eSkills Malta Foundation

ICT Skills Demand and Supply Monitor | 2021

A study prepared by
The eSkills Malta Foundation

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1 Foreword by Hon. Silvio Schembri Minister for the Economy and Industry

The COVID-19 pandemic has demonstrated how important it is for both industry and society to be digitally savvy. Digital enablement will pave the way for further e-commerce, increase our competitiveness and reduce operational costs. COVID-19 did not leave us that many options, but through government's ample support wherever and whenever it was required, Malta went through a successful phase of excellent digital transformation.

Due to the COVID-19 pandemic, the ICT Industry faced a high influx of digital demand. This demand emanated not only from a myriad of organisations but also from society as a whole. But I, for one, am delighted that the industry stepped up to the plate and rose magnificently to the challenge. I must say that this sector has keenly facilitated the post-COVID economic recovery for Malta, which now looks even brighter. However, one must not forget that the ICT Industry specifically depends on highly skilled resources, which, by extension, depend on the upskilling and reskilling of human capital through the right competencies.

The Demand and Supply Monitor is a project that provides an accurate snapshot of the current state of affairs when it comes to the current talent pool, skills and competencies in the ICT Industry, ICT departments or units of the sectorial industry, and the CIO offices within the public sector. The Monitor also gives a good idea of the available training and education resources to supply this demand and forecasts the future landscape of the emerging technologies used by the demand and supply of competencies by the ICT professionals and practitioners. Therefore, the Demand and Supply Monitor is crucial for the sector and will be a pivotal reference point.

Meanwhile, the European digital decade will see Malta achieve higher economic performance and results, and such projects will give us further insight to achieve these goals. As in previous years, the government will strive to continue with its excellent momentum in its drive to bolster the digital economy. In the end, the digital economy will become the main driver of industry and the crucial pillar on which the social well being of Malta's citizens is ensured. It is with great pleasure to launch this Demand and Supply Monitor to allow the digital stakeholders to excel even further on our digital journey.

Silvio Schembri
Minister for the Economy and Industry

2 Introduction from Carm Cachia Chief Administrator

The Demand and Supply Monitor 2021 has been long-coming. The original plan to launch this study in 2020 took a dive when the COVID-19 broke out. Our project was the last in anybody's mind. Priorities changed for everyone, our partners, stakeholders, organisations and their respective owners and employees. Eventually, we proceeded diligently and with consideration of the situation.

The pandemic has clearly shown us that digitalisation is a crucial element to the industry and its workforce, education of any level, and any person in society. Suddenly, the business model needed considerable adjustment to cope, bringing about a drastic change in the industry requirements, even to the digital sector.

eSkills Malta Foundation engaged EY through a public tendering process to facilitate the execution of this study. Input was gathered from Demand Organisations, Supply Organisations (education and recruitment), IT professionals and students undertaking ICT related courses through an on-line survey and 1:1 interviews. In collaboration with representatives of eSkills Malta Foundation, the study was structured to gather different dimensions of the competencies, roles, education, certification and soft-skills – aligned to the e-Competency Framework and other industry best practices.

The European Commission has laid out its goals regarding the ICT Professionals for the Next Decade. Europe must secure digital sovereignty with a common vision based on clear goals and principles. The target by the commission is to increase the number of ICT Professionals from 7 million to 20 million, including gender convergence. This goal presents a challenge to organisations like the eSkills Malta Foundation to actively equip ICT professionals with the right advanced digital skills, more than just mastering coding and computer science.

The Demand and Supply Monitor 2021 gives a good insight into the current position of the demand organisations (ICT companies, CIO offices, ICT departments and Units) and the supply organisations (universities, colleges, training companies), and also the view from the professionals. The project used the European e-Competence Framework as a base for potential competencies required in the ICT sector, thus giving it a European context. However, it must be pointed out that the study is based on the feedback acquired, even if it indicates the direction that this buoyant industry should consider taking so that apart from having the right competencies, the industry also fosters the right professionalism.

Finally, we would like to encourage the stakeholders in the ICT sector to sift through the pages of this study and use them intelligently in their plans.

Carm Cachia
Chief Administrator
eSkills Malta Foundation

3 Preface

The eSkills Malta Foundation is a National Coalition made up of various representatives from Government, industry and education, with a common aim of increasing basic and advanced digital skills and the further development of the IT profession. The Foundation implements several given mandates that guide its operations. These include:

- Advising Government and relevant stakeholders on matters related to eSkills policies
- Active contribution to the expansion of ICT educational programmes and related formative initiatives
- Leading an ICT professionalism development programme
- Instigating further reform in the ICT educational offerings and contribute to capacity-building of the ICT education community;
- Leading campaigns to promote the Maltese eSkills potential both locally and internationally.

International best practices have indicated that multi-sectoral partnerships are key in achieving synergy for the sustainable development of the right digital skills. The eSkills Malta Foundation endeavours to reflect this paradigm of inclusive synergy. In this respect, the Foundation set out several strategic goals to achieve in the short and long term.

- A Coherent National Long-Term Strategy to serve as a policy point of reference for coordinating a set of tasks by the relevant stakeholders which look beyond the current requirements (2025)
- Implement several initiatives to serve as short-term solutions for the current eSkills problems
- Popularising and professionalising ICT Careers
- Energising the Education Ecosystem from primary education to Further and Higher Education Internationalising Networking to make sure digital skills are regarded from an international context and so that international best practices standards relating to eSkills are shared locally;

The Demand and Supply Monitor project is a crucial one. It provides an accurate snapshot of the current demand by ICT entities (ICT companies, departments and units) and the supply of ICT education and training in Malta. The project also gives a thorough analysis of many specific areas and looks at the international trending technologies. The project should guide both the demand and the supply organisations for the near- and long-term actions that are required.

The Founding members of the Foundation include the Ministry for Education (MFED), the Malta Information Technology Agency (MITA), the Malta Communications Authority (MCA), the Malta Enterprise (ME), the Malta Gaming Authority (MGA) and The Malta Chamber of Commerce Enterprise and Industry.

4 Executive Summary

According to European Commission studies being conducted, the demand for digital technology professionals has been growing by 4% annually[1], with an accelerated growth in demand during the COVID-19 pandemic[2]. The number of ICT specialists in the EU has grown by 40% from 2011 to 2019, over 6 times higher than the increase in total employment[3]. A 21.9% employment growth in the Malta ICT sector is forecasted by Cedefop[4] from 2020 to 2030, more than twice as large as the forecasted growth for EU27 (8.9%).

The Demand and Supply Monitor is required to target the specific requirements of industry and ensure that the policies set by the Government of Malta, the programme of work of the eSkills Malta Foundation, the outputs of educational institutions and the adoption of relevant frameworks and standards are in line with such needs and the national strategic goals in Information and Communications Technology.

Educational institutions want to ensure that they are producing candidates with the right competencies and that these competencies are internationally aligned. The impact of changes to curricula and education policies result in impact in a 3 to 5 year horizon, however training and certification providers may have a more direct impact on skills and competencies of the existing ICT workforce.

Malta has a solid education system, but similar to other European countries, it faces challenges in the supply of ICT professionals to meet the required industry demand:

- There is an increasing need for ICT professionals, with the number of ICT students not increasing proportionally to meet this demand;
- Due to the rapid pace of changing technology, and the ever-expanding arsenal of tools available, there is a lag between the skills that are supplied by educational institutions compared to what is needed by industry;

The Demand and Supply Monitor needs to strike the right balance between looking at the "big picture" and examining tools, technologies, and skills in depth. Technological innovation, development of new products and services, and the adoption of these by organisations is happening at an accelerated rate. The ICT workforce needs to be suitably equipped to respond to these developments in order to ensure the aspirations of business, Malta's competitive position in the global economy and the attractiveness of Malta for Foreign Direct Investments in the digital and technology-related fields.

For Malta's island state economy, it is crucial that ICT sector remains competitive and innovative on the European and global stage. In the recent decade Malta has experienced the impact and pressures on the supply of ICT Professionals with the increase in local activity of the iGaming, Technology, and Financial Services sectors.

[1] COM(2016)381/F1 - EN (europa.eu)
[2] Digital skills: challenges and opportunities during the pandemic | Cedefop (europa.eu)
[3] ICT specialists in employment - Statistics Explained (europa.eu)
[4] Browse by Sector | Skills Panorama (europa.eu)

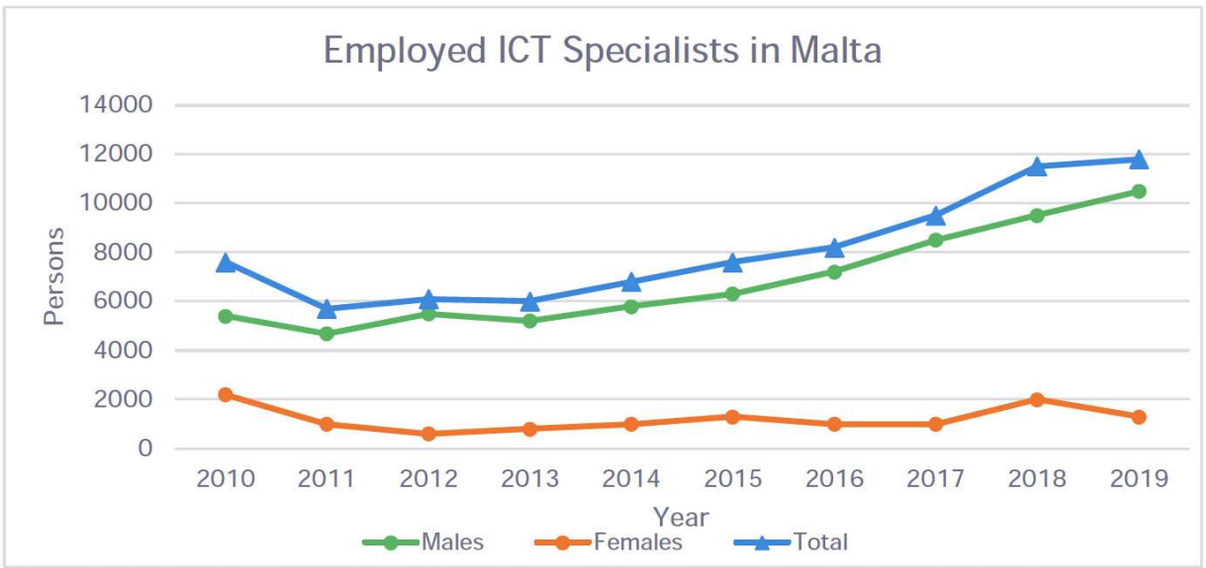

Figure 1- Employed ICT Specialists in Malta (2010 – 2019). Source: Eurostat (isoc_sks_itsps)

As such, the Demand and Supply Monitor has several goals:

- To guide and inform the educational institutions in the development and demand of ICTrelated training;
- To guide new and existing ICT professionals on developing trends to assist them in staying relevant to the market;
- To guide the Maltese ICT sector on emerging skills and trends at an international level;
- To guide governmental agencies in the establishment of ICT-related policies and strategies;
- To guide and foster collaboration between various ICT-related organisations who may even oppose or compete with each other.

