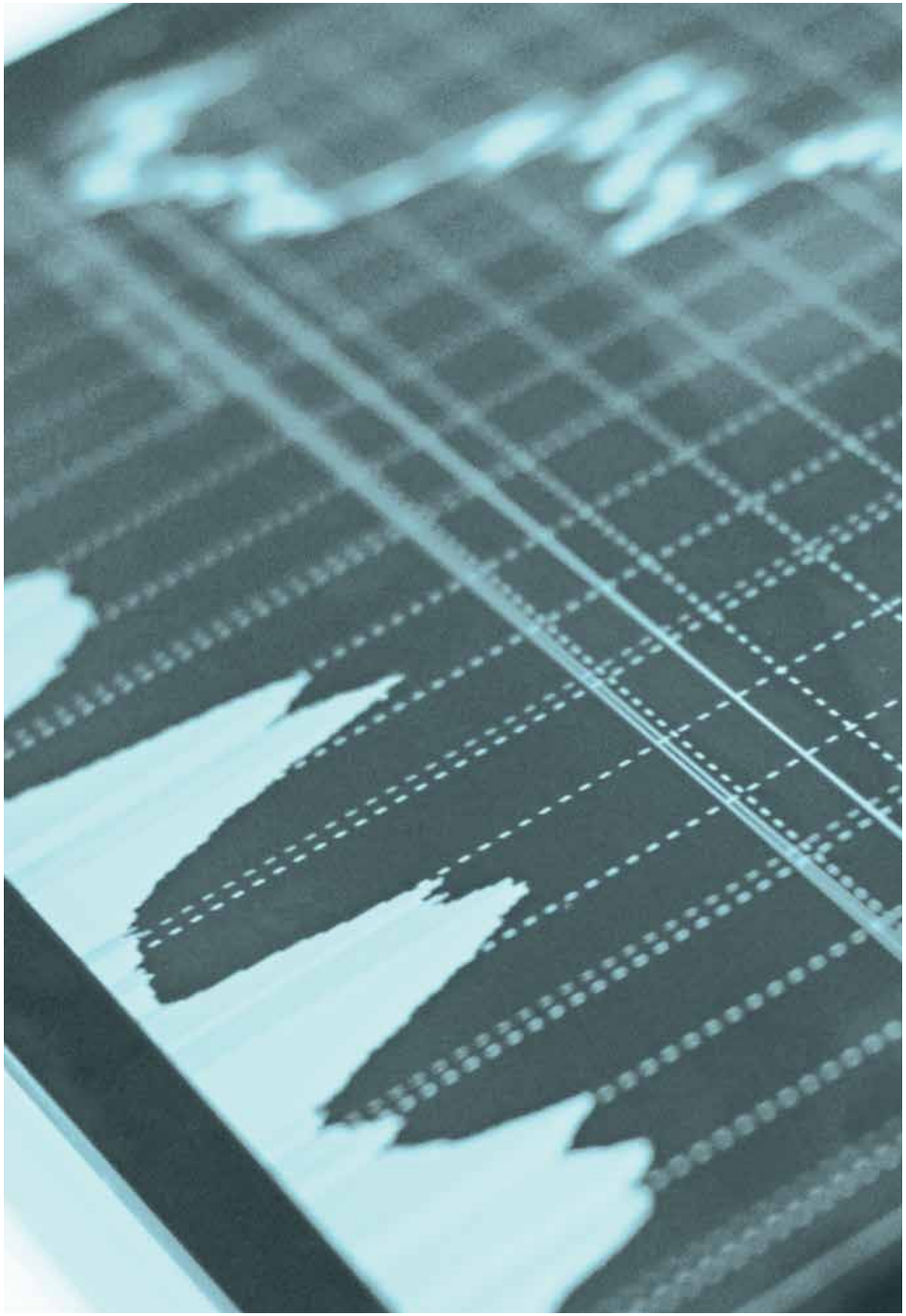
DELPHI ECONOMIC FORUM

CENTER FOR THE FUTURE OF WORK

THE CHALLENGE OF THRIVING IN THE DIGITAL AGE: SNAPSHOT SURVEY ON SKILLS IN DEMAND (2019-2021)

JUNE 2022



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ABOUT THE CENTER FOR THE FUTURE OF WORK OF THE DELPHI ECONOMIC FORUM

In the midst of groundbreaking technological developments and at a pivotal moment for the global debate on the new labour market realities, the Center for the Future of Work, established by the Delphi Economic Forum, aspires to contribute to the understanding of the major challenges that fundamentally redefine the world of work in Greece and globally, turning the lessons of international experience into new constructs and changes for the country.

At the core of the Center's identity is the combination of systems analysis and innovation, promoted by major international organisations as the best tool to enable the resilience of the world of work in a highly complex environment.

At the basis of the Center's operation is also the implementation of actions through strong partnerships with public, private and third sector actors aimed at promoting collaborative models of governance of the changes taking place, so that all forces of society and the economy, collectively, have the capacity and the means to take advantage of the significant opportunities offered by the future ahead.

As part of its activities, the Center for the Future of Work produces the "Delphi Insights," which are concise presentations of key topics and issues based on evidence-based scientific analysis, with the goal of informing the world of work and actors seeking to influence policymaking.

