Accounting for Product Impact in the Interactive Media and Services Industry

DG Park
George Serafeim
Katie Trinh

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DG Park, George Serafeim, Katie Trinh*

Impact-Weighted Accounts Project Research Report

Abstract

We apply the product impact measurement framework of the Impact-Weighted Accounts Initiative (IWAI) in two competitor companies within the interactive media and services industry. We design a monetization methodology that allows us to calculate monetary impact estimates for key welfare effects of social media, including addiction, depression, connectivity, and misinformation, among other effects identified in social media literature. Our results indicate substantial differences in the impact that competitors have through their products. These differences demonstrate how impact reflects corporate strategy and informs decision-making on industry-specific areas.

1. Introduction

Although significant progress has been made in the environmental and social metrics disclosed by companies and prescribed by reporting standards, these mostly pertain to a company's operations and are still not embedded in financial statements. In contrast to employment or environmental impacts from operations, product impacts, which refer to the impacts that occur from usage of a product once a company has transferred control of the good or service, tend to be highly idiosyncratic, limiting the ability to generalize and scale such measurements. As such, for companies that do measure product impact, impact evaluation is highly specific, limiting comparability and scalability. Moreover, the number of companies that have managed to measure product impact in monetary terms is even more limited.

We have put forth a framework in which product impacts can be measured and monetized in a systematic and repeatable methodology across industries, and have provided a sample application to the automobile manufacturing industry to address these issues.[1] Within any industry, the framework can be applied using a set of standard principles, industry assumptions, and public data to estimate product impacts across the following seven dimensions.

FIGURE 1

Product Impact Framework Dimensions

Reach		Dimensions of Customer Usage			Env Use	End-of-life
Quantity	Duration	Access	Quality	Optionality	Pollutants & efficiency	Recyclability
The magnitude of individuals reached	Length of time the product can be used, particularly for durables	Accessibility of product through pricing and efforts to provide for the underserved	Quality of product through health, safety, effectiveness, and inherent need or goodness	Ability to choose an alternative product with full information and free will	All pollutants and efficiencies enabled through customer usage	Projected product volume recycled at end of product life

In this paper we apply the framework to two competitor companies in the interactive media and services industry. We then discuss potential data points and data sources for monetization and

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[1] George Serafeim and Katie Trinh. "A Framework for Product Impact-Weighted Accounts", Harvard Business School. Accessed July 6, 2020.

detail the decisions behind assumptions made. Finally, we provide examples of insights specific to the interactive media and services industry that can be derived from impact-weighted financial accounts and their analysis. The application of the product impact framework to this industry demonstrates feasibility and actionability, while also providing guidance on the nuances and decision-making of applying the framework to other similar industries. The impacts derived demonstrate the potential for product impact measurement to inform strategic decision making. We see our results as a first step, rather than a definitive answer, towards more systematic measurement of product impact in monetary terms that can then be reflected in financial statements with the purpose of creating impact-weighed financial accounts.

2. Application of the product impact framework

We apply the product impact framework of the Impact-Weighted Accounts Initiative within the interactive media and services industry to ensure the framework is feasible, scalable, and comparable. Through a deep-dive of two competitor companies, we provide a cohesive example that examines the impacts of interactive media and services companies on social media users across the seven product impact dimensions of the framework to uncover nuances of the framework application in estimating actual monetary values. We also examine the impacts of interactive media and services companies on advertisers, but do not estimate actual monetary values given data availability. The companies will be referred to as Companies A and B given the purpose of this exercise is to examine feasibility and not to assess the performance of individual companies. We do note that the data is from two of the largest interactive media and services firms globally.

2.1 Data collection process

This application is based on publicly available data from company disclosures and industry-wide assumptions informed by regulatory bodies and established research firms. These examples reference user effects as identified in academic literature, and make use of existing data and metrics with the goal of incorporating publicly available data.

Self-disclosed company datapoints reflect information found in the companies' 2018 disclosures, such as the Form 10-K or annual sustainability reports, which often disclose Sustainability Accounting Standards Board (SASB) and Global Reporting Initiative (GRI) metrics.