A similar study, the *Malta ICT Skills Audit 2017*, was previously conducted by the eSkills Malta Foundation. This study helped to provide valuable insight into the needs of the Maltese technology sector and highlighted some of the key challenges faced by the industry.

As a result of the growing demand for ICT professionals, the changing technology environment, and the increasing diversity in roles, the European e-Competence Framework[5] was established as a tool to support mutual understanding and provide transparency of language through the articulation of competences required and deployed by ICT professionals (including both practitioners and managers). The e-Competence Framework has also been extended with the definition of 30 European ICT Professional Role Profiles[6].

[5] European e-Competence Framework (ecompetences.eu)
[6] e-Competence Framework ICT Role Profiles https://www.ecompetences.eu/ict-professional-profiles/#:~:text=CEN%20has%20published%20version%202%20of%20the%20European,%28e-CF%29%20as%20the%20basis%20for%20competence%20identification%3B%20and

Key changes in the approach and methodology between this report and the 2017 audit include:

- The use of an online survey platform to facilitate data collection from a wider audience;
- The inclusion of a survey for ICT professionals themselves;
- The alignment of roles and skills within the survey to the European e-Competence Framework;
- The addition of ICT students' perspective to add insight from future ICT professionals;

The structure of the conducted survey is designed to address and analyse the needs, requirements and potential issues of demand organisations, supply organisations, ICT professionals and ICT students across multiple dimensions ranging from education and skills to technology and work environment.

It is important to note that this study does not represent a census, but an analysis based on survey responses and personally conducted interviews with key stakeholders across the Maltese ICT sector aiming to identify key trends, critical areas of interest and the market's general sentiment towards the current state of the Maltese ICT sector.

The analysis in this report is based on the completion of 182 responses, of which 10 were held as video interviews with the respective stakeholders. The remaining responses were gathered through the independent completion of the online survey. 78 demand organisations representing at least 8,720 professionals, 22 supply organisations, 49 ICT practitioners and 33 ICT students have completed this survey.

Throughout the survey, reference is made to competencies and job profiles, which are based on the e-CF Framework. Specific technologies and respective technology categories were extracted from the annual Stack Overflow developer survey[7]. This allows the comparison of survey results to other evaluated sources.

This report has been compiled and structured to reflect the overarching dimensions and implications of the responses with a view to formulate recommendations that address the challenges faced by all relevant stakeholders while attempting to stay impartial to subjective individual challenges.

[7] Stack Overflow Developer Survey 2020

5 Key Findings

Below is a summary of the key findings derived from the analysis of the collected data and interviews.

A. Demand and Supply

1. Sourcing and retention of ICT resources is proving to be difficult for a majority of demand organisations;
2. The majority of the current ICT workforce is composed of Software Developers, DevOps Experts, Technical Specialists and Service Support professionals and System Administrators;
3. Advancements and an increased adoption of previously emerging technologies have increased demand for more specialised professionals;
4. A number of organisations would consider hiring ICT practitioners without formal education, but in the Public Sector this is constrained by Government policies and Collective Agreements;
5. Government, Public Sector and Financial Services are the leading sectors in using external sourced ICT skilled resources and also for outsourcing ICT related operations. This is not the case for the Private Sector however, where use of such resources is not predominant according to our respondents;
6. Government Programmes, while rich in number, have a relatively low adoption rate among demand organisations;
7. Despite numerous programmes promoting diversity in the ICT workforce, the profession remains a predominantly male one.

B. Education

1. The growth of demand for ICT professionals is not sustainable in respect to the local ICT student pipeline. Interviewed representatives of tertiary education providers have expressed their concern that interest in ICT related studies has been reducing;
2. More specialised educational offerings, such as Health sector-specific or specialised Data Science Masters, are being considered by Universities.
3. ICT students are primarily targeting Software Development roles upon graduation;
4. A majority of respondents consider that University graduates require additional training to meet the needs of the organisation.

C. Training, Skills and Certification

1. There is increased demand in skills and certifications for Cloud Technologies, Artificial Intelligence and Machine Learning, vendor-specific Technologies and Software Development;
2. The lack of specialised resources on the job market is pushing organisations to assign certain key responsibilities (such as Architecture or Business Analysis) to existing ICT staff carrying other roles;
3. Demand organisations need to increase their training opportunity offerings in order to meet ICT Practitioners' needs;
4. Whilst there is great interest in Machine Learning and Artificial Intelligence, adoption has been slow, potentially due to a lack of training and certification offerings;
5. The majority of demand organisations have limited plans in expanding their learning and development offerings for ICT employees.

D. Professional Bodies and Profession Recognition

1. The majority of ICT practitioners are in favour of formally recognising ICT professionals through the issuance of warrant, but have expressed concerns regarding the cost, accessibility and maintainability of a warrant;
2. ICT Professionals agree that membership in professional bodies supports the recognition of their knowledge and competence levels;
3. A large number of ICT professionals and practitioners are not members of any professional body.

E. Technologies

1. A large number of organisations are planning to shift towards Cloud and DevOps in the near future;
2. Microsoft technologies are the most popular among demand organisations, both in the Cloud and Software Development categories, with a significant increase in adoption planned for the next 1 to 3 years;
3. Despite great interest being expressed, the adoption of emerging technologies, such as Artificial Intelligence and Machine Learning, and Blockchain and IoT, appears to be low due to a lack of specialised resources.

6 Recommendations

1. The survey results relating to soft skills show a general agreement among demand organisations that many of the critical soft skills required in the ICT profession are somewhat lacking in both the current workforce and especially in recent hires from universities. According to a 2020 study[8] conducted by Udemy, soft skills are being prioritised by L&D leaders worldwide with a greater focus on contextual skills in terms of learning and development. We highly recommend that the learning and development strategy for both demand and supply organisations, as well as training providers, mirror the international initiative to further prioritise critical soft skills development.

2. Demand organisations need to increase their training opportunity offerings in order to meet ICT Practitioners' needs. We therefore recommend that a number of initiatives and programmes are set in place to incentivise organisations to support their employees in their educational and training endeavours by providing access to relevant resources.

3. The current Maltese ICT student pipeline will not be sufficient to meet ICT market demand growth. A number of campaigns to promote ICT studies and ICT job opportunities to prospective ICT students is recommended in order to ensure that sufficient talent is available on the market to sustain the continued growth of the ICT industry in the future.

4. A fragmentation of key responsibilities and skills is being observed among demand organisations due to a lack of proper candidates on the job market. Supporting and incentivising experienced ICT practitioners to pursue more specialised certifications and training is highly recommended in order to prevent developmental bottlenecks in both quality and size of ICT service and product offerings.

5. A relatively small percentage of ICT professionals are members of ICT professional bodies. Further incentivising professionals to pursue these memberships through Government and Corporate Programmes is recommended in order to enable both professionals and their organisations to benefit from the large number of advantages that professional bodies offer.

6. We recommend exploring the introduction of a national recognition initiative for ICT professionals to both legitimise their functions and strengthen the ethical considerations related to ICT activities. This would further incentivise continuous development and training in order to meet more specialised role requirements. It is also highly recommended that, in this pursuit, a number of potential issues be considered: difficulty to obtain such a warrant and costs associated with obtaining and maintaining such a warrant.

7. A large number of respondents do not avail of Government programmes despite having difficulties in areas supported by such programmes. It is highly recommended that a survey be conducted to ascertain which aspects of the current Government initiatives may represent an impediment for such organisations to pursue support.

[8] 2020 Workplace Learning Trends Report: The Skills of the Future | Udemy for Business

8. Despite a number of initiatives supporting diversity in the field of ICT, the ICT profession remains a majority male profession and prospects of a more diverse workforce are lacking. It is recommended that a number of further initiatives targeting younger generations be pursued in order to attract a more diverse public to the ICT field.

9. The local ICT workforce needs to be increased in order to meet the demand. The pipeline of Tertiary Education graduates would not be sufficient. In order to address this gap, it is important to attract talent from other EU and non-EU countries. We recommend the exploration of initiatives to attract international talent, such as tax incentives or specialised skill visas, similar to the H-1B visa in the U.S.[9], should be considered in order to bridge the gap between demand and supply for the foreseeable future. Notable examples of such initiatives are cases from Serbia[10],Luxemburg[11], and Romania[12].

10. This is a global challenge and Malta needs to compete for such talent. It is highly recommended that a greater presence at international recruitment and job events be pursued and incentivised in order to attract international talent to the Maltese market.