DELPHI ECONOMIC FORUM

CENTER FOR THE FUTURE OF WORK

FOREWORD

Dear friends,

It is with great pleasure that we present the first edition of the "Delphi Insights", dedicated to the skills in demand in the current work environment in Greece.

A product of our newly established "Center for the Future of Work", the survey was conducted by the Theoretical and Applied Economics and Law (TAEL) Lab of the National Technical University of Athens (NTUA) under the supervision of Dr. Marily Mexi. I want to personally thank Dr. Marily Mexi, Prof. Dr. Panayotis G. Michaelides and the great team over at NTUA for delivering such a thorough, scientifically astute account on one of the most consequential issues affecting the future of work. It was a real joy working with such valued partners. I also want to thank Microsoft for their support.

This type of contribution to public policy, scientific survey findings leading to concrete policy recommendations, was exactly what we had envisioned when designing the Center and its mission: an attempt to raise the level of public debate in Greece on issues that matter.

I wish you an enjoyable and thought-provoking read.

Yiannis Thomatos
Executive Vice President / Head of Strategic Initiatives
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This publication draws on research conducted at Center for the Future of Work – Delphi Economic Forum. The authors and survey contributors would like to thank their fellow experts and professionals from the epistemic, business, and policy communities for their helpful insights and suggestions to this document.

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I. SUMMARY AND KEY TAKEAWAYS

Greece is making significant progress in terms of reforming its economy, employment, and education and training system for the new digital era that unfolds. As we enter a new phase of increasing digital transformation and automation and the world strives to define a post-pandemic "new normal", it is obvious than ever that the potential to use digital technology will be critical to governments', businesses', and workers' future adaptability and prosperity.

How is the landscape evolving?

Global estimates based on forecasts from international labour organizations and government statistics warn of an increasing skills shortage, which they describe as a huge issue for businesses. A large part of the talent deficit is due to basic demographics. For decades, Greece and several other European countries have had low birth rates. The majority of baby boomers will have retired from the workforce in the United States by 2030, but younger generations will not have caught up in time to take many of the high-skilled jobs that will be left vacant.[1] Developing a 'lifelong attitude to learning' is frequently mentioned as a vital step in keeping digital skills updated (see e.g. European Skills Agenda & European Digital Strategy). This is because digital technologies are rapidly expanding, becoming omnipresent in complementing and augmenting human capabilities, resulting in more dynamic and complex working relationships and redefining the skills set landscape. Governments and businesses are being urged to prioritize talent strategy and take urgent steps to educate, train, and upskill their current workforces. In this context, it's also critical that countries prepare the business sector to succeed in the digital era.

[1] Refer to Korn Ferry (2018), Future of Work, The Global Talent Crunch, https://bit.ly/3HogqMO; WEF (2022), These are the world's most in-demand professions, https://bit.ly/3ObUJBW

How can businesses become future-ready?

While most of the focus has been on the supply of digital skills, little has been said about how we can equip our businesses to be digitally ready and so stimulate demand for more advanced digital skills. This is where our research comes in. During the pandemic, worldwide customers shifted substantially to online channels, and businesses and sectors sought to adjust.[2] Against this backdrop, a crucial issue inspired our research: What were the most in-demand digital skills amid Greece's huge digital transition sparked by the covid-19 pandemic? We then sought to identify top digital skills in demand and future-readiness, as well as important success determinants.

[2] Mexi, M. (2020), The Future of Work in the Post-Covid-19 Digital Era, Social Europe, https://bit.ly/3n4AISq

What is the focus of our survey?

We conducted a survey based on a dataset freely available by LinkedIn, and we looked at the time-period 2019 (Q4) – 2021 (Q1). The survey encompasses the entire covid-19 era when numerous Greek businesses had to turn to digital technologies to help keep them working and selling, and there was a significant increase in the number of businesses switching their primary focus to online channels. For instance, in 2020, Greece scored top, among other European countries, having the highest rate of increase in internet sales compared to 2019.[3] According to the annual e-commerce research done by E-commerce Europe and Eurocommerce, the rate of B2C e-commerce growth in 2020 climbed by 77 per cent.[4]

[3] Refer to : https://www.kathimerini.gr/economy/561512356/protathlitria-sto-ilektroniko-emporio-i-ellada-stin-eyropi/

[4] Ecommerce Europe and Eurocommerce (2021), 2021 European E-commerce Report, https://bit.ly/3KmFcgU

What we found?

Our snapshot survey shows that the most popular trending digital skills among all accessible skills required by employers in Greece throughout the timeframe studied is Javascript programming. No other digital skills except Javascript have made it to the very top.

Because JavaScript is widely applied in e-commerce development, we may assume that the fact that JavaScript is the most in-demand IT expertise is a response to that development since it is frequently used in e-commerce development – a pattern that has been observed globally. According to Developer Economics, JavaScript was used by 12.4 million software developers in Q3 2020, making it the most popular programming language in the world (cited in Korakitis, 2020).[5]

[5] Korakitis, K. (2020), "Infographic: Programming languages adoption trends 2020," Developer Nation, December 11, developernation.net/blog.

Overall, our research shows that there is no considerable discernible demand for advanced technology skills in the Greek labour market, during the timeframe studied. This finding is alarming, if one looks at global trends.

What explains the observed low demand for advanced digital skills in Greece?

