# Work-From-Anywhere Skills: Aligning Supply and Demand Starting from High Schools

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Abstract: The world of work-from-home (WFH) and work-from-anywhere (abbreviated WFX or WFA) grew more than ever during the COVID-19 pandemic. Many companies are now planning on permanently allowing WFX, with subsequent demand for specific skills. It is crucial to foster these skills in high schools, as students may enter the job market without attending University. Up-to-date analysis of the current situation is missing to align supply and demand by enabling educators to set goals and strategies to train students so that they will be able to mesh into a WFX setting. To address this issue, we collected complementary data using a case study (23 students), a questionnaire (616 students), and interviews with professionals and practitioners of the software development sector. Results suggest that information management, communication skills, autonomy, and resourcefulness are key competencies that enable professionals to succeed in a WFX environment. However, students feel less prepared in terms of communication skills; moreover, they lack time management and autonomy skills. Based on our results, we highlight recommendations for educational practice that educators can use in curriculum building to fill the gaps that emerged in this study to assure the effective development of the skillset demanded by current and future WFX conditions.



## 1 INTRODUCTION

The adoption of Work-From-Home (WFH) policies grew in the 2000s (Sako, 2021) and was followed by Work-From-Anywhere (abbreviated WFX or WFA), which provided employees with greater geographic flexibility and autonomy in choosing spaces, times, and tools (Choudhury et al., 2019; Sako, 2021). During pandemic conditions, several sectors leveraged these policies for business continuity. These changes occurred well beyond the working settings where these policies were already in place and have involved the educational context at every level.

After the most critical emergency conditions passed surveys reveal workers' desires to continue with the new working setting, and some companies are transitioning toward a permanent WFX model (Drera, 2021). Based on these considerations, strong demand for WFX skills (Paasivaara et al., 2013; Prossack, 2020) is expected for the next future in the job market. It is crucial to foster these skills in high schools (Fronza et al., 2022), as students may enter the job market without attending University. The COVID-19 pandemic has provided the chance to work in this direction. Indeed, school digitization accelerated, and students needed to organize their work autonomously by going beyond the concept of "school hours" and focusing instead on the achievement of the objectives (in a WFX style). However, up-to-date analysis of the current situation is missing to align supply (from schools) and demand (of the job market), which would enable educators to set goals and strategies to train students so that they will be able to mesh into a distributed, WFX setting.

This work aims at providing an overview of the current state of WFX skills supply and demand. To this end, we collected complementary (qualitative and quantitative) data using a mixed-method triangulation design in which we combined a case study (with 23 high school students), a questionnaire (with 616 high school students), and interviews with ten industry practitioners of the software development sector.

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Results suggest that a compound of soft and hard skills (some of them already visualized and required before the pandemic) are considered key enablers and assumed "givens" for those professionals joining and participating in global and WFX teams. Among these skills, students feel less prepared in terms of communication skills. Particular attention receives self-motivation: WFX workers are expected to be autonomous and self-driven, but our results evidence lack of time management and autonomy skills among students.

The rest of this paper is structured as follows: Section 2 introduces related work; Section 3 describes our research method and our data collection strategy. Results are shown in Section 4 and discussed in Section 5. Section 6 draws conclusions and suggest areas for future work.

## 2 RELATED WORK

Remote working involves working in a defined and stable place (e.g., home) with an appropriate desk, optimal Wi-Fi, and a fixed schedule. It arguably began with the Work-From-Home (WFH) policies in the 1970s to counteract rising gasoline prices (Choudhury, 2021); in 1983, M.H. Olson (Olson, 1983) found that the individuals who worked at home successfully were self-motivated and self-disciplined individuals who made the arrangement either because of family requirements or because they preferred few social contacts beyond family. In the 2000s, the adoption of WFH increased in several sectors thanks to digital technology (e.g., faster and cheaper computers, stable broadband Internet, video chat platforms, and desktop virtualization) (Sako, 2021). Research showed WFH performance benefits; for example, a 2015 study found increased productivity (by 13%) for the employees who chose WFH (Bloom et al., 2015). Consequently, some companies launched Work-From-Anywhere (WFX) programs, i.e., they moved toward greater geographic flexibility.

The COVID-19 pandemic accelerated these changes already underway: many companies implemented a working management philosophy based on giving people flexibility and autonomy in choosing spaces, times, and tools, which also means greater responsibility when talking about results. WFX does not mean simply working from a distance, i.e., it can include WFH, but it is more than that (Softtek, 2020): workers can organize the day by combining a time for private life and one for work-life, based on mutual participation and trust (Stamenova, 2021; Softtek, 2020) between the employer and the collaborators. Even though availability needs to be granted (e.g., to discuss the status of ongoing projects), what matters is meeting the objectives (Softtek, 2020) at the pre-established times. This encompasses a wider vision of the whole picture: a new organization of the working setting (goals, schedule, teamwork, collaboration, accomplishment, and accountability) that motivates a true shift in the working paradigm towards empowering employees to understand clearly the goal at hand, analyzing resources (tools and time), collaborating with others and delivering results (Smart Working Observatory, 2020).

