

Momentum & the Flywheel: Understanding Platform Growth

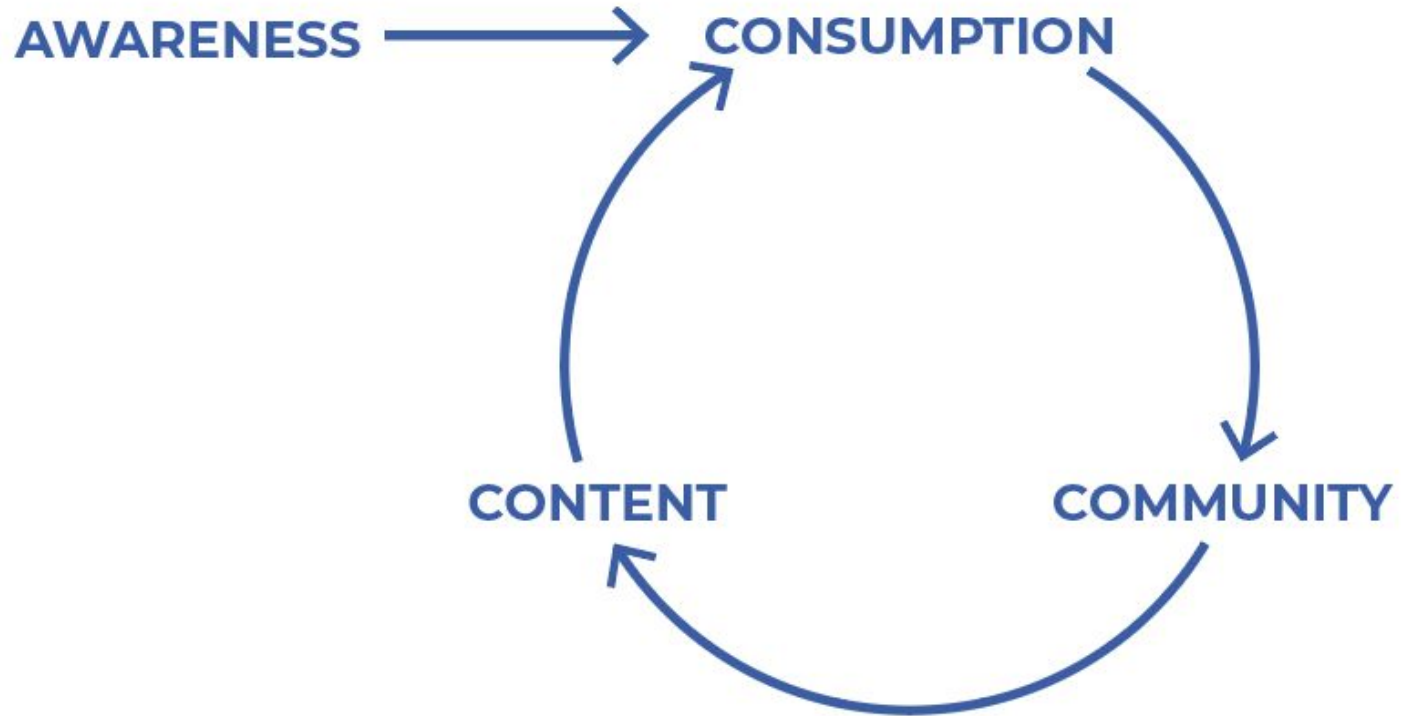
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Talk Outline

- Overview
- Our Approach
- Related Work
- Analytical Approach and Results

Project Overview



The Flywheel: a history

2018

Initial theory developed to represent the Free Knowledge Movement

2019

The Flywheel is adopted org-wide

Now

The Flywheel is used to frame and justify projects

A sequence of six carnations arranged in a line, showing the progression of growth from a small bud on the left to a fully bloomed flower on the right. The word "Why?" is overlaid in the center in a large, bold, black font.

Why?

Edward Howell on Unsplash

Our Approach

This is not our first attempt

The Flywheel is **oversimplified**

We don't have the **data** or **instrumentation**

The **analytical framework** would be too complex



Mikhail's Product Inspiration Week 2021

What if the Wikimedia Product Flywheel Model, but with maths?

Introduction

The core idea behind the flywheel math modeling project during the Product Inspiration Week 2021 was to quantify the flows between the three main components of the flywheel model. These components are Consumption, Community, and Content. (There is also an Awareness component, but that relies on knowledge of campaigns, marketing, etc., so I omitted it from this initial effort.)