Inter alia, a key answer to this is digital business maturity. Greek business digital maturity remain low, as also manifested in recent SEV study (2022)[6], according to which, until recently, only 3% of businesses used artificial intelligence systems, compared to 40% in the rest of developed countries. But even in "moderately technological" solutions like the Cloud, the gap remains significant: 26% of businesses adopts them in the EU, compared to only 7% in Greece.

[6] ΣΕΒ (2022), Ψηφιακή και τεχνολογική ωριμότητα οικονομίας και επιχειρήσεων 3η ετήσια έκδοση | Φεβρουάριος 2022, https://bit.ly/3MXidJT

How the future unfolds?

Worldwide there is a lot of discussion about how new advanced technologies provide opportunities for countries to diversify their economies, create new jobs, drive economic growth and enhance social inclusion.

Countries and territories with a low degree of Artificial Intelligence (AI) deployment across industries and a low presence of AI employees are expected to suffer innovation and competitiveness issues unless they move swiftly to secure a footing in this rapidly expanding environment. Adopting new technology can transform business potential, and Greece's policy focus and resources should go into that direction.

Moreover, in the digital age,, success will depend on businesses' ability to implement technologies innovatively by rethinking strategy, culture and talent. Charles Darwin's theory of species evolution is founded on the premise that those who adapt best to their environment, rather than those who are the strongest, have the highest chance of surviving. New digital technologies have fundamentally changed the environment in which businesses function, to the point that, if the theory of evolution were applied to business, only those businesses who adapt the best to the new digital environment will survive. Simply said, in today's market, it's a question of survival.[7]

[7] UNIDO (2020), Industrial Development Report 2020. Industrializing in the digital age, https://bit.ly/3xs41Tx

What's next?

Technopreneurs should be the next kind of entrepreneur in the digital age. They have the technological expertise and digital mindsets to grow their firm by implementing them, and they already understand and believe in the benefits of adopting new technologies in the workplace. Small firms' readiness to accept technology through preparing their human resources is a critical component of this approach.

Maturity in digitalization plays a significant role in growth for small businesses. Globally, SMEs are generally under-digitalized and hence may struggle to fully grasp the potential presented by digitalization (ILO, 2021)[8]. In particular, OECD research (2020)[9] shows that in terms of awareness, skills, and funding, SMEs confront considerable challenges to embracing new digital tools and implementing related organizational reforms. These impediments are a result of regulatory complexity, administrative constraints, and policy inefficiencies. Also, data shows that digital transformation happens at various speeds as well. SMEs are catching up to bigger businesses in terms of social media usage. In contrast, between 2014 and 2018, minimal progress was made in the use of business intelligence and supply-chain management software, particularly among smaller businesses. Similarly, the percentage of small businesses that provide employees with information and communications technology training has not expanded significantly in recent years (ibid). This is a particularly concerning issue, given that SMEs play a critical role in economies and society as job creators, as well as drivers of growth and prosperity. This is certainly relevant for Greece's SMEs, which are critical to the country's economic and social fabric.

[8] ILO (2021), Small goes digital How digitalization can bring about productive growth for micro and small enterprises, https://bit.ly/3MRBdts

[9] OECD, Digital Economy Outlook 2020, https://bit.ly/30hhvby

While technology will transform the future of work, businesses and organizations will be unable to take advantage of it unless they have the ability to absorb the necessary skills. Hence, this timely new issue of the Center for the Future of Work - Insights highlights the vital need to strengthen both digital workforce and business capacity to meet the demands of the digital world.

II. POLICY RECOMMENDATIONS

In light of the above observations, the following 7+1 recommendations are made:

1.

Greece must act now to ensure a competitive position in the future given the fast pace of change in the digital economy and the exponential growth of digital technologies. Research and development (R&D) support measures, tax breaks for specific digital innovation, innovation-oriented public procurement, promoting clusters and tech hubs, and skills and knowledge creation and diffusion, are all clearly important for leading into the digital economy.

2.

Identifying company and sector heterogeneity is also vital in establishing the necessary public support measures for SMEs and larger firms, as well as guiding them through a successful digital transformation. To that end, we must first understand why certain businesses find digitization difficult, bearing in mind the heterogeneous and diverse nature of enterprises found in various sectors and industries, but particularly those classified as SME. It is important to acknowledge that digital divides and barriers exist not just between populations and individuals, but also between enterprise types and sectors. That diversity should be reflected in public policies aimed at providing businesses with tailor-made support in adopting digital technology.

3.

Public policy can help SMEs improve digital uptake by providing owners or managers with digital training or education. Particularly, SME owners and managers will establish a robust digital vision and strategy if they have sufficient knowledge of digital technologies. Public policy can also help small enterprises with the development of a digital learning and training system for their employees. This approach could assist a small firm in lowering the cost of acquiring and training new employees.

4.

In addition, public policy can support small enterprises by establishing a collaborative eco-system that allows them to expand their network and interact with others - domestic and foreign. Local businesses will benefit from a collaborative ecosystem by integrating into global e-value chains or gaining access to global markets. Overall, a collaborative ecosystem will provide new potential for local business development, such as through partnerships with global digital firms, in social sectors including e-education, e-social services and e-health, in new niche industries involving e.g. in the app-development industry as well as in broad digital sectors e.g. digital media and e-commerce.

