ITCR Sustainability and Industrial Partnerships Workgroup (mid-term report)

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Approach

Data Collection → Data Analysis → Summarization and Synthesis

8 teams from diverse backgrounds. 1 additional team to be interviewed.

Sample Questions

- Can open-source software co-exist with profit-making commercialization, and how? How can researcher continue to benefit from the non-commercial arm of the s/w?
- Funding model for academia-industry collaborations?
- Should early engagement of academic and industrial partners be encouraged, or should there be an initial incubation period?
- What do industrial partners want to get from such collaborations? Cutting-edge algos? Data? Annotations? Trained models? Know-how? Large number of cloud users? Other?
- Criteria for industry's interest in a s/w product
- How do FDA regulations influence such collaborations and mutual interest?
- Clinicians: How do clinicians evaluate the benefit of a s/w and how does this influence industry's interest?

Stephen Aylward, Will Schroeder, Mike Grauer, Kitware Inc.

- Open source platforms → work with others to provide 1) basic support 2) customization 3) collaborative R&D 4) custom applications. Increasingly a high-level consulting role. ~**200 people worldwide**.
- No patents, no copyright, no GPL. If you pay them, you own it. Strongly encourage contribution to OS.
- Mostly R01, PI and subcontractor. Much of this is hypothesis-driven research. E.g. scoliosis detection in children with non-ionizing radiation; OHIF visualization tools for web browser; 3DSlicer, ….
- Good developers' community overcomes insufficient funding. This is undervalued/under-emphasized. Hiring good people is really hard so developing a community, training, materials is really important.
- When you move into final product that you want to move to FDA, adopting companies may do their own implementation. If this is key to the success of their product, will re-implement in their environment and integrate into their systems.
- Critical that the relationship between Kitware and Academia starts upfront, so that s/w practices, licensing etc are done properly. Otherwise you have to rebuild it.
- Geographic distance not a problem, but some F2F time for hackathons etc are important
- Sustainability model could include services and support for open source platforms

Bruce Fischl, Professor of Radiology, Harvard Medical School and Martinos Center

- Developer of FreeSurfer software, one of the most widely used neuroimaging analytics software
- 41,000 licenses distributed. Started in1999
- Primarily funded via pieces of R01s. Efforts with SBIR/STTR helped somewhat. Small institutional effort
- Development efforts have been primarily internal, with relatively small community contributions. Long-term support and development of the open source s/w seems to follow the past model or partial contributions from many R01 and other grants---he would welcome RFAs like that of the ITCR. Foundations like NumFOCUS were also discussed as ways to promote and support open-source
- Spin-off company (Cortecs) was initiated years back to take some of the clinical support load off their shoulders. It took years for the company to bring it to FDA approval level. Flow of technology was primarily from academia to the company, as the company primarily created wrappers around the algorithms and reported back bugs

Nick Bryan, Chair, Diagnostic Medicine, UT Austin, Former President RSNA

- Clinician + entrepreneur. Analytics/quantitative tools will see a continuing growth in the clinic
- It has been a challenge to move such tools from academia to a clinical routine and long-term FDA-level approval and support. He formed a company and experienced first hand that this translation and FDA approval is a demanding task
- His view was that long-term sustainability had to involve a good plan for commercialization. Even examples of relatively widely accepted and used open-source s/w hasn't had an impact in the clinic.
- Large-companies focus on integrated solutions, small companies could focus on a particular piece (widget). However O/S developers must maintain the software at levels of documentation and testing that are compatible with FDA requirements.
- One possibility is for NCI to support tools that are used in certain multi-site clinical trials (so presumably are mature tools) and further support the maintenance of this tool.
- Dr. Bryan's own endeavors to set up the RadDx company have not been particularly successful, especially since VC wait until later/more mature stages to chip in.

John Quackenbush, Chair of Biostatistics at HSPH

- Genospace – Sold a few years ago; WebMeV – more typical academic route
- Started about 20 years ago, in early microarray days; Clustering; more added later on; Funding was primarily NIH-based, using the model of software supporting hypothesis-driven work. In ~2013, → ITCR; renewed; web-based
- Genospace started in 2005 as a Dana Farber-funded collaborative consulting core. ARRA funds later → large genomic analyses. Various stages of up and down → Adelson Foundation support, no institutional traction → Built it themselves with a bit of self-funding and a lot of effort commitment → various stages of ups and downs, including failed Phase-II SBIR, Sarah Cannon support for clinical trial matching, sold to Sarah-Cannon in 2017 for a profit (not huge but respectable)
- There would be value in collectively develop and make available ITCR tools
- His plan going forward for maintaining OS includes experimenting with charging people to run analyses. Works reasonably well

Geraldine A Van der Auwera, Director, Outreach and Communications, Broad Institute, DSP (>100 s/w engineers)

- GTA (genome analysis Tkt). Many industrial partnerships (intel, for development, Google, AWS, MSFT-Azure, Ali Baba etc for cloud support)
- Broad pipeline spiky → cloud is a good solution
- Substantial support from Google on pipeline optimization (cost per case $45 → $5)
- Early industrial partnerships? No → Early incubation focused on scientific questions is important. Also different skillset is needed for industrial collaborations.
- Partnership with Appistry didn't work on either side. Mainly repackaging, no help with engineering. Product sometimes sold for the wrong use case. Hybrid licensing didn't work → data processing center within hospital?
- FDA clearance: Free pipelines for research use only. Companies are repackaging for clinical use—no problems
- Contacts were made via networking of the Chief data Officer of the DSP. Hard for PIs to pull it off
- Current direction: on the cloud (Data Generators > TERRA < Tool developers). Joint effort with Verily (sub of Alphabet), which provides funding and engineering. Supports their customers, so mutual benefit

Genentech Team, PHC Data Science & Analytics

- Just started academic collaborations this year
  - Stanford, Berkeley, Turing Institute: Joint research projects with Roche data, 1-2 scientists on each side for 1-2 years to develop new tools, biomarker-outcomes, and data analytics
  - Industry-alliance programs – sponsoring a department and sponsoring career days. Sending Genentech scientists for training. 10 running with 5 different institutions.
  - Key advisors – academic experts join an advisory panel in key areas to provide Genentech with monthly advice on strategy with key data areas.
- Open-Source considerations
  - Reliability, quality, extensibility, modularity, documentation. For FDA submissions, validation
- Sustainability thoughts:
  - A competitive quality products that benefits the whole industry may get broader support

Osman Ratib, U of Geneva, Founder of OsiriX, Kheops

- OsiriX started in 2004 as an open-source image viewer but branched over time into three areas:
  - Horus took over supporting open-source with online courses and documentation, support?
  - OsiriX MD is FDA approved proprietary commercial version supported by 3-4 companies
  - OsiriX Foundation got philanthropy to create Kheops open-source image management platform
  - Kheops and OsiriX MD both use ITCR-supported OHIF Web Viewer
- Recommends to incubate first to show success, in order to engage industry. It hurts if you have industry involved upfront, because you go too fast.
- Must paint a vision for investors to see the long-term return
- Must continue development and innovation AND support the community of users/developers
- Concerns with quality of contributions from community to open-source, how to curate these