# summary

16822 characters in 2403 words on 484 lines

Florian Moser

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# 1 Digital Sustainability

## 1.1 introduction

high prices need scarcity, which needs rivalry

### 1.1.1 logins

provide personalization & privacy for user
make information like physical possession; get statistics about usage

### 1.1.2 difference physical / informational

both have an apple and exchange it → both have one apple
both have an idea and exchange it → both have two ideas

**physical**
one original (no copies)
one consumer
denying others access is practical

**informational**
identical copies
many consumers
denying others access is challenging

### 1.1.3 characteristics of goods

excludable access (easy/difficult to deny others)
consumption rivalness (diminish of value when others consume too)

**dimensions**
easy/low like club goods (fire protection, cable TV)
easy/high like private goods (cars, books)
hard/low like public goods (sunset, peace, defence, knowledge/cultural)
hard/high like common pool (library, environment)

### 1.1.4 digitalization

applies to science, traditions, art, software, ...

**pre-digital area**
costly production & distribution
originals finite, scarce, of different quality
needs risky investment which needs incentives to do it

**after digitalization**
cheap production (computer) and distribution (internet)
concept of original does not make sense
less investment needed
mostly only transaction cost (contacting sources/target)

### 1.1.5 intellectual property rights (IPR)

for knowledge scarcity
exclude others from access/use by legal means (copyrights, patents, trademarks)
assumption that no new knowledge without financial incentives & rewards

#### 1.1.5.1 ethical position

"things that are not diminished when shared must be shared"
how to use digital resources in our society?

#### 1.1.5.2 contribution positions

**all alone**
one genius alone did all the relevant work
hence ensure protection & incentives for creator alone

**builds upon previous work**
the innovation was only possible thanks to previous
hence ensure access & information flow for all

## 1.2 scientific publishing

scholars publish articles in journals

### 1.2.1 system of referencing (citations)

to show other relevant previous work and how own work differs
avoids repeating and allows to discover & build up on previous work (and not just re-do it)
measure performance

### 1.2.2 mechanism important

knowledge exchange
reputation building (but not an incentive for quality)

### 1.2.3 cycle

scientists write papers & applies for journal
scientists peer-review (get reputation but no money)
journal proof-reads / edits paper & aquires copyright
journal publishes & sells subscriptions

### 1.2.4 market

top journals can not be substituted (demand independent of supply)
hence prices most likely much higher than cost

### 1.2.5 industry

ca 8 firms control about 2/3 of the 7.3 billion dollar market
while costs sinks (digitalization) demand stays constant (loyal readers)
illegal downloading of papers if heftly punished
sci-hub and library genesis as pirate alternatives

### 1.2.6 Open Access

wants to change (remove) the industry behind scientific publishing
make information / tools openly accessible for the public

**berlin declaration (2003)**
"mission of disseminating knowledge is only complete if all have access"
"openly accessible & compatible tools & content"
1) users get free, irrevocable, worldwide right to access, copy, use, distribute, transmit and display
2) complete version of work is deposited in online repository

**implementation**
free for readers
author pays up-front
contractural expiration of copyright

**implementation alternatives**
golden (payed publishing as a service)
green (can additionally publish on own website with some restrictions)

**examples**
public library of science plos.org
open science online courses foseropenscience.eu/courses
open access journals doaj.org

**blockchain for science**
can takle malfunctioning processes
reward first mover (prove who was first)
do peer reviews (protect against tampering)
incentivise sharing earlier (prevent double work or late knowledge exchange)

## 1.3 property

**property vs possession**
possession is to have it physically, the stronger one wins
property is a structure of law, rationale are effort & scarcity

**history**
german law includes use & ownership of produced items
roman law additionally includes abuse (can do anything you want with it)

**property forms**
private property (owned by specific person)
public property (owned by all, but maybe not payed by all)
common property (usable by all with some limitations)

## 1.4 knowledge

### 1.4.1 what

data is a collection of data points
information is the combination of data
knowledge is the interpretation (biased by culture, education, ...) of information

