reports, there is a lot of information available showcasing metrics, financial statements, and stakeholders. With the data online to the public it poses a moderate informational risk. While there is no PII for individuals, there are still moderate risks.

<a href="#">upwork</a> <a href="#">Find Talent</a> <a href="#">Find Work</a> <a href="#">Why Upwork</a> <a href="#">Enterprise</a>		
<a href="#">Careers</a> <a href="#">Life at Upwork</a> <a href="#">Diversity, Inclusion &amp; Belonging</a> <a href="#">Open Positions</a> <a href="#">Contract Roles</a> <a href="#">Upwork Teams</a>		
	Senior Analyst, Strategic Analytics	Remote
	Senior Manager, Marketplace Analytics	Remote
	Sr. Director, Corporate Accounting	Remote
Machine Learning	Director, AI Infrastructure & Systems	Remote
	Principal AI/ML Engineer, Search & Recommendations	Remote
	Senior API Engineer	Remote
	Senior Backend Engineer - Search & Recommendations	Remote
	Senior Software Engineer - Full Stack	Remote
	Sr. Software Engineer - Video	Remote
	Sr. Technical Product Manager, AI/ML	Remote

Figure 25: Upwork Jobs Search page (Upwork, 2023).

Going to the Jobs Search page of Upwork.com, we can infer that Upwork is investing in modernizing its platform with a particular emphasis on artificial intelligence and API development, which could mean that they are moving away from legacy systems. There is no direct mention of any outdated technologies that could have implied that Upwork is heavily reliant on legacy systems. Below are some free tools used to analyze domain health as part of the Open-Source Intelligence (OSINT) risk assessment process.



Figure 26: MXToolBox Domain Health check (Upwork.com Domain Health).





Domain Name:

### Analyzing DNSSEC problems for [upwork.com](https://upwork.com)

.	<ul style="list-style-type: none"><li>Found 3 DNSKEY records for .</li><li>DS=20326/SHA-256 verifies DNSKEY=20326/SEP</li><li>Found 1 RRSIGs over DNSKEY RRset</li><li>RRSIG=20326 and DNSKEY=20326/SEP verifies the DNSKEY RRset</li></ul>
com	<ul style="list-style-type: none"><li>Found 1 DS records for com in the . zone</li><li>DS=19718/SHA-256 has algorithm ECDsap256SHA256</li><li>Found 1 RRSIGs over DS RRset</li><li>RRSIG=30903 and DNSKEY=30903 verifies the DS RRset</li><li>Found 2 DNSKEY records for com</li><li>DS=19718/SHA-256 verifies DNSKEY=19718/SEP</li><li>Found 1 RRSIGs over DNSKEY RRset</li><li>RRSIG=19718 and DNSKEY=19718/SEP verifies the DNSKEY RRset</li></ul>
upwork.com	<ul style="list-style-type: none"><li>No DS records found for upwork.com in the com zone</li><li>No DNSKEY records found</li><li>jim.ns.cloudflare.com is authoritative for upwork.com</li><li>upwork.com A RR has value 104.18.89.237</li><li>No RRSIGs found</li></ul>
upwork.com	<ul style="list-style-type: none"><li>fay.ns.cloudflare.com is authoritative for upwork.com</li><li>upwork.com A RR has value 104.18.90.237</li><li>No RRSIGs found</li></ul>

Figure 27: Verisign Labs DNSSEC Analyzer (DNSSEC Debugger, n.d.)

The network risks as pictured above shows that Upwork has not enabled DNSSEC for their domain, allowing possible cache poisoning, DNS spoofing, the SOA serial number format is invalid, and the reverse DNS isn't matching SMTP banner.

The public records were last updated in 2023 and by showing the domain registration, it gives a potential attacker more information. While it does show that the domain has Cloudflare's DNS and CDN services to prevent unauthorized changes and restrictions, it still poses a threat. Through the social media glamorization of the company and the public blog posts with statistics, it leaves Upwork vulnerable to insider threats and social engineering.

Social media platforms pose a huge insider and social engineering risk. The example from above with the random employee search, is one of the many examples of risks, along with all the information from the company profiles and from executives. Upwork showcases the positives of the company which is displayed and shared on Upwork's YouTube, Instagram,

Facebook, X, and LinkedIn of behind the scenes which is more information for a social engineer even if it's for marketing purposes by showing reports and company data.

## **RECOMMENDATIONS**

A plethora of information is available online for Upwork in their social media presence that makes it easier for social engineering and public relations to be targetable. The employees on LinkedIn and Upwork website give varying details, but to keep report with clients, there should be a limit on information given publicly to protect the employees from insider and social engineering threats such restrictions on locations or by keeping them private. Certain statistics are fine for their social media posts. Other than human error there's only so much that can be helped in social media other than protecting users and employees' privacy. So awareness and training on what is posted can aid in that.

The financial reports shouldn't be as public as they are, nor showcasing Upwork's detailed assets. In any event, a request can be sent to a helpdesk-email for those who need the information. Certain data may be necessary to market or advertise, but it shouldn't be as easy to find or prevalent for the public eye.

Some possible network suggestions are upgrading the legacy system and implementing a patch management process. It is recommended to implement DNSSEC for domains and subdomains.

## **CONCLUSION**

Using Open-Source Intelligence (OSINT) we were able to gather information and analyze the publicly displayed data from Upwork. The categories in question were the company's profile, the executive leadership, employee personas, financials, network (website, connectivity, technologies, etc.), and social media. There were varying risks to each such as the alarming amount of data available publicly that make Upwork an easier target for social engineering attacks and insider threats. Particularly noteworthy is the absence of DNSSEC implementation, indicating a critical area for improvement in network security. Upwork's reliance on remote work necessitates robust internal security measures to mitigate insider threats.

Throughout this project, Team 21 demonstrated exceptional collaboration, overcoming challenges of remote coordination and varied schedules. While we faced obstacles, including limited participation from some members, the majority of the team's dedication to the project's success was evident in the thoroughness of our research and quality of our analysis.

Our recommendations aim to further enhance Upwork's security framework, advocating for DNSSEC implementation, continuation of modernization of any legacy systems, enhancing employee privacy on professional networks and strengthening remote work security protocols. These suggestions will remedy current vulnerabilities and protect against threats and will also be proactive measures against evolving cyber threats.

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