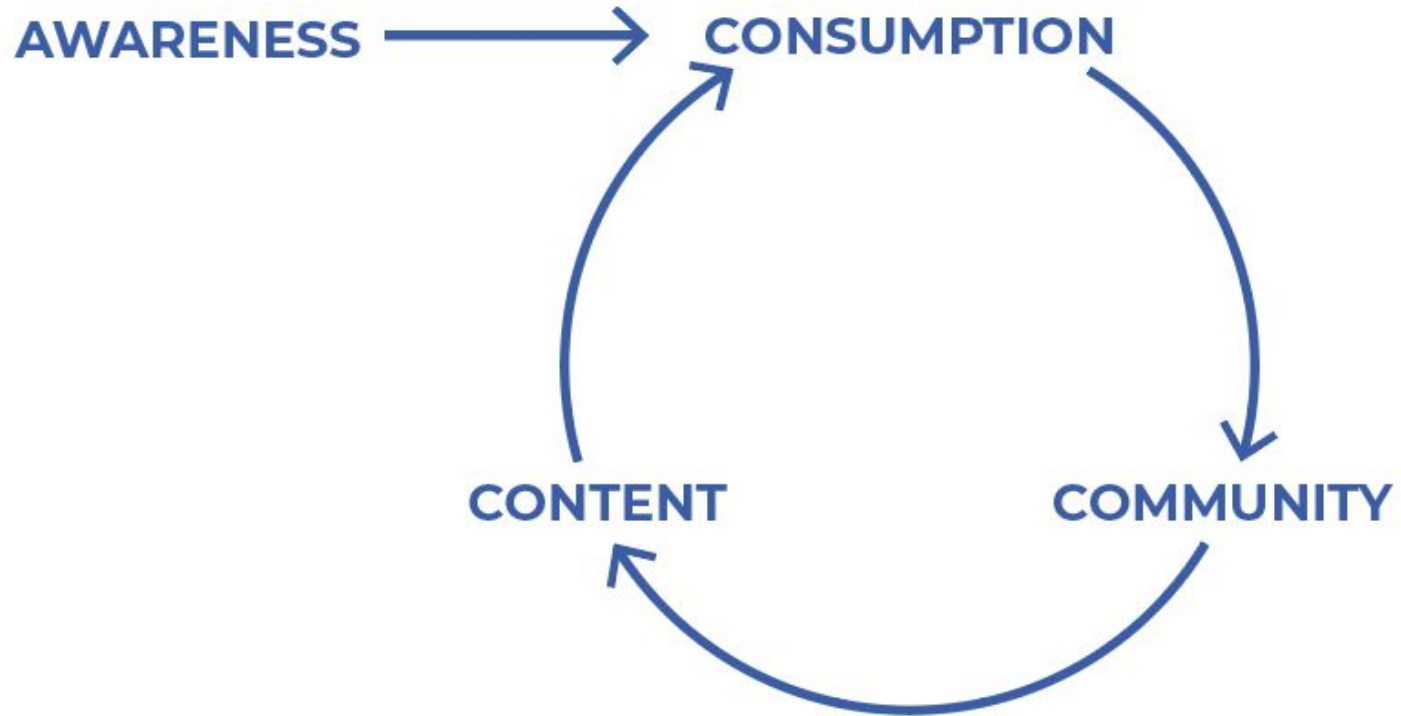
The flywheel model of the Wikimedia movement relates the idea that as more people read Wikipedia (and consume content on other projects such as Wikimedia Commons), some of them decide to contribute and become editors, joining the huge, global community of contributors. More people contributing and being involved in the community means more content and better content, and that leads to more reasons for people to visit and read Wikipedia and its sister projects.

To quantify the flywheel model, the mathematical model would have to model the relationships between those components and would even allow us to find similarities among different groups of projects based on those relationships. However, ***in working on this project I learned that we currently do not have the capability to actually do this.*** Namely, we do not have the metrics that would allow us to quantify the components, much less define and quantify relationships between them.

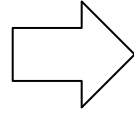
Learnings & Conclusions

Consumption: The key metrics we report on in this area are: unique devices, interactions (pageviews & page previews), and the recently added session length. The only proxy we have for "how many users (either reader or editor) consumed our content" is unique devices, which is a flawed a metric for the purpose of this project because:

- it's web only; due to the explicit opt-in nature of usage data sharing on the apps we do not have an accurate count of users – we only have estimates of how many users had opened the app at least once in a 30 day window, provided by app stores

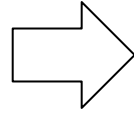


Consumption



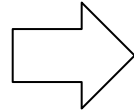
Community

Community



Content

Content



Consumption

Research Questions

RQ 1

Does an change in Wikipedia's **readership** correspond to a change in **contributors**?

