

Information Systems

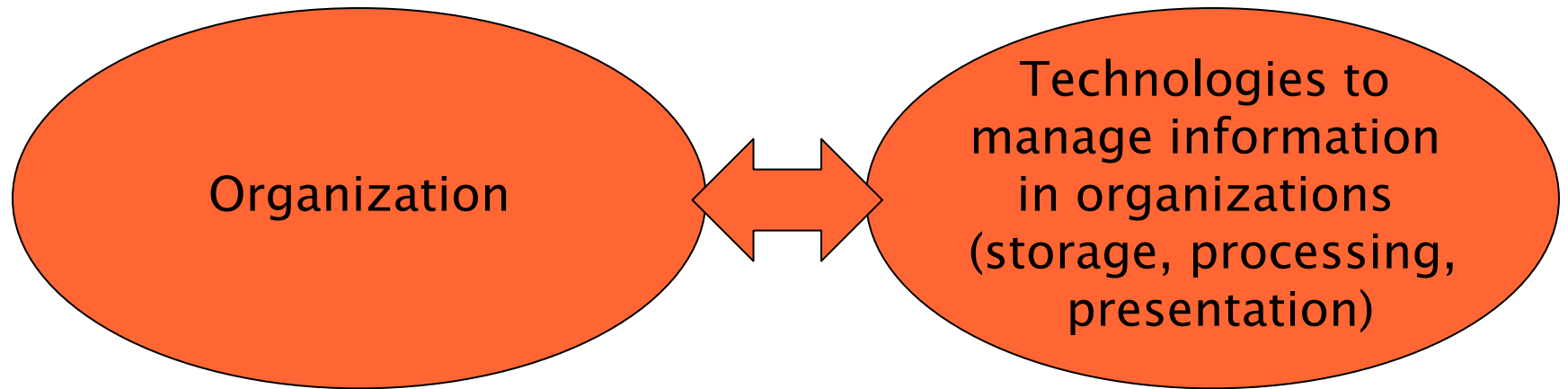
A.Y. 2023/24

01 PDWOV



SoftEng
<http://softeng.polito.it>

Course focus



Course goal

Best analysis and design of

IT support

to

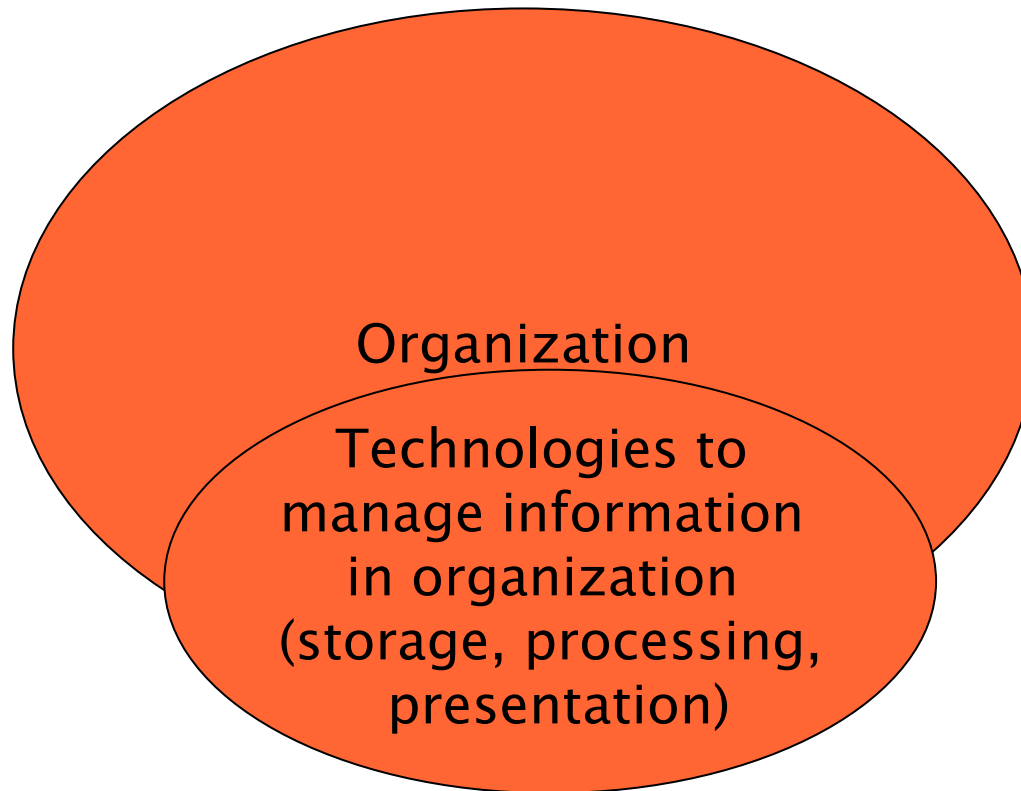
Business processes and activities

in

organizations

Beware

- Organization and information system are intertwined and not separated



IS is «software 'embedded' in organization»

