



BUILDING THE LEDGER OF RECORD FOR RESEARCHERS AND SCIENTISTS

ARTiFACTS Overview

Discussion Document

4/26/2018

WHAT IS ARTiFACTS?

- ARTiFACTS provides a simple, user-friendly collaboration platform, purpose built for academic and scientific research that leverages blockchain technology
- Researchers can record a permanent, valid, and immutable chain of records in real-time, from the earliest stages of research for all research artifacts, including citing/attribution transactions

Launched March 19

THE ARTiFACTS PLATFORM

Enabling Researchers & Scientists To Do Three Simple Things:

- Establish proof-of-existence and confirm provenance at any time
- Protect and manage intellectual property (IP) while concurrently facilitating knowledge and content sharing
- Provide and receive valid, break-proof attribution and assignment of credit

CITATION

sī'tāSH(ə)n/

The Mertonian description of normal science describes citations as the currency of science. Scientists make payments, in the form of citations, to their preceptors— *Eugene Garfield, 1962*



ARTIFACTS MAKES SHARING EASY, SAFE AND BENEFICIAL-- DRIVING BEHAVIOR CHANGE



EASY



SAFE



BENEFICIAL

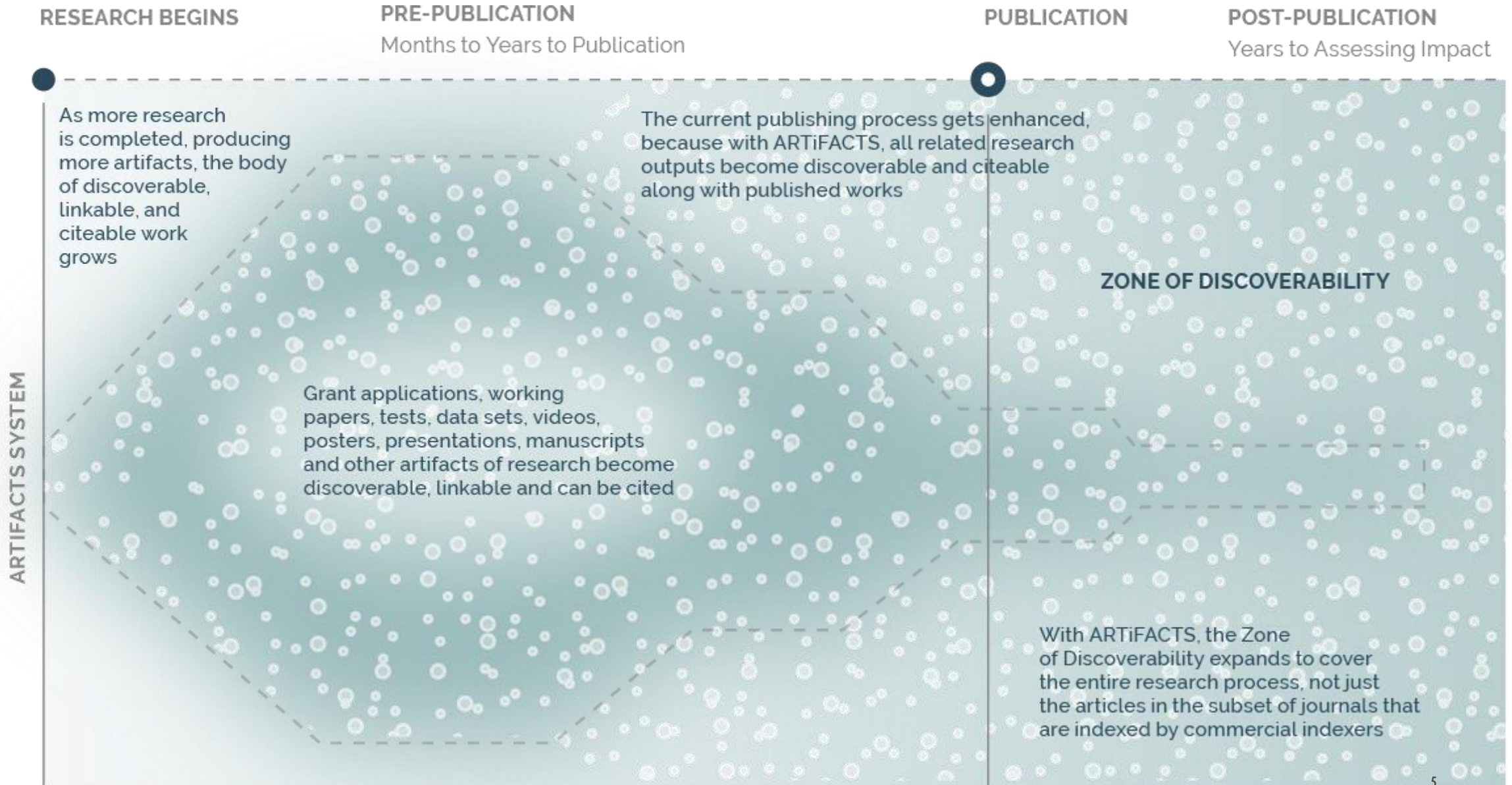
- Specifically for research workflows
- Integrates with leading research forms