In 2021, Barrero et al. developed systematic evidence about whether remote work will stick after the pandemic, why, and some of its economic and societal implications: desires to continue with remote work emerge across groups defined by age, education, gender, earnings, and family circumstances. Moreover, most workers express a willingness to accept sizable pay cuts in return for the option to work from home two or three days a week (Barrero et al., 2021). In a 2021 survey (Buffer, 2021) with a total of 2300 respondents, 94% percent of the respondents who started working remotely as a result of the pandemic selected that they would like to work remotely, at least some of the time, for the rest of their career; that number increased to 99% for people who were remote workers before COVID-19. Moreover, 46% said that their company was planning on permanently allowing remote work. M. Sako (Sako, 2021) foresees a hybrid model combining remote and in-office working: workers will balance tasks that can be carried out remotely (e.g., writing reports) and tasks that are better carried out in social spaces (e.g., brainstorming). In this regard, Smite et al. identified the future challenge of "identifying the must-happen in-the-office or in-collocation practices, ceremonies, and events that will help maintain the organizational culture" (Smite et al., 2021). Offering employees customized working styles seems to be the winning strategy to attract talents (Kelly, 2021). At the moment, the strategy is not uniform among tech companies. For instance, Facebook, Uber, and Microsoft are pushing for a pre-pandemic model, at least in a short period. Others (such as Twitter and Spotify) are transitioning toward a permanent WFX model (Drera, 2021).

WFH determined changes and novelties of working routines and practices; for example, daily rhythm is more flexible and self-imposed (Smite et al., 2021). Moreover, WFH comes with a list of issues, such as not being able to unplug, loneliness, difficulties with collaboration and communication (Buffer, 2021). As a consequence, specific skills are needed to succeed in this working setting, as reported by the research liter-

ature in Global Software Engineering (i.e., a common practice in software development teams) (Monasor et al., 2010; Richardson et al., 2010; Swigger et al., 2010). These skills include strong written communication, adaptability, time management, collaboration, focus, working in culturally diverged teams, and using collaborative technologies (Paasivaara et al., 2013; Prossack, 2020). Notably, most of these are soft skills (Paasivaara et al., 2013). Having an overview of the current state of WFX skills supply and demand would allow educators to set goals and strategies to train students so that they will be able to mesh into a distributed, WFX setting.

# 3 METHOD

In this study, we will answer the following questions:

- **RQ1.** How ready are high school students for WFX?
  - **RQ1.1.** How do students perceive WFX?
  - **RQ1.2.** What WFX skills do students have?
- **RQ2.** What skills do employers think are needed for WFX?
- **RQ3.** How aligned are the supply and demand of WFX skills?

A *mixed-method triangulation design* has been used in this study to obtain different but complementary data (Creswell and Creswell, 2017). As shown in Figure 1, we collected and analyzed quantitative and qualitative data separately and then merged the different results. Concurrent, but separate, collection and analysis of quantitative and qualitative data included the following methods: 1) case study, involving 23 students of a CS high school (Section 3.1), 2) questionnaires, involving 616 students attending a range of types of high schools (Section 3.2), and 3) interview of ten professionals in industry/productive sectors in the area of software development, holding roles of recruitment, talent detection, talent acquisition, and front-line people leadership (Section 3.3).

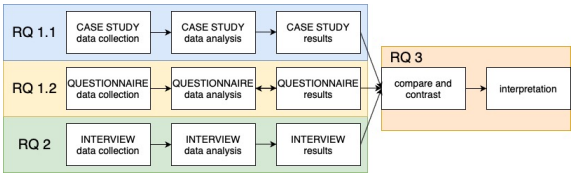


Figure 1: Triangulation design: convergence model (adapted from Creswell and Cresswell, 2017).

## 3.1 Case Study

The study context is a business simulation project in a fifth-year class of a CS high school in Bolzano, Italy. A total of 23 students (21 M, 2 F; 18-19 years old) was involved. The project simulated 15 professional working days to implement a web-based application commissioned by a customer (i.e., the lab technicians), who asked for a system with a dynamic database to manage the material in the chemistry and microbiology laboratories.

A simulation project has been chosen because of its ability to enhance skills, including strategy development, time management, team building, negotiation skills, decision making, and team-working (Asiri et al., 2017; Xu and Yang, 2010). To obtain a didactic transposition (Hazzan et al., 2010) of a professional context, we adopted a pseudo-business structure, with reference figures (chosen by the students upon teacher's approval) and an organizational plan. The activity was carried out partly remotely and partly on-site; in both cases, the adoption of WFX working practices (i.e., time management, sharing documentation, work organization with the other groups) was encouraged. All the project documentation is available online (www.iisgalilei.eu/cmb/documentazione/).

As shown in Figure 2, students were divided into the following two areas: the technical area (dedicated to project development) and the communication area (focusing on documentation, communication, and graphic/web layout). Each area was coordinated by a group leader chosen by the CS teacher among the most motivated students in the group. Each area was divided into smaller groups according to the tasks assigned; for example, the technical area included smaller groups that worked on security/testing, human-machine interaction, and server implementation. Each student could choose the area and the group membership according to their characteristics, inclinations, and tasks in the area. We used self-selected teams (i.e., students chose the team) because this approach is more efficient for short-term projects (Bacon et al., 1999). Each sub-group had a student leader, who was chosen by the team and interacted with the other groups and with the area leader.