11. There is a general increase in interest in Machine Learning and AI from business, particular driven by recent awareness campaigns and general industry and technology trends. However, adoption is constrained by the knowledge and skills of the ICT workforce which could pose a constraint on business operating in Malta to gain competitive advantage. It is recommended that an increase in offerings and availability of training and certifications for Machine Learning and Artificial Intelligence is pursued in order to sustain adoption and stay relevant on the international market.

12. Local educational institutions should further explore and pursue the development of "Work and Learn" programmes, apprenticeship degrees and other similar programmes that have been proven to be highly successful in other European countries such as Germany.

13. The existing apprenticeship and internship programmes should include rotation of students in different roles throughout their experience in order to offer the necessary visibility and exposure to the multitude of ICT disciplines available.

14. An extended dialogue with key stakeholders regarding the professional recognition of ICT professionals is recommended to find the best way to achieve this in the future. Feedback from this survey complements the national eSkills Strategy[13], where most parties express a desire for such national recognition.

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[9] H-1B Specialty Occupations, DOD Cooperative Research and Development Project Workers, and Fashion Models | USCIS
[10] (PDF) Tax incentives for keeping and attracting highly skilled workers: The case of Serbia (researchgate.net)
[11] TNI 11-19-2018.book (simmons-simmons.com)
[12] BR Exclusive. Romania has tax incentives for the IT industry in place, but companies can't really use them - Business Review (business-review.eu)
[13] National eSkills Strategy, p. 50

15. There is an opportunity to improve communication and networking across ICT Professional, creating opportunities for upskilling and also providing a broader perspective on professional development and career paths.
    a. Establish and promote a social network for ICT professionals in Malta in order to facilitate communication across all dimensions of the Maltese ICT sector.
    b. A larger number of ICT-related events would facilitate communication between stakeholders and further promote the Maltese ICT market.
    c. Create a national platform to offer a comprehensive view of nationally available training and certification offerings, as well as Government incentives for this purpose, in order to facilitate a streamlined pursuit for both professionals and organisations and to encourage adoption.
    d. A tax deduction for ICT professional bodies membership should be considered.
    e. Establish specialised learning plans centred around nationally relevant career frameworks in line with ICT market requirements in order to continually develop the current ICT workforce in line with strategic demand.

7 Research Methodology

Due to the need to reach a wider audience, and due to the challenges caused by the ongoing COVID-19 pandemic, the skills audit was carried out through a combination of online surveys and video interviews. The video interviews were conducted with stakeholders from selected demand and supply organisations.

A digital survey platform was used to capture responses. Since the survey has multiple target groups (demand organisation, supply organisation, and ICT professionals), the tool was configured to use branching logic to conditionally show survey sections and questions.

Many sections were common to all groups. This included demographic questions to determine the size and sector of their respective organisations and included some questions that explored the importance and sentiment towards topics such as diversity, inclusion, certification, and industry recognition.

Demand organisation respondents were asked to quantify their current and predicted ICT workforce requirements, along with indicating the technologies in use. Respondents were also asked to detail the extent to which they provide training, certification, and ongoing professional development opportunities to their workforce.

Similarly, supply organisations indicated their expected skills and graduates that would be entering the workforce and shared insights into the tools and technologies that they utilise in their training.

The "Technology" questions have been aligned to the annual Stack Overflow developer survey[14] in order to facilitate a comparative analysis and the "Emerging Technology" questions are based on Gartner's "Top Strategic Technology Trends for 2021" report[15].

The European Union's target of better transnational coordination has been supported by the introduction of a number of ICT competence frameworks, such as ESCO (the European Competence, Skill, Qualifications and Occupations classification), the BoK (European Function Body of Knowledge) and the e-CF (European e-Competence Framework).

Whenever respondents were asked to provide details related to roles and skills, these were aligned to the set of standardised roles and skills defined by the e-CF. The European e-Competence Framework (e-CF) is a reference framework and a European standard (EN16234-1) of competences applied within the Information and Communication Technology (ICT) sector that can be used and understood by ICT user and supply companies, ICT practitioners, managers and Human Resources (HR) departments, the public sector, educational and social partners across Europe[16].

An additional survey for the purpose of gathering ICT student insights into their prospective goals on the ICT job market post-graduation has also been conducted.

A mix of qualitative and quantitative research methods have been employed in combination with grounded theory to formulate the certain sections of this report.

[14] Stack Overflow Developer Survey 2020
[15] Gartner Top Strategic Technology Trends for 2021
[16] European e-Competence Framework (ecompetences.eu)

8 Analysis and Findings

8.1 Demographics

The analysis in this report is based on the completion of 182 responses, of which 10 were held as video interviews with the respective stakeholders. The remaining responses were gathered through the independent completion of the online survey.

A total of 644 individuals were approached through direct e-mail distributions and an extensive social media campaign together with collaboration with organisations like the Malta Chamber of Commerce, MIA and Tech.mt. Additionally, 10 interviews have been conducted across Demand and Supply organisations. A number of 182 respondents comprised of demand organisations, supply organisations, ICT practitioners and ICT students have consented to the prefacing privacy notices and completed the survey. The respondents of Demand organisations represent a workforce of at least 8,720.

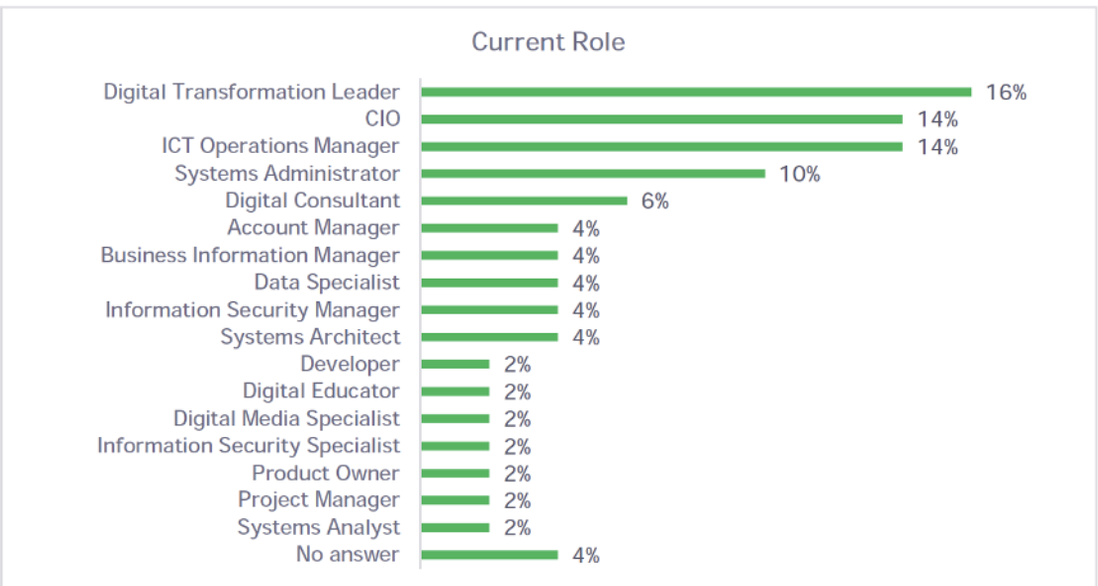


Figure 2 - Roles of Demand Organisation Respondents

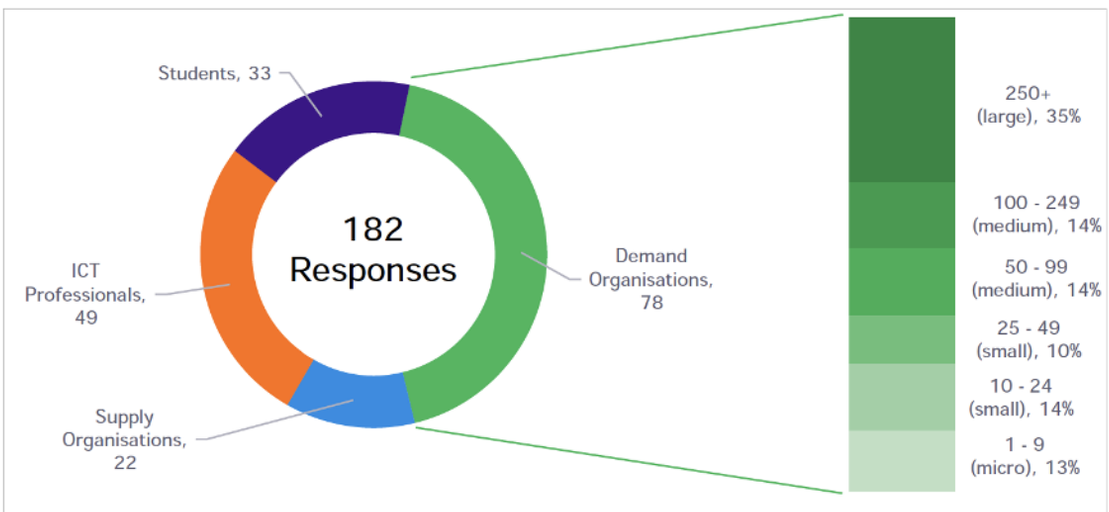


Figure 3 - Split of Survey Respondents combined with Company Size split of Demand Organisations

84% of respondents were male, while the predominant age was between 30 and 49 years with the majority holding leadership positions such as CIO, Digital Transformation Leader or ICT Operations Manager.