- Cryptographic hashing and time stamping
- Anonymous or public
- DRM via smart contracting (future)

- Build reputation immediately
- Find collaborators
- Speed research

THE ARTIFACTS' SYSTEM LIBERATES KNOWLEDGE AND BUILDS REPUTATIONS IN REAL TIME

ARTIFACTS ENABLES FASTER, MORE COLLABORATIVE RESEARCH, EXPANDING KNOWLEDGE



HOW DOES IT WORK: EXAMPLE, ESTABLISHING PROOF OF EXISTENCE

The screenshot shows the ARTiFACTS web interface. At the top, the logo 'ARTiFACTS' is on the left, and 'My Projects', 'Support', and a user profile 'courtney morris' are on the right. Below the logo, navigation tabs include 'mountains', 'Files', 'Wiki', 'Contributors', 'Add-ons', and 'Settings'. A 'Transact' button and a chat icon are on the far right. The main content area displays the file 'heli.jpg (Version: 1)'. A blue button labeled 'Proof of Existence' is highlighted. A teal callout box points to this button with the text: 'Creates a SHA-256 one-way hash (fingerprint) of the file and puts that hash on the blockchain with the block's timestamp'. To the right, another teal star-shaped callout box says: 'SUCCESS! I have just immutably established provenance for this picture'. Below the file name, there are buttons for 'Check out', 'Delete', 'Download', 'Share', 'View', and 'Revisions'. On the left, an 'Artifact Metadata' section lists: Contributors: courtney morris (Methodology - Some, Conceptualization - High); Date created: 2018-03-01 16:00 PM | Last Updated: 2018-03-27 19:24 PM; Type: Image and Recording Picture; Stage: draft/in-process; Location: DOI (http://atata.ai); Rights: Attribution(by); Description: heli ski picture. At the bottom left, a file browser shows a folder 'mountains' containing 'ARTiFACTS Storage' and a list of files: 'heli.jpg' (selected), 'IMG_20180319_111959_625.jpg', 'rock fest.JPG', and 'WIN_20171121_08_14_00_Pro.jpg'. The main image area shows a close-up of a helicopter's rotor hub against a sky with a rainbow and snow-capped mountains.

HOW DOES IT WORK: EXAMPLE, ESTABLISHING PROOF OF EXISTENCE



ROPSTEN (Revival) TESTNET

Search by Address / Txhash / Block / Token / Ens

GO

HOME

BLOCKCHAIN ▾

TOKEN ▾

CHART

MISC ▾

Transaction 0x93ab46a3b7aaa258278d99546eaba03f0a0817ce0b6def8e56c6823e5f1fae08

Home / Transactions / [Transaction Information](#)

Overview

Transaction Information

Tools & Utilities ▾

TxHash: 0x93ab46a3b7aaa258278d99546eaba03f0a0817ce0b6def8e56c6823e5f1fae08

TxReceipt Status: **Success**

Block Height: [2848412](#) (259119 block confirmations)