Since it was a simulation project, we attempted to promote knowledge and experiences that emulate, methodologically and practically, the common environment of the software industry (Corral and Fronza, 2018). Moreover, we aimed at facilitating the achievement of the objectives. Based on these considerations, the teacher proposed and agreed on a series of daily objectives for both groups and individual participants. Then, the teacher and the leaders regu-

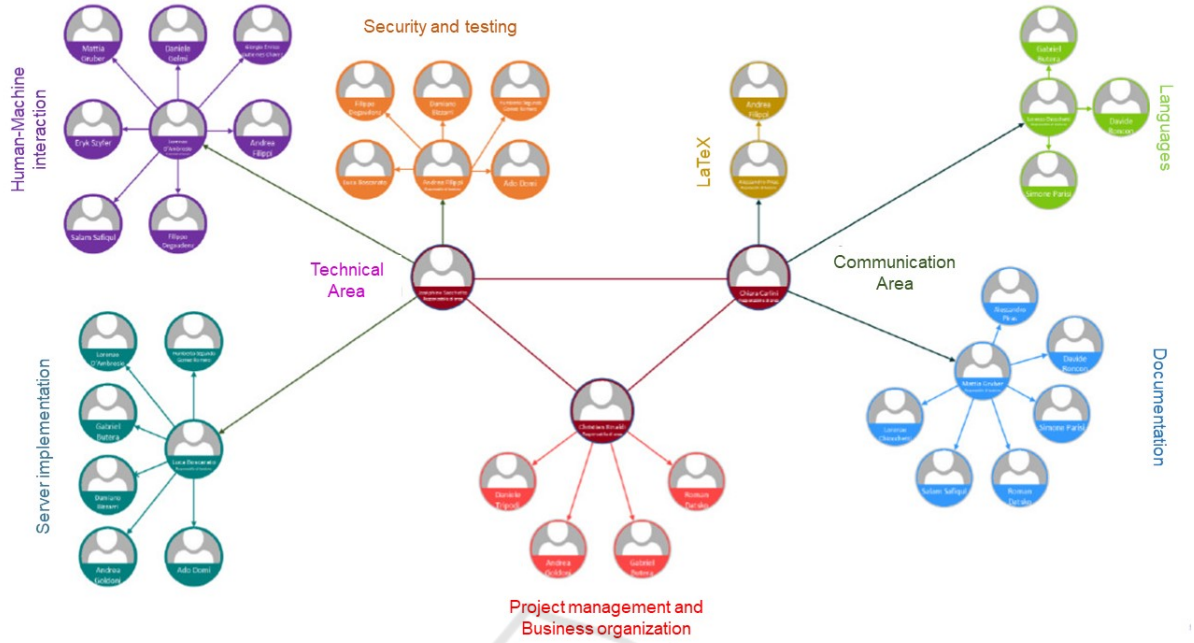


Figure 2: Organizational chart of the case study.

larly verified the progression of the work and the actual achievement of the objectives. Throughout the process, we distributed the following daily questionnaire (using an online form) to track the progress of the WFX experience in terms of work hours, achievement of goals, self-perception in the team, and issues encountered:

1. Indicate the time slots of the day in which you worked best in the remote team.
2. Indicate the time slots of the day in which you worked best individually.
3. In your opinion, did your team achieve the goals? [yes; no]
4. Did you find it difficult to achieve the goals? [yes; no]
5. Did you feel being appreciated during the project? [Likert scale 1-10]
6. How difficult were the following activities? [area management; time management; group management; identify critical issues/problems; solve critical issues/problems]

At the end of the activity, students wrote a final report focusing on their opinion on the project. Moreover, they identified the Strengths, Weaknesses, Opportunities, and Threats of the activity (i.e., SWOT analysis). These considerations were subsequently received and discussed by the class teacher.

## 3.2 Questionnaire

We distributed a questionnaire among students of different high schools all over Italy to assess the acquisition level of digital skills after distance learning. The questionnaire was developed following the approach adopted by (Park and Han, 2019) and included five questions. The first three demographic questions collected information about the respondent's characteristics (i.e., city, grade, age range). Then, the following main questions were asked:

1. Since resuming in-person (even partially) classes, how much are you using the following tools for studying reasons? [Never, A little (1-2 times a month), Often (1-3 times a week), Always (at least 4 times a week)]
   - Devices (PC, Notebook, Smartphone, Tablet)
   - Social Network (Instagram, Facebook, LinkedIn, YouTube, Linknow, Google Plus, Twitter)
   - Videoconferencing tools (Zoom, MS Teams, Google Meet, Discord)
   - Storage/sharing tools (Google drive, One drive, N-drive, Dropbox, Apple I-cloud, e-Register, e-Mail)
2. How do you assess your skills in the following areas? [None, Poor, Good, Excellent]
   - Ability to find information (web, wiki, YouTube, social networks)

- Ability to create documents (MS Word, Excel, PowerPoint, keynote, Office 365, Google documents)
- Ability to manage materials in a systematic manner (digital notes, folders, papers)

The questionnaire was distributed using an online form. We followed legal requirements and ethical codes of conduct of child participation in research (EU Agency for Fundamental Rights, 2014). For example, we collected informed consent, asked for voluntary participation, and informed the respondents about the confidential treatment of data.