5.

Artificial intelligence is the next stage of the digital revolution, and Greece needs to step up efforts. AI has the potential to become a new general purpose technology that will be as impactful on the workforce as on skill sets.[10] According to a LinkedIn analysis from 2019[11], countries like Germany and Sweden have already reaped major benefits from investing in AI technology and skills. However, Greece lags behind in AI talent and skills (defined as individuals with both statistical modeling and big data computational skills, both of which are required to build and execute the algorithms that power AI technologies), and AI knowledge and technologies have yet to reach many sectors of the Greek economy (ibid). Moreover, from previous research[12] completed in the pre-covid 19 period, we know that companies in Greece are generally aware of the importance of digital transformation, but as competitive pressures for skills increase, these organizations are confronted by the combination of a tight talent market and the urgency of hiring skilled personnel. Notably, the digital skills with significant demand-supply mismatches are mobility solutions skills and skills related to robotic process automation. Greek companies also expect to see a major deficit in digital skills in the near future, particularly for security skills, automation skills, and skills related to mobility solutions (ibid). It is evident that assisting businesses, particularly SMEs, which play a critical role in Greece's economic landscape, in adopting more innovative technology is critical. At the same time, adoption must be supported by Targeted Skill Development to enable the efficient application of high-quality digital skills that will help Greece's workforce to be future-proofed. The capacity to train, recruit, and retain AI professionals, in particular, is expected to emerge as a key differentiator among EU and other countries.

[10] Babina, T., Fedyk, A., Xi HE, A. and Hodson, J. (2022), ''Firm Investments in Artificial Intelligence Technologies and Changes in Workforce Composition '', https://ssrn.com/abstract=4060233

[11] LinkedIn: AI Talent in the European Labour Market, Nov 2019, https://economicgraph.linkedin.com/research/ai-talent-in-the-eu

[12] Refer to Alexa and Homola (2019) ''The State of Digital Skills in CEE: Greece'': https://news.microsoft.com/wp-content/uploads/prod/sites/421/2019/12/Greece-report-digital-skills-04122019EN.pdf

[13] Stephenson, M. (2020), ''Digital FDI Policies, regulations and measures to attract FDI in the digital economy'', White paper, https://www3.weforum.org/docs/WEF_Digital_FDI_2020.pdf

6.

Attracting Digital FDI - skills should be at the core of policy action: Skills are a top priority when investors are choosing where to place their capital. Digital skills are generally the most crucial issue holding back "Digital FDI" (referring to attracting FDI to build the digital economy), according to surveys.[13] To attract Digital FDI and foster digitally friendly investment climates would necessitate identifying the required skills that are strategically crucial for the Greek economy through sectoral dialogue and strong partnerships between Greece's industry and research/academic groups. Such partnerships can be facilitated by targeted subsidies, incentives or mandate.

7.

Building cross-cutting partnerships across a wide range of stakeholders can help achieve the right balance of demand and supply for digital skills. In this regard, the strengthening of a multi-stakeholder Digital Skills Alliance, which brings together government, public, and private sector leaders, with the goal of leveraging digital skills at the national, regional, and local levels, as well as across industries and workforce groups, allows for the most effective adoption and scaling of digital skills.

Last, but not least: No single policy can address the digital future of work on its own. Policies may fail to produce effects if they are not coordinated. International experience shows that policymakers in various ministries responsible for digital transformation and its various components – economic, industrial, employment, and education – must therefore work closely together as part of a broader cohesive strategy.

III. SURVEY FINDINGS - TOP SKILLS IN DEMAND

This work aims at offering new, evidence-based, insights into the dynamics between skills in demand and the Greek labour market, over the period 2019 (Q4) – 2021 (Q1), that can help inform policymaking in this area.

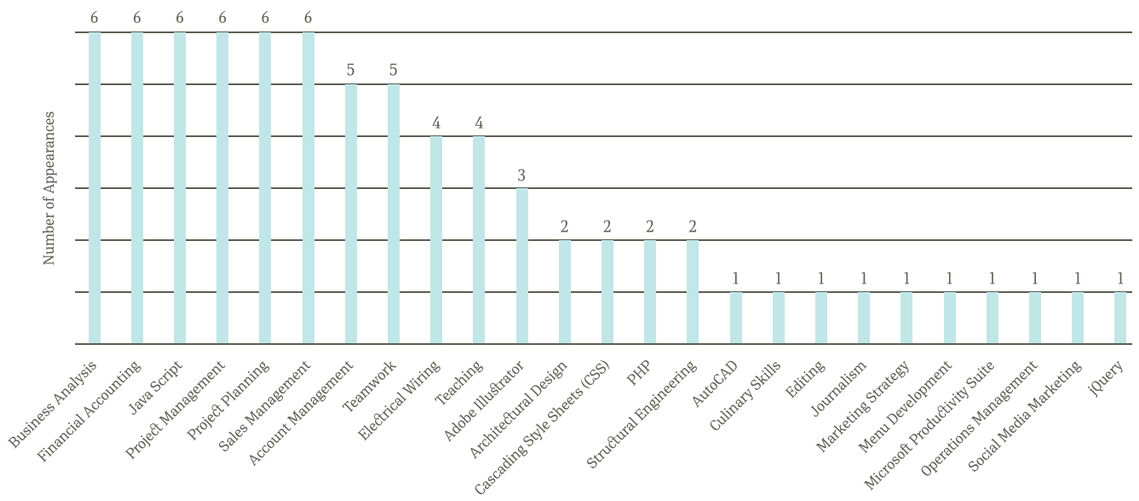
In this study, except for **descriptive statistics**, we use **correlation analysis** and **cluster analysis**. We employ data in quarterly frequency that span the period 2019 (Q4) – 2021(Q1) capturing a large part of the ongoing CoVid-19 pandemic. The available data refer to the skills and their ranking position in each quarter of our sample for Greece and come from LinkedIn's database that are freely available.