TimeStamp: 39 days 21 hrs ago (Mar-16-2018 06:29:20 PM +UTC)

From: [0x84b5f9945fe6ffe0c5b8924b1ac7c9d150f407cf](#)

To: Contract [0xe17b2a6a77dca09aab62e4d86d165e7b24946f5b](#) ✓

Value: 0 Ether (\$0.00)

Gas Limit: 250000

Gas Used By Txn: 113099

Gas Price: 0.000000005 Ether (5 Gwei)

Actual Tx Cost/Fee: 0.000565495 Ether (\$0.000000)

Nonce: 99

Input Data:

```
Function: add(string art_id, string entity, bytes32 hash)
```

```
MethodID: 0xa725984b
```

```
[0]: 0000000000000000000000000000000000000000000000000000000000000000
```

FOUNDERS

**Kevin
McCurry**

25+ years across
technology and
information industries
Former CSO, Thomson
Scientific

**Courtney
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and academia
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**Marcos
Blanco**

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and start-ups



BERTELSMANN

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ADVISERS

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Ron Dixon

Head of Clinical Affairs
at Onduo

THANK YOU



WHY SHOULD YOU CARE?

- Publishers have an opportunity to add value to the community by adopting new technology and leading on addressing known issues
- Adding additional knowledge/history to a published article – while supporting the enhancement of the researcher’s reputation – concurrently builds the reputation of the journal & the publisher

Reputation & Recognition



The NEW ENGLAND
JOURNAL of MEDICINE

Variations in Databases Used to Assess Academic Citation Impact

N Engl J Med 2017; 376:2489-2491 | June 22, 2017 | DOI: 10.1056/NEJMc1616626

“Online scientific databases are used to evaluate academic productivity. **discrepancies among database recognition and professional academician.**”

“There were significantly more citations for faculty with Ph.D.s than for those with D.D.S.s, and dual degrees. These citations increased significantly with increased academic recognition.”

Research Integrity



China cracks down on fake peer reviews

Funding agencies announce harsh penalties and stronger policies

David Cyranoski

“The Chinese government is going to crack down on scientists who dupe journals by creating fake **reviews of submitted papers.** A crackdown by the science ministry announced last week would suspend the government of scientists involved in such fraud, which surfaced when a cancer journal retracted 10 papers by Chinese authors.”

“[A Chinese Researcher] says that such behavior cannot be excused, other factors such as the pressure to publish and the desire for career advancement are also contributing factors.”

Peer Review



Peer review: a flawed process at the journals

Richard Smith

“THE DEFECTS OF PEER REVIEW are well documented. Evidence on the effectiveness of peer review is considerable evidence on its **poor at detecting gross defects:** detecting fraud it is **slow, expensive, and highly subjective** and is prone to bias, **and easily abused**.”

Reproducibility



Reproducible Research, Just Not Reproducible By You

By DAVID CROTTY | MAY 24, 2017

“At the recent STM Annual Meeting in Vancouver, Pritsker, founder and CEO of the Journal of Experimental Biology (JOE) gave a talk about the challenges present in efforts to drive scientific reproducibility. Enormous amounts of effort, money, and time have been put toward opening up the data for sharing in experiments. But very **little attention is directed toward the protocols and methods used to collect those data.**”

“If I want to reproduce your experiment, I need to see your protocols and methods.”

Data Access



Data Sharing by Scientists: Practices and Perceptions

“Nearly two thirds (67%) of the respondents agreed that lack of access to data generated by other researchers or institutions is **a major impediment to progress in science**”

“The high percentage of non-respondents to this question [of data sharing] most likely indicates that **data sharing is even lower than the numbers indicate.**”

“A vast majority (93%) find it a fair condition to use other people's data if there is **formal acknowledgement...** in all disseminated work making use of the data and 95% of the respondents reported that they find it fair to use other people's data if there is **formal citation...**”

WHAT ARE SOME USE CASES FOR YOUR CUSTOMERS?