Examples

- Polito Information Systems
 - ◆ didattica.polito.it
 - Manage students (order 100K)
 - Taxes, curricula, grades
 - Manage courses (order 100 – 1K)
 - Teachers, schedule, classrooms
 - ◆ swas.polito.it
 - Manage personnel (order 2–5K)
 - Salaries, careers, pensions, taxes, timesheets
 - Manage projects
 - Manage accounting

-
- Polito information systems
 - ◆ Probably 50–100 different software programs (applications)
 - ◆ See later, «Application portfolio»

Examples

- Bank
 - ◆ Manage personnel
 - ◆ Accounting
 - ◆ Manage customers (order 10K – 10M)
 - ◆ Manage accounts
 - Bank transfers, payments, balances, ..
 - ◆ Manage other services
 - Lendings, mortgages, investments, ..

Basically two extreme cases

- Small organization (1–10 staff)
 - ◆ Use off the shelf services or programs
 - Office suite, email, accounting, cloud storage
 - ◆ Nobody in charge of IS
- Large organizations (1000+ staff)
 - ◆ Off the shelf services or programs
 - ◆ Customized programs (ex ERP, CRM)
 - ◆ Tailor made services / programs
 - ◆ IT area: group in charge of IS

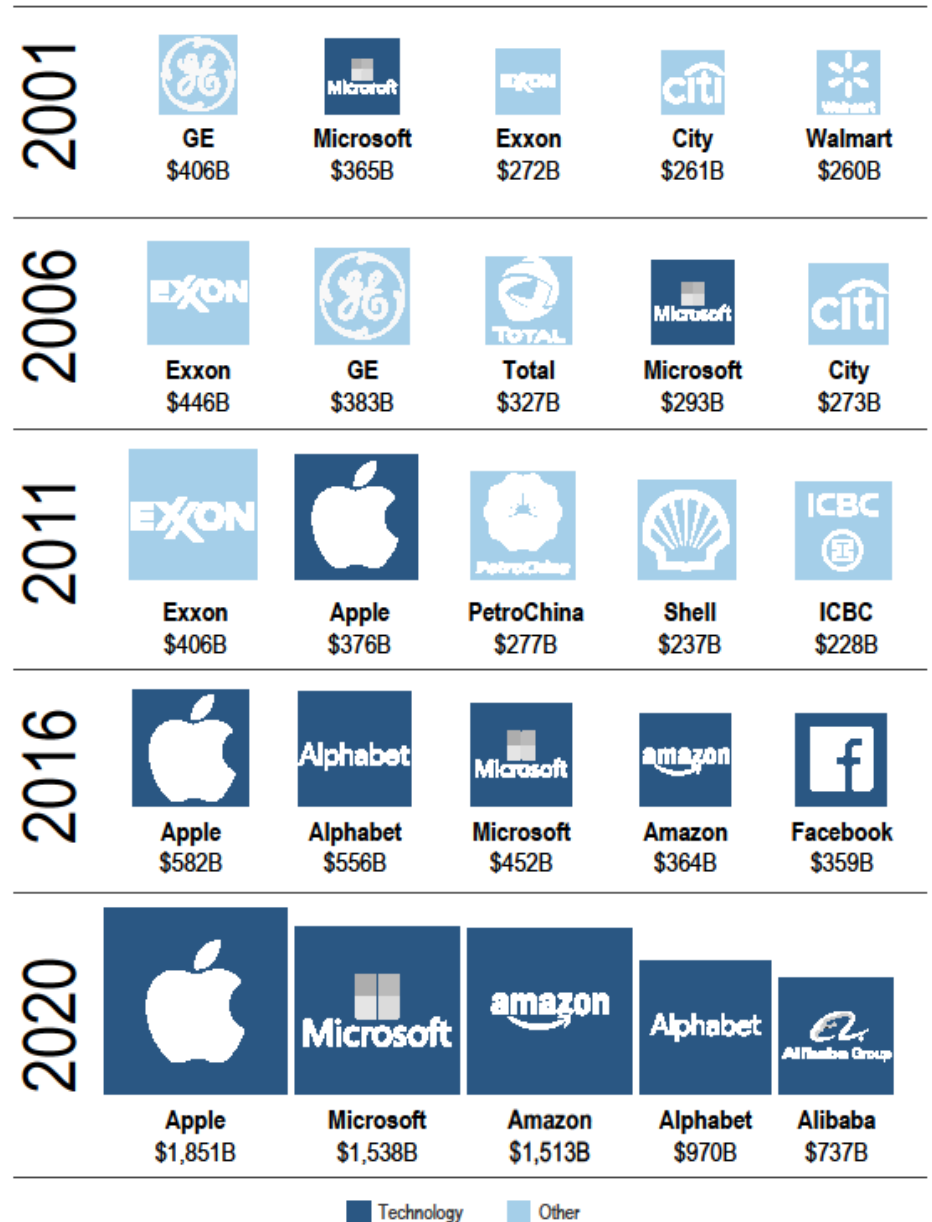
Is it important?

