



**Work creation , not just mere regulation:
Joint Design of Technology, Organization, People growth**

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1. Three thesis about the future of work

The Fourth Industrial Revolution is a way of describing the fast advancement and the blurring of boundaries between the physical, digital, and biological worlds. It's a fusion of advances in artificial intelligence (AI), robotics, the Internet of Things (IoT), 3D printing, genetic engineering, quantum computing, and other technologies.

This is not the beginning of a **jobless society** but a new overwhelming phase of what Adam Smith called as the **source of wealth of nations, that is organized labour**.

1. The new technologies upset the existing world but **only human design will shape the new organizations, companies, cities, society and above all the quality and quantity of work**.
2. The future of work depends largely on innovation in the **content of work itself: processes, results, cooperation, skills**.
3. The development of **new roles, professions, professions and the learning of new skills** will be the field of active cooperation between companies, institutions, educational system, unions

*This approach reverses the current debate: **from the effects of technology to design and development of new sociotechnical systems***

1. Is it really possible to design and develop work in Italy and in Europe in the current highly critical situation?



- **Unemployment** 10, 2% (UE 8,3%, Germany 3,2%)
- **Youth unemployment** 30,2 % (UE 15,2%)
- 1.400.000 young under 24 are **Neet**
- Many companies are closing or reducing the workforce
- «Gig jobs» increase
- **Skill gap**: from 150.000 to 500.000 uncovered technical jobs

But everybody agrees that

- **Numbers need to be changed**
- **New high quality jobs are created**



1. The «race of work against machines»?



For the pessimists, the **race against the machine** is already lost

50% of present jobs in 2025 will not exist anymore; the others will be profoundly changed

For Frey and Osborne and McKinsey 49% of hours worked in the US could theoretically be computerized (**11.900 billion dollars less salaries**)

In Europe the balance between lost and new skilled jobs could be -30% in total: over 4 million unemployed with serious problems of reconversion

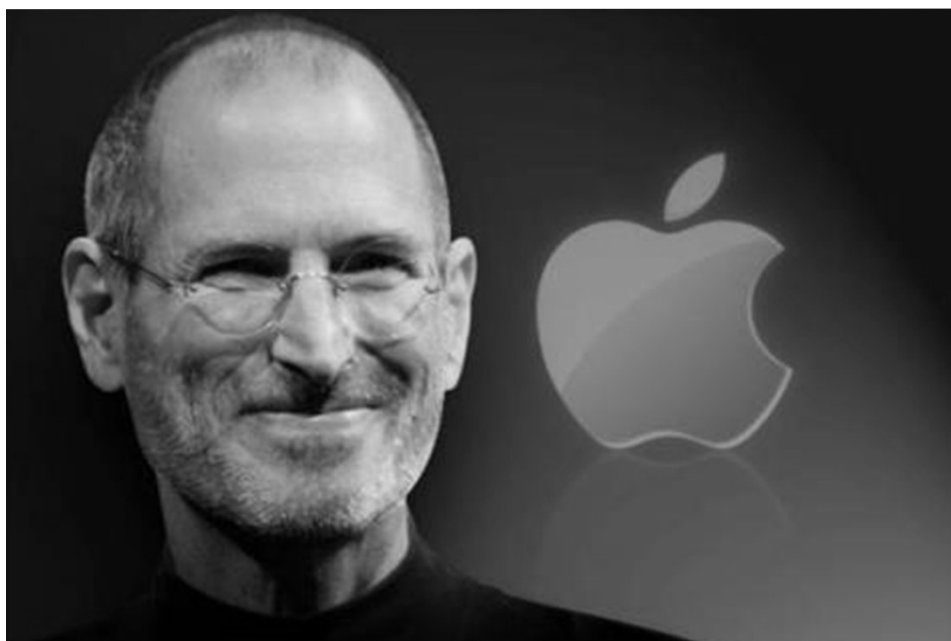
A real panic is underway. **Roboapocalypse now and jobless society.**

But things do not necessarily have to go this way:

we should distinguish trends (if we do not intervene) from designing the future

We can!