Each skill that is present in each one (1) of the six (6) quarters considered, gets the value of 1 for each quarter, or 0 zero otherwise. For instance, a skill that has a total value equal to 3, means that it appeared as a skill in 3 quarters. Obviously, the highest possible score for a certain skill is 6, meaning that is has appeared among the various skills in all 6 quarters.

In **Figure 1**, we can see that the following skills appear in all the six (6) quarters investigated, and thus get a total score equal to six (6). These skills are: **Business Analysis, Financial Accounting, Javascript, Project Management, Project Planning**, and **Sales Management**. We can see that among the skills that appeared in all six (6) quarters, is a digital skill, namely **Javascript**.

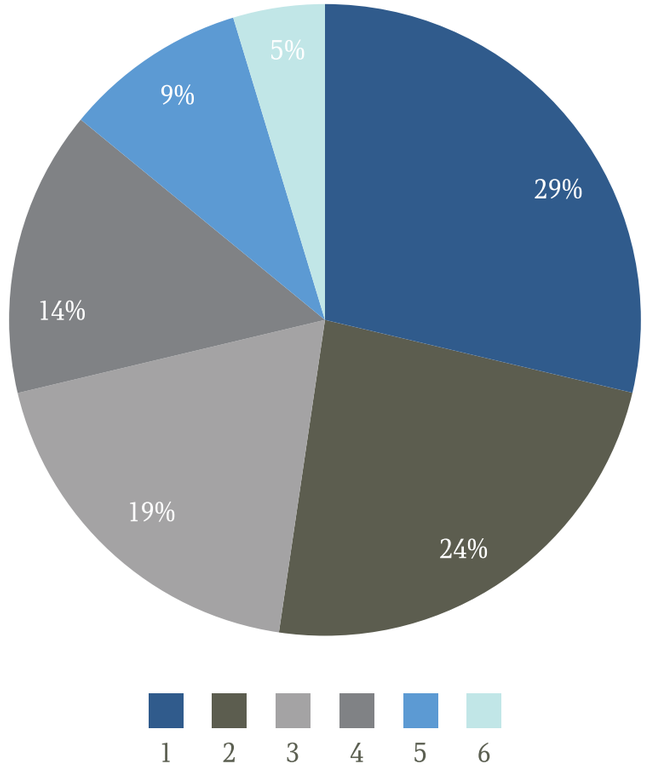
The following skills appear in five (5) of the six (6) quarters, getting thus a total score equal to five (5): **Account Management**, and **Teamwork**. The following skills appear in four (4) out of the six (6) quarters investigated, getting thus a total score equal to four (4): **Electrical Wiring**, and **Teaching**. The following skill appears among the most popular in three (3) out of the six (6) quarters investigated, getting thus a total score equal to three (3): **Adobe Illustrator**. The following skills appear in two (2) out of the six (6) quarters investigated, getting thus a total score equal to two (2): **Architectural Design**, **Cascade and Style Sheets (CSS), PHP** and **Structural Engineering**. The following skills appear only in one (1) out of the six (6) quarters investigated, getting thus a total score equal to one (1): **AutoCAD, Culinary Skills, Editing, Journalism, Marketing Strategy, Menu Development, Microsoft Productivity Suite, Operations Management, Social Media Marketing,** and **JQUERY.**

Figure 1: Number of Skill Appearances in the six (6) quarters between 2019 (Q4) – 2021(Q1)



Next, **Figure 2** shows the probability that a skill appears a certain number of times among the six (6) quarters, based on its relative frequency.

Figure 2: Probability that a skill appears, in the six (6) quarters, 2019 (Q4) – 2021(Q1)