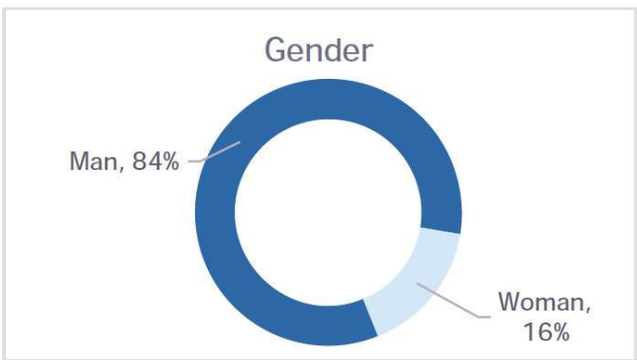


Figure 4 - Gender Split of Total Respondents

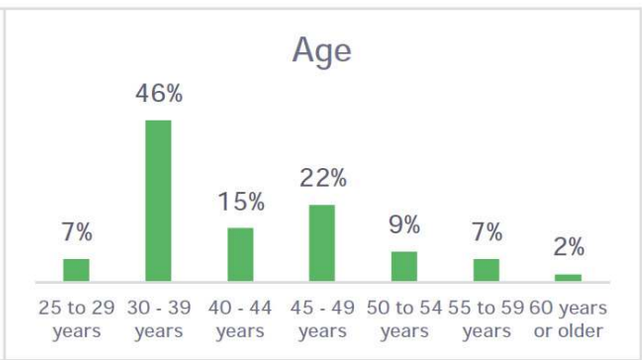


Figure 5 - Age Split of Total Respondents

Of the 78 demand organisations that responded to our survey, 77% are locally incorporated and owned entities across a varied number of sectors with a large focus on ICT Service & Operation and Software Development.

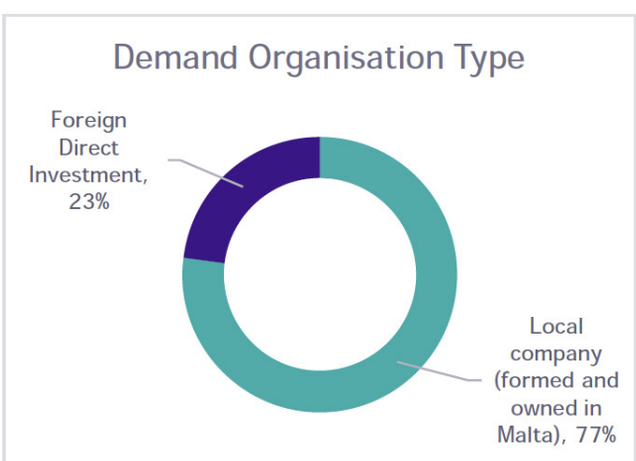


Figure 6 - Demand Organisation Type

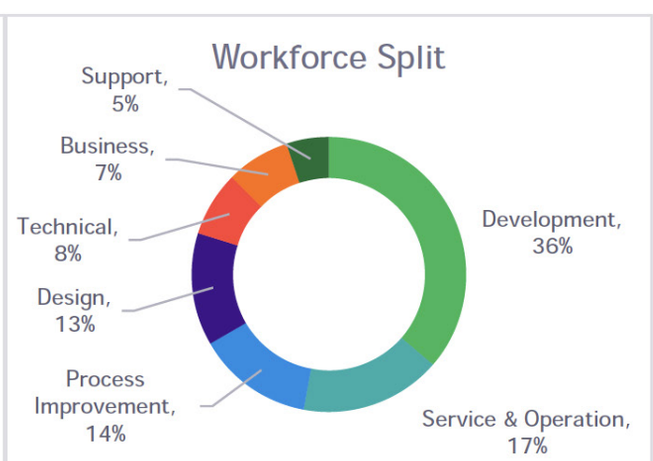


Figure 7 - ICT Workforce Split of Demand Organisations by Category

The majority of the current ICT workforce is made of Developers, DevOps Experts, Technical Specialists, Service Support professionals and System Administrators indicating a very technical landscape.

Category	Role	Quantity
Business	Business Information Manager	50
	ICT Operations Manager	49
	Data Scientist	44
	Chief Information Office (CIO)	33
Design	Business Analyst	76
	Systems Architect	66
	Systems Analyst	64
	Solution Designer	48
	Enterprise Architect	42
	Data Specialist	25
Development	Developer	621
	Test Specialist	103
	Digital Media Specialist	27
Process Improvement	DevOps Expert	106
	Digital Transformation Leader	91
	Product Owner	91
	Scrum Master	40
Service & Operation	Technical Specialist	103
	Service Support	101
	Systems Administrator	100
	Network Specialist	65
	Data Administrator	64
Support	Account Manager	53
	Digital Consultant	35
	Information Security Specialist	20
	Digital Educator	19
Technical	Project Manager	90
	Service Manager	69
	Information Security Manager	34
	Quality Assurance Manager	20

Figure 8 - ICT Workforce Split of Demand Organisations by Category & Role (absolute values)

Sector Group	Organisation Primary Sector	Sector%	Group%
Computer Programming, Consultancy & Related Activities	Computer Programming, Consultancy & Related Activities	15.71%	24.29%
	Software Publishing	4.29%	
	Tech	1.43%	
	Telecommunications	1.43%	
	Data Processing, Hosting & Related Activities	1.43%	
Public Sector	Public Sector	11.43%	15.71%
	Attraction & Facilitation of Foreign Direct Investment	1.43%	
	Environment & Resources Authority	1.43%	
	Erasmus	1.43%	
Professional, Scientific & Technical Activities		12.86%	12.86%
Financial & Insurance Sector		11.43%	11.43%
Other	Arts, Entertainment & Recreation (Includes iGaming)	7.14%	20.00%
	Electricity, Gas, Steam & Air Conditioning Supplies	2.86%	
	Manufacturing	2.86%	
	Education	1.43%	
	Retail	1.43%	
	Road Construction & Maintenance	1.43%	
	Sport	1.43%	
	Training, Recruitment & Data Analytics	1.43%	
No Answer			

Figure 9 - Demand Organisation Primary Sectors of Operation

8.2 Market Perspective

8.2.1 Demand and Supply

The forecasted growth in the ICT job market indicates that the current disbalance between demand and supply may further increase. Our supply organisation responses show that the most in demand roles are also the amongst the hardest to fill, with roles centred around development, data and operations constituting the biggest challenge.