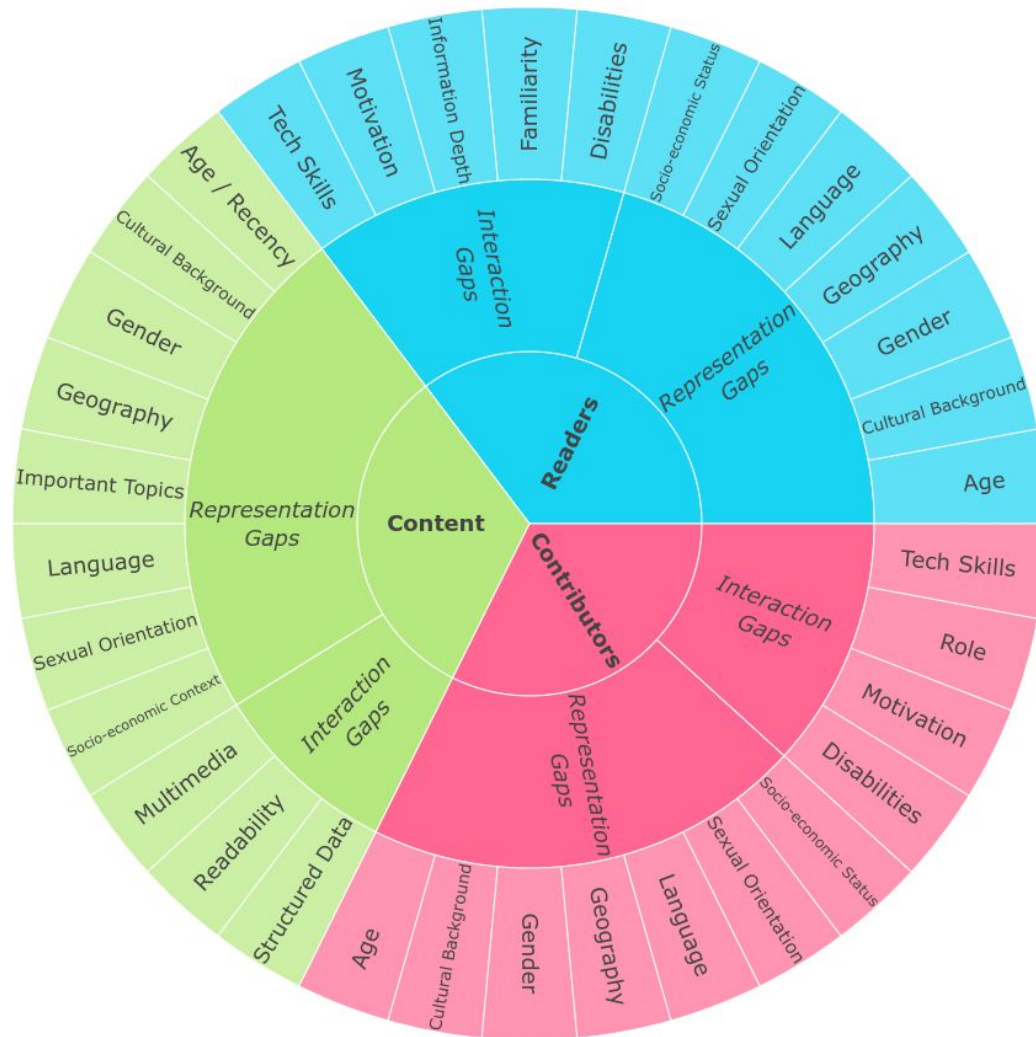
RQ 2

Does a change in the number of **contributors** to Wikipedia correspond to an change in the **volume of content contributed**?

RQ 3

Does a change in **content volume contributed** to Wikipedia correspond to a change in Wikipedia's **readership**?

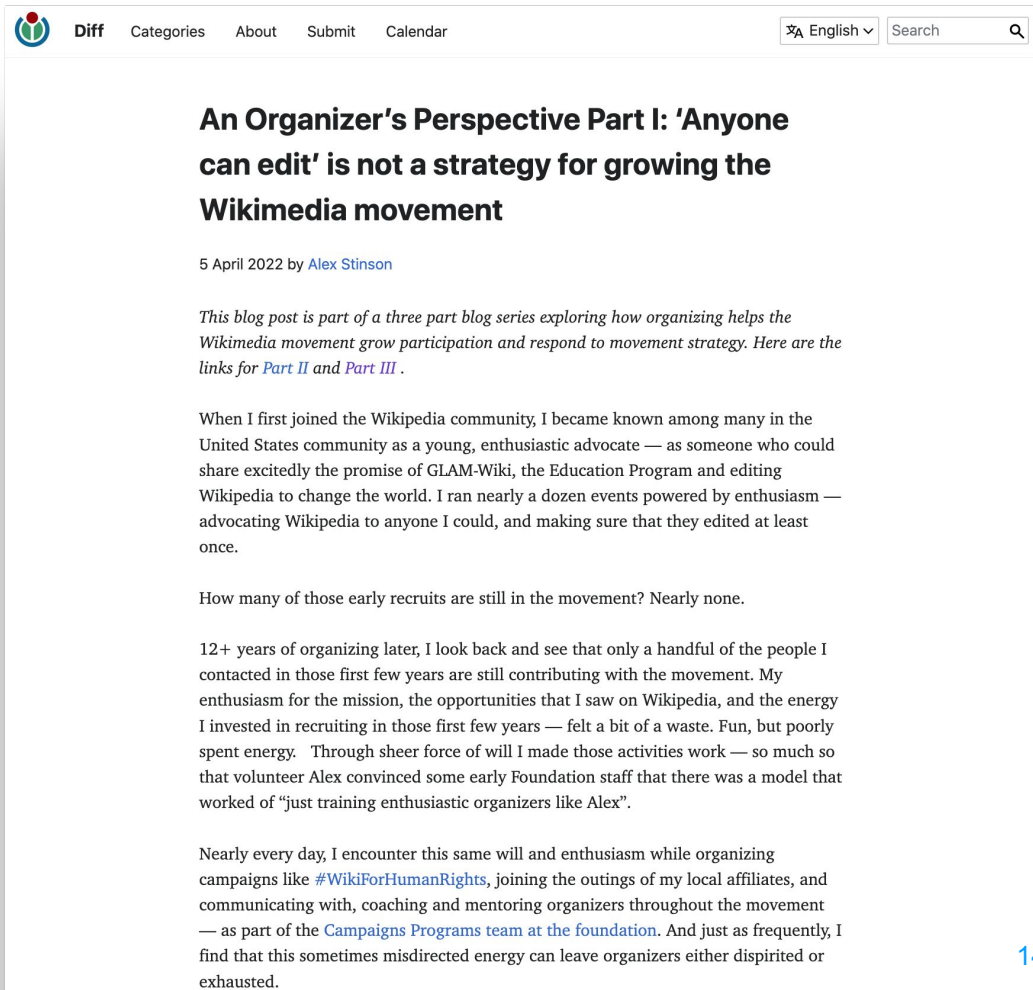
Literature Review



Readership to Contributors

Reading Wikipedia is not the only entry point for contributors

Knowing that Wikipedia can be edited does not provide sufficient motivation to contribute