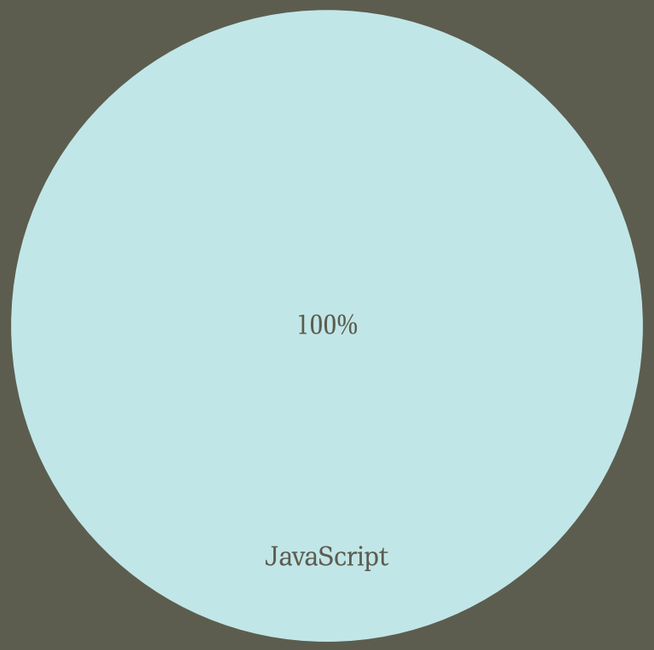
More precisely, the actual probability that a randomly chosen skill appears 6 times, i.e. in all six (6) quarters, is equal to just 5%. Also, the actual probability that a randomly chosen skill appears five (5) times in all six (6) quarters is equal to 9%. Next, the actual probability that a randomly chosen skill appears in four (4) out of the six quarters is 14%. Furthermore, the actual probability that a randomly chosen skill appears in three (3) out of the six (6) quarters is 19%. Moreover, the actual probability that a randomly chosen skill appears in two (2) out of six (6) quarters is 24%, and finally, the actual probability that a randomly chosen skill appears in only one (1) out of six (6) is 29%.

In this context, we notice that it highly likely for a skill to appear in all the six (6) quarters examined. This probability is just 5%, marked with green colour in the pie, in Figure 2. However, the digital skill **Javascript** has made it in the top 5%.

Now, let's get a closer look at the most popular skill. According to the available data, we can infer that the first five (5) ranks are occupied by the following skills: **Javascript, Financial Accounting, Project Management, Account Management, Sales Management, Project Planning, Adobe Illustrator**, and by the skill **Cascading Style Sheet (CSS)**.

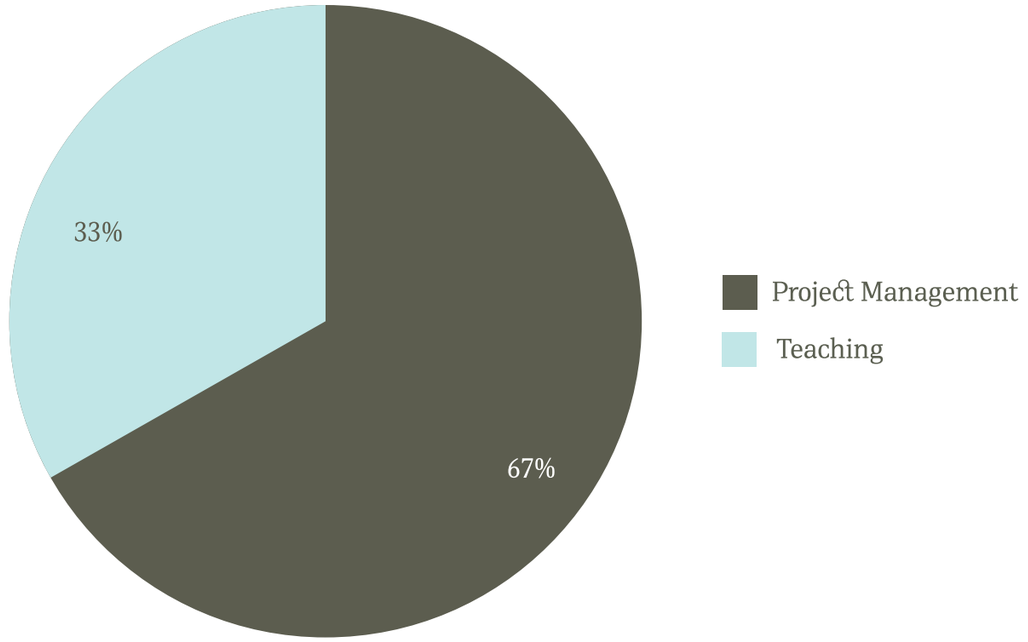
More precisely, the probability that **Javascript** is the top trending skill (Rank #1) among the various quarters is 100%, according to Figure 3a. In other words, in all quarters, **Javascript** occupies the first position as the most popular skill, which constitutes a quite interesting finding.

Figure 3a: Top trending skills (Rank #1), and relative frequencies, 2019 (Q4) – 2021(Q1)



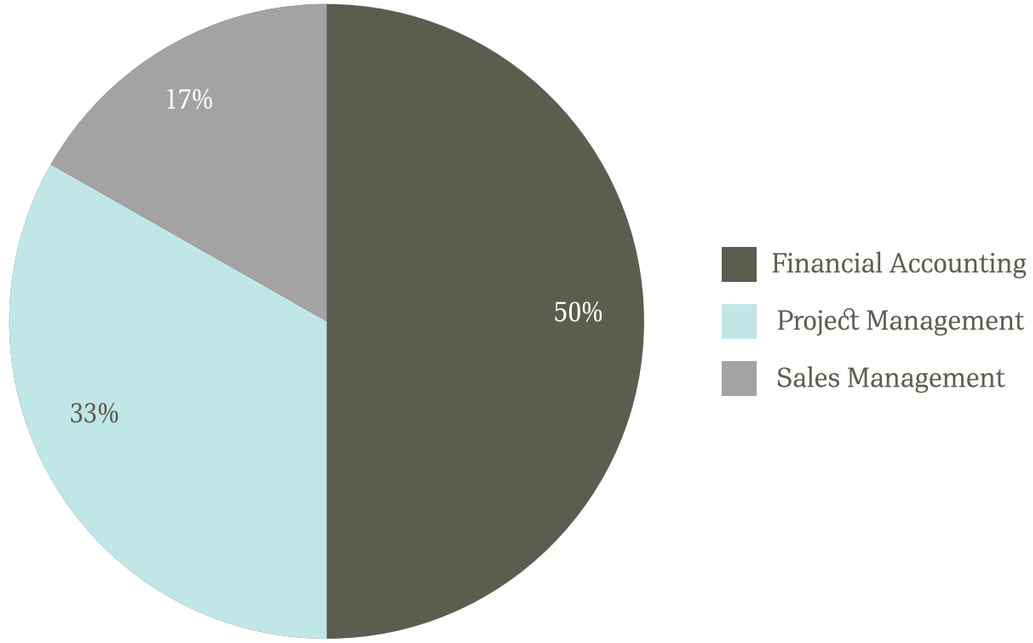
Next, based on **Figure 3b**, the second most popular skill position (Rank #2) among the various quarters is occupied by the skill **Project Management** with probability 67% and by the skill **Teaching** with probability 33%.