- **ENHANCE PEER REVIEW** – enable peer review to efficiently consider corroborating evidence of reported findings
- **DATA SHARING & REPRODUCIBILITY SERVICES** – provide access to research outputs related to your authors' publications for stakeholders
- **REPUTATION ENHANCEMENT** – of your authors, your journals and your publishing brand
- **ANALYTICS & INDICATORS** – develop, test and deploy relevant indicators of improvements made addressing scholarly communications issues
- **PROTECT AUTHORITATIVE CONTENT** – address rogue sharing and copyright abuse

INTEGRATING ARTIFACTS INTO AUTHOR / PUBLISHER WORKFLOWS

The image shows a Google Drive document editor interface. The document title is "Final draft for submission". The sidebar on the right is titled "ARTifacts" and "THE LEDGER OF RECORD FOR RESEARCH". It shows the user is signed in as "dko...ai" and provides options for integrating the document into research workflows. Three numbered arrows point to specific elements: arrow 1 points to the "TRANSACTION" button, arrow 2 points to the "SAVE" button, and arrow 3 points to the "SUBMIT" button. The document text discusses scientific publications and retractions, with two phrases circled in red: "a representative dataset" and "https://files.umich.edu/phd_data/bibliodata.". The document text is as follows:

in the form of scientific publications, have laid a solid foundation for the overall development and advance of science for centuries. Accumulative scientific advances are predicated on the assumption that scholars are honest and serious about the accuracy and integrity of their published work. Unfortunately, this is not always true. The scientific community bears the responsibility of self-examination and self-correction to ensure the integrity and authority of scientific literature.

During the past few decades, the rate of paper retractions, because of errors or purposeful misconduct, has increased dramatically in nearly all academic fields (Noorden, 2011; Steen, Casadevall, & Fang, 2013) see a representative dataset [https://files.umich.edu/phd_data/bibliodata.] A retraction of a published article indicates that the ideas, methodology, or results presented in the original article are shown to be scientifically invalid, and therefore can no longer serve as the proverbial "shoulders of giants." The most common reasons for retraction are scientific misconduct (i.e., fabrication or plagiarism) or unintended errors. Retractions are typically initiated by journal editors or by the article's authors themselves.

Recently, a growing list of retracted papers has drawn the attention and scrutiny of both the academic and the popular media. In one widely reported case, an evolving attitudes toward gay marriage published in Science (LaCour & Green, 2014) was retracted because one of the authors was not able to provide the raw data. The Lancet retracted a study by Wakefield et al. (1998) that suggested that combined vaccines of measles, mumps, and rubella lead to autism in children. Despite the retraction of the study, many parents continue to believe it, which has resulted in a decline of vaccines for children in Britain and the United States. In another prominent case, two papers about human stem cells published in Science (Hwang, Roh, et al., 2005), were retracted because the authors fabricated the data.

Although the systematic and exhaustive study of the publication retraction is still in a nascent stage, several previous studies explore this area from different aspects and inform our work. Fang, Steen, and Casadevall (2012) categorized more than 2,000 biomedical and life science research articles based on retraction reasons and found that more than 60% of retractions are attributed to misconduct. Liu, Hui, and Jones (2010) conducted a controlled experiment showing that the citation counts of retracted articles decrease more

CONFIRMING ATTRIBUTIONS DURING AUTHORIZING PROCESS

The screenshot shows a Chrome browser window displaying a Nature article. The address bar shows the URL <https://www.nature.com/articles/d41586-017-08589-4>. The page header includes the Nature logo and navigation links. The article title is "Could Bitcoin technology help science?" and the author is Andy Extnance. A notification box from ARTifacts is overlaid on the right side of the page, indicating a transaction on the blockchain that cited the user's work. A large arrow points from the notification to the text "You've Been Cited!".

Chrome
85%
Mon 6:13 PM
Could Bitcoin tech... x

nature.com > nature > news > article
a natureresearch journal
ARTiFACTS THE LEDGER OF RECORD FOR RESEARCH

Signed in as cmor...ai
+ A transaction to the blockchain just cited your work: <https://artifacts.ai/2vsYTH>

NEWS · 18 DECEMBER 2017

Could Bitcoin technology help science?