Industry-wide assumptions on leisure time, addiction, depression, privacy, and misinformation come from various economic, academic, and medical studies. Given the methodology determines monetary impacts, the industry wide assumptions inevitably rely on some market-determined prices and valuations.

3. Interactive media and services application of the product impact framework

3.1 Overall impacts estimated

TABLE 1

Product Impacts of Company A and B

Company	Revenue	Relevant Impact Revenue	Positive Product Impact	Negative Product Impact	Reach		Access		Quality			Optionality	Env Use	End of Life
					Quantity		Affordability	Underserved	Health & Safety	Effectiveness	Need	Addiction & Information Failure	Emissions	Recyclability
A	$56bn	$56bn	$57.5bn	-$51.1bn	Daily active users	1,520m	-	-	-$1,089m	$57,456m	-	-$50,034m	-	-
B	$3bn	$3bn	$5.2bn	-$5.6bn	Daily active users	126m	-	-	-	$5,216m	-	-$5,560m	-	-

Table 1 summarizes the monetary impact estimates of two interactive media and services companies on their daily active users. The quality dimension examines the impact to users of data breaches[2] and user satisfaction.[3] The optionality dimension captures the impact to social media users of misinformation[4] and addiction.[5] We note that the impact to advertisers is not included in these estimates and discuss how a firm can apply internal information to examine their product impact on advertisers within this framework. The following sections dive into the details, assumptions, and decisions behind these estimated impacts.

[2] Hassan Zamir. "Cybersecurity and Social Media". *Cybersecurity for Information Professionals: Concepts and Applications, CRC Press.* Published June 28, 2020. Accessed April 2021.

[3] Cass R. Sunstein. "Willingness to Pay to Use Facebook, Twitter, Youtube, Instagram, Snapchat, and More: A National Survey". *Harvard Law School*, available at SSRN. Published June 2018. Accessed April 2021.

[4] Hunt Allcott, Matthew Gentzkow, and Chuan Yu. "Trends in the diffusion of misinformation on social media." *Research and Politics April-June 2019: 1-8.* Accessed April 2021.

[5] Hunt Allcott, Luca Braghieri, Sarah Eichmeyer, and Matthew Gentzkow. "The Welfare Effects of Social Media". *American Economic Review 2020, 110(3): 629-676.* Accessed April 2021.

3.2 Reach

3.2.A Users reached in interactive media and services

TABLE 2

Users Reached by Company A and B

Data		A	B
10K	Daily active users	1,520,000,000	126,000,000

The goal of the reach dimension is to identify the number of individuals served by the company. For interactive media and service companies, we identify the number of users reached through financial disclosure data.

In financial disclosures, firms tend to disclose both the number of daily and monthly active users. To be conservative, this example refers to the number of daily active users, which is the lower of the two. We note that companies estimating their own reach can use their own discretion to determine a conservative estimate of the number of users reached.

3.2.B Advertisers reached in interactive media and services

While this example does not examine the advertiser side of product impact given public data availability, a company estimating its own advertising reach could identify the number of advertisers served on its platform and the number of ads delivered.

3.3 Access – Affordability

3.3.A Interactive media and services affordability to users

The goal of the affordability dimension is to identify the positive impact of more affordable product or service provision. With interactive media and service companies, there are complexities to affordability considerations. While these firms do not monetarily charge users for platform use, these firms use data from their users without any monetary payment. This suggests that service provision in this industry is not simply affordable in monetary terms as users indirectly pay for these services through their data and privacy. Due to these complications, we do not currently estimate an affordability impact and instead, estimate the data and privacy impact within the health and safety and optionality dimensions. The other benefits enabled by service provision are estimated within the effectiveness dimension.

3.3.B Interactive media and services affordability to advertisers

However, interactive media and service companies do have an affordability impact on advertisers as they do charge for advertising services. While this example does not estimate Company A or B's affordability impact on advertisers, companies could estimate this impact by comparing internal data on the cost per click to the industry average cost per click and multiplying the difference with a floor at zero by the number of ad clicks enabled to estimate the affordability impact. We note that more granular affordability benchmarks and comparisons by advertiser size or industry could provide a more precise affordability impact estimate. For example, of the advertising options available to a smaller business, interactive media and services might provide an affordable advertising venue compared to alternatives.