1. The race against machines can be won in Italy. Why? (1)



The problem is our inadequacy in competences, organizations, institutions to follow the rhythm of technological change in due time, as Keynes wrote

The race against machines is actually far from being lost. Because

1. there are many things that machines can't do
2. SMEs, even if digitized, will not replace all their people; the Public Administration will not reduce too much staff numbers
3. the big and medium enterprises of Industry 4.0 have a growing need for skilled labor (skilled workers, skilled craftsmen) and will enrich normal jobs
4. personnel who will design, manage and maintain those technologies and socio-technical systems shall increase
5. the “cake” of the supply of goods and services can and must grow

There are many things that machines can't do

What computer can't do: Micromanipulation, artistic work, set questions, solve conflicts, strategic guidance, new ideas, entrepreneurship, create empathy, love and hate, dedication, manage anxiety and despair, creativity and many others: these are key components of services.

Currently some advanced AI devices in labs may simulate or surpass these human behaviour, but they cannot substitute billions of humans manufacturing physical or informational goods and moreover providing **actual services to final or intermediate clients in complex social and technical systems.**(75-805 of the total GDP in advanced countries)

Human beings + computers may do what both of them alone can't do: as in the chess games man + Watson together may win both Kasparov and Watson when they **play alone.**

Humanized technology and augmented workers are the key components of the 4.0. world of services.

2. The forecast of the World Economic Forum

In a survey among business leaders of companies including 15 millions employees:

- **A net positive outlook. In the companies of the respondents 0.98 million of job lost and 1.74 new jobs.**
- **Extrapolating to the total population of their countries 75 million job lost, and 133 million new jobs**

????

1. The forecast of the World Economic Forum and the *augmentation strategy*

Proficiency in new technologies is only one part of the 2022 skills equation, as “human” skills such as creativity, originality and initiative, critical thinking, persuasion and negotiation e, as will attention to detail, resilience, flexibility and complex problem-solving. Emotional intelligence, leadership and social influence as well as service.

Required roles:

- increasing demand for **established technological roles**
- expectation of growth for **roles based on ‘human’ skills**
- accelerating demand of **wholly new specialist roles**



1. The forecast of the World Economic Forum

Table 3: Examples of stable, new and redundant roles, all industries

Stable Roles	New Roles	Redundant Roles
Managing Directors and Chief Executives	Data Analysts and Scientists*	Data Entry Clerks
General and Operations Managers*	AI and Machine Learning Specialists	Accounting, Bookkeeping and Payroll Clerks
Software and Applications Developers and Analysts*	General and Operations Managers*	Administrative and Executive Secretaries
Data Analysts and Scientists*	Big Data Specialists	Assembly and Factory Workers
Sales and Marketing Professionals*	Digital Transformation Specialists	Client Information and Customer Service Workers*
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	Sales and Marketing Professionals*	Business Services and Administration Managers
Human Resources Specialists	New Technology Specialists	Accountants and Auditors
Financial and Investment Advisers	Organizational Development Specialists*	Material-Recording and Stock-Keeping Clerks
Database and Network Professionals	Software and Applications Developers and Analysts*	General and Operations Managers*
Supply Chain and Logistics Specialists	Information Technology Services	Postal Service Clerks
Risk Management Specialists	Process Automation Specialists	Financial Analysts
Information Security Analysts*	Innovation Professionals	Cashiers and Ticket Clerks
Management and Organization Analysts	Information Security Analysts*	Mechanics and Machinery Repairers
Electrotechnology Engineers	Ecommerce and Social Media Specialists	Telemarketers
Organizational Development Specialists*	User Experience and Human-Machine Interaction Designers	Electronics and Telecommunications Installers and Repairers
Chemical Processing Plant Operators	Training and Development Specialists	Bank Tellers and Related Clerks
University and Higher Education Teachers	Robotics Specialists and Engineers	Car, Van and Motorcycle Drivers
Compliance Officers	People and Culture Specialists	Sales and Purchasing Agents and Brokers
Energy and Petroleum Engineers	Client Information and Customer Service Workers*	Door-To-Door Sales Workers, News and Street Vendors, and Related Workers
Robotics Specialists and Engineers	Service and Solutions Designers	Statistical, Finance and Insurance Clerks
		Lawyers

2. How to manage the 4° industrial revolution?

- a. **Industrial policies** at European, national and regional level aimed at encouraging structural changes, suitable for an open economy.
- b. **Social policies.** New welfare, professional retraining, protection of vulnerable groups, inclusion, training
- c. **Joint design of technologies, organizations, work** at the level of companies, public administrations, cities.
- d. **Participation of people and stakeholders** involved in innovation processes: workers and users with a proactive role of companies, unions, education system.