### 3.3 Interview

Research interviews were selected as a data collection method thanks to their possibility to engage in deeper conversations with professionals and practitioners. Besides discovering what skills are valuable in the current remote working settings, interviews allowed us to elaborate deeper on the obtained responses and relate them better to the current working settings (Creswell and Creswell, 2017). This latter idea is also paramount in this data collection strategy: responses delivered by industry interviews do not refer to a development outlook or a series of competencies to grow: responses commonly reference back to a current working context, situations that are happening now in a productive setting and that, as such, represent a series of skills that employers and companies are already looking for or requiring.

Each semi-structured interview (Wohlin et al., 2012) involved the same interviewer together with one interviewee at a time and lasted between 40 and 50 minutes. In the first part of the interview, we obtained consent from the interviewee and informed them about the confidential treatment of collected data. The interview was conducted remotely through an online video-conferencing platform and included the following two questions (excluding elaboration or follow-up questions):

- What are the skills or competencies you are looking for in candidates or colleagues to engage better in a WFX environment?
- Which of those skills are new, that is, you previously did not consider them as core competencies?

Ten industry representatives were available for an interview; this number respects the suggested dimension of a qualitative sample to collect expert views, i.e., an average of 5 with a range of 2 to 8 (Benzo et al., 2017). The profiles of the interviewees vary from roles of recruitment, talent acquisition, frontline people leadership, and technical leadership. The profiles of the companies involved are mostly technology, spanning from software development to artificial intelligence services, hardware, infrastructure, and education. Companies interviewed are based out in Austria, Poland, Mexico, the United States, and Indonesia. The names of the companies were kept anonymous to ensure transparency and confidentiality of the results.

## 4 RESULTS

In this section, we provide the answers to each research question.

**RQ1. How Ready Are High School Students for Smart Working?** *RQ1.1. How do students perceive WFX?* During the case study, as requested by the customer, the students designed and implemented a web-based application to manage all the material in the chemistry and microbiology laboratories. The application is based on a LAMP architecture (i.e., Linux, Apache, MySQL, PHP services). The application is browser-based and accessible via HTML and CSS. All the objectives proposed during the project have been achieved; the application has been tested and is correctly functioning. Figure 3 shows the SWOT analysis completed by the students at the end of the activity.

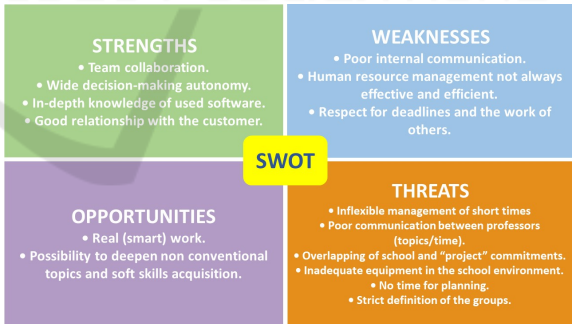


Figure 3: SWOT analysis completed by the students at the end of the case study.

Focusing on the identified *opportunities*, the students considered the initiative a good chance to deepen topics treated only theoretically and briefly during school lessons; moreover, they felt they could improve their soft skills, which was considered important for their future. Among the *strengths* of the activity, students appreciated team collaboration, mentioned that they found short-term goals challenging, and found it very useful to obtain teacher feedback regularly. The analysis of the daily question-


Figure 4: Daily questionnaire: difficulty and achievement of the daily goals.

naires (Figure 4) shows that majority of the students reported that they achieved the goals every day. However, achieving these results was difficult for most of them. Furthermore, students felt being appreciated during the activity (Figure 5).

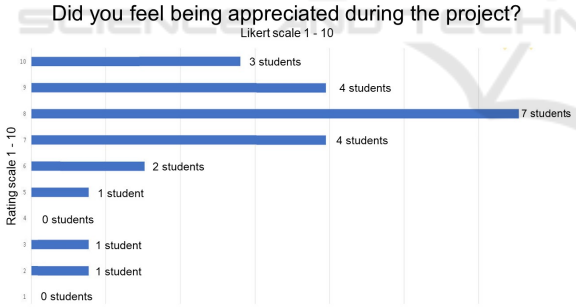


Figure 5: Degree of perceived appreciation.

Students enjoyed autonomy in the decision-making process (which requires being responsible) and the possibility to learn digital skills and new tools for collaborative work. However, *weaknesses* and *threats* highlight several issues in the existing school system. For example, school equipment is not always up to the demands, there is a lack of time management between different disciplines, and inadequate communication between teachers, who do not always manage to work together to achieve common goals. Moreover, according to the participants, it was difficult to stop using the typical school work model, where productivity is often condensed into the morning hours. In this regard, the analysis of the daily questionnaires shows that students worked best in the 8:00-12:00 time slot (Figure 6), both in groups and independently. Therefore, students maintained their regular school habits even though they could autonomously organize their workday in a WFX style.

These considerations were subsequently received and discussed by the class teacher, who strongly agrees on the criticisms set out by the students and the need for better planning of time and content as a teaching model for the future. During the discussion with students, another interesting area of reflection emerged: the approach used in the case study was easier to accept and implement in families where parents are used to WFH or WFX. Instead, the new working style was more difficult to implement where parents have a fixed schedule and do not work remotely, possibly indicating that the concept of flexibility and WFH/WFX has yet to enter into common habits, with all its pros and cons.