Our civilization runs on software
[Bjarne Stroustrup]

(and notably, organizations run on software)

In short, software is eating the world
[Marc Andreessen]

- Market value



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1. The largest companies today are technology companies
 2. Any type of company cannot consider IS as a compulsory burden to their business, or as an invisible commodity

Information technology and business are becoming inextricably interwoven. I don't think anybody can talk meaningfully about one without talking about the other

[Bill Gates]

The distinction between technology and business is ante-deluvian

[D Merrill] (ex CIO Google)

IT and IS in companies

IS as add on

- Walmart (IS to manage suppliers in traditional retail)
- (traditional IS, new deliveries 4 times a year)

IS as competitive advantage

- Amazon (IS as core for e-retail)
- Zara (IS as a way to reorganize the supply chain, 3 weeks from design of product to product in store, new deliveries every 3 weeks)

IT and IS in companies

IS as add on

- IS perceived as a legacy or a commodity
- IS performed by IS office, IS roles distinct from management
- Management has little or no IT competence

IS as competitive advantage

- IS perceived as strategic asset
- IS roles and management collaborate strictly
- Management has deep IT competence

-
- Anyway, information is a key resource for companies

UK air traffic control failure

- August 2023
- Flights canceled / delayed over 3–4 days in UK, and Europe as side effect
- Hundreds of thousands of passengers affected

British airways IT fail 2017

- 1 000 flights canceled
- 75.000 people affected
- 200 million USD compensation
- 220 million USD share drop at stock exchange



More failures..

Table 2.1. Systems failures in business computing history

Year	Company	Outcome
2020	Heathrow Airport	A software failure, affecting T5's check-in services, resulted in the cancellation of more than 200 flights, delays, and thousands of passengers in "utter chaos."
2019	Boeing	An overaggressive autopilot and the lack of adequate pilots' training proved disastrous, resulting in the 737 Max fleet's total grounding. The resulting two deadly crashes cost the firm \$19 billion and put the firm in serious trouble.
2018	Facebook and Cambridge Analytica	Eighty-seven million users' personal data were leaked without consent and then sold for political advertisement. The scandal cost Facebook allegedly five billion dollars.
2017	Amazon	An employee's mistyped command generated a cascade of failures that resulted in the outage of Amazon Web Services (AWS) cloud services in Northern Virginia, USA. The two-hour outage caused an estimated \$150 million losses for S&P 500 companies, \$160 million for U.S. financial services.
2016	Delta Air Lines	A computer outage in the airline main data center caused the cancellation of about 2,300 flights. The firm reported that the system failure resulted in \$100 million less revenues in the month of August alone.
2015	Paderborn Baskets	A second-division German basketball team, the Paderborn Baskets, was relegated to a lower division for starting an official game 25 minutes late. The cause of the delay? An automatic Windows update that froze the digital scoreboard and prevented the start of the game.
2013	French Ministry of Defense	Expected to enter service in 2017, Louvois—Logiciel unique à vocation interarmées de la solde—was supposed to simplify and unify the payment system for the French army's 130,000 members. The system was scrapped in November 2013 after consuming €346 million.
2013	NHS Connecting for Health (UK)	Originally expected to cost £2.3 billion over three years, in June 2006, the total cost was estimated to be £12.4 billion over 10 years. The system was abandoned in September 2013 despite already costing taxpayers £10 billion.
2012	Royal Bank of Scotland Group (UK)	A failed upgrade to the payment processing system left customers without access to their accounts for two weeks and disrupted customers' payments either incoming (i.e., wages) or outgoing (i.e., bill payments). The company was later fined £56 million over the accident.
2011	Allied Irish Banks (AIB)	AIB sued Oracle Financial Services Software for €84 million, plus damages and lost profits, claiming it wasted the money on the failed implementation of a new retail banking system.
2011	U.S. Federal Bureau of Investigation (FBI)	In 2001, the FBI started work on a criminal case management system called Virtual Case File. The project was scrapped four years (and \$170 million) later. The project was restarted under the name Sentinel and as of May 2011, was unfinished after five years (and \$400 million) in development.
2010 (2007)	AXA Rosenberg, a privately owned investment management company (U.S.)	A "coding error" led to underrepresented investing risk factors and resulted in investors losing a total of \$217 million.
2010	Electronics retailer Dixons (UK)	Reiterated difficulties with its new eCommerce system were blamed for £15 million in lost revenue.
2009	Government of Victoria (Australia)	A smartcard ticketing system (called Myki), contracted in 2005 with AU\$500 million budgeted, was rushed into operations (current cost: AU\$1.3 billion) with limited functionality and still causes significant operational problems.
2009	Britain's National Health Service (NHS)	NHS scaled down its "Connecting for Health" program, designed to create the national electronics health record system, after investing an estimated £12 billion since the project began in 2002.
2008	Centrica, the largest utility supplier of gas to domestic UK customers	Centrica sued Accenture for £182 million in damages stemming from a collapse of customer service levels and loss of more than one million customers attributed to the failure of a "best-of-breed" customer bill system.