2. How to manage the 4° industrial revolution?

Policies

a) & b) Policies



Industrial policies

- Infrastructural investments
- Industrial policies supporting technological and organizational innovation (eg Industry 4.0)
- Fiscal policies in digital matters (eg web, digital tax)
- Investments in technical education and training

Social policies

- Support qualification and training programs for those who lost their jobs
- Inclusion income; Basic income; etc
- Tax exemption for youth work
- etc

2. How to manage the 4° industrial revolution

Joint design

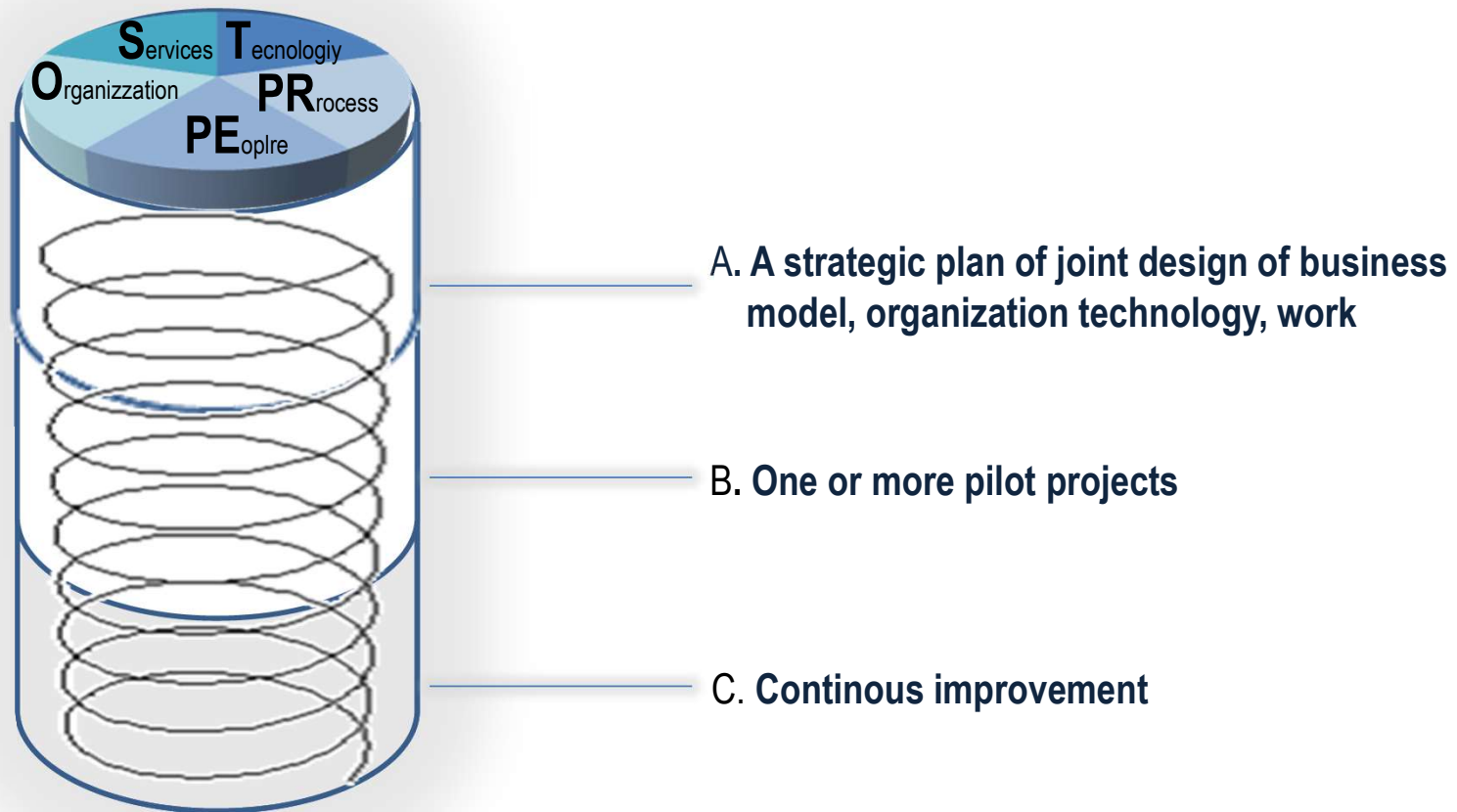
c) Joint design: of what?