### 1.4.2 how

needs tangible medium
artifact like books, articles
facilities like libraries, repositories
regulation happens on this level

### 1.4.3 who

**public domain**
abstract space nobody owns
unlimited acces, use without restrictions
basis of cultural heritage (receips, traditions, literature)
initiatives like gutenberg, cpdl, mutopiaproject allow upload/downlad of copyrightfree works
in contrary enclosure (public goods declared private like wild west)

## 1.5 tragedy of the commons

each rational separate actor benefits when overconsuming scarce resources
everyone has the right to use, noone has the right to exclude others
hence prone to overuse
examples are forests, parks, high seas

## 1.6 tragedy of the anticommons

when commons is inverted
everyone has right to exclude others, no one has the priviledge of exclusive use
hence prone to underuse
examples are software patents, copyright
patents are legally binding even if not known to the offender, hence risky to use

## 1.7 case study netscape

94 mosaic netscape developed
95 IPO during internet hype
was defactor standard because free; mosaic got money with server software
95 release of internet explorer 1.0
microsoft abuses market power to force IE (bundled with windows)
feature bloat, instabilities, incompatabilities, bugs
IE does not respect standards, implements proprietary extensions
98 netscape dies
microsoft is sued, internet explorer usage explodes
innovation ceased
but dumped code to mozilla
02 release of mozilla 1.0

# 2 intellectual property rights (IPR)

## 2.1 monopoly

"alone-seller", single provider of service/product
hard to compete, substitute, enter market

## 2.2 IPR

knowledge has incentive problem (non-excludable, non-rival)
grants exclusive (create incentive), time-bounded (avoids monopoly) rights

**incentive purpose**
create incentive to investment in R&D
but balance with optimal (hence public) ressource allocation
change temporal (how long) and spatial (how much) dimensions

**allocation purpose**
efficient (reduce transaction costs)
marketable (to get price the product is worth)

**implementations**
copyright, patents, design rights, ...

**alternatives**
culture flat rate (instead middle man taking cut)
innovation prices (many prices already exist)
trade secrets (but other cannot contribute)
subsidies of the state
competitions / hackatons

altruism
crowdfunding

## 2.3 copyright

protects original forms/expressions
exclusive rights for the work

### 2.3.1 history

1662 licensing act (only printin guilde can copy)
1710 copyright 14 years

### 2.3.2 grant rights

grants any rights in any forms
grant license (permission to use without ownership)

### 2.3.3 neighbouring rights

database rights ("leistungsschutzrecht" EU)
renting rights
performers rights

### 2.3.4 forms

co-creators (each author has veto rights)
derivative works (ownership depending on contribution amount)

### 2.3.5 exceptions

no need to pay if transaction cost higher than monetary value CITATION NEEDED
fair use for education/criticism

### 2.3.6 recent development

**for public**
public benefts from easy difficult-to-prevent distribution
license to reduce transation costs & define CC / copyleft

**for author**
extend copyright duration & rights
prohibided to circumvent copyright protections
development of digital rights management (DRM)

### 2.3.7 motivations

utility (maximize net social welfare)
labor (your worked for it)
personality (human needs, self expression)
social planning (justice)

## 2.4 patents

protects ideas/concepts
exclusive rights for the listed claims

### 2.4.1 history

1474 venetia "new, ingenious, useful device"

### 2.4.2 preconditions

patentable (for example math excluded)
novel (never seen before)
non-obvious (US) / inventive step (EU)
useful (US) / industrial application (EU)

### 2.4.3 issues

block competition (expensive prosecutions)
races (around hype technologies)
trolls (buy patents to sue others)
thickets (many patents in same area)
lots of applications (slow granting process)

**cumulative inventions**
composed out of many previous work
previous strongly protected work may prevent further because too similar

### 2.4.4 solutions

pools (many owners act and use jointly)