3.4 Access – Underserved

The goal of the underserved dimension is to identify the impact associated with provision of products or services to underserved customers. For a product or service to enable underserved access, two criteria need to be met as outlined in the initial framework and discussed in subsequent applications to pharmaceuticals[6], airlines[7], and others. First, the product or service must be accessed by an underserved population. Second, the product or service must enable sustainable development, as outlined by the UN Sustainable Development Goal.

While interactive media and services companies do provide services to underserved populations, including users and advertisers in emerging markets, the services provided do not meet a UN Sustainable Development Goal. We note that while provision of internet to these underserved populations as discussed in the telecommunications application[8] would qualify for underserved impact as it meets the target 9C[9] of the Sustainable Development Goals, the activity enabled by interactive media and services companies in emerging markets as outlined by Pew Research surveys, such as broader social network and communication[10] and easier political engagement[11], are a result of mobile and internet access rather than enabling mobile and internet

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[6] Amanda Rischbieth, George Serafeim and Katie Trinh. "Accounting for Product Impact in the Pharmaceuticals Industry", Harvard Business School. Accessed May 2021.

[7] George Serafeim and Katie Trinh. "Accounting for Product Impact in the Airlines Industry", Harvard Business School. Accessed April 2021.

[8] George Serafeim and Katie Trinh. "Accounting for Product Impact in the Telecommunications Industry", Harvard Business School. Accessed April 2021.

[9] Department of Economic and Social Affairs. "Sustainable Development Goal 9". *United Nations*.

[10] Laura Silver and Christine Huang. "In Emerging Economies, Smartphone and Social Media Users Have Broader Social Networks". *Pew Research Center*. Published August 2019. Accessed April 2021.

[11] Aaron Smith, Laura Silver, Courtney Johnson, JingJing Jiang. "Publics in Emerging Economies Worry Social Media Sow Division, Even as They Offer New Chances for Political Engagement". *Pew Research Center*. Published May 2019. Accessed April 2021.

access. Thus, we do not estimate an underserved impact for interactive media and services companies based on their current scope of service.

3.5 Quality – Health and Safety

<div align="center">

TABLE 3

Health and Safety Impact of Company A and B

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Data			Estimation		
Company datapoints	**A**	**B**		**A**	**B**
10-K Users affected by data breach	29m	m	Users affected by breach	29m	-
				x	
Industry assumptions			Value of online info protection	$37.56	
JMIS Value of user protection from breach	$37.56			=	
			Health & safety impact	**-$1,089m**	**-**

3.5.A Interactive media and services health and safety for users

The health and safety dimension aims to capture instances where a customer's health, safety, or privacy has been breached. For an interactive media and services company, this dimension is where we examine cybersecurity data breaches to social media users.[12] We note that this dimension examines unexpected health and safety issues outside of expected product performance. While there exists other studied welfare effects of addiction and user misinformation on data use from social media use that can affect mental health and privacy, these welfare effects are not a result of unanticipated breaches to expected product performance and thus not captured within the health and safety dimension.[13] Instead, these effects are inherent to service use and therefore captured in the optionality dimension.

3.5.B Data on cybersecurity data breaches

In this example, we identify data on the number of users affected by a data breach from Company A and B's financial disclosures. While news media also reports separately on data breach incidents, we turn to financial disclosures for consistency. For example, Company B experienced an internal bug and advised users to change their passwords through a press release announcement

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[12] Hassan Zamir. "Cybersecurity and Social Media". *Cybersecurity for Information Professionals: Concepts and Applications, CRC Press.* Published June 28, 2020. Accessed April 2021.
[13] Hunt Allcott, Luca Braghieri, Sarah Eichmeyer, and Matthew Gentzkow. "The Welfare Effects of Social Media". *American Economic Review 2020, 110(3): 629-676.* Accessed April 2021.

but also noted that there was no evidence of breach or misuse. Thus, this incident was not reflected in their financial disclosures, and this example's estimate of Company B's users affected by a data breach excludes this incident. However, a company estimating its own health and safety impact could turn to internal data on the number of user accounts affected by a data breach.