- **Jobs, roles, professions**
- **Work organization**
- **Production Systems**
- **Enterprise**
- **Organizational network**
- **Platforms**
- **Ecosystems**
- **Cities**
- **Territories**

Structural Change Management

Structural Change Management means changing together the **sociotechnical system** and the people attitudes and capabilities. A proven methodology develops three classes of activities that reinforce each other, not in a waterfall mode but as a recursive process: **a plan, one or more pilot projects, continuous improvement**. It implies that it is possible to start at any point, creating a learning process.

Each of these activities develop and design service, processes, organization, technology, people in an integrated way.



2. How to manage the 4° industrial revolution ?

Participation

d) Participation: who?

- Companies
- Public Institutions
- Research
- University and school
- Labor unions
- Media
- Cultural movements

and especially

- Workers
- Citizens

2. The three pillars of 4° industrial revolution *Technology*



Industria 4.0: Le tecnologie abilitanti



2. The three pillars of 4° industrial revolution

Technology

Enabling technologies



New digital technologies are **enabling** because they allow to

- manage and generate knowledge
- disintermediate
- connect operations
- accelerate decisions
- be the core of personalized products and services

But for this to happen it necessary to **activate the other two factors of the fourth industrial revolution: the organization and the work, based upon new models.**



2. The three pillars of 4° industrial revolution *Organization*

New models of organization



- A. **Strategies. From scale to scope.** New business models based on products and services focused on individual customers
- B. **Macro-organization design. From castle to network.** Global organizational networks; ecology of knowledge
- C. **Organizational functioning. From clockwork to organism.** Organic organizations and flexible organizational units. Non-hierarchical coordination and control systems
- D. **Integral companies.** Beyond the corporate social responsibility. Companies with a soul. New business culture and ethics

2. The three pillars of 4° industrial revolution *Organization*

Business 4.0 will be centered upon

- customization
- servitization
- full customer satisfaction of current and future customers
- competitiveness upon quality against low cost models

The **key capabilities** that Industry 4.0 managers must possess are

- continually reviewing strategy
- renew / "servitize" their products / services
- mass Customization
- continuously innovating the Business Model
- activate new competitive advantages to better compete

It is evident that **developing successful strategies cannot be delegated to the technology suppliers** and instead it is a matter of courage and entrepreneurial skills, of capacity building, of valorization of work at all level

3. The three pillars of 4° industrial revolution *Organization*

B. Organization networks: enterprise and macro-organization design

Digital technologies 4.0 allow the global connections among the global value chains and customers but this works only if they are components **of governed organizational networks**, complex socio-technical systems.

*Alfredo Altavilla, former FCA number two, describes Industry 4.0 for FCA a configuration of a **governed network** that connects the company, suppliers, workers and users. Bonfiglioli is actively transforming its supply chain into a **governed network company***

3. The three pillars of 4° industrial revolution *Organization*

C. The organizational functioning

Digital technologies enable but do not create by alone a different model of organizational functioning which is an genuine social construct.

In Industry 4.0 the organic model of organization will be based upon autonomous organizational units and teams

- centered on processes and results
- based upon non-hierarchical coordination
- largely operating on projects
- able to manage variances and the unexpected,
- generating continuous improvement and innovation
- activating communities of practices.