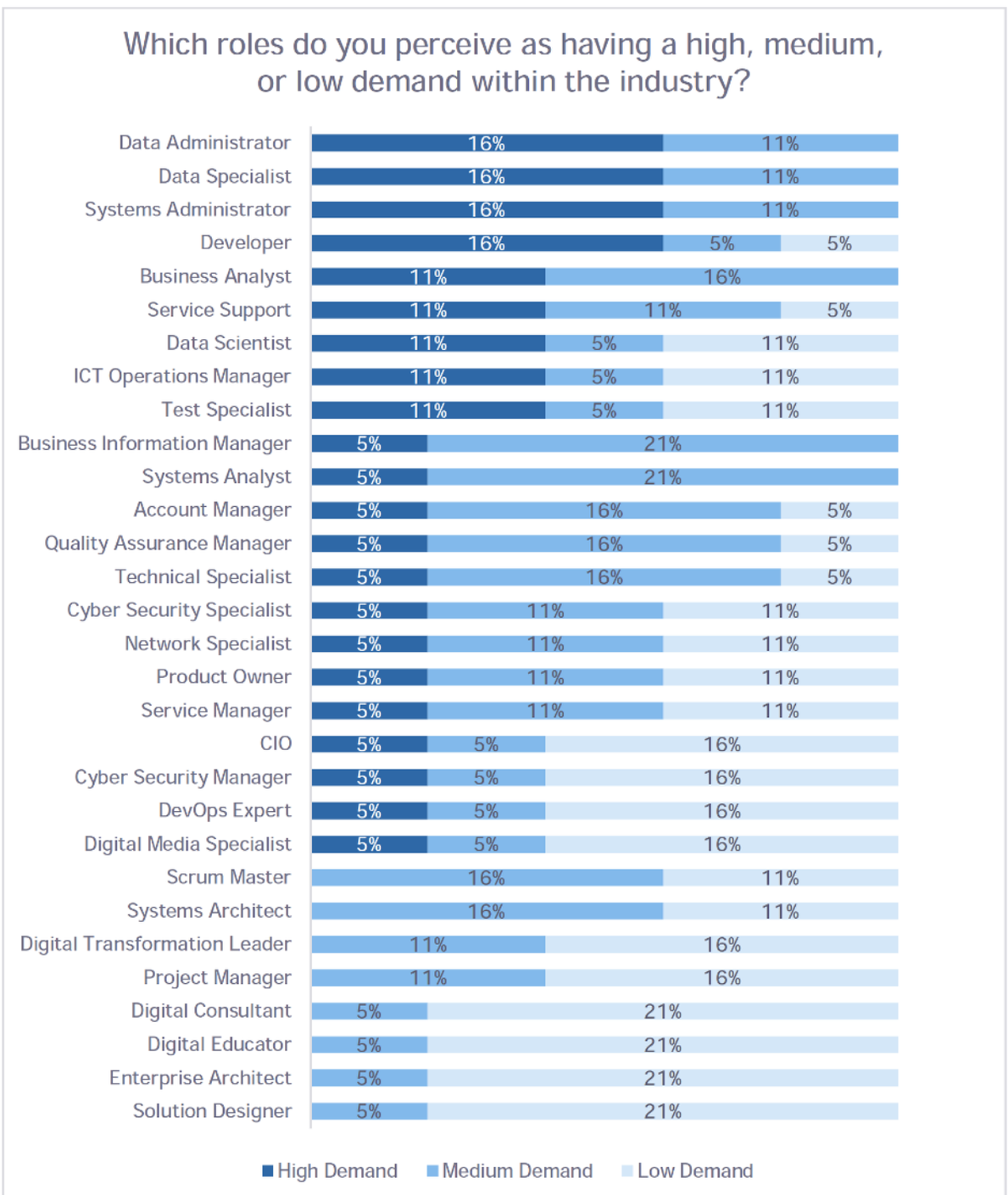


Figure 10 - Demand of Roles within the Industry

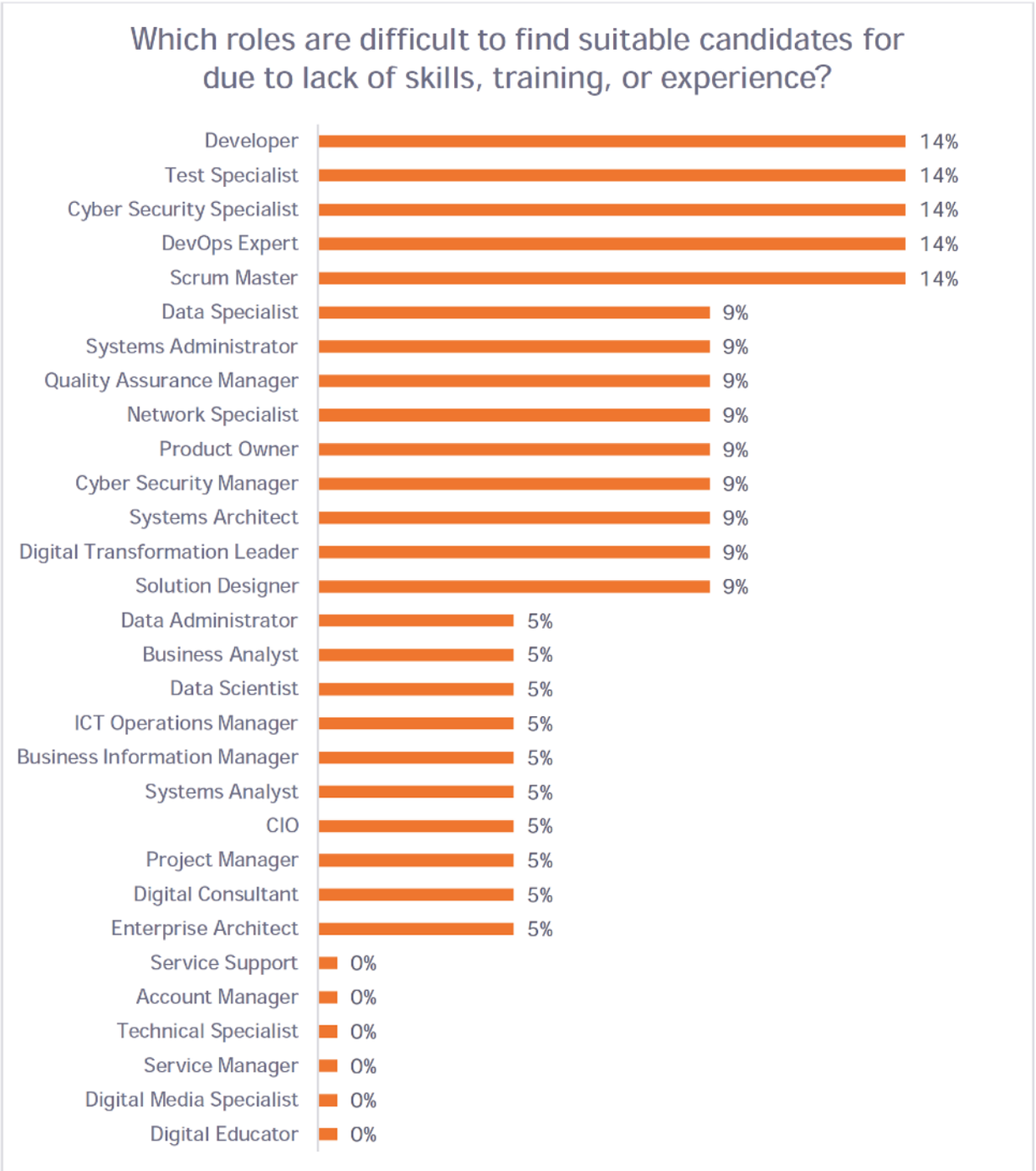


Figure 11 - Difficulty to find Suitable Role Candidature

One positive outlook is that the results of our student survey present those same roles as being the most sought after by students upon graduation. This may, however, not represent the greatest challenge.

According to CEDEFOP[17], a 21.9% employment growth is being forecasted in the ICT services sector in Malta over the next 10 years comparative to 2019 figures. A similar growth should be expected in terms of ICT tertiary education graduates in order to sustain market demand, which given current figures provided by national institutions, is not currently the case, with 542 ICT graduates in the past 5 years and an estimated average of 102 graduates per year for the next 3 years.

[17] Skills Panorama (europa.eu)

One other potential issue is fulfilling the right roles. Student responses to our survey have indicated that the most sought-after roles post-graduation are Development (29%) and Technical (19%) roles. And while this does align with the most in-demand roles identified by supply organisations, it does not align with demand organisations' specific tertiary education requirements for process improvement roles, design roles and business roles, with those categories ranking bottom in our student survey results with 11% each.

One particularly interesting and indicative factor to be considered is the correlation between the planned increase in competencies declared by demand organisation respondents and their specific role requirements.

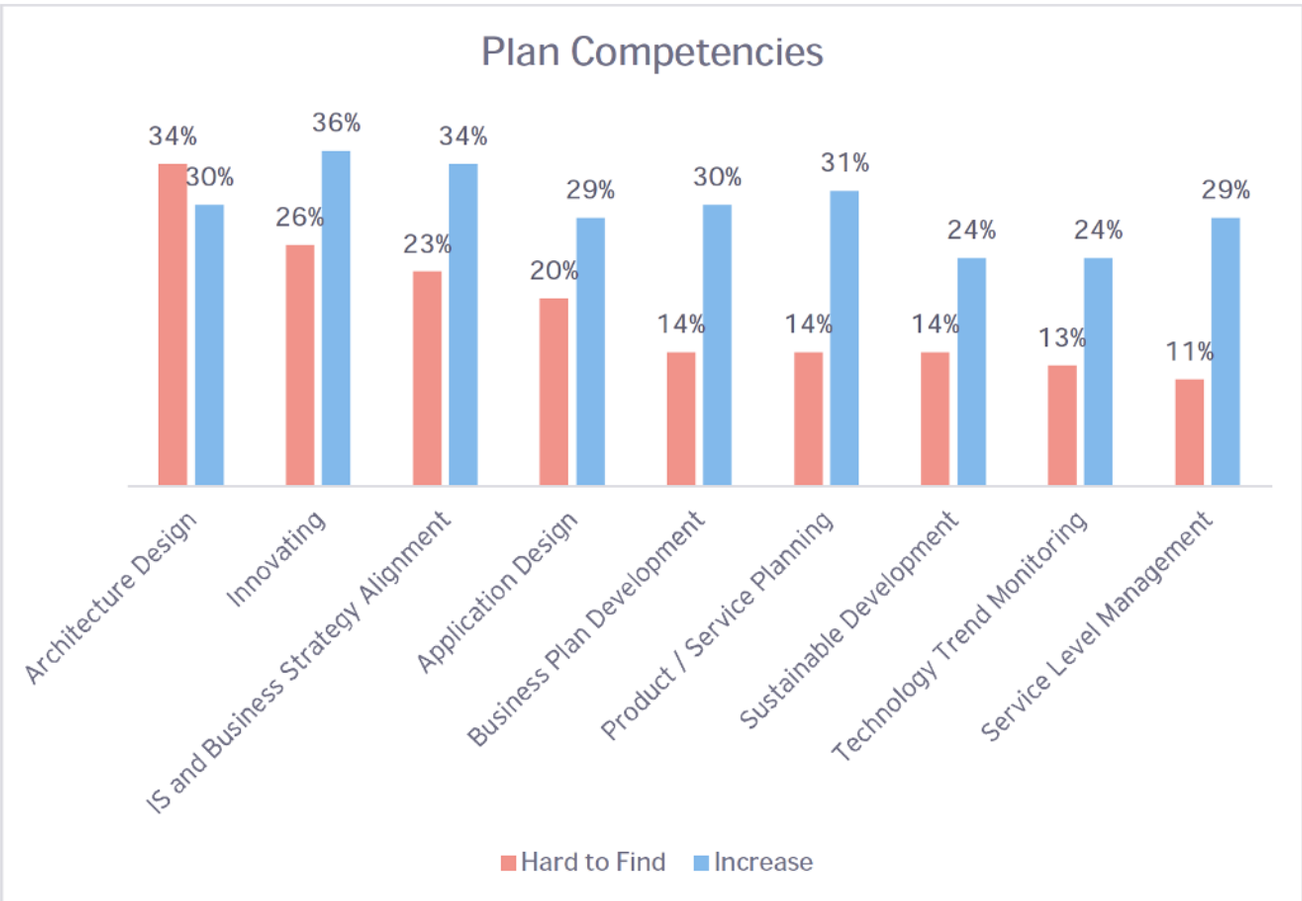


Figure 12 - Difficulty to Find & Predicted Increase of Plan Competencies

With Architecture Design, Innovation, IS and Business Strategy Alignment, Business Plan Development and Product/Service Planning being the major competencies being targeted for increase, this is not reflected in the most demanded roles in the responses of this survey. Based on this information and some contextual information provided to us during the interviews executed for this survey, we see an inclination to distribute specific competencies among roles, as opposed to having specific roles focused on one key function. With the example of the Architecture Design competency, despite it being hard to find and targeted for increase, we do not see an increased demand for Architecture roles, which indicates that this competency is expected of professionals in more technical, hands-on roles, who would then eliminate the need of a specific Architecture role within their organisations – a strategy presumably employed in order to account for the lack of Architecture professionals on the job market.

A similar situation can be seen in the business development and analysis disciplines, where the growing demand, indicated by both demand organisation responses and supply organisation certification demand responses, is being addressed in a similar manner.