Blockchain could lend security measures to the scientific process, but the approach has its own risks.

Andy Extnance

PDF version

RELATED ARTICLES

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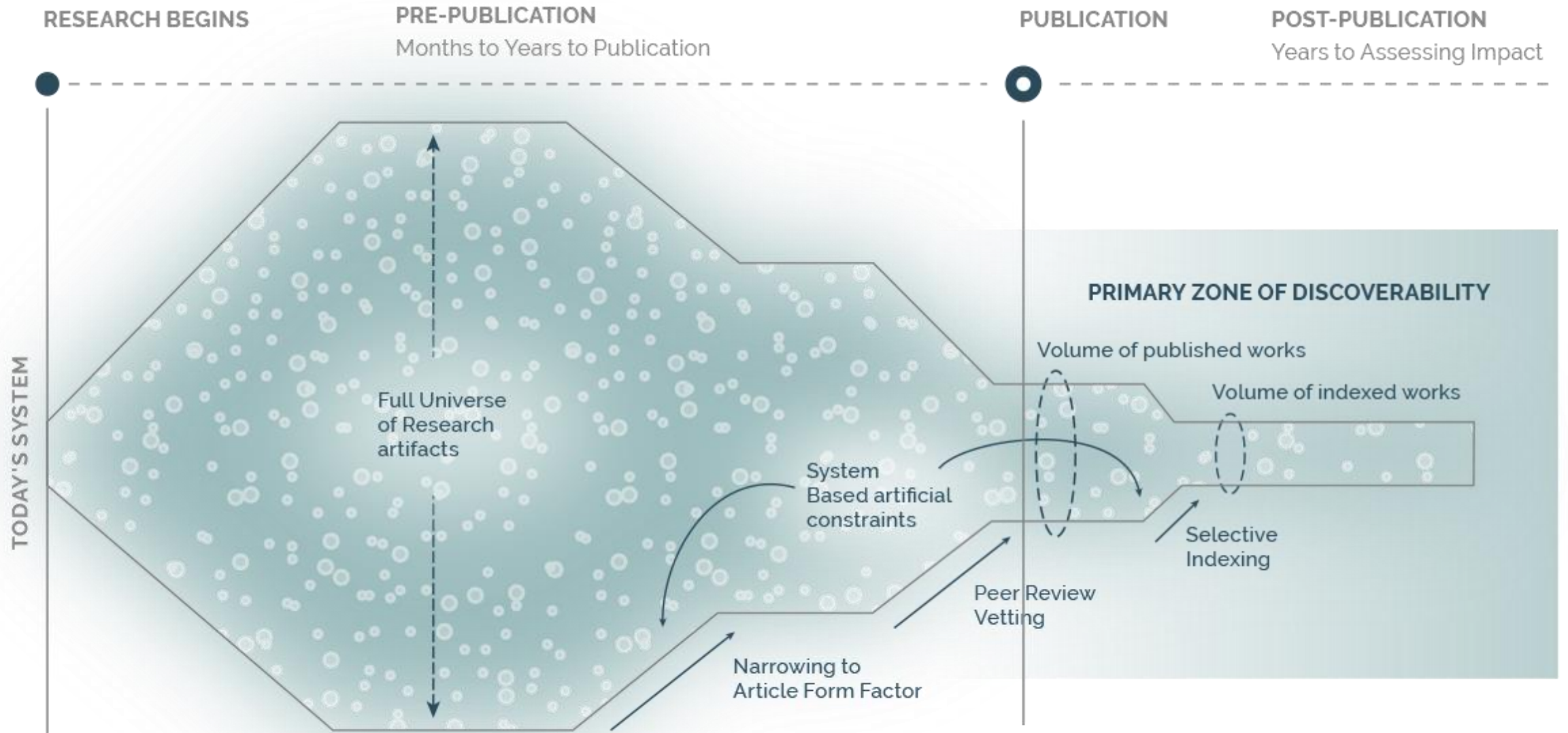
You've Been Cited!