The Global Risks Report 2021

16th Edition

INSIGHT REPORT

Top Risks

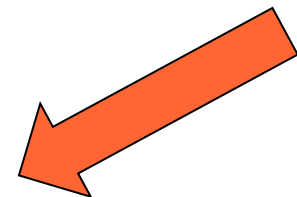
by likelihood

- 1 Extreme weather
- 2 Climate action failure
- 3 Human environmental damage
- 4 Infectious diseases
- 5 Biodiversity loss
- 6 Digital power concentration
- 7 Digital inequality
- 8 Interstate relations fracture
- 9 Cybersecurity failure
- 10 Livelihood crises

Top Risks

by impact

- 1 Infectious diseases
- 2 Climate action failure
- 3 Weapons of mass destruction
- 4 Biodiversity loss
- 5 Natural resource crises
- 6 Human environmental damage
- 7 Livelihood crises
- 8 Extreme weather
- 9 Debt crises
- 10 IT infrastructure breakdown





Digitalization

- Digitalization, Digital transformation
 - ◆ is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities
 - ◆ the process of making workflows and processes easier and more efficient

Course focus



Course goals

- Make you capable of
 - ◆ Understanding how an organization works
 - Goals, strategy
 - Structure, roles, business processes
 - ◆ Analyzing how business processes can be improved via IT (and ICT)
 - ◆ Analyzing costs and benefits of IT
 - ◆ Distinguish commodity / strategic IT services

Capability acquired

- Given an organization:
 - ◆ Being able to analyze the organization and the IT support to it
 - ◆ (Being able to assess IT support, find critical points)
- Given a process
 - ◆ Being able to identify options in improving current IT support to the process
 - Evaluation and selection of IT services / programs

Typical questions about IS

- How much does it cost to automate (a certain business activity) and what is the advantage?
- What software could we use to automate it?
- Should we buy it? From which provider? Should we build, maintain and operate it?

Course main topics

- Organizations

- ◆ Models of (processes, functions, organizational structure)
 - High level models (T model, Anthony ..)
 - More detailed models (BPMN, UML, org charts)
- ◆ Strategy, BMC, management loop, KPIs, SLAs
- ◆ Process redesign



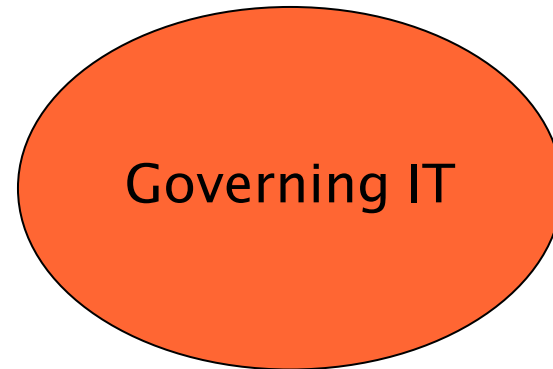
modeling



improving

Course main topics

- IT in organizations
 - ♦ ERP, CRM and core IT offering
 - ♦ IT economics, cost and value of IT
 - ♦ Selection and adaptation of IT, outsourcing
 - ♦ ITIL COBIT



Course main topics

- Software embedded in organizations
- Out of scope
 - ◆ Software embedded in products
 - Cars, homes, devices
 - ◆ Software stand alone
 - Platform: OS, DB, network
 - Application: email, word processing, ..