For an estimate on the value associated with user protection from a data breach, we turn to academic literature on the willingness to pay associated with online privacy protection against errors and improper access relating to personal information.[14] Given a range of estimates is provided, we apply the average in this example.

3.5.C The impact estimate

In Table 3, we provide an example of estimating the health and safety impact for Company A and B. We multiply the number of user accounts affected by a data breach by the average willingness to pay associated with online privacy protection to estimate the health and safety impact of both firms.

3.5.D Interactive media and services health and safety to advertisers

As discussed in section 3.3.B, this example does not provide estimates of Company A or B's product impact on advertisers. However, companies could estimate the health and safety impact to advertisers by examining both data breaches and brand safety. With data breaches, a company could identify the advertisers affected by a data breach and multiply that with an estimate for the lost value associated with a data breach at the business rather than individual level. Examples of this estimate could include academic literature on the cost associated with improper access to corporate data or advertiser willingness-to-pay for privacy. With brand safety, a company could examine whether there have been any incidents in the past year that affect their own branding and identify the cost to associated advertisers.

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[14] Il-Horn Hann, Kai-Lung Hui, Sang-Yong Tom Lee & Ivan P.L. Png. "Overcoming Online Information Privacy Concerns: An Information-Processing Theory Approach". Journal of Management Information Systems 24(2):13-42. Published 8 December 2014. Accessed April 2021.

3.6 Quality – Effectiveness

TABLE 4

Effectiveness Impact of Company A and B

Data				Estimation		
Company datapoints		**A**	**B**		**A**	**B**
ASCI	Customer satisfaction	63%	69%	Daily active users	1,520m	126m
HLS	Willingness-to-pay for service	$60	$60		x	
				Customer satisfaction	63%	69%
					=	
				Satisfied users	958m	87m
					x	
				WTP for service	$60	$60
					=	
				Effectiveness impact	**$57,456m**	**$5,216m**

3.6.A Interactive media and services effectiveness

In the effectiveness dimension, we aim to capture whether the product or service is effective at meeting customer expectations. For interactive media and services, we aim to measure how effective the service is at meeting customer expectations of expected platform and network performance. Since the efficacy of these services is intangible and difficult to directly measure, we examine customer satisfaction as we have done in other industry applications, including autos[15] and consumer finance[16] where efficacy cannot be directly measured.

3.6.B Data on customer satisfaction

As with the other industry applications, we turn to the American Customer Satisfaction Index to estimate the customer satisfaction of users with Company A and Company B. We recognize that the application of these estimates assumes that the satisfaction of the American user is representative of global satisfaction. Given the services provided by Company A and B do not differ significantly by geography, we believe this is a reasonable assumption.

For industry assumptions on the value to a satisfied user, we turn to academic literature on the beneficial welfare effects of social media which estimate willingness-to-pay for various social media platforms.[17] We note that this literature not only estimates willingness-to-pay, but also willingness-to-accept, and provides both the mean and median for both estimates. Given willingness-to-accept is much higher than willingness-to-pay and may reflect the addictive nature

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[15] George Serafeim and Katie Trinh. "A Framework for Product Impact-Weighted Accounts", Harvard Business School. Accessed April 2021.
[16] George Serafeim and Katie Trinh. "Accounting for Product Impact in the Consumer Finance Industry", Harvard Business School. Accessed April 2021.
[17] Cass R. Sunstein. "Willingness to Pay to Use Facebook, Twitter, YouTube, Instagram, Snapchat, and More: A National Survey". *Harvard Law School.* Published June 2018, Available at SSRN. Accessed April 2021.

of these platforms, we apply the willingness-to-pay estimates in this example for conservatism.[18] We also note that willingness-to-pay estimates may still be skewed by addiction effects. However, we do not adjust these estimates to reflect addiction given the addiction effects are estimated separately within the optionality dimension in section 3.8. Similarly, we apply the median rather than the mean estimate for conservatism as the mean is much higher than the median given large positive estimates in some cases. We note that as newer estimates of willingness-to-pay become available, the industry assumption applied should reflect contemporary literature and research.