Designing and managing organic organizations and teams instead of organizational charts, departments and offices is the frontier of organizational development in Industry 4.0: the «team science»,

Examples in Avio Aero, Pirelli, Poliform

3. The three pillars of 4° industrial revolution

Organization

The Olivetti «integral enterprise»: the two sidewalks of via Jervis in Ivrea, 1965

- on the left, the highest level of technological and organizational modernity of that time
- on the right the most modern corporate welfare system of the time (and of the following times): infirmary, social services, kindergartens, libraries, psychology center, sociology center



Federico Butera. Non riprodurre senza autorizzazione

3. The three pillars of 4° industrial revolution *Organization*

D. Social responsibility and "integral enterprise"

The Fourth Industrial Revolution requires the development of "integral enterprises", that is non moralistic responsible companies but **normal companies that jointly pursue high economic and social performances**. They are able to respect the 17 objectives of the AGCS (Global Agenda for Sustainable Development) of the UN without losing competitiveness.

The "integral enterprise" main characters:

1. "Socially valuable" products
2. Quality processes
3. Care of people: managers, professionals, technicians, workers, and also customers and suppliers. "Product of work is people"
4. Investments that take care of the prosperity of investors, suppliers and customers, local communities and global systems
5. Social capital: economic and social development of the community
6. Environmental and social sustainability

A few examples. Yesterday the "Olivetti" by Adriano Olivetti; today Zambon, Luxottica, IMA, Technogym, Cucinelli, Loccioni. Who else?

Parameters for sustainable design



3. The three pillars of 4° industrial revolution *Work*

The most successful cases of Industry 4.0 exhibit ideas of work totally different both from

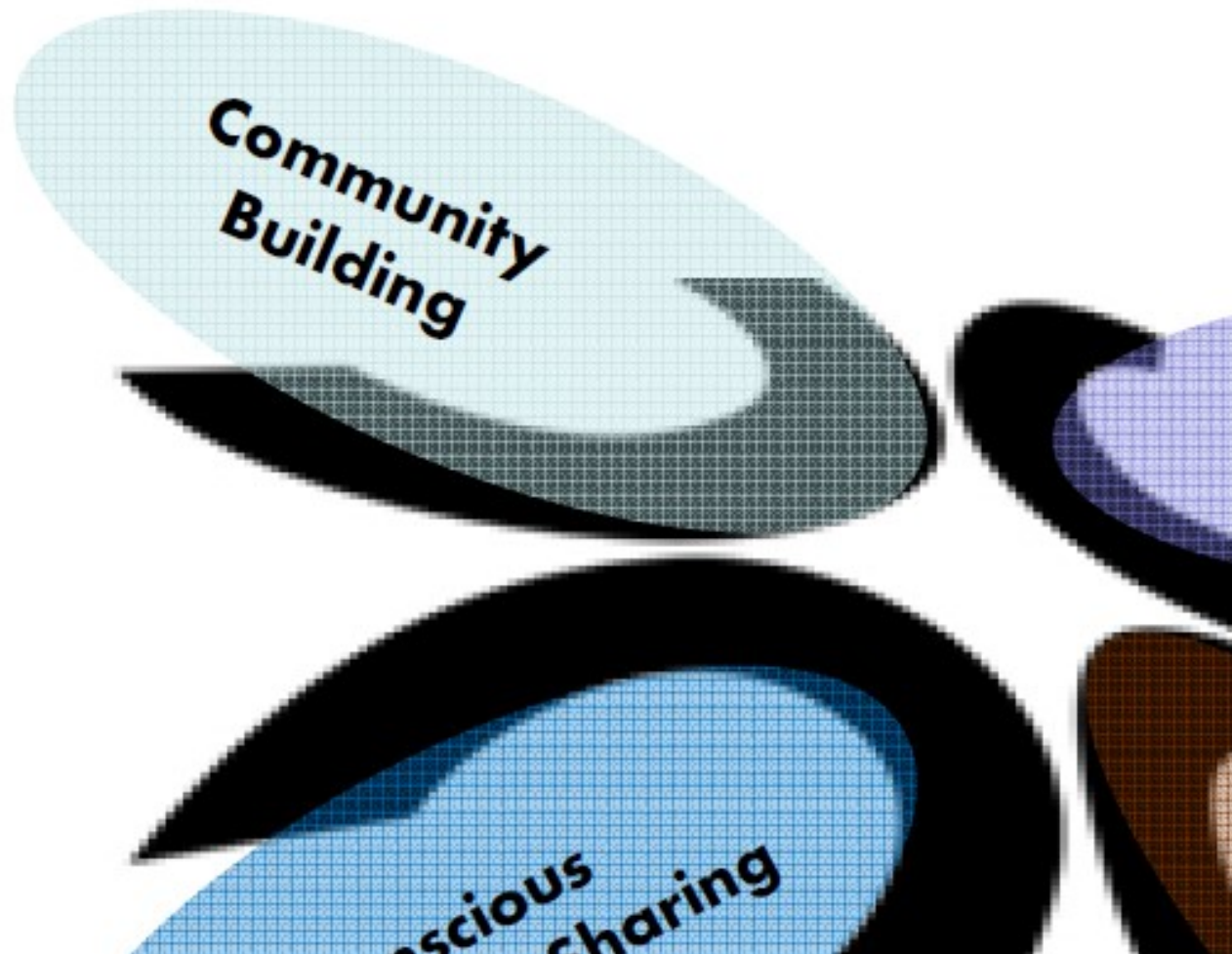
- * the intensive division of labor that dominated the fordist tradition (and that seems to reappear in Chinese and Vietnamese factories and in online gig jobs).
- * the idea of “egg head” work of stars and super knowledge workers in highly automated unmanned organizations.