As expected, and illustrated by previous response results, Systems Engineering, and Application Development appear to be most problematic in terms of sourcing.

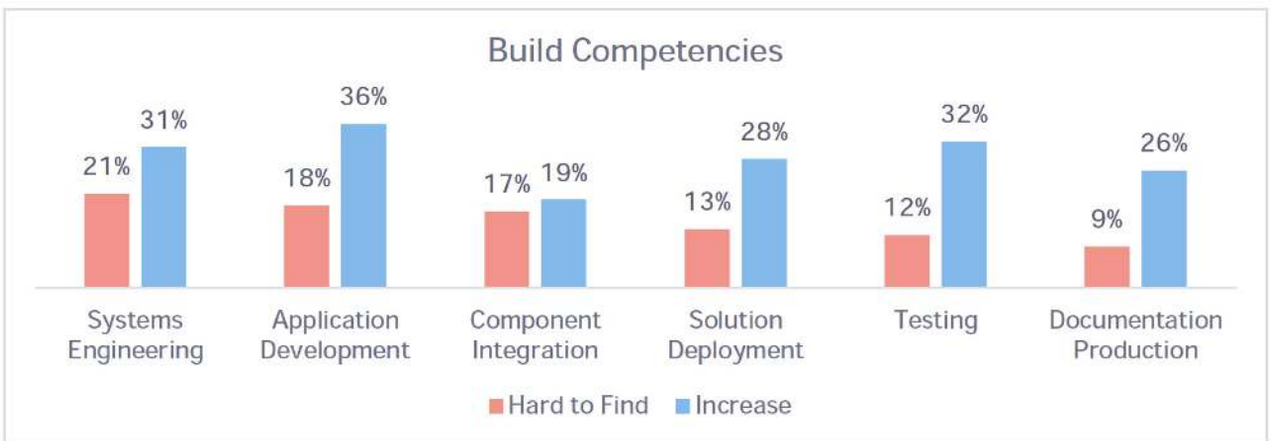


Figure 13 - Difficulty to Find & Predicted Increase of Build Competencies

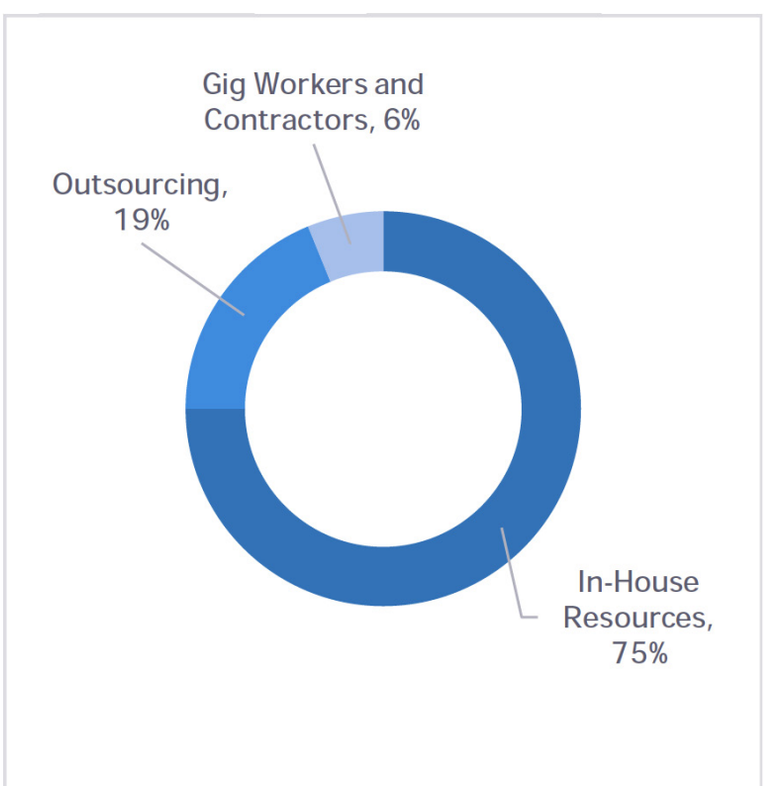


Figure 14 – Demand Organisation Workforce Source

Some demand organisations are coping with the lack ICT resources by outsourcing part of their operations or employing gig and contract workers, with roughly 25% of operations being handled externally.

The Financial and Insurance and Public sectors have the highest rate of externally sourced resources which could have a number of implications:

- Lack of specialised resources
- Restrictive policies with regard to the recruiting process
- Higher role candidacy expectations

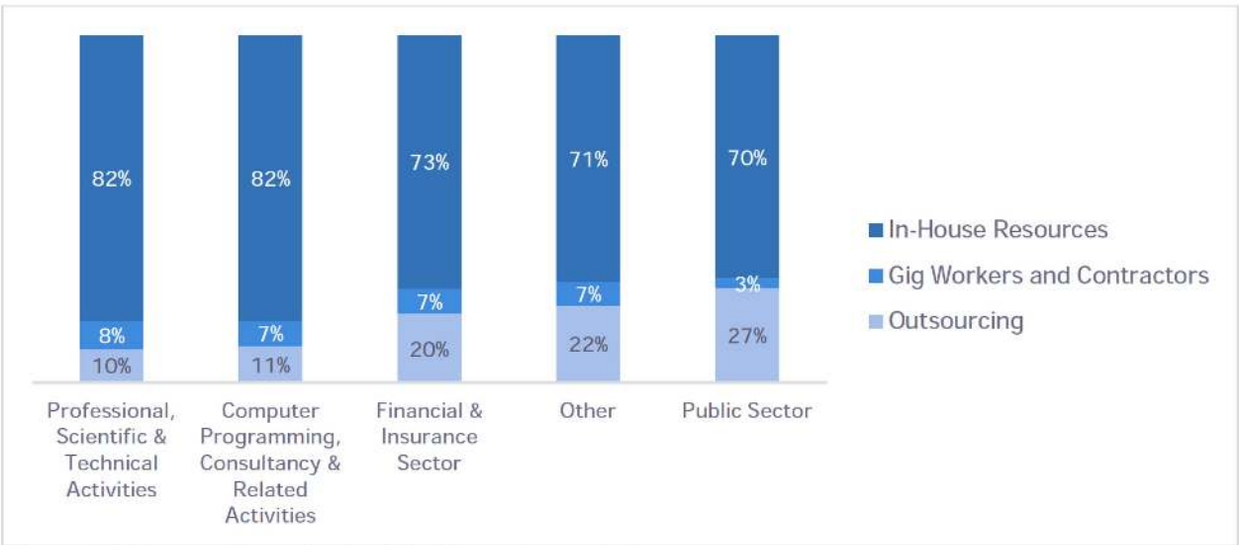


Figure 15 - Demand Organisation Workforce Source by Sector

Overall, demand organisations expect a large number of increases in demand, with the largest expected growth to be seen in Development, Process Improvement and Design with a particular focus on Developers, Business Analysts and Test Specialists (Figure 16).

Category	Role	Current	Total within 1 year	Total within 3 years
Business	Business Information Manager	50	36	57
	ICT Operations Manager	49	33	57
	Data Scientist 44 69 126			
	Chief Information Office (CIO)	33	24	28
Design	Business Analyst	76	81	134
	Systems Architect	66	67	83
	Systems Analyst	64	57	81
	Solution Designer	48	42	67
	Enterprise Architect	42	43	58
	Data Specialist	25	18	39
Development	Developer	621	722	1142
	Test Specialist	103	117	172
	Digital Media Specialist	27	22	31
Process Improvement	DevOps Expert	106	91	128
	Digital Transformation Leader	91	91	134
	Product Owner	91	93	152
	Scrum Master 40 44 46			
Service & Operation	Technical Specialist	103	87	125
	Service Support	101	99	152
	Systems Administrator	100	70	114
	Network Specialist	65	51	67
	Data Administrator	64	59	88
Support	Account Manager	53	47	71
	Digital Consultant	35	30	44
	Information Security Specialist	20	21	32
	Digital Educator 19 19 36			
Technical	Project Manager	90	77	112
	Service Manager	69	40	76
	Information Security Manager	34	23	60
	Quality Assurance Manager	20	14	23

Figure 16 - Role Demand in Current & Future Scenarios for Demand Organisations (absolute values)

8.2.2 Education

According to a study carried out in 2019[18] by Eurostat, 63.6 % of ICT professionals in the EU had completed tertiary education at that point in time. Demand organisations in Malta consider formal education at the tertiary level to be of significant importance with 50% saying it is very important or critically important and a further 15% considering it fairly important with 34% of demand organisation respondents actually requiring a Bachelor's Degree (MQF6). The most demanding roles in this regard have been identified as technical roles, design roles, process improvement roles and business roles, with the same roles also requiring the most amount of professional experience.