Figure 3b: Top trending skills (Rank #2), and relative frequencies, 2019 (Q4) – 2021(Q1)



Also, according to **Figure 3c**, the third most popular skill position (Rank #3) among the various quarters is occupied by the skill **Financial Accounting** with probability 50%, by the skill **Project Management** with probability 33% and by the skill **Sales Management** with probability 17%.

Figure 3c: Top trending skills (Rank #3) and relative frequencies, 2019 (Q4) – 2021(Q1)



Furthermore, according to Figure 3d, the fourth most popular skill position (Rank #4) among the various quarters is occupied by the skill Financial Accounting with probability 50% and by the skill Sales Management with probability 50%.

Hence, we can infer that **Javascript** development is the top trending skill in the 2019 (Q4)-2021(Q1) time span, followed by **Project Management** which occupies 67% of the second most popular trending skills positions, as well as 33% of the third most popular trending skills positions.

Now, let's take a look at the evolution of the rank of each skill over time. According to **Figures 4a, 4b, 4c** below, **JavaScript** is the top skill throughout the sample of our analysis, since it ranked first in each quarter, throughout the period 2019 (Q4)-2021(Q1).

Also, from the same Figures 4a, 4b, 4c we can infer that another very interesting finding is that in the third quarter of 2020 several skills that were not present in the second quarter of 2020 (Rank #0) made their appearance and the market almost immediately absorbed them, since they disappeared (Rank #0) in the fourth quarter of 2020. These skills were the following: **Adobe Illustrator, Architectural Design/ Teaching, AutoCAD, Editing, Journalism, Microsoft Productivity Suite, Structural Engineering.**

Figure 4a: Rank of skills over time (alphabetically, Part A), 2019 (Q4) – 2021(Q1)

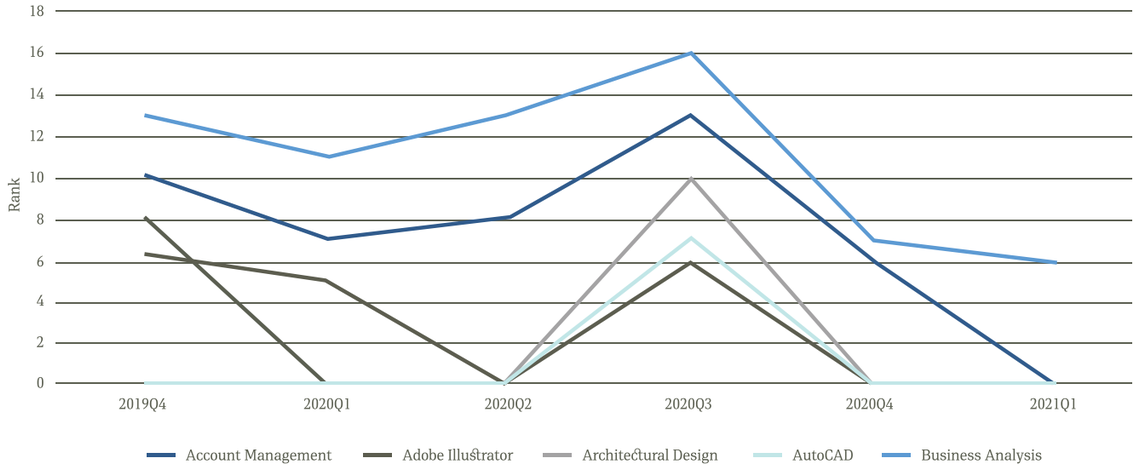


Figure 4b: Rank of skills over time Part A (alphabetically, Part B), 2019 (Q4) – 2021(Q1)