THE message

- To build an effective IS you need to understand the organization, its processes, its goals
 - ♦ Technology is (usually) not the main problem

Course goals

- This class is **NOT** about technology and programming
- This class **IS** about how technology can be used to build information systems
 - ♦ Interaction among IS, organizations, management, business processes
- Technology (Internet, DBs, web apps, etc.) is the enabler

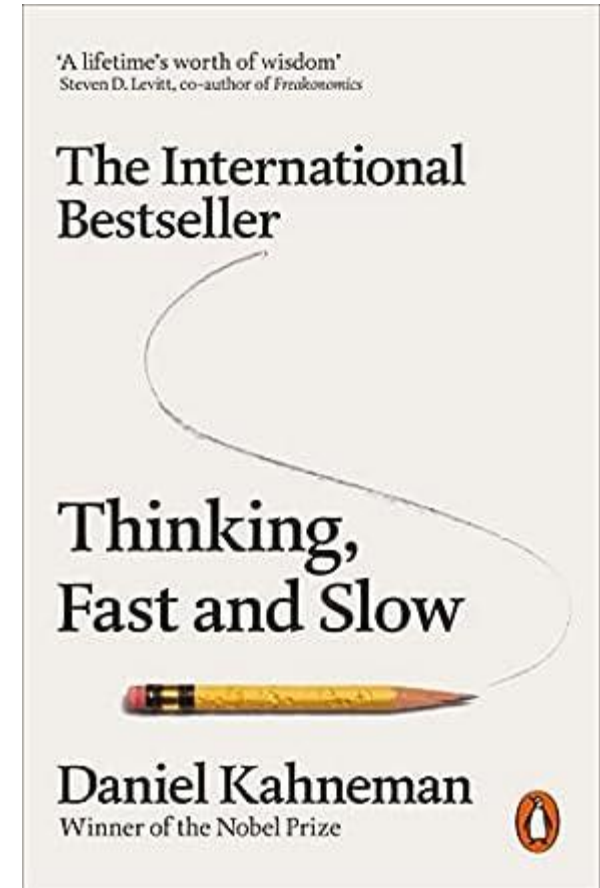
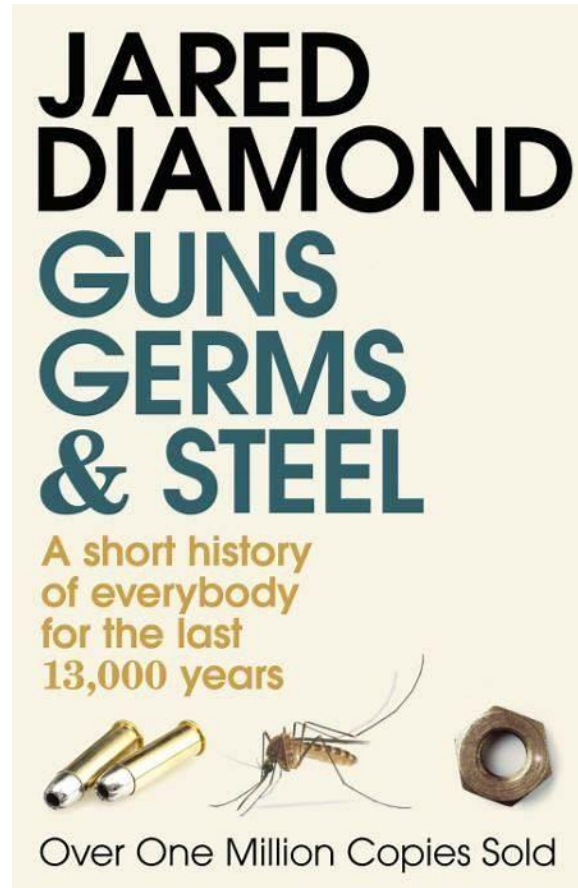
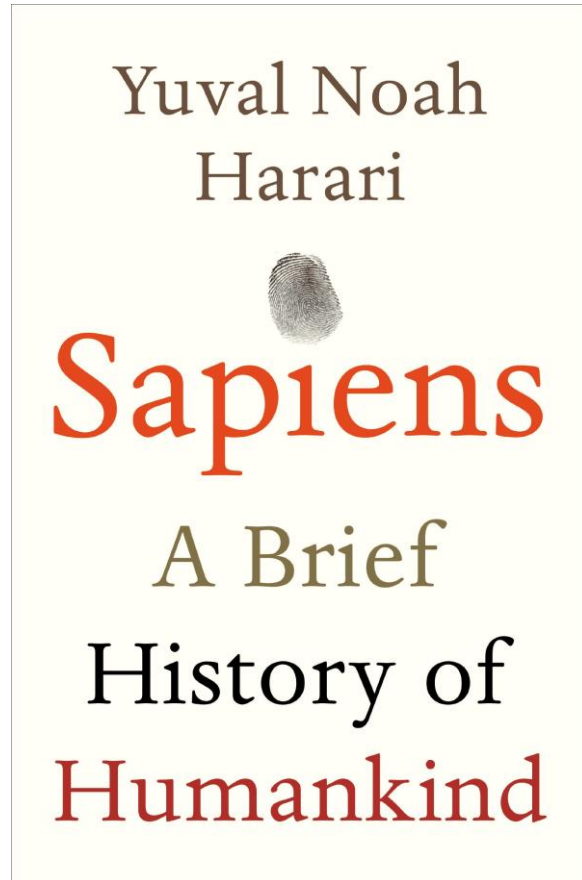
Prerequisites