*RQ1.2. What WFX skills do students have?* As shown in Table 1, the questionnaire received 616 answers from students aged 14-19 (95.6%) and students aged 20 or over (4.4%). Respondents had the following backgrounds: technical (63.5%), arts, classical, scientific, foreign language (20.3%), vocational (14.8%), and others (1.4%).

Regarding the usage of digital tools (question 1), Figure 7 shows that only 5-6% of students do not

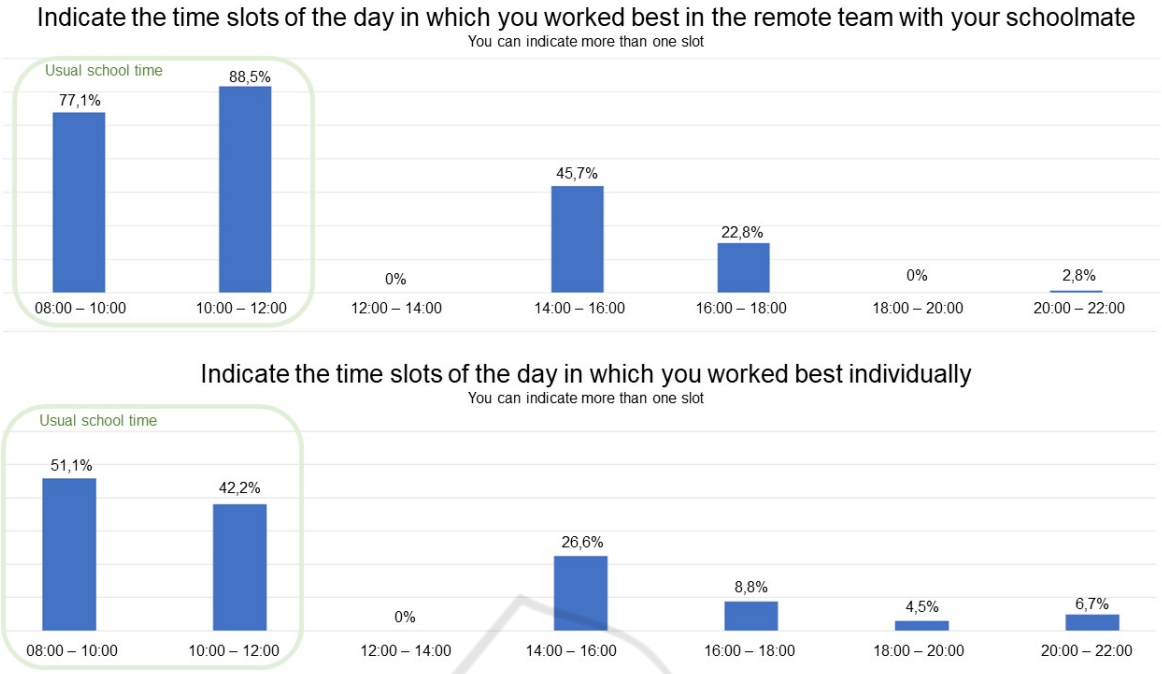


Figure 6: Time slots of the day in which students worked best in the remote team and autonomously.

Table 1: Questionnaire: respondents' age.

| 14-16 years | 17-19 years | >20 years |
|---|---|---|
| 49.3% | 46.3% | 4.4% |

know the indicated tools, and 10% rarely use them. About 41-42% use the tools sometimes during the week and 40% almost daily for school activities. Most of the respondents use *communication* tools one to three times a week, while 45.9% use *social network and communication tools* at least four times a week. Most students never/rarely use *information management tools*. When asked to self-assess their skills (question 2), even though information and management tools are the least used, only a few respondents have no or low *information collection and management* skills (1-4% as shown in Figure 7). The *information sharing and communication* skills are those in which students feel least prepared (20-22%).

**RQ2. What Skills Do Employers Think Are Needed for WFX?** The responses delivered by interviews converged on mentioning a collection of skills that could be already identified even before the pandemic conditions. Due to the informal format of the interview and the structure in open-ended questions, we grouped the answers in concepts, establishing clusters for similar ideas or synonyms (for example, self-motivation included other responses like "self-determination" or "self-driven attitude"). The following list displays the skills mentioned by respondents sorted by frequency.

- **Self-motivation (6):** Understood as the ability to understand business goals and deliver to them. Self-motivation implies overflowing that understanding into the day-to-day way to work, establishing clear personal goals and working toward them without the need of being constantly reminded about goals, or working in co-location with other colleagues that share the same goals.
- **Communication (5):** In a distributed work environment, communication is of utmost importance to maintain a continuous dialog with other team members, promote teamwork and collaboration, understand and convey goals and objectives, report progress, explain designs, and, very interestingly, maintain the morale of a team.
- **Autonomy (5):** The ability to learn independently, cover independently learning curves, understand goals and execute tasks with a minimum guide. In particular, self-learning is required since employees learn a lot while working hand in hand with colleagues; now, they have to learn on their own.
- **Time Management (4):** Work schedule interpreted as a time frame with a start time in the morning and end time in the afternoon is no longer in place. It was expressed a particular interest in attracting talent that can manage time independently and deliver to goals regardless of the number of hours invested and the schedule followed.