A new idea of work as **knowledge in action**

- combining intellectual (cognitive) and manual (operational) work to achieve valuable results in products or services
- mastering advanced technology
- acting an intense relationships between people and machines
- requiring technical skills and human skills (hard and soft skills)

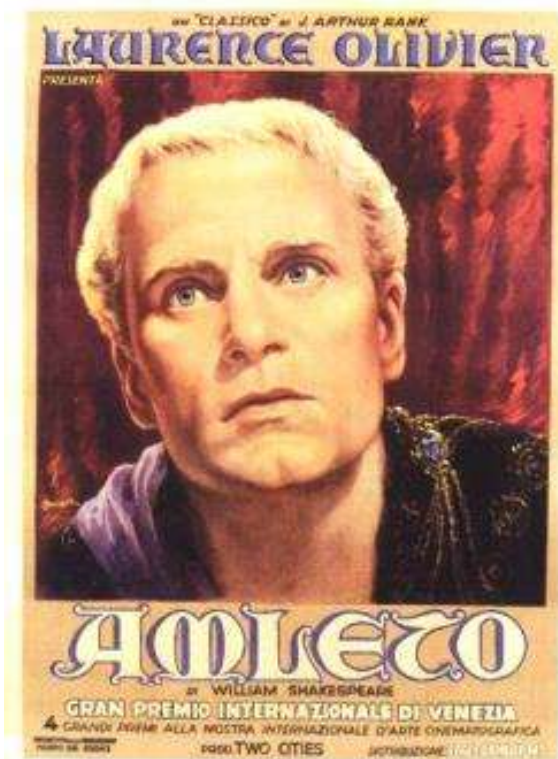
An idea of work based upon a **4 C model of work organization**: self-regulated **Cooperation**, **Conscious** knowledge sharing, extended **Communication**, **Community** building

The 4C model of work organization (Butera)



4. How to design and create new work

Create flexible and responsible highly valued work: roles instead of tasks



The basic component of work will not be anymore fragmented, prescribes tasks and job profiles but "open roles" based upon

1. responsibility for measurable results
2. mastering and improving meaningful work processes
3. full control of cooperation with people and technology
4. continuous acquisition of adequate skills technical and human skills.

These roles are "scripts", "characters" that become animated "acting roles", interpreted and enriched by real people according to context and skills.