A screenshot of a web browser displaying an article on the Diff website. The page has a white background with a light blue header. The header includes the Diff logo (a green and blue circle with a person icon), navigation links for 'Categories', 'About', 'Submit', and 'Calendar', a language dropdown menu set to 'English', and a search bar. The main content area features a large, bold title: 'An Organizer's Perspective Part I: 'Anyone can edit' is not a strategy for growing the Wikimedia movement'. Below the title is the date '5 April 2022' and the author 'Alex Stinson'. A sub-header reads: 'This blog post is part of a three part blog series exploring how organizing helps the Wikimedia movement grow participation and respond to movement strategy. Here are the links for Part II and Part III .'. The body text consists of three paragraphs. The first paragraph describes the author's early involvement in the Wikipedia community and their role in organizing events. The second paragraph asks how many of those early recruits remain in the movement. The third paragraph reflects on the author's experience 12+ years later, noting that only a few people from their early contacts are still contributing. The final paragraph discusses the author's current work with campaigns like #WikiForHumanRights and mentoring organizers, highlighting the challenge of misdirected energy.

Contributors to Content

Wikipedia's policies defining **Verifiability**, **Neutrality**, and **Notability** exclude or bias content about traditionally underrepresented subjects.

Not all content production is equally distributed across topical areas



Content to Readership

Zhu et al. conduct a series of quasi-experiments with pages improved through the WikiEdu program, and they show that **an increase in article content tends to result in a sustained increase in pageviews.**



Research Questions

RQ 1

Does an increase in Wikipedia's **readership** correspond to an increase in **contributors**?

RQ 2

Does an increase in the number of **contributors** to Wikipedia correspond to an increase in the **volume of content contributed**?

RQ 3

Does an increase in **content volume contributed** to Wikipedia correspond to an increase in Wikipedia's **readership**?

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Analytical Approach and Results

$$|NewEditors = \sum_{i=0}^n \beta_{T0-Ti} Pageviews + \dots$$

WIKIPEDIA

The Free Encyclopedia

English

6 458 000+ articles

日本語

1 314 000+ 記事

Español

1 755 000+ artículos

Русский

1 798 000+ статей

Français

2 400 000+ articles

Deutsch

2 667 000+ Artikel

Italiano

1 742 000+ voci

中文

1 256 000+ 条目 / 條目

Português

1 085 000+ artigos

العربية

مقالة 1 159 000+



Readers to Contributors

Unit of Analysis: Wiki-Month

Dependent Variable: New accounts

Independent Variable: Pageviews

Controls: Seasonality, Language Edition Age,
Language Edition Size



	Coefficient	P> z
num_new_accounts.L1	0.671	0
num_pageviews.L0	4.33E-06	0
wiki_age	-95.0671	0
month_2	-7669.5659	0
month_3	-2665.9155	0.035
month_4	-9168.4442	0
month_5	-7675.3087	0
month_6	-1.10E+04	0
month_7	-8324.9417	0
month_8	-6552.9386	0
month_9	-4048.745	0.002
month_10	-4559.4296	0
month_11	-7431.7847	0
month_12	-1.06E+04	0

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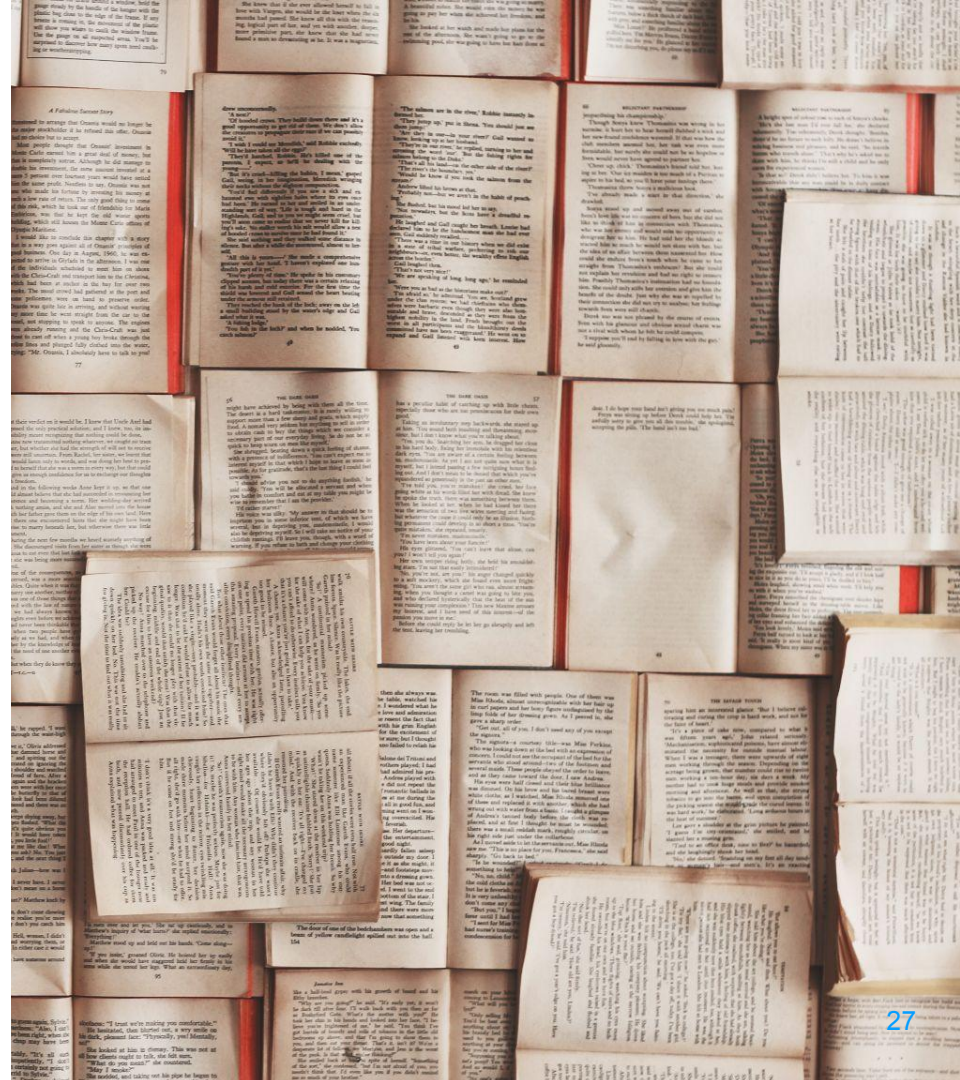
Contributors to Content