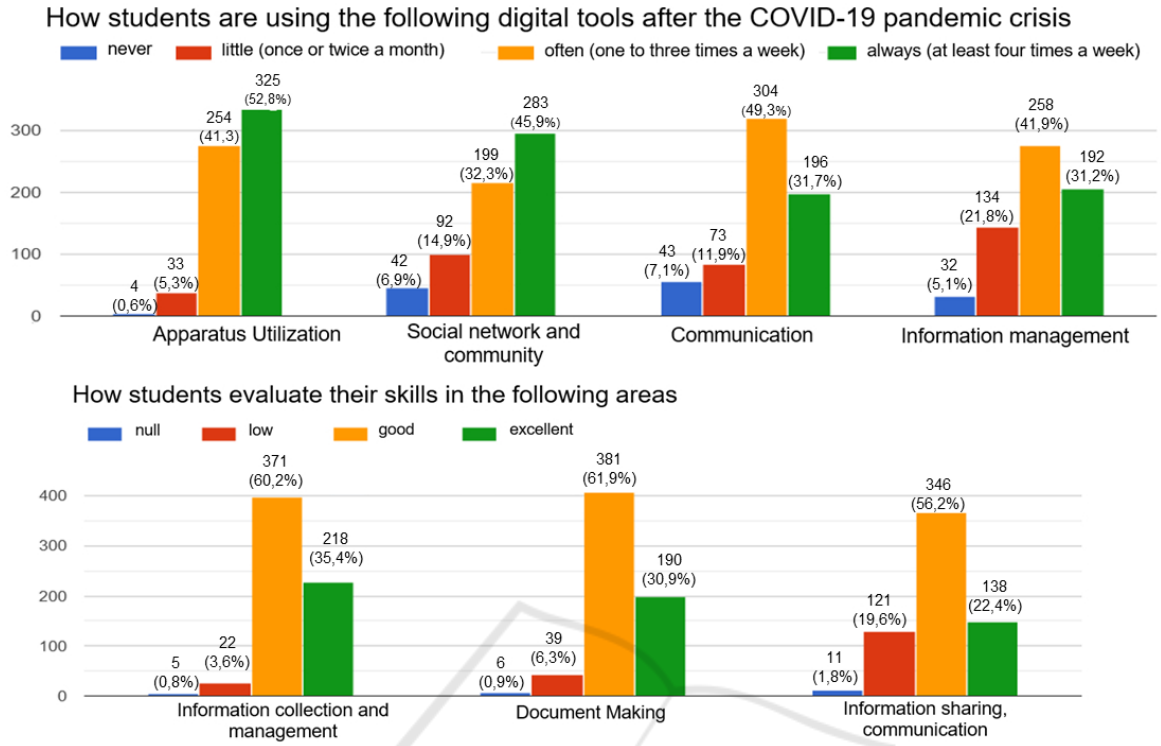


Figure 7: A synthesis of the questionnaire replies.

- **Curiosity (1):** The capacity of employees to initiate action, having an exploring attitude towards uncertain or ambiguous conditions.
- **Endurance (1):** Also referred to as resilience, the capacity of employees to overcome failure, deal with ambiguity, manage frustration, be persistent and establish the emotional temper that is required to work in isolated conditions.
- **Position Fit (1):** Alignment between personal goals and company goals, that would bring as a consequence a better understanding of goals and better motivation to deliver.

Concerning the second question, we could observe an almost unanimous convergence towards expressing that the above-mentioned skills are not anymore a desired characteristic or a professional plus. Instead, respondents now consider these skills as *basic qualifications*, and without them, it would be difficult to succeed in current professional environments. However, interviewees stressed that skills like *time management* or *autonomy*, commonly required in interviews, became particularly relevant in current business conditions.

**RQ3. How Aligned Are the Supply and Demand of WFX Skills?** To answer RQ3, we bring the separate results together, comparing and contrasting (Creswell and Creswell, 2017) the vision of three different settings, i.e., the personal opinion of several students, the perception of participants of a simulated working setting, and the reflections of practitioners currently part of the productive sector. Indeed, it is of particular interest to identify elements that are relevant depending on the environment, and also to discover convergent elements.

According to the collected data, the educational environment focuses on outlining elements of computer and technological literacy by, for example, listing tools that are important for seamless integration in a WFX environment (hardware and software tools and a good command of their use). Several of the mentioned tools are specifically designed and distributed to facilitate communication (social media tools) or collaboration (Google Documents, Wikis). Professional respondents take for granted technological literacy and focus their attention on other job-specific competencies. However, information management tools are never or rarely used by most students.

In contrast, the simulated work environment converged in several traits to answers given in the productive working setting. For instance, teamwork and collaboration are highly valued by the two sources. Flexibility in the schedule and time invested in the work is highly valued in the educational setting and also mentioned by practitioners bound in the concept of time

management. Communication skills, autonomy, and resourcefulness are elements mentioned both by the student and professional setting as key competences that enable professionals to succeed in a remote work environment. However, students feel less prepared in terms of communication skills; moreover, poor internal communication is listed among the weaknesses in the SWOT analysis at the end of the case study. Particular attention receives *self-motivation*: WFX workers are expected to be autonomous and self-driven so that they can lead and deliver in an environment of little personal interaction with other peers, or without the need of being supervised closely by managers. In this regard, the case study participants included the possibility of flexible time-management among the opportunities provided by the activity; however, students continued to work in the morning (as if they were at school) without taking full advantage of this possibility. This result evidences a lack of time management or autonomy skills, which are considered particularly relevant by the interviewed industry representatives.