- You should be aware of IT technologies available
 - ◆ Networks
 - ◆ Data bases
 - ◆ Computing devices
- No actual use of it (programming) in this course

Classware

- Piccoli, Pigni, Information Systems for Managers, 5th edition
- Dumas, LaRosa, Fundamentals of BPM
 - ♦ Business processes
- Osterwalder Pigneur, Business Model Generation
- Daft, Organizational theory and design.

Books you should not miss



Lessons

- In classroom
- Recorded and streamed

Web site

- didattica.polito.it
- News about the course
- Material
 - ♦ Slides, exercises, links

Final, projects

- Final exam – max grade 30
 - ◆ Written paper, 2 hours
 - Most about a (small) BPR case, examples are available on web site
 - Few mnemonic questions
- Project – not mandatory, up to 3 points
 - ◆ Groups max 4 people
 - ◆ Analyze a business case
 - Report
 - Presentation and discussion

Final exam – example

- AS IS analysis
 - ◆ (current situation)
- TO BE analysis
 - ◆ (future situation)
- Why doing the transition
 - ◆ What improves?

Enter Italy from Covid risk country

- AS IS
 - ◆ Fill in paper form
 - Where coming from
 - Commitment to make Covid swap within 48 hours
 - ◆ Hand paper to authority at airport
 - ◆ Do swab at ASL