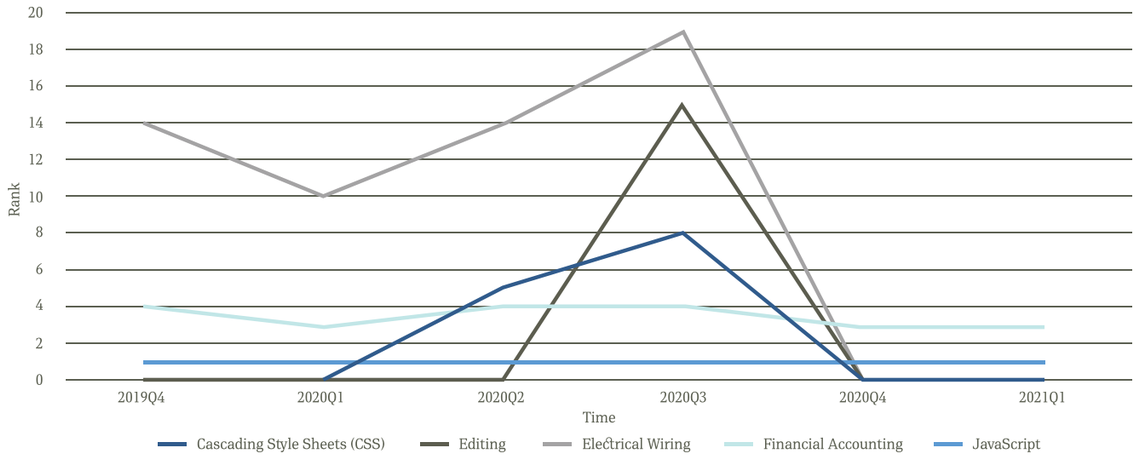
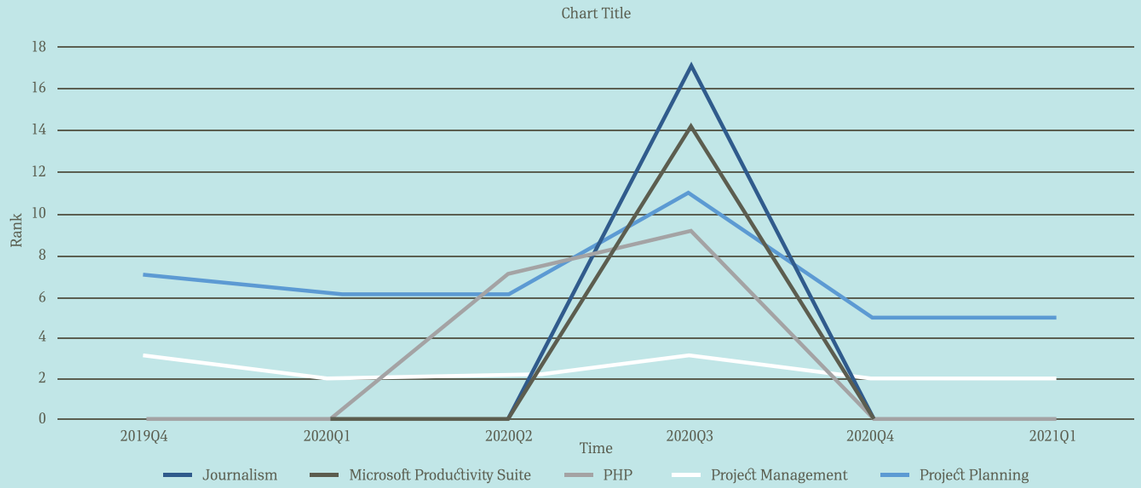


Figure 4c: Rank of skills over time (alphabetically, Part C), 2019 (Q4) – 2021(Q1)



Next, in order to make the ranking of the various skills more intuitive, we have made a transformation of the rank of each skill as follows: Rank #1 gets a score equivalent to 100 units, Rank #2 gets a score equivalent to 90 units, Rank #3 gets a score equivalent to 80 units, and so on. Note, that for the sake of simplicity only skills which ranked in the top 10 positions received a score, whereas skills below the 10th rank received zero (0) units.

In this context, we continue our analysis by performing **k-means clustering** with five (5) clusters to the various skills based on their ranking score. In other words, we categorize the various skills according to their ranking scores, i.e. their popularity, into five (5) distinct categories. Note that we dropped from our analysis **Culinary Skills** and **PHP**, because they are highly correlated and contribute overlapping information with their pair. Similarly, we also dropped from our analysis the skill **Teaching**, since it is correlated with more than five (5) other skills.

Figure 5, below, presents all the five (5) clusters with the various skills for the period 2019 (Q4) - 2021(Q1). Based on Figure 5, we can see that **JavaScript** and **Project Management** both belong to the 1st cluster, in the sense that both skills present very high scores throughout the period analyzed, i.e. these skills are **very popular**. The **2nd** cluster consists of **Sales Management** and **Financial Accounting**, since these skills are **popular**. The **3rd** cluster consists of **Project Planning, Business Analysis and Adobe Illustrator**, i.e. these skills are **relatively popular**. The **4th** cluster consists of **AutoCAD** and **Cascading Style Sheets (CSS)**, and the 5ht cluster consists of **Account Management**, **Structural Engineering**, and **Teamwork**, which are **less popular** skills.

Figure 5: k-means clustering of the various skills, 2019 (Q4) – 2021 (Q1)

Clusters Formed

1st Cluster

- Javascript
- Project Management

2nd Cluster

- Sales Management
- Financial Accounting

3rd Cluster

- Project Planning
- Adobe Illustrator
- Business Analysis

4th Cluster

- AutoCAD
- Cascading Style Sheets (CSS)

5th Cluster

- Teamwork
- Account Management
- Structural Engineering

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