## 5 DISCUSSION

Our findings suggest a core of skills needed to adapt and contribute in a WFX setting. There are relevant coincidences between the experience reported by students and the expectations outlined by industry practitioners. Information management, communication skills, autonomy, and resourcefulness are considered key WFX enablers competencies. However, students feel less prepared in terms of communication skills and lack time management and autonomy skills.

Based on our results, we highlight a set of recommendations for educational practice that educators can use in curriculum building to fill the gaps that emerged in this study. First, current timetable management in the school does not seem to foster time management and autonomy skills. Indeed, the school timetable is generally strict: each subject has a specific number of time slots, not always functionally distributed. Furthermore, the high number of subjects and their alternation during the morning (or day) produce general fragmentation of knowledge and skills, instead of favoring their connection. The same rigidity applies to the clear separation between school time and free time, which are in turn non-communicating areas. This time management model is likely to reflect on how these future workers will cope with working time. Our suggestion is to involve students in activities in which the daily routine is interrupted for short periods and completely disrupted. These activities would represent a total subversion of time management and foster productive autonomy through short-term planning in a scenario where the teacher supervises, detects, and rewards the work of individuals and groups.

Second, instructors should dedicate space to practical involvement through hybrid (i.e., partially onsite, partially remote) or fully-remote projects. These activities may start laying foundations on WFX critical skills before students integrate into the labor market. Third, instructors need to carefully understand how to incorporate these activities, either designing a specific curriculum to teach enabler concepts or adapting the practice on current subjects to incorporate practices. As students grow in age and maturity, experiences that are closer to an industrial setting should be incorporated, as exemplified by simulated work environments. Finally, high schools should keep up embracing the adoption of digital and collaborative tools just like the professional and productive sector. With the pandemic conditions, this adoption has been promoted and accelerated; however, getting back to "normal" may cause losing momentum on the paradigm shift and pivotal changes that remote work promoted in schools. With a positive adoption of the best practices of remote work, and taking the best of face-to-face interactions at school, students will be both more experts in the use of digital tools that enable WFX, while exploiting better the social and personal competencies that the productive sector is and will be looking for. Through the wise mix of the two strategies, and through the promotion of simulated WFX work environments, schools have now an unparalleled opportunity to prepare future WFX workers.

## 6 CONCLUSION AND LIMITATIONS

In this paper, we described an initial outline of the current needs expressed by educational and productive sectors concerning abilities that are expected and desired in WFX workers. Based on this core, we foster the discussion on how to adapt strategy and curriculum to educate students in the theory, practice, and technology that foster the ability to have a seamless integration into a WFX setting. We acknowledge that the works presented by this paper may have some limitations. In the following, we discuss them and elaborate on how these limitations do not threaten the strength of our results:

- The first two sources of information are the personal opinion and subjective views of school stu-

dents, concerning their regular interaction, or their experience in a simulated work. Subjectivity may be seen as a threat to the validity of the results; nevertheless, we believe that in this case, the personal view and experience provided by participants is precisely the subject matter of discussion. Acquiring information about the insight and executing the necessary analysis to extract the insight is outlined as a high-level goal, so working directly with subjects and understanding their experience is a critical foundation of this work.

- The number of interviews with employers is rather small with respect to the number of students surveyed in the other two settings. We understand that qualitative research tends to have smaller samples as the emphasis is placed on capturing data in depth. A suggested dimension of a qualitative sample to collect expert views is an average of 5 with a range of 2 to 8 (Benzo et al., 2017), and the viewpoint and insight obtained from them, shed light on the practitioner's perspective on the matter. Moreover, the voice of the experts permits us to understand how these perspectives translate into job requirements, job descriptions, or skills that are searched in the labor market.
- Another limitation associated with interviews with employers is a continuous request to keep anonymous their names and the names of the companies they are affiliated to. These requests come from the fact that private industry is not always willing to share practices, criteria, and information that may represent a competitive advantage in an aggressive labor market, and anonymity obfuscates information associated with a specific company. Although the interviews spanned global, high technology companies, their request to remain anonymous does not permit to show evidence on this claim.
- Larger samples are needed to confirm and generalize the results and limit the validity threats connected with the reliability and validity of our instruments. Moreover, multiple iterations of piloting and testing will allow us to develop valid and reliable instruments.
- Another limitation is represented by the need for teacher training, as teachers need to be trained to apply the given recommendations effectively.

Educators can use our results as a baseline and entry point to map out competencies, design curriculum, and teach courses that assure the effective development of the skill set demanded by current and future remote working conditions. High education time frames can be leveraged to enhance the educational experience to prepare professionals more capable to incorporate themselves into a WFX environment. Other elements of discussion remain open: items like work safety, information security, stress that can be associated with the fact of being continuously connected, fatigue associated with the use of technological tools, privacy, and employee's well-being are ideas that need to be explored when discussing how to educate and prepare future WFX workers.

## REFERENCES


Asiri, A., Greasley, A., and Bocij, P. (2017). A review of the use of business simulation to enhance students' employability (wip). In *Proceedings of the Summer Simulation Multi-Conference*, SummerSim '17, San Diego, CA, USA. Society for Computer Simulation International.