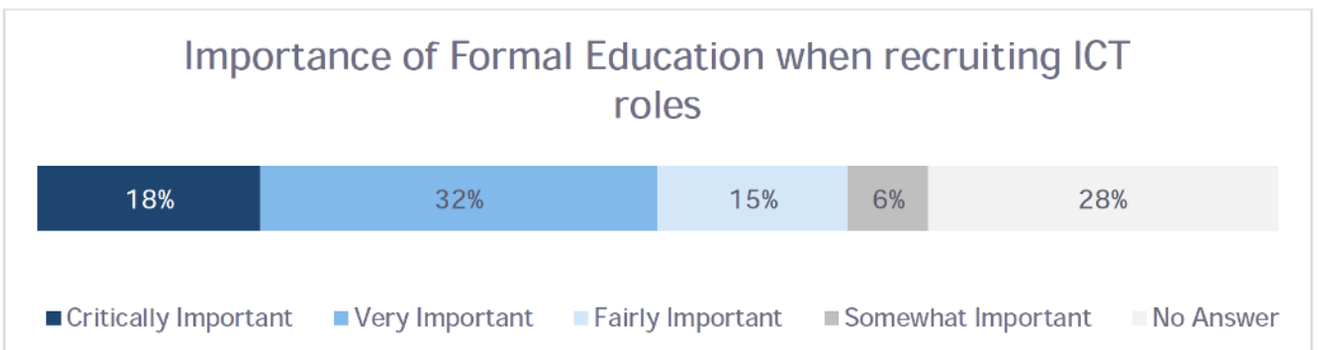


Figure 17 - Importance of Formal Education when Demand Organisations recruit ICT roles

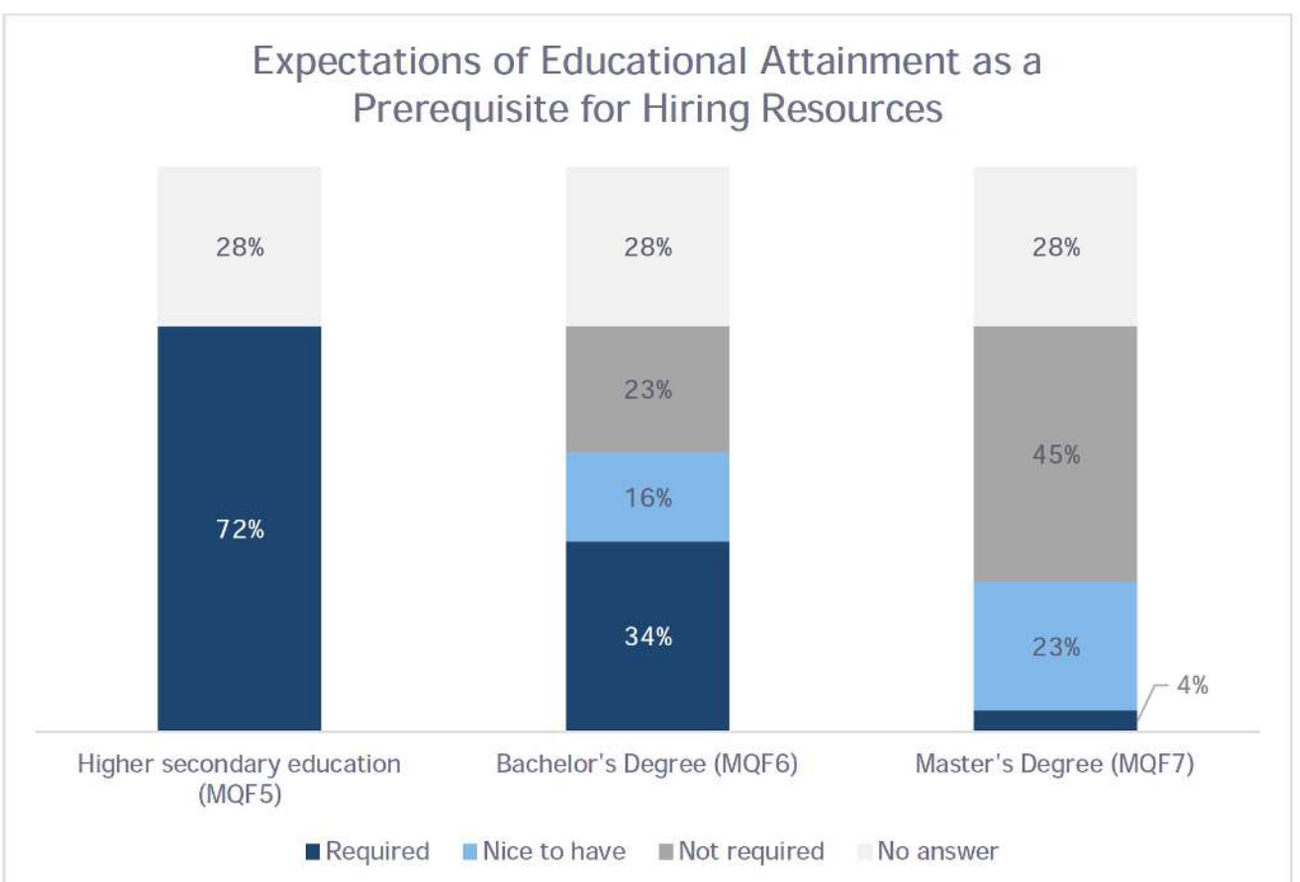


Figure 18 - Expectations of Educational Attainment as Prerequisite for Hiring Resources (Demand Organisation perspective)

[18] ICT specialists in employment - Statistics Explained (europa.eu)

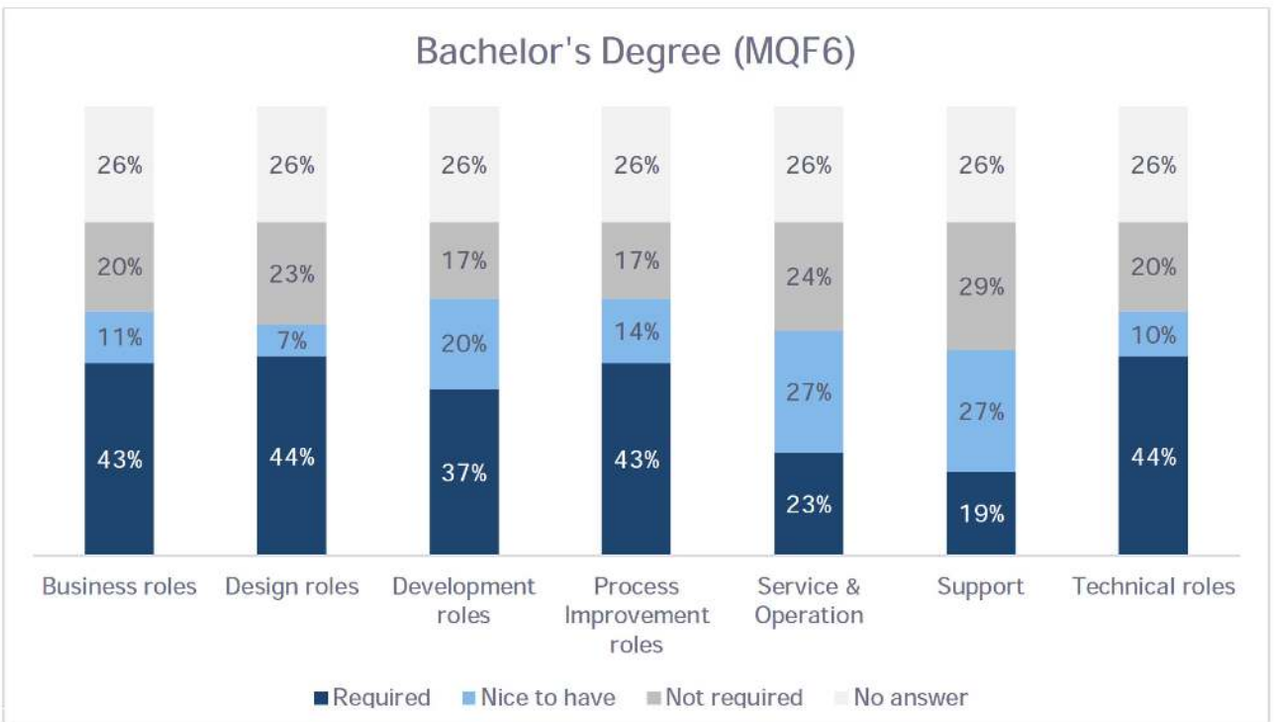


Figure 19 - Bachelor's Degree as a prerequisite for Hiring Resources amongst Role Categories (Demand Organisation perspective)

