European technical leadership through shared, open interfaces and Empowering European citizens to create value with Information technology

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I'd like to begin to expressing my thanks for the opportunity to contribute to this debate, which I believe is potentially even more critically important than ever. The effect of technology on society in the next 10-20 years will be even more profound than ever before and European Commission led, broad based research initiatives have a major role to play. That role involves shaping both European technical leadership and impacting European socio economic effects in the next two decades.

The content of this position paper might properly be considered two papers since there are two very important themes:

1. I believe much of the key to success for European technical innovation will lie in ***open interfaces and platforms***. The creation of stable reusable technologies which are "higher up the stack" than today's standard network technologies is fundamental to creating both European technical leaders (individuals and companies) and to unleashing innovation in applications and services.

2. The rapid pace of technical advancement (in everything from artificial intelligence and robotics, to network effect platforms) is incredibly important and such technologies are valuable for society. However, the way technology is introduced to society and who is able to ***create value*** with such technology is absolutely crucial in determining whether technology becomes a ***dividing factor driving inequality*** or a ***social leveling factor bringing economic opportunity*** across society as a whole. In particular, I believe it is a fundamental responsibility to seek to support technology initiatives which enable broad sections of society to be creators of value with technology, not just consumers of technology.

The framing of the discussion around ***European competitiveness*** specifically is a natural one given the role of the European Commission and the central premise. However, I would argue (see below) that network effects are not in an of themselves negative - they in fact create value. The challenge is when the network effects create lock-in which can and is abused. Further, the economic inequality which arises when some technology means a small minority are technology creators and many are consumers is the real problem to solve. In the current era, it happens to be the case that the technology companies creating technology consumed by many are also often from outside the European Union - which compounds the problem. However, I

would argue that any situation where one company creates lock in to derive benefit without enabling its users significant agency is negative - even if that company is European.

The content of this paper is in the next two sections made up of several declarative statements.

Part 1: Open Platforms and Interfaces

While there are many areas of technical importance, I believe open platforms and open interfaces are absolutely key to European technical leadership and success. Further, it is a cross cutting theme across many areas.

I) Open Interfaces beat Open Source (but they are both incredibly valuable)

The effect of open source on software and the world is well documented. Further, it is excellent practice (frequently applied) for projects to deliver open source software during their life times. This is excellent but it is ***not enough***. Specifically, it is very rarely enough to spark longer term use and adoption when only one implementation of a system / platform exists. There are often worries about support, commercial versions and there is little incentive for commercial organizations to get involved.

What is much more effective is to produce, validate and make available openly standard interface definitions for systems developed: ***APIs***, ***Services***, ***Protocols***, ***Data Models***. making these available (and if at all possible IPR unencumbered) has huge additional benefit. These definitions provide the potential means for the interoperability of many implementations of a technology (open AND closed source). Furthermore, the formal interface definitions of a domain promote alignment between users of a platform and creators.

Shared, open interfaces create vital resources for the development of new markets, just as standards for internet protocols, GSM and many other standards did in previous eras.

II) Standards must move up the stack

While it may seem obvious that interfaces are valuable, the arenas they make sense in may not all be obvious. Traditionally standards have been applied to low level areas of the technology stack (network protocols, encryption etc.). However, innovation has moved “up the stack” into applications, web systems and higher level systems. This means there are now huge benefits possible from:

1. Standardizing higher level technical infrastructure such as identity systems, rights management, security, location etc.

2. Developing standards for specific domains. An exemplary project in this regard is the CitySDK project[1] which produced, implemented and deployed API definitions for a range of city related government data APIs.

Such specifications are an enormously valuable resource. Especially if evolved over time and deployed widely. They:

- create the ability for compatible platform software and app software to be developed
- act as an attractor for an ecosystem of commercial and open source implementations
- drive down costs for buyers (in this case cities) since vendors conform to a public standard, making them compete without interface lock-in
- spur innovation by reducing to learning curve across users for access to systems for developers of new application

The effect of such higher level, domain specific interfaces cannot be under-estimated. Evolving these would provide Europe which huge leverage in European and global markets.

III) Networks are positive, not negative.

The setup to this discussion by the European Commission notes the damaging effect closed platforms can have. Network effects are also mentioned. It is important to remember that Network effects are inherently beneficial, value creating things. In fact they arise specifically because the growth of the network adds value to each individual user. Hence we should seek areas where natural network effects exist.

Further, network effects can be created by open standard interfaces as well as closed platforms.

IV) Platforms should enable value creation

Platforms for their own sake teach us little: in particular, if projects allow little effort to build things on top of the platform. Instead, the very definition of an effective platform is to allow value co-creation. In other words, the platform provides tools / features / resources which are hard to access otherwise. Then interested parties are able to create valuable user results / applications / experiences on the platform.

V) Suggestions

Given these benefits, the following may be valuable. Large projects (IP Style projects) should be strongly encouraged to produce standard interface definitions for the domains they work in. They should further work with practitioners in the domain to ensure the models are relevant to real world use cases and should set goals for encouraging adoption.

[1] http://www.citysdk.eu/

Such interfaces have unifying effects for domains (scientific, government, commercial) which mean that software providers and users are both incented to continue to deliver and use software that uses the interface. This in turns creates a market and innovation.