Unit of Analysis: Wiki-Month

Dependent Variable: Bytes Added

Independent Variable: Active Accounts

Controls: Seasonality, Language Edition Age, Language Edition Size



	Coefficient	P> z
num_bytes_added.L1	0.9249	0
num_active_editors.L0	2.24E+04	0
num_active_editors.L1	-2.09E+04	0
wiki_age	-7.14E+05	0.047
month_2	6.63E+07	0.315
month_3	6.17E+07	0.292
month_4	1.12E+08	0.096
month_5	1.46E+08	0.021
month_6	1.22E+08	0.093
month_7	-2.95E+07	0.634
month_8	6.70E+07	0.281
month_9	3.21E+07	0.617
month_10	6.02E+06	0.92
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Wrapping Up

Takeaways

We use a combination of prior work and quantitative analysis

We break the Flywheel into its three component parts and analyze each individually



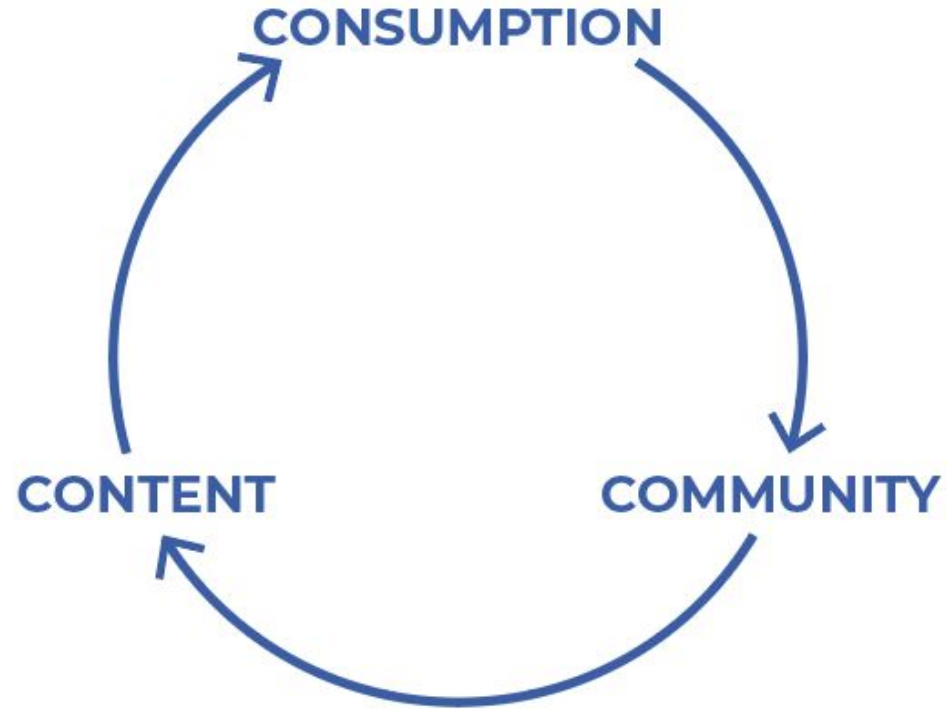
Takeaways

The Flywheel is intentionally oversimplified, and **we should be careful not to extrapolate** too much from our empirical analysis.

Prior work shows that **increases in content volume** tend to result in **more pageviews** over time (RQ3).

We find **no evidence** that a **change in readership** leads to **future changes in new account creation** (RQ1).