4. How to design and create new work

Broad professions

We know very well the professions belonging to professional orders , as doctors, nurses, lawyers, journalists, social workers, etc.)

ICT designers, mechatronics technicians, qualified vendors, logistics technicians, etc. are professions as well, but less regulated. Digital artisans are trade and professions too.

40% of trades and professions of today will disappear or change in 2022/26. We need now to develop open and flexible roles grouped in wide broadband professions that allow

- people to move from one role to another without losing identity and
- help institutions and organization to plan education and mobility.

As traditional professions, broadband professions consists of expert and discretionary activities, responsibility for results in front of the “client” and the public, an evolving set technical and social skills, codes of ethical behavior. Do not require licenses and corporations.

4. The design of broadband professions

Professions are at the same time a **service system**, a **human capital management system**, a **source of people's identity**. They require a set of theories and techniques within a specific domain of knowledge and skills achieved through a curriculum of studies and experiences more or less legitimized (**profession as a social institution**). The professions have a name, a social recognition, a positioning on the labor market (**profession as a source of identity**). The professions imply general rules of recruitment, tariffs, rights (**profession as a model of people management**).



4. Some broad profession in the 4° Industrial revolution

Architects of the new technological-organizational systems

Who design innovations? "Ambidextrous" professions able to innovate in phase and to realize those innovation

The architects of the new technological-organizational systems are not the technologists alone: they are multidisciplinary architects of socio-technical systems capable of conceiving and engineering together business models, markets, objectives, technologies, processes, organization, work, culture

They will have to operate on the basis of design thinking

The organizational subject that can best perform this function is not a single role but a project team

Those who carry out this profession must have a multidisciplinary education

This type professions in most cases are not well prepared this way in the European universities

4. Some broad profession in the 4° Industrial revolution

Integration professions

Crucial figures in the development of Industry 4.0 are the **technicians and professional integrators** who manage and develop sociotechnical systems taking care of

- **interaction between technologies and organization**
- **frequency of variances and unexpected phenomena**
- **maintenance**
- **monitoring**
- **involvement and guidance of people.**

Today these profession are named scatterly as domain experts, maintainers, vendors, team leaders and others.

They are prepared in well technical schools belonging to dual system model (as Fachhochschule, ITS, Company Academies, etc)

4. Some broad profession in the 4° Industrial revolution

Digital new craftsmen, hybrid workers, skilled service workers

In Industry 4.0 a significant place will have the figures of **digital artisans**. In Italy those employed in made in Italy companies characterized by quality, beauty, product customization: shoes, clothes, furniture, food but also software "made especially for the individual end user".

Process operator jobs will use largely digital technology in setting, steering and maintenance operations: **hybrid workers**

Service personnel in health, banking, tourism, education, etc. should master digital technology and to profit of huge availability of data, improving the quality of service to the final or intermediate "client".

*Their level of training will be much higher: "**augmented workers**". The theme is how to train and retrain with totally new methodology and how to protect their rights and their working condition.*

Professionalization of everyone?

It is plausible the prospect of a "**professionalization of everyone**", proposed 50 years ago by H. Wilensky, therefore not only of managers and professionals ?

In fact, the fourth industrial revolution requires that **knowledge increasingly belongs to the person** who must share it with others and the digital systems The **dedication to service** should prevail over compliance to procedures and hierarchy.