3.6.C The impact estimate

In Table 4, we provide an example of estimating the effectiveness impact of Company A and B to users. We estimate the number of satisfied users by multiplying Company A and B's customer satisfaction rate by the number of daily active users. We then multiply the number of satisfied active users by the median willingness-to-pay for platform service to estimate the effectiveness impact.

We note one nuance to this methodology that differs from the other industry applications, which also apply customer satisfaction (such as autos). In this industry application, we estimate the value to all satisfied users whereas in the other industry applications, we estimate the value to satisfied users over the industry average. We make this determination due to two differences between these industries. First, the auto industry does not provide their product free of charge while interactive media and services companies do. Second, customers choosing an automobile are substituting between automobiles within the industry. Interactive media and services customers might not substitute between different platforms, but can use platforms in addition to one another and instead substitute against time (which is accounted for in the optionality dimension). Therefore, the industry assumption applied for the auto industry is implied lost value or averted lost value whereas the assumption applied for interactive media and services is willingness-to-pay. Implied lost value or averted lost value is established in comparison to some baseline, in this case, average customer satisfaction. On the other hand, willingness-to-pay applies to all satisfied customers.

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[18] The national survey on willingness-to-pay for social media reports that the median willingness-to-pay ranges from $5 to $10 monthly ($60 to $120 annually) and that the median willingness-to-accept ranges from $88 to $100 monthly ($1,056 to $1,2000 annually).

3.6.D Interactive media and services effectiveness to advertisers

Depending on internal data availability and relevance to the particular company, companies estimating the effectiveness impact to advertisers could examine a variety of different metrics, such as advertiser satisfaction, advertiser brand loyalty, enabled sales, and various conversion rates. We note that in line with the nuance noted in the previous section, since advertisers can substitute between different platforms for advertising services and are charged for the service, these metrics should be comparative to a reasonable and conservative benchmark, such as the industry average.

3.7 Quality – Basic Need

The basic need dimension examines whether the product or service provides some basic need to the population. While the United Nations and various countries have declared connectivity is viewed as a basic human right, the focus is on access to internet and internet connectivity.[19] Thus, while interactive media and service companies do improve connectivity between users and to advertisers, they do not provide the basic need of internet access and internet connectivity. The value generated from the increased connectivity enabled by social media is instead estimated within the effectiveness dimension. We note that like other industry applications which turn to elasticity to identify products that are basic needs as discussed in the initial product framework paper, the income elasticity for various internet services suggests that these services do not constitute a necessity.[20]

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[19] Frank La Rue. "Report of the Special Rapporteur on the promotion and protection of the right to freedom of opinion and expression". *United Nations General Assembly, Human Rights Council Seventeenth Session.* Published May 2011. Accessed April 2021.
[20] Rajeev K. Goel, Edward T. Hsieh, Michael A. Nelson, and Rati Ram. "Demand elasticities for Internet services". *Applied Economics* 38(9): 975-980. Published August 2006. Accessed May 2021.

3.8 Optionality

TABLE 5

Optionality Impact of Company A and B

Data		A	B		Estimation	A	B
Company datapoints		**A**	**B**			**A**	**B**
Statista	Adolescent users	43m	10m		(Daily active users	1,520m	126m
Statista	Users encountering fake news	58%	49%			x	
					Privacy loss from platform use	$11.66	
Industry assumptions						=	
W. et al.	Social media addiction prevalance	12%			**Info failure of privacy loss)**	**-$17,723m**	**-$1,469m**
	Cost of lost leisure time	$21.36				+	
PLoS One	Adolescent risky use prevalance	4.50%			(Users encountering fake news	58%	49%
J Clin Psych	Cost of depression	$5,769				x	
CHEQ	Per person cost of fake news	$19.70			Daily active users	1,520m	126m
S. et al.	Value of basic online privacy	$11.66				x	
					Per person cost of fake news	$19.70	
						=	
					Info failure of fake news)	**-$17,365m**	**-$1,216m**
					Information failure impact	**-$35,088m**	**-$2,685m**
					(Daily active users	1,520m	126m
						x	
					Addiction prevalence	12%	
						x	
					Cost of lost leisure time	$21.36	
						=	
					General addiction)	**-$3,897m**	**-$323m**
						+	
					(Adolescent users	43m	10m
						x	
					Risky use prevalence	5%	
						x	
					Cost of depression	$5,769	
						=	
					Addiction for vulnerable popl.	**-$11,049m**	**-$2,551m**
					Addiction impact	**-$14,946m**	**-$2,874m**
					Optionality impact	**-$50,034m**	**-$5,560m**

