A Taxonomy of Software Types

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Empirical software research could be improved if there was a systematic way to identify the types of software for which empirical evidence applies. This is because results are unlikely to be globally applicable, but are more likely to apply only in certain contexts such as the type of software on which the evidence has been tested.

We present a software taxonomy that should help researchers to apply their research systematically to particular types of software. The taxonomy was generated using existing partial taxonomies and input from survey participants. If a taxonomy such as ours gains acceptance, it will facilitate comparison and appropriate application of research.

This taxonomy can be used to help categorize empirical studies and other evidence obtained by software engineering researchers, so that the applicability of the evidence can be more systematically understood. The taxonomy can also be used in the practical application of research results. For example, research findings for a particular software category might be applicable in closely related categories within the taxonomy.

For further information about the benefits of such a taxonomy, the process we used to develop it, and the taxonomy itself please refer to Forward and Lethbridge (2008).

References

Andrew Forward, Timothy C. Lethbridge: *A Taxonomy of Software Types to Facilitate Search and Evidence-Based Software Engineering*.
http://doi.acm.org/10.1145/1463788.1463807 CASCON 2008, pp.171-191

A Data-dominant software

A.con Consumer-oriented software

1 Communication and information
- **a** Voice
- **b** Text / Chat
- **c**. Email
- **d** Web browsers
- **e**. Personal Information management (calendaring, address book)
- **f**. File / document sharing (i.e. FTP)

2. Productivity and creativity
- **a**. Text Editors
- **b**. Word processing
- **c**. Spreadsheets / Calculators
- **d**. Presentation (e.g. PowerPoint)
- **e**. Desktop Publishing
- **f**. Personal time management

3. Entertainment and education
- **a.** Learning and Reference
- **b.** Training / Courseware
- **c.** E-Books
- **d.** Photo / video / music management (e.g. iLife)
- **e.** Media players (e.g. music, graphics, photo etc)
- **f.** Movies / Animations / Audio (as software as opposed to pure data or players)
- **g.** Games

4. Personal management
- **a.** Genealogy
- **b.** Personal finance / budgeting
- **c.** Personal will / legal assistance software
- **d.** Tax preparation / planning
- **e.** Monitor / tracking software (e.g. training / health)

A.bus Business-oriented software

1. Strategic and operations analysis
- **a.** Statistical / risk analysis
- **b.** Financial analysis and enterprise resource planning
- **c.** Legal analysis / assistance
- **d.** Domain specific database searching (e.g. patent, trademark off-line searches)
- **e.** Workforce Management (e.g. time and attendance software)
- **f.** Payroll and human resources management
- **g.** Project management / workflow
- **h.** Procurement
- **i.** Scheduling and logistics
- **j** Medical diagnosis

2. Corporate management
- **a.** Real-estate management
- **b.** Restaurant management / reservations / meal planning
- **c.** Sales management
- **d.** Portfolio management
- **e.** Hospital management
- **f.** Facilities management

3. Information management and decision support systems
- **a.** Data warehousing
- **b.** Expert systems
- **c.** Management information systems
- **d.** Knowledge / records / information management system
- **e.** Product support, help desk system
- **f.** Health information / online medical records
- **g.** Geographical information systems
- **h.** Data mining / business intelligence management systems

4. Transaction processing
- **a.** Accounting
- **b.** Payroll
- **c.** Inventory management
- **d.** Order management and Billing support
- **e.** Bank transaction processing
- **f.** Government tax processing
- **g.** Transportation reservation (airline, train, bus)
- **h.** University / school timetabling and registration
- **i.** Reward program backends
- **j.** Bulk data analysis

A.des Design and engineering software

1. Development environment
- **a.** Implementation tools (i.e. editors, refactoring, code-assist, etc)
- **b.** Version control / configuration management
- **c.** Process support tools (i.e. debuggers, context-sensitive help, etc)
- **d.** Development environment plugins
- **e.** Software development simulation / prototyping