## 2.5 patents vs copyright

both grant time-limited exclusive rights
idea/concept vs expression
application fee & reviewed vs free & immediate
defined by work vs by fuzzy claims
disclosed implicitly vs exlicitly
unintentional infringement unlikely vs more likely
monitoring costly vs cheap

limitations for other creators big vs small
transaction cost high vs lower

## 2.6 IP architecture

### 2.6.1 WIPO

for wordwide IPR with treates
can not publish defectors because part of UN
grants copyright to software

**history**
1886 copyright (bern convention)
1883 patents (paris convention)
1961 performers/producers (rome convention)

**internet**
1996 copyright & performers/producers
2000 patents (PCT)
bit later EU & CH

### 2.6.2 WTO

for trade relations with TRIPS contracts
can punish members that do not uphold contract
protects software like literary works
allows to grant patents of any form

### 2.6.3 EU

defines implementation with EPC (european patent convention)
excludes discoveries, theories, math, aestetic creations, mental acts, playing
games, doing business, computer programs, presentation of information
but only if its referred as such
hence can reformulate abstract ideas to automata

## 2.7 software

source code is compiled to binary

### 2.7.1 approaches

**proprietary**
bill gates is a market person, sees software as a product for profit
only binary distributed with EULA describing how usage should be done

**free software**
richard stallman is an societal activist, sees software as commons for
freedom
source code published with four freedoms
free software as a social movement

**open source**
linus torvalds is an engineer, sees software as tool for hobby
full source code disclosed
open source as a development methodology
developed much later in internet

### 2.7.2 licenses

**four freedoms**
right granted to use/read/modify/distribute

**copyleft**
"all rights reversed" or "share-alike" (as CC)
published derivatives fall under GPL too

**vitality**
if you combine with free software, you also need to use GPL

**examples**
GPL/AGPL with copyleft & vitality
LGPL/MPL with copyleft
BSD/APL as permissive licenses
public domain which removes copyright
dual licensing with multiple licenses for different groups

### 2.7.3 societal questions

**who**
mainly young, male, high education

**why**
rewards (learning, solve own problems, low sharing cost, monetary reward)
incentives (reciprocity, reputation, future career benefits, freedom)
enjoyment (fun, coding as art, altruism, ego-boosting)
obligation (sense of community, adherence to community norms, political
like GPL, reputation)
no skills/interest in sales/marketing

**how**

project defining communcation, conflict resolution, release schedule
collaborative work on repository
communication over mailing lists, chats, meetings, conferences
companies as part of the community

## 2.8 open source community

### 2.8.1 characterization

user engagement (else no point in having project)
transparent (developments, decision taking)
collaboration (work together with diverse set of people)
agility (adapting to changing environment)
sustainability (keeping up pace for needed period of time)
tools (wikis, bugtracker, versioning, email lists)

### 2.8.2 management methodologies

cathedral (single contributor) vs bazaar (many contributors)
dictator (single decisionmakers) vs meritocracy (many decide)

**examples**
GNU emacs as cathedral, dictator
Linux as bazaar, dictator
HTTPD as bazaar, meritocracy
apache OODT as cathedral, meritocracy
ubuntu as in between

### 2.8.3 governance design

choice of license (to only allow wanted behaviour)
legal sanctions (to deal with misbehaviours)
protect brand (with trademarks)
legal setup (like a foundation)
organisational (responsibilities, support, contribution process)

## 2.9 examples

### 2.9.1 openness

**data/content**
opendefinition to check what is open or not
creativecommons which provides licenses
projects include wikipedia, openclipart

**format/protocols**
open communications protocols like http/ftp/...
file formats like odt, ogg, png
technical standards

### 2.9.2 limitations

format/protocols may be proprietary

**technical standards**
legal open but may lack technical details
publicly available as royality free / RAND
standards of organisation which must be bought (ISO, DIN, IEEE)

## 2.10 history of free software

1950 computers as big as a room with user manuals (software)
1969 unbundling of hardware, software by IBM
1975 microsoft, apple
1984 GNU
1989 copyright for software
1992 openSuse, redhat, linux
1995 IE with browser wars
1998 haloween documents (microsoft identifies FOSS as major threat)
2002 OpenOffice
2007 java under GPL