Bacon, D. R., Stewart, K. A., and Silver, W. S. (1999). Lessons from the best and worst student team experiences: How a teacher can make the difference. *Journal of Management Education*, 23(5):467–488.

Barrero, J. M., Bloom, N., and Davis, S. J. (2021). Why working from home will stick. Technical report, National Bureau of Economic Research.

Benzo, R., Mohsen, M. G., and Fourali, C. (2017). *Marketing research: planning, process, practice*. Sage.

Bloom, N., Liang, J., Roberts, J., and Ying, Z. J. (2015). Does working from home work? evidence from a chinese experiment. *The Quarterly Journal of Economics*, 130(1):165–218.

Buffer (2021). The 2021 state of remote work. https://lp.buffer.com/state-of-remote-work-2020. Last accessed: February 15, 2022.

Choudhury, P., Larson, B., and Foroughi, C. (2019). Is it time to let employees work from anywhere. *Harvard Business Review*, 14.

Choudhury, P. R. (2021). Our work-from-anywhere future. *Defense AR Journal*, 28(3):350–350.

Corral, L. and Fronza, I. (2018). Design thinking and agile practices for software engineering: an opportunity for innovation. In *Proceedings of the 19th Annual SIG Conference on Information Technology Education*, pages 26–31.

Creswell, J. W. and Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Drera, S. (2021). Is work-from-anywhere (wfa) here to stay? Linkedin, https://tinyurl.com/pv8xbtdd. Last accessed: February 15, 2022.

EU Agency for Fundamental Rights (2014). Child participation in research. https://fra.europa.eu/en/publication/2014/child-participation-research. Last accessed: February 15, 2022.

Fronza, I., Corral, L., Wang, X., and Pahl, C. (2022). Keeping fun alive: an experience report on running online coding camps. In *Proceedings of the 44nd International Conference on Software Engineering: Software Engineering Education and Training (ICSE-SEET '22)*, New York, NY, USA. ACM.

Hazzan, O., Dubinsky, Y., and Meerbaum-Salant, O. (2010). Didactic transposition in computer science education. *ACM Inroads*, 1(4):33–37.

Kelly, J. (2021). Smart companies will win the war for talent by offering employees uniquely customized work styles. Forbes, https://tinyurl.com/3asxn9cy. Last accessed: February 15, 2022.

Monasor, M. J., Vizcaíno, A., Piattini, M., and Caballero, I. (2010). Preparing students and engineers for global software development: A systematic review. In *2010 5th IEEE International Conference on Global Software Engineering*, pages 177–186.

Olson, M. H. (1983). Remote office work: Changing work patterns in space and time. *Commun. ACM*, 26(3):182–187.

Paasivaara, M., Lassenius, C., Damian, D., Räty, P., and Schröter, A. (2013). Teaching students global software engineering skills using distributed scrum. In *2013 35th International Conference on Software Engineering (ICSE)*, pages 1128–1137.

Park, M. and Han, T. I. (2019). A study on digital ability change after the smart worker education of the prime-aged learner. *International Journal of Information and Education Technology*, 9(4):257–262.

Prossack, A. (2020). 5 must-have skills for remote work. https://www.forbes.com/sites/ashiraprossack1/2020/07/30/5-must-have-skills-for-remote-work/?sh=642d20df33c4. Last accessed: February 15, 2022.

Richardson, I., Moore, S., Malone, A., Casey, V., and Zage, D. (2010). Globalizing software development in the local classroom. In *IT Outsourcing: Concepts, Methodologies, Tools, and Applications*, pages 1534–1556. IGI Global.

Sako, M. (2021). From remote work to working from anywhere. *Commun. ACM*, 64(4):20–22.

Smart Working Observatory (2020). Smart working. https://www.osservatori.net/en/research/active-observatories/smart-working. Last accessed: February 15, 2022.

Smite, D., Moe, N. B., Klotins, E., and Gonzalez-Huerta, J. (2021). From forced working-from-home to working-from-anywhere: Two revolutions in telework. [Online]. Available: https://arxiv.org/abs/2101.08315. Last accessed: February 15, 2022.

Softtek (2020). Smart working: Much more than telework. https://softtek.eu/en/tech-magazine-en/innovation-trends-en/smart-working-mucho-mas-que-teletrabajo/. Last accessed: February 15, 2022.

Stamenova, A. (2021). Smart working: The agility and flexibility enterprises need. https://www.lumapps.com/blog/digital-workplace/smart-working-definition-benefits-tools/. Last accessed: February 15, 2022.

Swigger, K., Brazile, R., Serce, F. C., Dafoulas, G., Alpaslan, F. N., and Lopez, V. (2010). The challenges of teaching students how to work in global software teams. In *2010 IEEE Transforming Engineering Education: Creating Interdisciplinary Skills for Complex Global Environments*, pages 1–30. IEEE.

Wohlin, C., Runeson, P., Höst, M., Ohlsson, M. C., Regnell, B., and Wesslén, A. (2012). *Experimentation in software engineering*. Springer Science & Business Media.

Xu, Y. and Yang, Y. (2010). Student learning in business simulation: An empirical investigation. *Journal of Education for Business*, 85(4):223–228.