2. Compilers / interpreters / disassemblers

3. Automatic Code Generation

4. Database, Development, Reporting

5. CAD / CAE tools

6. Modeling / CASE tools

7. Drafting / Architecture tools

8. CAM (Computer-aided manufacturing) tools

9. Engineering analysis

10. Benchmarks

11. Software testing tools

A.inf Information display and transaction entry

1. Information resources
- **a.** Languages (Spoken / Written)
- **b.** Libraries
- **c.** Maps & Travelling
- **d.** Contact information software (e.g. phone book)

2. Standalone applications for displaying information

3. Web applications / services
- **a.** Search engines
- **b.** News and media
- **c.** User-generated content (e.g. Blogger, Wordpress, message boards)
- **d.** Social networking (e.g. Facebook)
- **e.** Weather
- **f.** Job search
- **g.** Maps and navigation

h. Online dictionaries and encyclopaedias
i. Online booking (travel, entertainment)
j. Online productivity software
k. Website content management
l Web Authoring / Publishing Software
m. Public library systems
n. Enrolment / registration in education
o. E-Commerce
p. E-finance (banking, investing, money transfer)
q. E-Government (passports, birth certificates, vehicle registrations, gun registration, unemployment insurance apps. etc.)
r. E-Democracy (voting online)

B. Systems software
  B.os Operating systems
    1. Accessibility
    2. Administrator software and tools
    3. Emulation / emulators
    4. Games console operating systems
    5. Virtual machines
    6. Kernels / distributions (e.g. Linux, Mac, Windows, Palm, QnX)
  B.net Networking / Communications
  B.dev Device / Peripheral drivers
  B.ut Support utilities
    1. Anti-virus / anti-spyware / firewalls
    2. Authentication tools
    3. Backup, Recovery, Storage
    4. Compression / decompression
    5. Data format conversion
    6. Diagnostic / process viewer / activity monitor
    7. Disk maintenance
    8. Encryption / decryption
    9. Failure diagnosis
    10. Logging and log analysis
    11. Screen capture
    12. Network traffic monitor
    13. Security
    14. Software installer / uninstaller
    15. Tunnelled communication network client (e.g. VPN)
    16. Wireless Utilities
  B.mid Middleware and system components
    1. Database servers
    2. Graphics packages / rendering engines
    3. Interoperability infrastructures
    4. UI support software
    5. Virtual machines
    6. Windowing system servers
  B.bp Software Backplanes (e.g. Eclipse)
  B.svr. Servers
    1. Email servers
    2 IM servers
    3. Load balancers
    4. Proxy servers

    5. Web / FTP / Content servers
    6. Other daemon processes
  B.mal Malware
    1. Key loggers
    2. Spyware
    3. Viruses / Trojans

C. Control-dominant software
  C.hw. Hardware control
    1. Firmware (e.g. software in printers, DVDs, watches, fridges, etc)
    2. Device control - soft-loadable (e.g. robotics, medical, e-voting, etc)
  C.em. Embedded software
  C.rt. Real time control software
  C.pc. Process control software (i.e. air traffic control, industrial process, nuclear plants)

D. Computation-dominant software
  D.or. Operations research
    1. Computer science hard problems (i.e. Travelling salesman)
    2. Simulation software
  D.im. Information management and manipulation
    1. Inventory control
    2. Sales forecasting
    3. Budget generation / management
    4. Search engine processing
  D.art. Artistic creativity
    1. Photo, drawing, graphics editing / manipulation
    2. Audio & recording, mastering
    3. Music composition (audio editing / synthesis)
    4. Movie creation (film / movie production)
    5. Video processing (editing, surveillance, recognition)
  D.sci Scientific software
    1. Idle-time data analysis (e.g. SETi)
    2. Simulation software
    3. Signal analysis software
    4. Image processing
    5. Computer Vision
  D.ai Artificial intelligence
    1. Agents
    2. Machine learning
    3. Virtual Reality
    4. Robotics / Cybernetics