THANK YOU



APPENDIX

TODAY'S SYSTEM CONSTRAINS & INHIBITS RESEARCH VELOCITY



WITH A BROKEN CURRENCY – WHERE NO TWO SOURCES EVER AGREE

Web of Science

THEORY OF FIRM - MANAGERIAL BEHAVIOR, AGENCY COSTS AND OWNERSHIP STRUCTURE

By: **JENSEN, MC (JENSEN, MC)**; MECKLING, WH (MECKLING, WH)

[View ResearcherID and ORCID](#)

JOURNAL OF FINANCIAL ECONOMICS

Volume: 3 Issue: 4 Pages: 305-360

DOI: 10.1016/0304-405X(76)90026-X

Citation Network

12,872 Times Cited

90 Cited References

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(data from Web of Science Core Collection)

All Times Cited Counts

13,420 in All Databases

12,872 in Web of Science Core Collection

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ELSEVIER

Journal of Financial Economics

Volume 3, Issue 4, October 1976, Pages 305-360



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Theory of the firm: Managerial behavior, agency costs and ownership structure

Michael C. Jensen, William H. Meckling *

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Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure

Michael C. Jensen, A THEORY OF THE FIRM: GOVERNANCE, RESIDUAL CLAIMS AND ORGANIZATIONAL FORMS, Harvard University Press, December 2000
Journal of Financial Economics (JFE), Vol. 3, No. 4, 1976

78 Pages - Posted: 19 Jul 1998 - Last revised: 18 May 2013

Paper statistics

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91 [References](#)

4,341 [Citations](#)



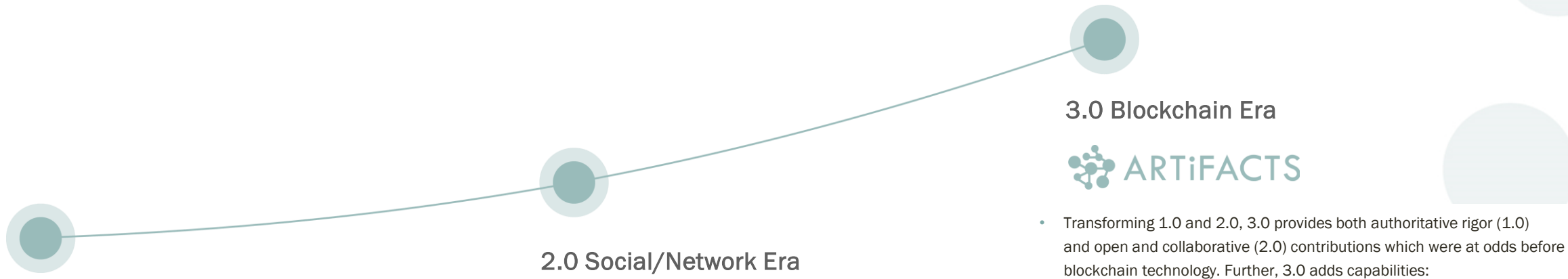
Theory of the firm: Managerial behavior, agency costs and ownership structure

MC Jensen, WH Meckling - Journal of financial economics, 1976 - Elsevier

Abstract This paper integrates elements from the theory of agency, the theory of property rights and the theory of finance to develop a theory of the ownership structure of the firm. We define the concept of agency costs, show its relationship to the 'separation and control' issue,

[Cited by 67845](#) [Related articles](#) [All 64 versions](#) [Cite](#) [Save](#) [More](#)

ARTiFACTS OPERATES IN A NEW ERA WHERE THE COMPETITION DOES NOT



1.0 Database & Internet Era



- Traditional Abstracting & Indexing (A&I) databases
- Historically considered 'rigorous' due to explicit coverage, editorial, and curation policies
- Limited, however, focusing only on a sub-set of published articles missing a vast corpus of research outputs
- Deeply retrospective—greatly reducing value in discovering and assessing current research
- Susceptible to editorial errors, author ambiguity, and citation breaks —tolerated as 'better than nothing'
- No source of truth—Inconsistent in policies, coverage, and methods which creates widely divergent citation counts and metrics