3.8.A Optionality in interactive media and services to users

The optionality dimension aims to capture the impact from consumers lacking freedom of choice when making a purchase, which we determine by examining whether the industry is monopolistic, whether the product or service is addictive, and whether there have been any information failures. To estimate the optionality impact to users of interactive media and service companies, we examine the impact of an addictive service and user misinformation.

Psychological literature indicates that interactive media companies do provide an addictive service to users that is associated with mental health problems such as stress, anxiety, and

depression,[21] and impacts how users spend their leisure time.[22] In this example, we assume that all addicted users experience loss to their leisure time and identify addicted users that would be vulnerable to mental health problems with a proxy of at-risk adolescent users.[23]

Economic literature indicates that interactive media companies do contribute to information failure from both misinformation through false content[24] and misinformation regarding company use of user information.

The impact from misinformation through false content is currently estimated within the optionality dimension as information failure given interactive media and services companies are not responsible for the content on their platforms at a regulatory level per Section 230.[25] However, we note that as these firms have increasing liability and responsibility for their content, the impact of false content could be estimated within the effectiveness rather than the optionality dimension.

Similarly, surveys indicate that most social media users are unaware of how interactive media and services companies use their personal information.[26] We thus estimate this impact within the optionality dimension as information failure. As users do become more aware of this over time, this impact no longer is information failure and could be estimated within the other dimensions. Whether the personal data use is estimated as a health and safety, effectiveness, or even affordability impact can depend on nuances around how the data is accessed and used.

Finally, given interactive media and services companies provide their service to users free of charge, we do not estimate a monopoly impact within the optionality dimension for users given no price rents are experienced. We however acknowledge that while users do not experience a price rent, the companies' provision of services for free further preserves the monopolistic nature of the industry and could contribute to the other optionality issues as discussed above. We thus do not estimate a separate monopoly impact to users as we intend the other optionality dimensions to capture these issues. While users may not experience price rents associated with monopoly, we discuss the potential monopoly impact to advertisers in section 3.8.D.

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[21] Yubo Hou, Dan Xiong, Tonglin Jiang, Lily Song, and Qi Wang. "Social media addiction: Its impact, mediation, and intervention". *Cyberpsychology: Journal of Psychosocial Research on Cyberspace,* 13(1) Article 4. Published 2019. Accessed April 2021.
[22] Hunt Allcott, Luca Braghieri, Sarah Eichmeyer, and Matthew Gentzkow. "The Welfare Effects of Social Media". *American Economic Review 2020, 110(3): 629-676.* Accessed April 2021.
[23] Fanni Banyai, Agnes Zsila, Orsolya Kiraly, Aniko Maraz, Zsuzsuanna Elekes, Mark Griffiths, Cecile Andreassen, and Zsolt Demetrovics. "Problematic Social Media Use: Results from a Large-Scale Nationally Representative Adolescent Sample". *PLoS One,* 12(1). Published 2017. Accessed April 2021.
[24] Hunt Allcott, Matthew Gentzkow, and Chuan Yu. "Trends in the diffusion of misinformation on social media." *Research and Politics April-June 2019: 1-8.* Accessed April 2021.
[25] Katie Canales. "Mark Zuckerberg says Facebook should be liable for 'some content,' but the social giant and other platforms still shouldn't be regulated as publishers or telecom firms". *Business Insider.* Published November 2020. Accessed April 2021.
[26] Paul Hitlin and Lee Rainie. "Facebook Algorithms and Personal Data". *Pew Research Center.* Published January 2019. Accessed April 2021.