We find preliminary evidence that **an increase in active contributors** tends to correlate with **an increase in content creation** (RQ2).



	coef	std err	t	P> t 	[0.025	0.975]
num_pageviews	7.67E-06	1.25E-06	6.138	0	5.18E-06	1.02E-05
wiki_age	-261.2704	13.961	-18.714	0	-289.094	-233.446
month_2	1505.2014	1927.799	0.781	0.437	-2336.896	5347.299
month_3	2554.4221	1756.777	1.454	0.15	-946.83	6055.675
month_4	-766.1085	1786.436	-0.429	0.669	-4326.471	2794.254
month_5	-2592.8284	1735.346	-1.494	0.139	-6051.368	865.711
month_6	-5066.5222	1959.82	-2.585	0.012	-8972.438	-1160.606
month_7	-6982.8369	1845.844	-3.783	0	-1.07E+04	-3304.076
month_8	-5177.4077	1885.748	-2.746	0.008	-8935.697	-1419.118
month_9	-1292.6497	1958.752	-0.66	0.511	-5196.437	2611.137
month_10	-908.2611	1808.386	-0.502	0.617	-4512.369	2695.846
month_11	-1536.0897	1862.166	-0.825	0.412	-5247.381	2175.202
month_12	-5672.668	1875.733	-3.024	0.003	-9410.998	-1934.338
const	2.65E+04	8473.146	3.127	0.003	9605.388	4.34E+04

	coef	std err	z	P> z 	[0.025	0.975]
const	3637.5536	5946.577	0.612	0.543	-8219.585	1.55E+04
num_new_accos.L1	0.671	0.066	10.15	0	0.539	0.803
num_pageviews.L0	4.33E-06	8.65E-07	5.005	0	2.61E-06	6.06E-06
wiki_age	-95.0671	18.991	-5.006	0	-132.934	-57.201
month_2	-7669.5659	1528.238	-5.019	0	-1.07E+04	-4622.347
month_3	-2665.9155	1238.208	-2.153	0.035	-5134.831	-197
month_4	-9168.4442	1412.175	-6.492	0	-1.20E+04	-6352.648
month_5	-7675.3087	1265.745	-6.064	0	-1.02E+04	-5151.484
month_6	-1.10E+04	1382.952	-7.937	0	-1.37E+04	-8218.732
month_7	-8324.9417	1191.91	-6.985	0	-1.07E+04	-5948.34
month_8	-6552.9386	1217.849	-5.381	0	-8981.261	-4124.616
month_9	-4048.745	1285.233	-3.15	0.002	-6611.427	-1486.063
month_10	-4559.4296	1213.728	-3.757	0	-6979.535	-2139.324
month_11	-7431.7847	1326.223	-5.604	0	-1.01E+04	-4787.371
month_12	-1.06E+04	1295.406	-8.172	0	-1.32E+04	-8002.898

	arwiki	bnwiki	cawiki	cswiki	dewiki	enwiki	eswiki	frwiki	hiwiki	idwiki	jawiki	ptwiki	ruwiki	viwiki
num_pageviews	0.000024	0.000039	0.000004	0.000011	0.000007	0.000008	0.000009	0.000014	0.000017	0.000009	0.000002	-0.000009	-0.000001	0.000017
month_2	-7.709601	238.460337	-36.153484	55.545127	-98.498105	1505.201409	-514.006053	227.090314	-34.124037	-22.893629	-42.758735	-613.840922	-601.678698	-48.922796
month_3	-403.68916	173.038854	24.524909	96.256274	-68.00553	2554.422093	-242.839893	340.295548	-3.448003	26.534465	141.707034	448.097127	-224.154872	-22.187659
month_4	-413.794543	41.439894	-91.574419	25.524189	-372.700163	-766.108517	-750.561543	-397.103586	35.284107	-114.175349	49.996921	116.512341	-497.115141	-36.374457
month_5	-204.739697	9.335865	-117.679047	-12.440345	-350.598612	-2592.828379	-265.484613	-399.297781	28.298329	-43.842654	42.777194	283.46934	-511.675134	50.192914
month_6	-315.672877	-22.071074	-253.088972	-29.217653	-366.277059	-5066.522219	-320.005906	-335.996937	-7.701176	19.23168	-151.073928	-41.091269	-1360.030369	32.887969
month_7	-289.769707	119.443445	-336.732044	-84.676845	-708.744046	-6982.836936	-700.638391	-930.57077	7.098305	74.74278	-121.88698	-241.334311	-1468.975283	41.807171
month_8	-321.538094	145.628231	-377.883252	-82.294004	-725.05789	-5177.407742	-797.372254	-1267.179761	16.353694	12.608476	-31.394112	-147.026258	-1553.810809	96.188608
month_9	-287.561003	30.771336	-273.732071	-107.21162	-577.081303	-1292.649696	-672.227325	-697.275676	-1.879815	-107.210187	-202.809996	-411.620558	-1654.623096	-5.361026
month_10	-453.763827	35.299668	118.960136	5.887519	-407.81039	-908.261092	107.557543	-388.547437	-35.113028	-100.80536	-202.705392	117.194294	-775.674435	-18.653566
month_11	-336.808006	28.467062	83.508677	81.90752	-277.897715	-1536.089683	96.146071	-262.977282	44.749403	-48.236135	-304.101187	46.981357	-524.83421	-55.947266
month_12	-65.572862	13.608245	-122.673707	-9.802861	-612.584825	-5672.668034	-92.650743	-440.21624	-6.719736	3.024159	-188.569496	-594.712613	-566.902955	-6.913237
const	307.217339	173.837266	1002.439587	651.685401	5432.655513	70124.49899	2767.660187	-2276.594263	170.613898	213.525256	979.623833	4728.781344	7842.064169	266.6839
wiki_age	nan	nan	-1.855246	-2.216228	-22.665587	-261.270396	-4.644849	7.655205	nan	4.220532	6.124523	10.14631	-4.428295	nan