It is true that often at least one implementation (preferably open source) is also needed. However, only delivering open source code is rarely enough to genuinely create long term adoption.

Part 2: Technology that enables value creation/capture for non-technologists.

Many of today's technology focus on automation, intelligence and the creation of almost wondrous experiences for the user. These advances are welcome and valuable. However, there is a deep fear for many, that some of these technologies will also eliminate vast numbers of today's jobs.[2]

This fear is real, clear and present.

In particular, the beginnings of technologies which automate cognitive function or real world regular tasks such as driving have clear potential impact. If such technologies reach the market in a way in which:

- A small numbers of technologists / companies provide automation
- And most others are primarily users / consumers with little agency in using the technology

Then large parts of the populace will loose the ability to create or capture value in the economy. It is critical therefore that new technologies not only provide compelling experiences but that they, above all, empower non-technologists to rather than dis-empower them.

To illustrate this, while this may seem a trivial example, the Excel spreadsheet is one of the largest and most broadly impactful value creating pieces of technology ever invented. It is delivered at a fixed license fee (which benefits its originators) but can be used in almost every branch of business for analysis, tracking, models and so forth. Businesses worth many millions of Euros run wholly on Excel spreadsheets. Spreadsheets furthermore enable innovation in all these businesses since they enable modelling and planning on a scale never seen before. Excel truly enabled broad-based prosperity for its users.

This is an example of a technology which enabled a broad swath of the population to create value in many domains without being a computer scientist. Similar technologies include Word processors, blogging platforms, graphic design packages, email programs and so on. Even

[2] e.g. see https://hbr.org/2015/06/the-great-decoupling and the Second Machine Age Book.

platforms such as Facebook have provided some new channels to market that are accessible to the wider populace.

In new advanced technologies - in particular Artificial Intelligence, Robotics, Automation and similar fields - it is crucial that technology in conceived which empowers value creation and enables these creators to capture much of the value they create. In other words we need to enable:

- citizen programmers
- citizen analysts
- citizen roboticists
- technologies which blend the digital and real world
- technologies which enhance and augment individuals in their existing professions - rather than replacing them.

Again the aim here is to enable specialists in disparate fields from medicine to art, mathematics to gourmet cuisine, transportation to finance and others to tap into new tools, (automation, AI, control systems, robotics, messaging, IoT) and be the creators of value. Further to empower them to get paid much of the value they create with the technology.

This thread is very much related to work in previous programs on co-creation and living labs. However, it is potentially more specific in focus, arguing that it is not just the notion of involving real human users in experiences, BUT focusing on how to deliver new tools for them to be genuinely creative and productive.

This thread also combines with Thread #1, in that the evolution of standard interfaces and capabilities, as well as the ability to combine certain technologies is key. Just as Excel became a trainable skill for large chunks of today's population, the ability for non-technologists to learn skills that are transferrable across different systems will be key.

Done well such tools will empower European citizens to be productive far beyond what is possible today.

A few examples include:

- (Food Industries) Nutrition tools: APIs already exist (e.g. Nutritionix) which provide excellent nutrient information, adding new intuitive interfaces they could become powerful assistive tools in food creation, healthcare and other sectors.
- (Retail) Robotics and IoT: robotic and sensor equipment in a retail environment with the right interfaces, would enable non-technical retail specialists to configure and control the customer experiences in a store. Allowing them to create value. Rather than having a technical specialist configure this.
- (Craft and Art) Visualizations, Voice Search: brain-storming tools to improve group ideation with automated voice driven searches of visualization. Intelligently augmenting ideation rather than taking it over.

- (Finance/Insurance) digital assistants: increasingly sophisticated AI which may be voice driven which know rules, risk etc. but human users navigate through the space and use their customer knowledge to recommend solutions.
- (Transportation) platforms for local transport providers: the ability for SMBs to plug into maps, social graphs, app frameworks etc. to create their own "uber"-like experience but control it entirely.

In each case, the platform enables creators.

I cover some related themes in a recent presentation in Paris:
http://www.slideshare.net/3scale/apis-and-the-creation-of-wealth-in-the-digital-economy-apidays-paris-2015-keynote

Suggestions

The suggestions for encouraging this set of outcomes include: 1) ensure budgets for co-creation and experimentation, 2) encourage the exploration of technologies and interfaces that enable non-technologist to create value, 3) fundamental research on natural transferable core technologies in AI, Speech and other interface metaphors that are transferrable.

Conclusions

There are clearly many more important areas for future development and this paper takes a narrow focus on just two. However, I believe they are two areas of very significant impact. They also represent, in my view, a point of view that is a fundamental differentiator for Europe v's many other places in world.

1. Open interfaces provide huge advantages. Pushing down the cost of technology over time (which is vital since this enables the next layer of technology on top), these standard interfaces further enable companies to drive change in world markets.
2. The focus on enabling "the many" to be value creators is incredibly important in terms of social policy. Further it will result in an almost immeasurable long-term economic advantage for Europe. The creativity of 600-700 Million people enabled by tools is vastly superior to the creativity of a few 100's of thousands of the pure technologists. Citizens will not be fearful that machines may take their jobs, but empowered to be productive in their chosen specialty by new technology.

While these things are not the sole responsibility of the European Commission R&D program, the program is of a scale and importance that a powerful contribution can be made.

Thank you again for the kind opportunity to contribute.

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