2.0 Social/Network Era



- Focus on sharing, researcher promotion, and collaboration—several with rapid adoption—leveraging the power of the researcher community
- Have not solved 1.0 issues and have additional persistent pain points of:
 - In-efficient/non-comprehensive citing
 - Risk of researcher loss of IP
 - Undefined/incomplete coverage
 - Potential for copyright infringement (from unintended to explicit pirating as seen with Sci-Hub)
 - Measures derived from any of these solutions ('alt-metrics') are 'soft' and lacking in rigor

3.0 Blockchain Era



- Transforming 1.0 and 2.0, 3.0 provides both authoritative rigor (1.0) and open and collaborative (2.0) contributions which were at odds before blockchain technology. Further, 3.0 adds capabilities:
 - Covers all stages of the research cycle and all relevant research artifacts
 - Leverages the community, and technology, enabling prospective curation and meta data capture, vastly reducing resource needs
 - Provides high integrity, comprehensive, break-proof citations and artifact linkages in 'real time'
 - Unlimited scalability with no single point of failure
 - Facilitates sharing, providing proper attribution and to creators and IP protection for copyright owners
 - Rich dimensionality for citations and other metrics
 - Smart contracting for access and use rights
 - Logical capability extensions to support peer review and data management (e.g. clinical trials)
- With a natural migration path for adoption...
 - Addresses researcher needs by resolving trade-offs (e.g. sharing while protecting IP, transparency with privacy)
 - Works within existing researcher workflows
 - Capabilities and attributes that appeal to industry incumbents

OPPORTUNITIES FOR UNIVERSITIES

- There are several areas where the ARTiFACTS system can help institutions further their missions

Scholarly Impact

- Because so much research is not shared, institutions are not measuring their full impact to scholarly advancement

Grants/Funding

- Similarly, understanding the full outputs/impact of grants is challenging, particularly if results don't get published
- Grant dollars can be more effectively allocated and used if more previous research is liberated, limiting duplication or wasted work
- Grant funding can be more confidently awarded to institutions who are showing the full impact of previous grant awards
- Compliance with grantor sharing requirements is inconsistent and burdensome. ARTiFACTS can make it seamlessly built into the workflow, including owned repositories (ARTiFACT can run your repository and drive usage)

Reputation

- Adopting ARTiFACTS signals the institution's commitment to building the reputations of its researchers in real time and supporting the sharing and collaborating of in-process research
- By considering a more comprehensive profile of scholarly achievement, tenure, promotion and funding decisions are more informed

THIS NEW VIEW HIGHLIGHTS THE INHERENTLY RELEVANT & DISTINCTIVELY COMPELLING APPLICABILITY OF ARTIFACTS' BLOCKCHAIN DEPLOYMENT

- **Increased transparency, security and distributed control** are inherent benefits that the scientific community gains with DLT
- **ARTiFACTS seamless blockchain** deployment in the workflow creates a **more effective, immutable and efficient** way for establishing proof of existence (POE) and provenance
- **Blockchain provides an inherently transparent and persistent link** to the citation and the citation chain
 - Authors and all other participants have an unbreakable chain to what a work is citing and what is citing a work
 - Citation counts are consistent and, through the distributed ledger model, balances are in-sync
- **Blockchain can help fix a broken currency*** and, at scale, **creates a transparent 'ledger of record' for research, where everyone can see and agree the balances**
- By making blockchain enabled POE **easy**, the ARTiFACTS' deployment makes **sharing and discoverability** at all stages of research across all forms of content **more secure**, thereby **reducing risk in losing IP control**, and **beneficial** with **ability to 'pay' and receive full attribution at any time**
- Blockchain allows for **information rich citations** (e.g. why a prior work is cited) which can't be done in today's binary system
- **Blockchain is fully compatible with today's workflow**, but can also provide potentially transformative extensions into peer review, funding administration, and digital works rights and access management