Economic and Future Development: Adopting a FOSS Based Ecosystem

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About the Author

Open source advocate, professional member of ACM and IEEE/Computer Society. Life member Pakistan Engineering Council.

BE Electrical Engineering from NED University, MS Computer Engineering from KFUPM, KSA.

Working in the areas of big data, ML/AI, IT training, IoT and cloud computing, promote/recommend open source software for solutions.

PING Systems was one of the IT companies involved in promotion and delivery of open source solutions.

Major clients included:
Shaheen Airport Services, Soneri Bank, Engro Chemicals, Habib Bank Asset Mgmt, General Tyre, Peoples Steel, The Legend, Gerrys International, PSEB

FOSS (Free and Open Source Software)

→ The source code of the original work is open.
→ Making copies of the original work is allowed.
→ Distribution of the original work is allowed. A copyright notice should be attached to all distributions.
→ The license grant is non-exclusive, global, royalty-free, and for all purposes.
→ Warranty is disclaimed.

Different licenses:

- GNU GPL v2
- BSD License
- Eclipse
- MIT License
- Apache License
- Mozilla Public License
- Copyleft

Ref: https://en.wikibooks.org/wiki/FOSS_Licensing/How_to_Make_the_Source_Free_or_Open

Common FOSS Models

- Service and Support Firms
  - Provide service to existing open source software
  - Do not own IP
  - Do not attract venture capital

- Open Source Distributor Firms
  - Working assembly of open source components
  - Own non-core-software IP like configuration data, test suites
  - Can attract venture capital

- Single-vendor Open Source Firms
  - Provide a traditional software product to enterprises
  - Exclusively own (key parts of) the software business is based on
  - Can attract venture capital

Ref:https://www.dirkriehle.com

FOSS Advantages

- Lowers cost for society
- Increases knowledge
- Easy to share and reuse software and applications as well as data, information and knowledge
- Increases innovation and collaboration
- Transparency
- Can be inspected for security issues
- Vendor independence
- Creates an environment of inter-operable systems

Open Source Is Secure

- ✔ Open source nature
- ✔ Secure and better privacy
- ✔ Runs on older computers
- ✔ Great for programmers
- ✔ Stable
- ✔ Better software updates
- ✔ Higher customization
- ✔ More choice (variety of distributions)
- ✔ Completely free of use
- ✔ Good community support
- ✔ Reliable

In recent history, majority of the devastating attacks like NotPetya, WannaCry and others have caused billions of $ in financial and data loss by exploiting Windows vulnerabilities

Open Source Domains

- Open Data: government, health, population, financial datasets available for public

- Open data formats: XML, JSON, Open Document, Apache Parquet

- Energy: LF Energy, openHAB, OpenMotics

- Manufacturing: Odoo, xTuple, ERPNext, OpenMDM, OpenETCS

- Automotive: autopilot, project-aslan, GENIVI

- IoT: RT-Thread OS, openremote, iot.eclipse, Project OWL, MQTT, iobroker

- Security: Metasploit, Tor, Wireshark, Tcpdump, OWASP

- Datacenter: Mesos, Kubernetes, OpenStack, SaltStack

- Fintech: Blockchain, Ethereum, Bitcoin, HyperLedger, Ripple, XRP Ledger

- Educational: Moodle, Sakai, LaTex

- Military/Defense: MQTT, HiveMQ

Open Source Product Areas

- **Databases**: MySQL, MariaDB, PosGreSQL, Redis, Cassandra

- **Cloud Tools**: OpenStack, Docker, DC/OS, OpenShift, Cloudify, Vagrant

- **Productivity**: OpenOffice, Drupal, LibreOffice, Sendmail, AV, NiFi, NodeRed, LTSP

- **Security/Monitoring**: pfsense, Anti-Spam, NMAP, SNORT, WireShark, NagIOS

- **AI/ML**: TensorFlow, PyCaret, PyTorch, MLFlow,

- **DevOPs**: Terraform, Chef/Puppet, GitHub

- **Development**: Python, R, Scala, Go, C, JavaScript, Jupyter NB, Raspberry Pi

- **Datacenter**: Kubernetes, Virtual Box, Grafana, Mesos

- **Stacks**: LAMP, SMACK, ELK, MEAN, MERN

- **Graphical Design**: GIMP, PovRay, Krita, Blender, Scribus (DTP)

FOSS Success Stories

World changing open source success stories:

- HTML (world wide web)
- Internet
- Google
- GNU/Linux
- PGP/OpenPGP
- C
- Sendmail
- Android
- Many many more ...