3.8.B Misinformation and addiction data

Given public data availability, we turn to secondary sources for estimates on the number of adolescent users and the percentage of users encountering "fake news" or false content. A company estimating their own optionality impact could refer to internal data on adolescent users and the prevalence of false content.

The percent of users affected by addiction to social media[27], the percent of at-risk adolescents[28], and the cost of depression[29] comes from psychology literature. We estimate the cost associated with lost leisure time by multiplying the average leisure hours used for well-being as determined by the U.S. Bureau of Labor Statistics[30] by the global leisure wage as applied in the automobile and telecommunications industry applications. We note that we assume the leisure hours essential to well-being are representative globally and thus apply US estimates.

We estimate the per person cost of fake news or false content exposure by dividing the global economic cost of fake news[31] by the number of global interactive media and services users.[32] We apply estimates of willingness-to-pay around online privacy including concealing browser history, contacts, and location[33] as a proxy for the value of basic online privacy.

3.8.C The impact estimate

We estimate the optionality impact to users in Table 5. We first estimate the impact from misinformation regarding company use of user information by multiplying the number of daily active users and the lost value of basic online privacy from general platform participation. Next, we estimate the impact from misinformation from false content by multiplying the number of daily active users by the percent of users encountering false content and the per person cost associated with false content. We sum both of these impacts to estimate the optionality impact due to misinformation.

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[27] Yubo Hou, Dan Xiong, Tonglin Jiang, Lily Song, and Qi Wang. "Social media addiction: Its impact, mediation, and intervention". *Cyberpsychology: Journal of Psychosocial Research on Cyberspace,* 13(1) Article 4. Published 2019. Accessed April 2021.

[28] Fanni Banyai, Agnes Zsila, Orsolya Kiraly, Aniko Maraz, Zsuzsuanna Elekes, Mark Griffiths, Cecile Andreassen, and Zsolt Demetrovics. "Problematic Social Media Use: Results from a Large-Scale Nationally Representative Adolescent Sample". *PLoS One,* 12(1). Published 2017. Accessed April 2021.

[29] Paul E. Greenberg, Andree-Anne Fournier, Tammy Sisitsky, Crystal T. Pike, and Ronald C. Kessler. "The Economic Burden of Adults with Major Depressive Disorder in the United States". *The Journal of Clinical Psychology, 76(2): 155-162.* Published November 2014. Accessed October 2020.

[30] "American Time Use Survey". *US Bureau of Labor Statistics.* Published June 2020. Accessed April 2021.

[31] University of Baltimore. "The Economic Cost of Bad Actors on the Internet Fake News | 2019". *CHEQ.* Published 2019. Accessed April 2021.

[32] Brian Dean: "Social Network Usage & Growth Statistics: How Many People Use Social Media in 2021?" Backlinko. Updated April 2021. Accessed April 2021.

[33] Scott Savage and D. Waldman. "The Value of Online Privacy". *University of Colorado at Boulder.* Published October 2013. Accessed April 2021.

To estimate the impact from provision of an addictive service, we estimate both the impact of lost time to all addicted users and the additional cost associated with depression for at-risk users. We multiply the number of daily active users by the prevalence of addiction to social media and the cost of lost leisure time to estimate the impact from lost time. We then multiply the number of adolescent users by the percent that are at-risk and the cost of depression to estimate the additional impact from social media addiction on mental health. We sum both impacts to estimate the optionality impact due to addiction. We then sum the optionality impact due to misinformation and the optionality impact due to addiction to estimate the overall optionality impact of Companies A and B.

3.8.D Optionality in interactive media and services to advertisers

For advertisers using interactive media and service companies, advertisers lack freedom of choice given the industry's monopolistic nature, as evidenced by the industry's HHI which exceeds 3,000.[34] A company estimating their optionality impact to advertisers could examine the price rents their advertisers experience from the monopolistic nature of the industry.[35]

3.9 Environmental Usage

The environmental usage dimension aims to capture any environmental emissions, pollutants, or efficiencies produced from use of the service or product. We examine two examples to determine that interactive media and services firms do not have an environmental usage impact given platform users and advertisers do not generate emissions from use of the service itself.