	arwiki	bnwiki	cawiki	cswiki	dewiki	enwiki	eswiki	frwiki	hiwiki	idwiki	jawiki	ptwiki	ruwiki	viwiki
const	27.083825	123.045476	1002.439587	335.241348	2557.766888	19513.76342	348.151722	-118.174687	61.71233	177.760967	283.891593	467.17273	1362.64142	195.035255
month_10	-113.991766	29.450483	118.960136	88.415635	-454.851395	-4559.429626	278.007046	-159.455899	-50.472345	-74.095059	-257.004003	6.233319	94.139972	3.122273
month_11	-273.925408	15.772543	83.508677	121.264993	-549.110852	-7431.784702	-374.238222	-391.92779	48.966855	-47.332775	-201.698897	-533.015014	-59.228562	-52.563356
month_12	67.599742	0.28185	-122.673707	-61.204205	-983.256118	-10585.86444	-693.66594	-889.649452	-32.62912	-35.844596	-85.817715	-722.174068	-197.266525	13.116422
month_2	-0.016081	228.313706	-36.153484	20.602912	-917.455708	-7669.565861	-750.375707	-706.147234	-56.888256	-47.323128	59.890347	-943.146174	-213.392652	-43.784145
month_3	-135.340973	109.920002	24.524909	54.200956	-405.844253	-2665.915501	-100.292777	-192.037858	15.003359	57.411409	-22.837296	139.643296	-110.802337	26.565845
month_4	-141.361554	-18.347796	-91.574419	-33.252309	-908.514404	-9168.444184	-954.959458	-1308.724294	10.996866	-159.349955	-70.95865	-710.856548	-256.305304	-22.565334
month_5	-56.383589	-4.607287	-117.679047	-73.163871	-664.778764	-7675.308702	-179.229797	-494.124713	7.242626	-41.445348	-169.05423	-368.245605	-175.379852	46.23471
month_6	-423.929643	-25.648205	-253.088972	-87.736436	-766.232634	-10976.25928	-657.948468	-903.208735	-34.736978	-3.926893	-139.090952	-575.123139	-489.452387	29.485581
month_7	140.905792	132.214337	-336.732044	-141.306875	-969.411839	-8324.941729	-868.602228	-1265.182691	19.411581	67.123084	-215.134375	-505.22907	-326.136529	47.137752
month_8	-171.810787	103.972263	-377.883252	-68.921524	-843.187786	-6552.938647	-597.61781	-960.922818	1.863022	28.271999	-92.898543	-532.814088	-456.419537	102.972187
month_9	-12.157194	-11.213077	-273.732071	-49.374323	-730.382011	-4048.745028	-413.933599	-189.141876	-14.241236	-111.964389	-211.583367	-713.289839	-667.290735	-8.064539
num_new_accounts.L1	0.81383	0.293874	nan	0.211537	0.414957	0.670961	0.614287	0.800669	0.698633	0.308486	0.495303	0.884479	0.747226	0.167678
num_new_accounts.L2	-0.463921	nan	nan	0.25255	nan	nan	nan	nan	nan	nan	0.312141	nan	nan	nan
num_pageviews.L0	0.000016	0.000028	0.000004	0.000008	0.000005	0.000004	0.000008	0.00001	0.000013	0.000006	0.000003	nan	0.000004	0.000015
num_pageviews.L1	nan	nan	nan	nan	nan	nan	-0.000004	-0.000007	-0.000008	nan	-0.000002	nan	-0.000004	nan
wiki_age	nan	nan	-1.855246	-1.606663	-12.445385	-95.067125	-0.269474	0.120442	nan	2.78898	0.09834	2.399625	-0.108025	nan

	coef	std err	t	P> t 	[0.025	0.975]
num_active_editors	2.43E+04	699.392	34.731	0	2.29E+04	2.57E+04
wiki_age	-1.14E+07	4.93E+05	-23.044	0	-1.23E+07	-1.04E+07
month_2	1.49E+07	1.44E+08	0.103	0.918	-2.68E+08	2.98E+08
month_3	8.41E+06	1.44E+08	0.059	0.953	-2.75E+08	2.91E+08
month_4	6.90E+07	1.44E+08	0.48	0.632	-2.14E+08	3.52E+08
month_5	1.54E+08	1.44E+08	1.074	0.284	-1.29E+08	4.37E+08
month_6	2.22E+08	1.44E+08	1.542	0.124	-6.15E+07	5.05E+08
month_7	1.19E+08	1.44E+08	0.829	0.408	-1.64E+08	4.02E+08
month_8	8.52E+07	1.45E+08	0.586	0.558	-2.01E+08	3.72E+08
month_9	5.70E+07	1.45E+08	0.392	0.695	-2.29E+08	3.43E+08
month_10	-4.00E+06	1.45E+08	-0.027	0.978	-2.90E+08	2.82E+08
month_11	3.02E+07	1.45E+08	0.208	0.835	-2.56E+08	3.17E+08
month_12	9.06E+07	1.45E+08	0.623	0.534	-1.96E+08	3.77E+08
const	2.92E+08	1.18E+08	2.471	0.014	5.93E+07	5.25E+08

