The first European Chips Act is vital in boosting Europe's semiconductor ecosystem by expanding research and innovation capacity; supporting manufacturing through targeted funding; strengthening supply-chain resilience; enabling the access for SMEs to design and production infrastructure; and establishing a coordinated crisis-response system.

Workforce and skills are essential

It should be emphasized that semiconductor workforce development is an essential part of the equation: technical staff is urgently needed, not only in process technology development and in manufacturing, but equally in system and architecture development and in chip design.

Problem statement

Technical job postings are growing at worrisome rates, but the supply of graduates is stagnating - or at best growing modestly - and the resulting talent gap is becoming a primary challenge for Europe's semiconductor sector.

The "Skills Strategy 2024" report from the European Chip Skills Academy (ECSA) project has estimated the semiconductor workforce gap in Europe by 2030 at 75,000 workers - aggregated over technicians, hardware engineers and software/data specialists. This results from a gap between the projected job openings (approx. 205,000) and the supply of graduates entering the semiconductor sector (approx. 130,000). This forecasted European talent gap was based on actually reported expansion and investment projects. It is to be noted that the stated goal of expanding Europe's share of global semiconductor production capacity to 20% has not been taken into account in the projections. The 2025 update of the ECSA Skills Strategy recently revised the talent gap downwards, as a result of postponed or cancelled investment projects; still it estimates the European talent gap by 2030 at 65,000 workers.

Action lines and different time horizons

We distinguish 3 major action lines addressing the semiconductor workers' pipeline:

a. Growing the STEM talent pool, targeting youngsters in elementary school and high school (time horizon to the job market: 10–15 years)
b. Growing the student population in STEM domains, targeting students in university and higher technical education (time horizon to the job market: 5–10 years)
c. Growing the influx of workers in semiconductor companies (time horizon to the job market: 1–5 years).

The actions and the outcome of the sequential workstreams are interdependent: growing the interest for STEM in the early-age school population is mandatory for a growing STEM student population in high schools and university/vocational education and training (VET), which in turn is imperative in building a larger "pipeline" of candidate-employees for companies and research organisations.

But it is important to notice that if we trust the time horizon of 2030 – which is only 4 years away – for the talent gap predictions, "growing the influx in semiconductor companies" is the most urgent workstream and adequate action lines will have to be compellingly implemented (e.g. through adult education, reskilling, talent-driven mobility, ...).

Fragmented and uncoordinated actions

Many workforce-related initiatives have existed – and still exist – under various EC programmes (Horizon Europe, Digital Europe, ERASMUS+ …). Most if not all current or planned workforce initiatives make a valuable contribution to at least one aspect of growing the semiconductor workers' pipeline. But they remain fragmented and lack overall coordination and governance: a coordinating body with sufficiently large authority, outlining an *integrated* approach and setting clear KPIs for the various action lines is missing.

The number of additional workers or students on the "demand side" should be quantified clearly and set along a specific timeline. The actions on the "supply side" (undertaken or being planned) should be classified according to a timeline (short-term, medium-term and long-term effect); to resources required (budget, staff, infrastructure); and to impact (e.g. number of additional students registered; number of workers reskilled or hired).

One of the promising components of the "Chips for Europe Initiative" pillar of the Chips Act concerns the establishment of a network of chips competence centres (CCCs): these recently established CCCs are expected to become regional antennas and a.o. poles for development of new talent. On the positive side, it is important to notice that for the first time in an EC research programme on microelectronics the build-up of technology and chip-making capacity is addressed, *concurrently* with building the human capital to enable it.

The CCCs hold promise but the initiative is still being established and it is too early to assess their merit. And in spite of the formation of a network among the local CCCs and the existence of a "Coordination and Support Action" to support this network, a proper governance needs to be ensured: the CCCs need to become *strategic* actors in a coherent European semiconductor ecosystem.

Recommendations for Chips Act 2.0

After a plethora of well-intended projects which often did not quite meet the ambitious objectives, it is time to think and act strategically in terms of skills and workforce development. Our recommendations to support this endeavour under the Chips Act 2.0 are summarised as follows:

1. The EC needs to set up a "**Chips Skills Council**" as a high-level body within the governance structure of the Chips JU – at an equal level as the European Semiconductor Board – dedicated to semiconductor skills and workforce development, (i) with adequate representation from all involved stakeholders (i.e. EC, Member States, industry, RTOs and the education providers); (ii) which develops a master plan and sets KPIs for the various workstreams; (iii) which monitors on a regular basis the progress and updates/refines the needs and means in a changing landscape; and (iv) which is endowed with sufficient authority to influence key actors and to facilitate decisions.

2. A "skills observatory" has been introduced in various projects, but this typically has a temporary horizon (due to the limited duration of the projects) and with little or no "operating power" w.r.t. assuring the necessary support, or gathering the data for the demand side and the supply side of skills. It is therefore recommended to install a permanent Semiconductor Skills Observatory at EU level, that operates intimately with the Chips Skills Council, (i) with representatives from all major stakeholders (from demand and supply side); and (ii) that is

given sufficient authority to collect on a regular basis fine-grained data from supply and demand side.

3. The various Ministries of Education throughout Europe should be held responsible for contributing to the Semiconductor Skills Observatory by providing, on a regular basis, data for the student population in secondary, higher and adult education, which should allow (i) recommendations to be issued and (ii) steering and corrective actions to be taken, wherever and whenever needed.

4. Women are disappointingly underrepresented among graduates in STEM studies and careers. The two major 'drop-off points' for girls/women in European tech are (i) at the end of secondary education; and (ii) at the workforce entrance with a tertiary education degree. This signals a serious and multifaceted problem of Europe's STEM education and career paths. It calls for a comprehensive, multi-level and integrated approach that encompasses educational reforms, policy interventions, societal attitude shifts and targeted support mechanisms to effectively bridge the gap.

5. The cost of state-of-the-art laboratories and clean rooms at educational institutions is becoming prohibitively high. Government agencies need to stimulate and adequately support RTOs, education providers and industry to jointly and effectively (i) establish authoritative roadmaps, aimed at scaling up workforce training and development for high-tech industries; (ii) agree on joint programmes aimed at bridging the gap between academic curricula and industry needs; and (iii) grow the cohort of experts with an industry mindset (e.g. through internships; dual learning initiatives...).

6. It is strongly advised that all stakeholders devote workforce development efforts involving sufficiently large resources in the local regions with high growth needs and a thriving talent ecosystem (mimicking e.g. the Brainport region in The Netherlands). The CCCs will undoubtedly be able to support these regional activities and they are expected to share expertise and exchange best practices. But we advocate to follow the principle "think global, act local": the CCCs are regional operators, but it is recommended that they are monitored and coordinated from a supra-regional level, in agreement with an overall European semiconductor strategy.

Conclusion

Under the Chips Act 2.0 skills and workforce development need to move to the top of the agenda of Europe's decision makers: it is time for a moonshot Chips Skills Project.