## 2.11 open source usage

higher in software industry

**importance of factors (decreasing)**
security updates
stability
documentation
support-guarantees
compatability
adjustments
release planning
knowledge
support
legal bindings
trainings

## 2.12 business models

### distribution
provide packages (OS, security tools, ...) and schedule releases, delivery, support
need expertise, community relations, developer access
earn with dual licensing, proprietary additions, consulting, support
examples are redRat, mySQL

### service provider
provide business process expertise, IT consulting, training
need business knowhow, topic scouting, event management
earn with support/training, consulting
examples are accenture, ibm, CMS provides

### hardware
provide free/open hardware
need to be able to build hardware
earn with hardware, merchandise
examples are fairphone, Edge, Vivaldi

### retail
provide specialized sales channel
need sales experience
earn with books, tutorials, merchandise
examples are oreilly

## 2.13 open source policy

### policy
guideline, plan of action
must not be adhered to, but will be tried to be followed

### arguments
cost (relative to GDP quite significant)
data exchange (incompatabilities or inaccessibility)
independence (reduce influence of other entities)
education (others must be able to study others code)
cultural diversity (remove restrictions to others)

## 2.14 distributed ledgers

multiple nodes agree on what transactions are included in log
removes intermediary normally do the tasks
forms are blockchains, directed ascyclic graph (DAG), hashgraphs

### 2.14.1 blockchains

forms are smart contracts, currencies
form of currencies are bitcoin, litecoin

### 2.14.2 blockchain 2.0

transactions are code
code execution is verified
hence blockchain is now verified execution

### 2.14.3 drawbacks

#### privacy
transaction are public; only addresses are not trivially known
→ privacy coins that try to encrypt DL

#### decentralized
ripple has no open network ("permissioned"), bitcoin all in china

### 2.14.4 workings

create block from hash of previous block, transactions
change nonce and hash itto get some non-invertible function (hash)

## 2.15 sustainability

### 2.15.1 aspects

intragenerational (for fellow citizens; but who decides)
intergenerational (for our children; but who represents)

### 2.15.2 definitions

#### by UN
sustainable development meets the need of the present
without compromising the ability of future generations to meet their own needs

#### strong sustainability
keep stock constant, consume only renewable part
von den zinsen leben

#### weak sustainability
assume resources can be substituted / are replaced in the future

gamble with the future

### systemic view by Bundestag
use of self-regenerating system
such that it preserves its properties
and such that it can rebuild itself

### 3-pillar view
ecological
financial
social

### 2.15.3 resource focus

#### physical
because finite, scarce, depletable
trade using money or distribute using a fixed system

#### digital
not so much discussed because immaterial and invisible

## 2.16 digital sustainability

if utility for society is maximized equally for present/future generations
hence if minimum technical, legal, social restrictions
digital resources are digital knowledge/cultural artifacts as text, image, audio, ...

### pillars
code (free / open source software)
formats (open formats & protocols)
data (open data such as research results)
content (open content such as music, social networks, ...)

### renewable
accessible (anyone, forever, everything)
and resuable (legally, technically, socially)

### systemic view
need to know what natural state of system are
to be able to help them being preserved

### vs physical
physical can be depleted to be unavailable
digital can be opened to be available

## 2.17 digital human rights

### debate culture
re-frame old terms
coin new terms

### definition power
social, cultural reality is created in discourse
definition power have actors which dominate the discourse
this agenda setting can influence debates

### digital divide
different definitions influence debate
who (countries, communities)
which (income, education, age)
how (access, use, reuse)

### comunication rights
public sphere (freedom of expression, access to information, diversity of content)
knowledge (knowledge-share regime, availability of knowledege)
TODO slides
civil (related to the processes of communication in society)
cultural (communication of cultural information, for different cultures)

### openness
describes technical & legal to use/distribute digital content
but terms used differently based on community