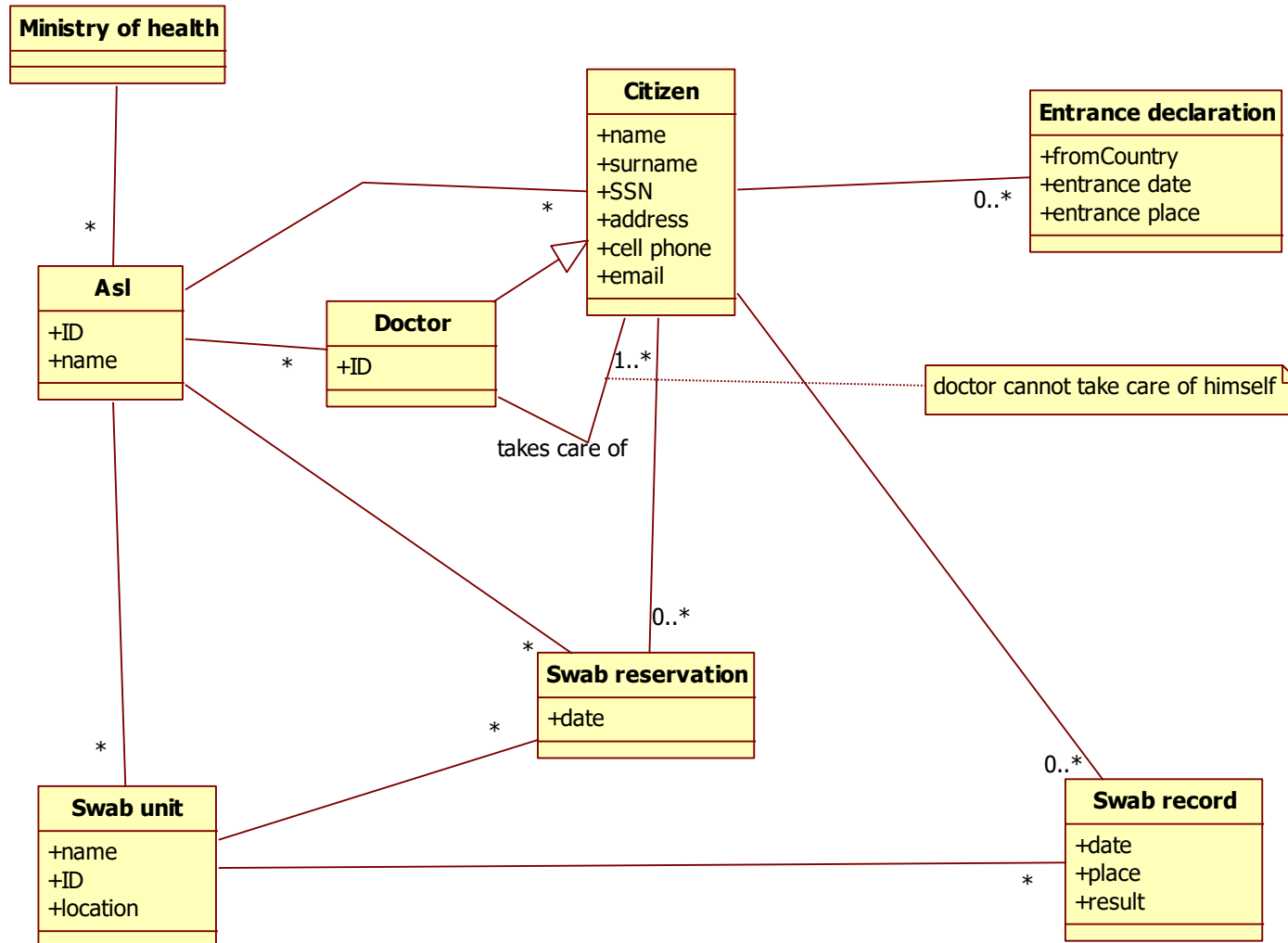
- AS IS – issues

- ◆ Paper form – information typically lost or hard to process
- ◆ Many times nobody collects the form
- ◆ Do all passengers perform the swab?
- ◆ Anyway citizen has to find ASL and arrange for swab

Models – organizational

- ◆ Many organizations / roles involved
 - Citizen
 - Regional government
 - ASL (offers health services in a geo area)
 - Base doctor (takes care of citizen's health)
 - Swab unit (makes swab, processes it)
 - Authority (border police?)