FOSS Organizations

- Free Software Foundation – promotes the universal freedom to study, distribute, create, and modify computer software

- Apache Foundation – hundreds of projects in multiple domains

- Open Source Initiative – promote use of open source software

- Linux Foundation – standardize Linux, support its growth and promote

- Kuali Foundation – educational

- Eclipse Foundation – tools for innovation and collaboration

- GNU Health – health and medical records, standards

- IEEE/ACM* – promoting standards, advancing technology for benefit of humanity

- Apereo – committed to open software and open innovation in higher education

- Open Konsequenz – energy sector

- Osehra – accelerating innovation in electronic health record software

- GenIVI Alliance – automotive

*IEEE/ACM are not FOSS organizations, rather they create and promote standards in engineering and computers

FOSS User Organizations

* Goldman Sachs – obevo, MRWord2Vec, gs-quant
* JPMorgan – Quorum blockchain
* LinkedIn – Kafka, Samza, DataFu
* Facebook – Hydra, PyTorch, Presto
* Netflix – Genie, Simian Army
* IBM – LoopBack, Kabanero
* Google – Android, Go, Kubernetes
* AWS – FreeRTOS
* Microsoft – VS Code, TypeScript
* Apple – Swift, WebKit
* Tencent – TARS, Angel (AI)
* Alibaba – RocketMQ, Pouch, Dragonfly, ApsaraCache, Fastjson, dubbo

Top Open Source Companies

➢ Automattic – many projects like WordPress, WooCommerce

➢ Confluent – Apache Kafka

➢ Canonical – Ubuntu Linux

➢ Elastic – Elasticsearch (ELK Stack)

➢ GitHub – Atom, de facto open source projects repository

➢ Twitter – over a hundred open source repositories on GitHub

➢ Redis Labs – Redis DB

➢ RedHat – many projects like OpenShift, Gluster

➢ Adobe – many projects like PhoneGap, Brackets, Apache Cordova

➢ Databricks – Apache Spark

➢ HashiCorp – Vagrant, Terraform

EU Commission Study

The study's high-level recommendations are:

- emphasize the use and benefits of open source;
- create a dedicated open source entity that fosters and measures strategy adoption;
- improve procurement and product-management processes;
- establish an open culture;
- collaborate with communities and the open source software ecosystem;
- manage legal/license/intellectual property rights issues; and
- enhance and develop the technical infrastructure and services.

https://ec.europa.eu/info/sites/info/files/en_ec_open_source_strategy_2020-2023.pdf
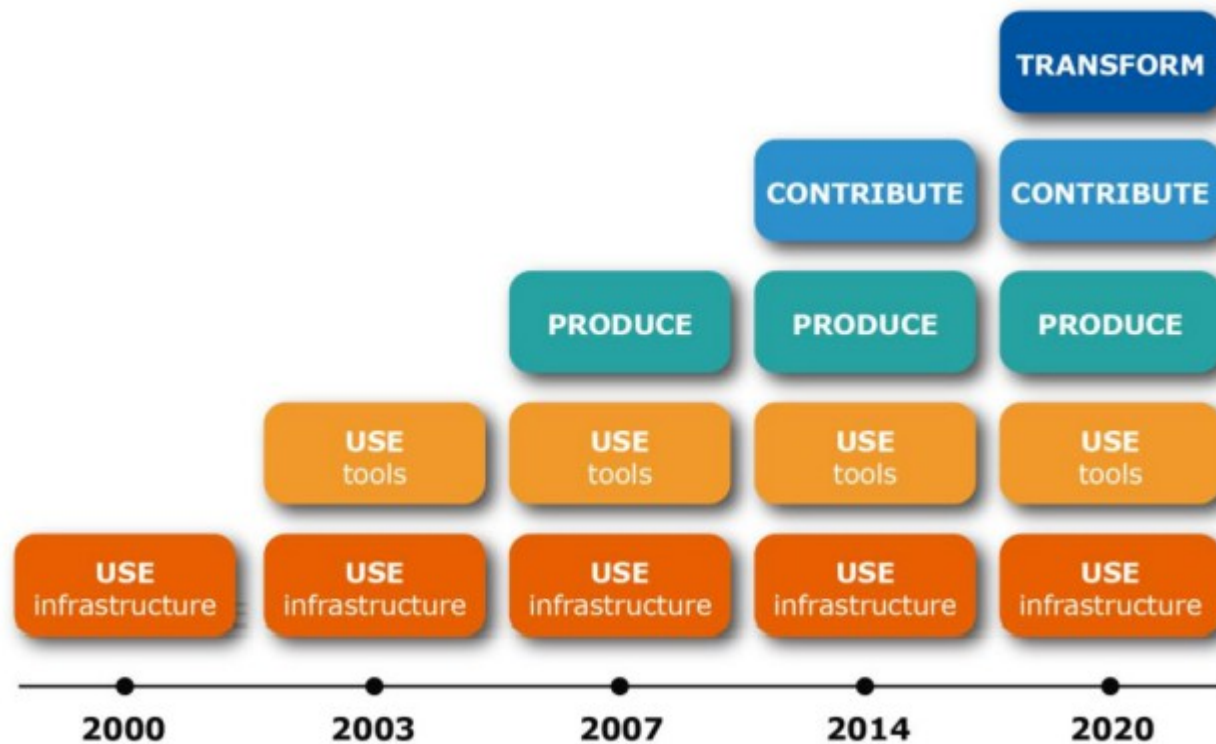
EU Strategy (2020 - 2023)