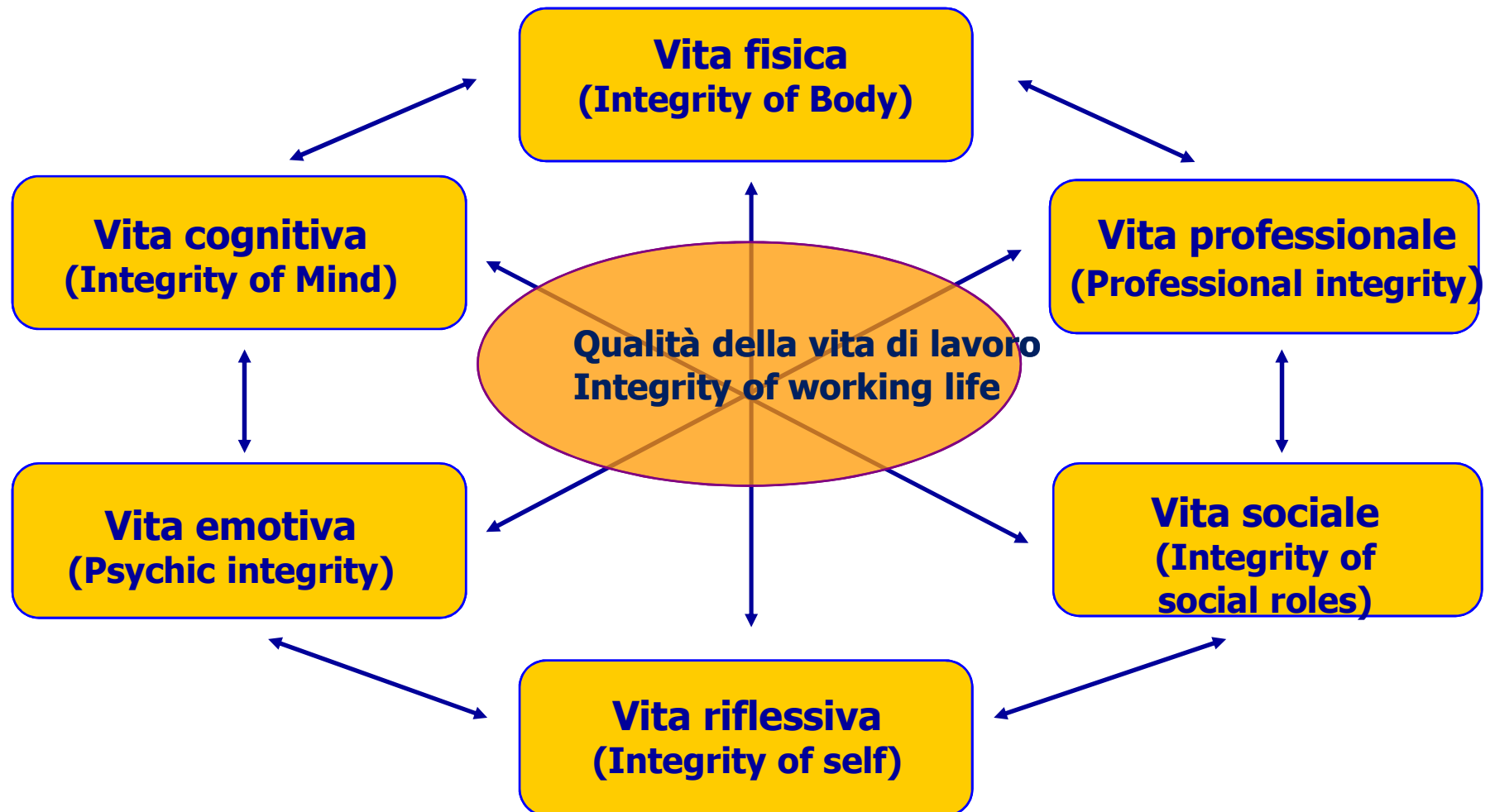
The production worker, the call center employee, the restaurant waiter, the technical assistant, the public employee, the caregiver, should and can have a **decent job, a good job** and be helped to learn, to contribute to strengthening one's work identity and human identity.

5. The content of *job design*



The parameters of role and profession design

The Quality of Working Life Model (Butera)



5. Design of new skills and new jobs

The new jobs will be as an **iceberg** in which **the visible parts** are, as said before, the prescribed role , the acting role played, the trade or profession more or less formalized, the system of capabilities / knowledge, the distributed intelligence between people and technological systems.

The **much larger invisible part** is the **workplace within**, that is the set of potential, knowledge, skills, energies, professional and non-professional motivations of the person.

The management and the organization of work of new sociotechnical systems require an **alliance between organizations, systems of professions** “ and the **workplace within of real people**.

As a consequence we need to develop an education for **hommes et femmes integral, integral persons, persone integrali**.

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