	coef	std err	z	P> z 	[0.025	0.975]
const	-3.53E+07	5.57E+07	-0.633	0.527	-1.45E+08	7.44E+07
num_bytes_added.L1	0.9249	0.026	35.429	0	0.873	0.976
num_active_editors.L0	2.24E+04	2858.77	7.84	0	1.68E+04	2.80E+04
num_active_editors.L1	-2.09E+04	2814.212	-7.411	0	-2.64E+04	-1.53E+04
wiki_age	-7.14E+05	3.57E+05	-2.001	0.047	-1.42E+06	-1.11E+04
month_2	6.63E+07	6.59E+07	1.006	0.315	-6.35E+07	1.96E+08
month_3	6.17E+07	5.85E+07	1.056	0.292	-5.34E+07	1.77E+08
month_4	1.12E+08	6.70E+07	1.669	0.096	-2.01E+07	2.44E+08
month_5	1.46E+08	6.31E+07	2.318	0.021	2.19E+07	2.70E+08
month_6	1.22E+08	7.25E+07	1.686	0.093	-2.06E+07	2.65E+08
month_7	-2.95E+07	6.18E+07	-0.477	0.634	-1.51E+08	9.23E+07
month_8	6.70E+07	6.20E+07	1.081	0.281	-5.51E+07	1.89E+08
month_9	3.21E+07	6.42E+07	0.5	0.617	-9.44E+07	1.59E+08
month_10	6.02E+06	6.00E+07	0.1	0.92	-1.12E+08	1.24E+08
month_11	8.74E+07	6.48E+07	1.347	0.179	-4.04E+07	2.15E+08
month_12	1.13E+08	6.64E+07	1.706	0.089	-1.75E+07	2.44E+08

	arwiki	bnwiki	cawiki	cswiki	dewiki	enwiki	eswiki	frwiki	hiwiki	idwiki	jawiki	ptwiki	ruwiki	viwiki
num_active_editors	10582.20655	26602.5403	17895.99905	10621.06192	29606.64042	24290.56467	17321.27777	8791.868583	8102.258084	8197.827586	6147.303156	14202.57743	16914.15781	23710.39481
month_2	-5829842.017	1650546.892	-1242584.645	-704837.625	11925778.96	14857808.12	-4958982.42	-13256042.4	-1530416.928	-3201863.248	-4056566.057	-1249251.154	-4408400.009	-3674376.367
month_3	-5560781.128	1842651.065	-929702.4456	-950817.1956	26735559.64	8406523.844	-8875588.738	-3174474.313	4280495.243	-2760409.675	1434914.17	408152.3646	-1230369.515	-3433141.469
month_4	3637728.833	1100750.172	-819447.2459	-3094485.832	32250302.84	68947100	-8552387.262	350831.9542	468956.7899	-2152221.627	4894985.759	-3630976.953	-10789527.43	1937828.715
month_5	8285696.079	13669.03549	-1416122.944	-2393691.725	24952057.16	154286944.6	-12425552.32	-2639672.078	-353744.8195	-2954547.234	4582602.939	-322649.6611	-8048016.732	18037738.04
month_6	10643353.33	-585204.3962	-642068.7877	-3179391.098	39917212.07	221719824.1	-7835822.377	-14427948.24	-258467.0894	-2108942.646	-7857668.286	-1424757.108	-5223370.259	3869073.362
month_7	482583.5149	-1709100.098	851527.8278	-2078046.409	56311593.88	119142005.7	-104964.7107	-12517911.88	-1231616.536	-3785904.253	-5026953.709	-4630090.711	-2636647.77	4307636.136
month_8	-5058967.44	510653.7294	1495481.16	-1337085.453	14773339	85171809.46	-4514778.153	-8570929.607	548379.2625	-4373705.217	-2219558.335	2113583.687	-1428919.727	4745553.915
month_9	-1405603.264	-1168768.224	484009.4596	-1323182.422	23719198.23	57013611.19	-3613184.642	-13989157.43	29156.78407	-5584626.069	130536.9378	-2812538.748	-1551402.888	-165713.6541
month_10	-4394860.242	-2193171.313	-399105.6179	-2870536.713	33455148.83	-3995308.542	-16579413.42	-1332390.552	77110.10953	-4850740.456	600445.3211	-5055840.971	-8176652.843	-1490765.813
month_11	-2263711.666	185591.2848	94860.62018	-2350085.187	20346191.91	30232327.91	-4953245.269	-16822617.49	1209728.384	-4572870.571	-2762281.119	-1950045.484	-15070765.35	8564.087615
month_12	-375746.8048	324039.7743	415853.3705	-1621587.079	48618774.09	90591221.38	6288588.913	-6781295.472	-1223829.531	-1726331.347	2226560.47	-681852.3179	-13028022.24	-2175920.914
const	26352436.64	3966166.066	3162909.756	8430031.624	51003315.04	280725660.4	34242466.03	86182787.8	4829617.936	10430749.95	47603467.41	11966227.7	64861021.58	-402153.8745
wiki_age	nan	nan	nan	nan	-2187174.582	-11351083.9	nan	nan	nan	nan	nan	nan	nan	nan
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