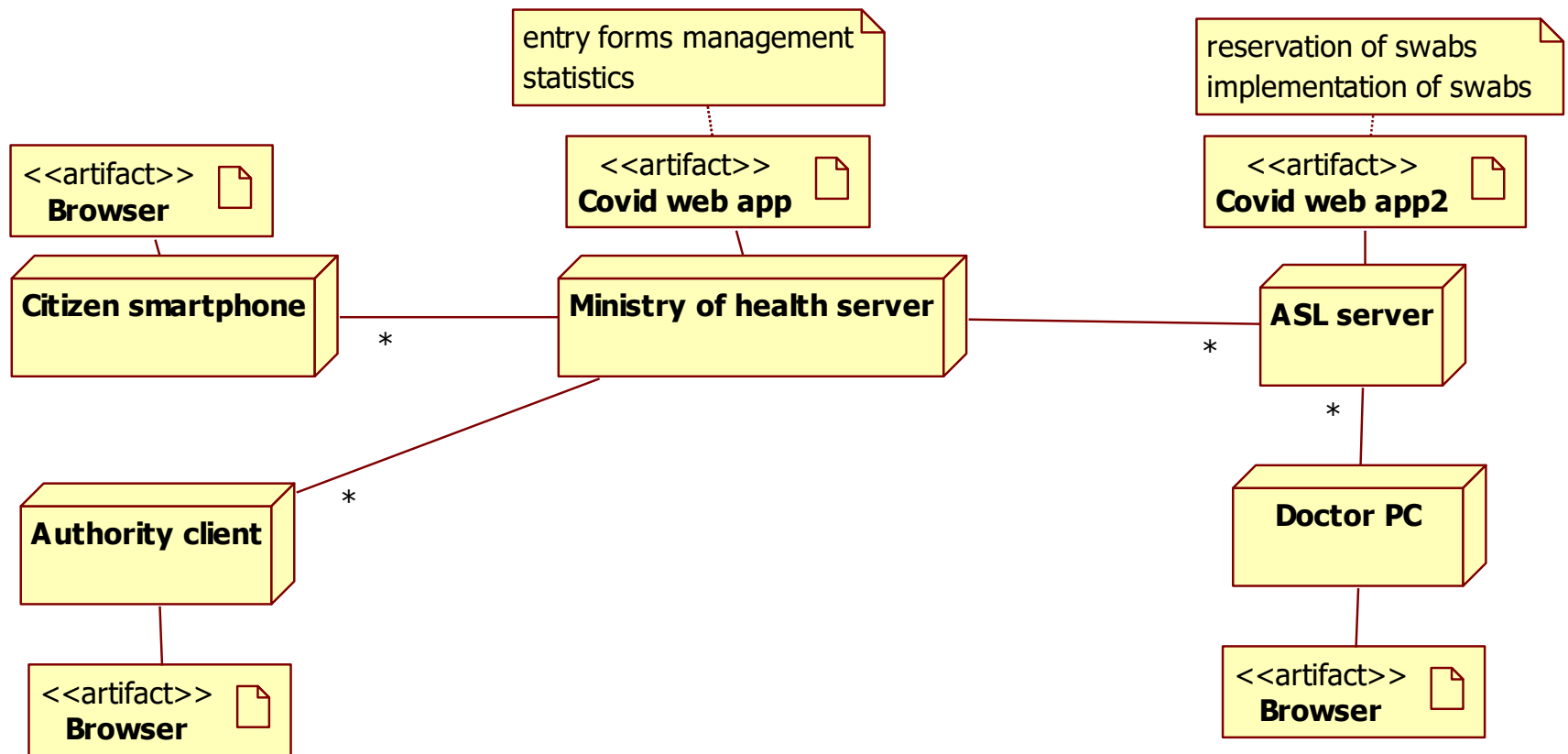
Models – data



Models processes

Process name	input	output	description
Entrance declaration		Entrance declaration (name, SSN, entry date, origin of trip, final destination, address)	Citizen declares his/her entrance in Italy from a Covid-risk country. Ministry of health receives the declaration, records it, and dispatches it to the relevant ASL
Declaration check	Citizen (name, ssn)	Check result	Border authority can check, when the citizen enters, if she has submitted the entrance declaration
Swab reservation	Entrance declaration	Swab reservation (date, hour, place)	The relevant ASL defines when and where the swab will be performed. The reservation is sent to the citizen and to the unit in charge of doing the swab
Swab execution	Citizen (name, SSN)	Swab (physical) Swab record (date, time)	An ASL unit performs the swab on the citizen
Swab analysis and result	Swab (physical) Swab record	Swab result	A lab analyzes the swab, and sends the result to the citizen, his/her base doctor, the ASL itself
Monitor			Ministry can check number of entrances, per country, and % of positive swabs per country of entrance / per ASL / per point of entrance, or else

Models – technology



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- Is it worth it?
 - ◆ More control for government
 - ◆ More convenient for citizen

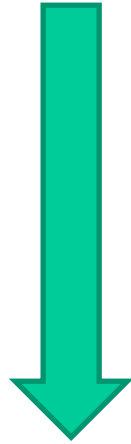
Instructor

- Maurizio Morisio
 - ◆ Dip. Automatica e Informatica
 - ◆ maurizio.morisio@polito.it

WhoAmI

- ◆ Electronic engineer, Polito, 1986
- ◆ PhD 1989, Polito, OO technology for industrial automation (simulation)
- ◆ Consultant OO technology, Paris, F, 1989–91
- ◆ Researcher, U Maryland, USA 1999–2001
- ◆ Professor, Polito
 - Software process, software metrics
 - Experimentation in Software Engineering
 - Mobile application development
 - Green software

Process
People
Tools
Techniques



requirements



Software functions



Office hours

- Class-time (break, end of lesson)
- Or send e-mail to schedule an appointment