Six principles from EU 2020 - 2023 strategy:

- Open-source solutions will be preferred when equivalent in functionalities, total cost and cyber security
- Harness the working principles of open source; innovate and co-create, share and reuse, and together build user-centric, data-driven public services.
- Share code and enable incidental contributions to related open-source projects.
- Strive to be an active member of the diverse open-source ecosystem.
- Ensure the code used and shared is free from vulnerabilities by applying continuous security testing
- Promote open standards and specifications that are implemented and distributed in open source.

https://ec.europa.eu/info/sites/info/files/en_ec_open_source_strategy_2020-2023.pdf

Open Source Strategy In Action

https://ec.europa.eu/info/sites/info/files/en_ec_open_source_strategy_2020-2023.pdf

Countries With Successful FOSS Ecosystems

- Pakistan – *awareness, commitment and adoption*
- Brazil – adoption in both government and private sectors
- Canada – government mandates use of open standards and solutions by default
- China – domestic version Red Flag Linux in use by government
- France – preference policy, Paris, French Police, R&D
- Germany – policy to promote FOSS in government depts, R&D
- United Kingdom – preferential policy to FOSS
- India – most states with preference towards FOSS software
- Japan – adopt Linux servers to reduce dependence on Microsoft
- Malaysia – Malaysian Public Sector Open Source Software Program
- South Africa – Open Source Software index near world average
- South Korea – saves hundreds of millions of ($) annually
- Spain – adoption by autonomous and central governments
- Sweden – R&D policy
- Africa – open source in government, health and education
- USA – biggest contributor to growth of FOSS in the world, host to hundreds of open source companies, federal policy mandates 20% custom code released as OSS, www.code.gov (6000+ OSS projects)

Ref:https://www.researchgate.net/publication/337318071_Adoption_and_Use_of_Free_and_Open_Source_Software_FOSS_Globally_An_Overview_and_Analysis_of_Selected_Countries

FOSS Initiatives

FOSS can help create entry level jobs in the industry by:

- Foreign exchange savings – proprietary software licensing costs
- Developing in-country skill set
- Access to top quality tools
- Training and professional development
- IT Service Industry – inflow of foreign exchange
- Support local industry

Easy Start in FOSS

- Easy access to information – applications, tools, data

- Download applications and start learning, developing and sharing

- Train the Trainer – key areas include automotive, big data, artificial intelligence, cyber security, IT in health, mobile and applications development

- Portal for resources including free tier accounts with cloud providers like AWS, Azure, GCP, programming languages, desktop tools, server tools, virtual servers

- Certification – CNKF, CompTIA Cloud+, A+ and similar

- Open courseware – Coursera, KhanAcademy, open edX (Courses from Harvard, MIT, Berkeley, Boston...)

FOSS Adoption by Government

FOSS Adoption:

- Maintain sovereignty (minimize dependence on foreign technology)
- Low cost of ownership
- Secure as code is open source
- Minimize or end software piracy
- Foreign exchange savings
- Develops local expertise
- Encourages good practice
- Facilitates collaboration
- External users can help make it better
- Others can learn from your work
- Easier to share standards
- Improves transparency on government's work
- Clarifies ownership
- Helps make government technology seamless

Promotion of FOSS by Government

- Government's role to promote and support FOSS at all levels, build infrastructure and capacity

- Encourage investment in open source software and technology by providing subsidies, tax exemption, financing, low cost loans

- Establish IT parks and centers of excellence in major cities

- Collaborate with open source companies to introduce programs like *MariaDB University* in educational institutes in the country

- Establish advisory council to help local companies transition to open source

- Increase awareness in open source cloud technologies as applications are migrating into cloud

- Introduce FOSS at school, college and university level – create engineers, developers, IT support, sales, marketing and business development resources

- Help establish IEEE/ACM student and professional chapters across the country

Promotion of FOSS by Government

- Promote Pakistan as IT hub for development, support and provider of open source services

- Translating available material – video, printed, podcasts

- Resources include free tier accounts on most cloud providers like AWS, Azure, GCP, programming languages, desktop tools, server tools

- Barter volunteer hours for credits

- Establish low cost, easily accessible computer labs and training centers with good internet access, low cost labs can be established at a fraction of cost using LTSP

- Support training in cloud, AI, development and IT support areas

- Foster leadership at school and university levels to promote and support open source

- Develop critical mass of technologists able to compete for IT projects on oDesk, Toptal, Freelancer, AWS Turk

FOSS Policies: Government Level

- Policy Types (Government Level)

  a) mandatory- where the use of FOSS is required or compulsory,
  b) preference-where the use of FOSS is given preference and
  c) advisory- where the use of FOSS is permitted.

- There is also another type of FOSS policy which is for research and development (R & D); allows the use of FOSS for research and development.

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Thank you!

Please send any questions to:
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