Is technology (only) the solution ?

Luca Simoncini

University of Pisa, Italy

Technological Determinism

Technological Determinism:

if something can be done it will be done !

This is particularly true in ICT field. Many complications - that do not contribute to dependability - are introduced simply for technological determinism (and market push)

- **do we need growing complexity operating systems ?**
- **do we need many gadgets and "intelligent" applications ?**
- **at what extent do we need ubiquitous computing ?**

It would be nice to recall Dijkstra's words:

"I mean, if 10 years from now, when you are doing something quick and dirty, you suddenly visualize that I am looking over your shoulders and say to yourself, "Dijkstra would not have liked this", well that would be enough immortality for me." ["Introducing a course on calculi" (EWD 1213), August 1995]

Information collapse

Too much information = no information

How many of the millions pages that are on the web contain valuable information ?

Statistically when one makes a search on the web only the documents that appear in the first 2-3 pages of the search engine are used.

- **who mediates for presenting the documents in a given order ?**
- **who "certifies" the value of the information ?**
- **how is the user protected from maliciousness in mediation ?**
- **how do we protect our society from cultural decay ?**

Information collapse

One relevant problem that interests Italian society (but not only) is the fact that young students at elementary and junior high school use Internet for their researches more than books, and that the teachers, who are not computer experts, have no idea on the validity of the retrieved and used documents.

There is a need for "certifying" the validity of what is on the web, while maintaining the freedom of publishing on it.

Certification OK by made by whom ? Independent bodies ? How can we trust on "correct" independence ?

In any case providing credits of who is publishing what should be mandatory.

"Information and information mediation" is Power and
"Correct, plural and certified information" is Democracy.

Complex global systems

Already today but for sure in the next future computer-based systems are evolving from simply technological to socio-technological to political-socio-technological computer-based systems involving not only humans, but also organizations and governments with all facets related to legislative processes, judicial activities etc.

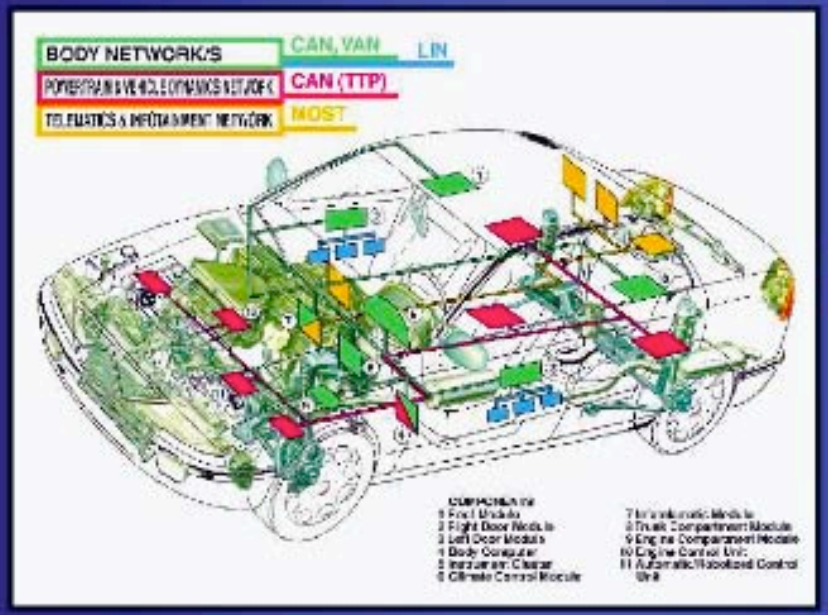
Exploitation of such systems will require a strong effort towards mixing up multidisciplinary fields, so that engineering, sociology, human organizations, psychology, politics all concur to "ambient resilience and trustworthiness".

Today computer crime finds strong allies in different countries legislation, uncertain liability assessment and user unawareness.

Example: Modern Cars

- **Embedded control systems in modern car** (brakes, transmission, engine, safety, climate, emissions, …)

Complex interaction increases safety risks



vehicle-to-vehicle network

vehicle-to-environment

- **The resilience of the car you will be driving in the future will depend on the dependability of the software in the other cars around you. Your airbags might inflate, for instance, if the software in a nearby car erroneously warns your car that it is about to crash into it.**
- **In the future car we will have an unimaginable number of powerful computing devices that are all connected, and that can potentially interact.**
- **Each of these powerful devices may be controlled by multi-million line programs. Who is going to write this software, and how can we make sure that the resulting systems are dependable (or resilient or trustworthy) ?**
- **Your car may now fail not because of faulty software in your own car but because of faulty software in someone else's car that interacts with yours in an unexpected way.**

Another example

- Pervasive and ubiquitous computing - always on-line
- Open dynamic heterogeneous interconnected system
- Sensitive personal information
- Untrained users - often threat unaware

- "Panic inducing" malicious faults
- "Huge multiplicity common mode" accidental faults

Catastrophic failure

Privacy

All together the previous issues threaten our privacy rights.

When a human will be a computer-based embedded ubiquitous system, he/she still should have the right to manage different environments, some completely private, others partially private, others public, all supported by the same platforms (be they PDAs, smart phones, intelligent tissues, wearable computers, nanochips, etc.), and ambient resilience and trustworthiness can only be the answer for defending individual rights and privacy.

It is very important to take in mind that

Technology is only part of the solution !