First, we examine efficiency improvements to data centers as disclosed by Company A. Since these improvements affect the energy use of Company A's operations rather than the platform user, these improvements are reflected in the environmental pillar of the Impact-Weighted Accounts methodology.[36]

Second, we examine the energy used in powering the devices on which Company A and Company B's services are accessed. We choose to exclude the energy required to power the

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[34] Christian Fuchs. "The Google and Facebook Online Advertising Duopoly". *The Online Advertising Tax as the Foundation of a Public Service Internet: A CAMRI Extended Policy Report*, University of Westminster Press, London, 2018, pp. 11–19. JSTOR. Accessed April 2021.
[35] Fiona M. Scott Morton and David C. Dinielli. "Roadmap for a Digital Advertising Monopolization Case Against Google". Omidyar Network. Published May 2020. Accessed April 2021.
[36] David Freiberg, DG Park, George Serafeim, and T. Robert Zochowski. "Corporate Environmental Impact: Measurement, Data and Information", Harvard Business School. Accessed April 2021.

devices on which Company A and B's services are accessed given Company A and B have no control over the device used and how the device is powered. This determination is further supported by both firms not disclosing any information related to this use case.

3.10 End-of-life Recyclability Impact

The end-of-life dimension aims to measure the averted and created emissions from the end-of-life treatment of the product, as well as the associated volume of product associated with the end-of-life treatment. For interactive media and services firms, users and advertisers generate no physical waste from use of the service. We thus do not estimate an end-of-life impact for these firms.

4. Discussion

This application of the product framework to interactive media and services not only indicates feasibility of estimating monetary product impacts within this industry, but also demonstrates the potential value of impact-weighted financial statement analysis.

The product impact dimensions reflect the nature of the interactive media and services industry. Effectiveness and optionality are the leading drivers of product impact in this industry, which reflects the value of connectivity generated to users and the costs associated with addiction and misinformation.

Another potential analysis could compare the product impacts of different companies. Within a single industry, one can identify differences in how the two companies approach different product attributes. For example, our analysis suggests that Company B is more effective than Company A when scaled by revenue. However, Company B has a greater adolescent population and thus could enable more addictive behavior and thus a larger optionality impact than Company A when scaled for revenue. Analyzing each dimension allows for a deeper understanding of the product impact performance of each company relative to competitors and the broader industry.

Finally, the impact-weighted financial statement analysis indicates which dimensions are most material to product impact creation. In interactive media and services, the impact is driven mostly by effectiveness and optionality.

5. Conclusion

   Although interest in ESG measurement continues to grow significantly, product impact has been difficult to systematically measure given the idiosyncratic nature of the impacts and the tendency to view products in broad categorizations of simply good and bad. The creation of a product impact framework allows for a systematic methodology that can be applied to different companies across a wide range of industries. This enables transparency, comparability, and scalability within product impact reporting. The identified standard dimensions on which product impact can be measured are rooted in existing measurement efforts, allowing data that is publicly available to be leveraged.

   To ensure applicability, determine feasibility, and identify nuances within each dimension of product impact, we examine applications of the framework to company pairs across each GICS sector. In this working paper, we provide a sample application to the interactive media and services industry. We use publicly disclosed data and industry-wide assumptions to derive monetary estimates of a product's reach, accessibility, quality, optionality, environmental use emissions and end-of-life recyclability. While publicly disclosed data can provide meaningful insights, use of internal company data can further enable precision and support internal decision-making. This example also highlights the need for ongoing discussion and refinement of industry-accepted assumptions as contemporary literature leads to changing guidance over time.

   This paper is one within the series of applications of the framework across each GICS sector, covering interactive media and services for the information technology sector.[37] Ultimately, the aspiration is to develop and provide a framework that enables more informed decisions which account for the many impacts created by products.

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[37] We note that the interactive media and services sector has since been moved to the communications sector.