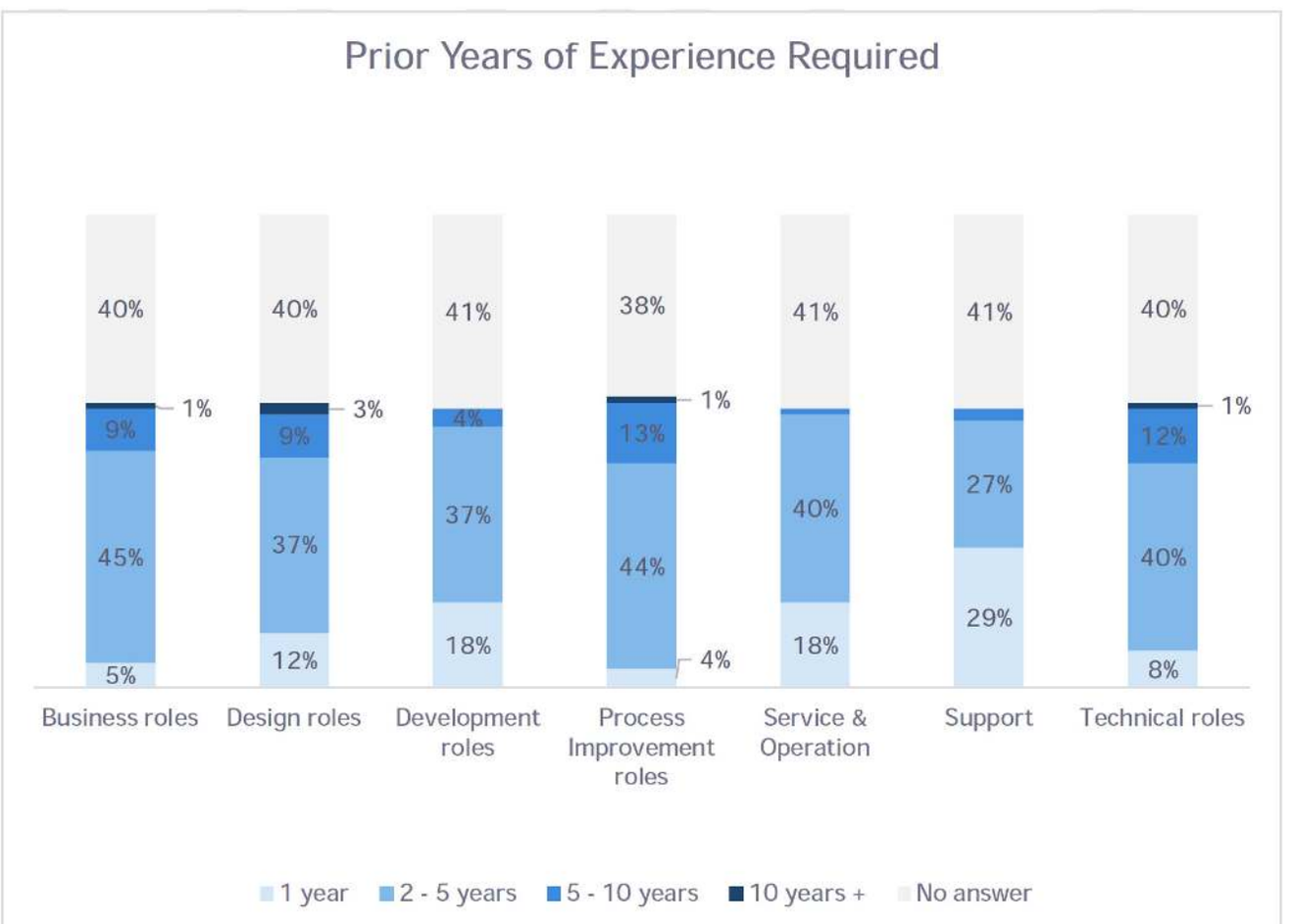


Figure 20 - Prior Years of Experience Required for Hiring Resources in Role Categories (Demand Organisation perspective)

While the ratio of role specific requirements to existing ICT professionals' qualifications may not pose a problem, where 86% of ICT professional respondents have achieved MQF6 or higher, a potential long-term issue may arise, given the lack of growth in ICT student numbers relative to market growth (see page 18).

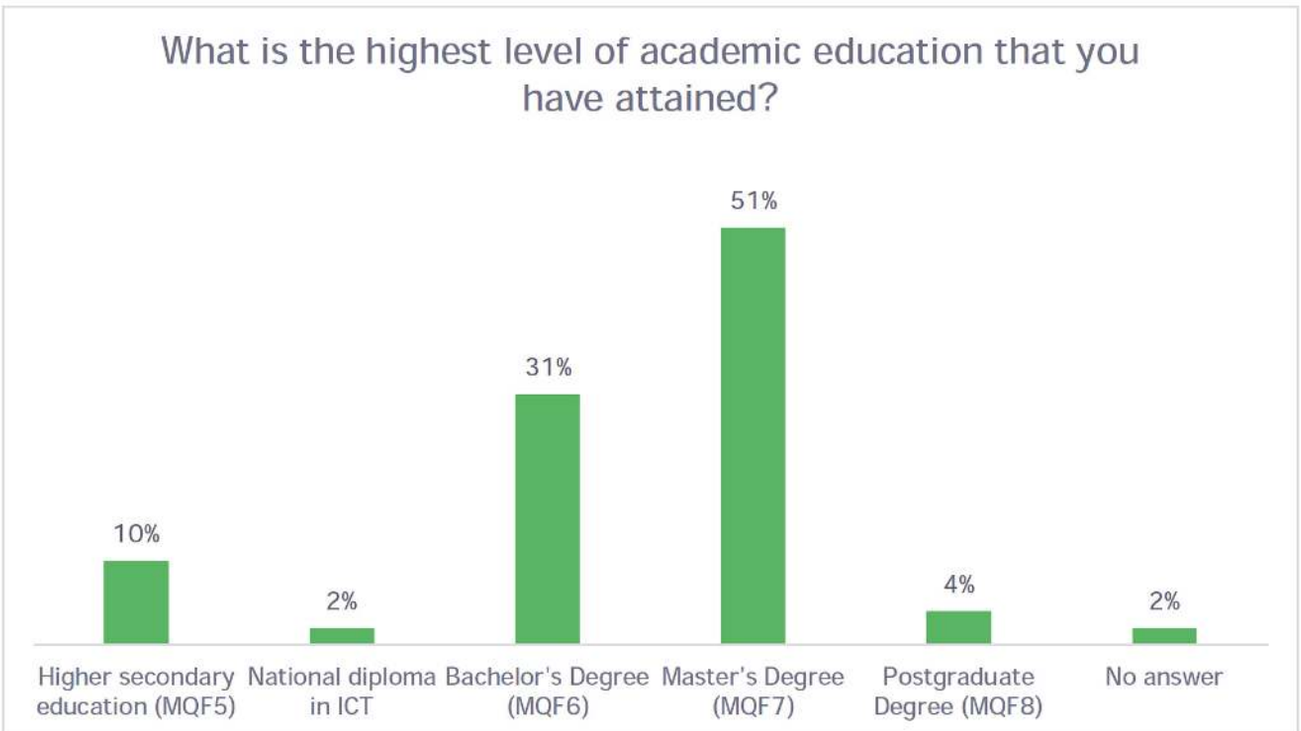


Figure 21 - Highest Level of Academic Education attained by ICT Practitioners & Professionals

8.2.3 Training, Skills and Certification

Certification has become increasingly important as offerings in this space have seen a large increase both in numbers and variety over the past decade. New technologies require new skills and companies worldwide are facing difficulties in finding appropriately qualified ICT professionals with demand forecasted to increase in the years to come.

The results of this survey support this, with 59% of the demand respondents to this survey either strongly or somewhat agreeing that organisations benefit from having ICT practitioners pursue professional certifications, with 36% neither agreeing nor disagreeing. Individual ICT professionals overwhelmingly agree on this front, with 72% recognising the importance of certification in the ICT profession.

Figure 22 – Statement: Having ICT practitioners pursue professional certifications is beneficial to the organisation (Demand Perspective)

The most common formats for training being offered is, as expected, online training with 53% offering live online training and 32% offering pre-recorded online lectures and sessions, while 42% of supply organisations offer in-person classroom training.

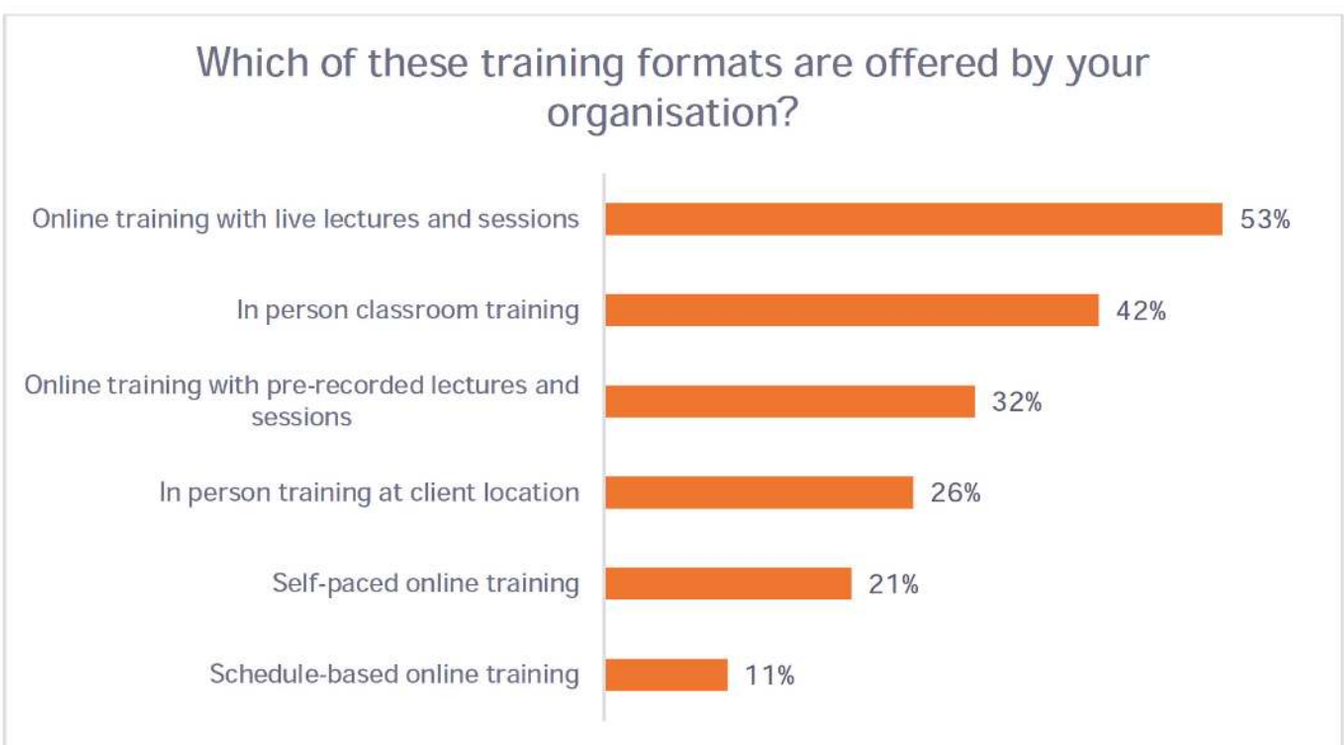


Figure 23 - Training Formats offered by Supply Organisations

The most commonly offered certification training provided by supply organisations are Vendor Specific Technology Certifications (32%), with Information Security, Project Management and Software Development as a close second (23%), and Agile Development, Cloud Certification, IT Architecture, and Business Analysis among the least common offerings with 18%, 18%, 14% and 9% respectively.

Figure 24 - Certification Training provided by Supply Organisations

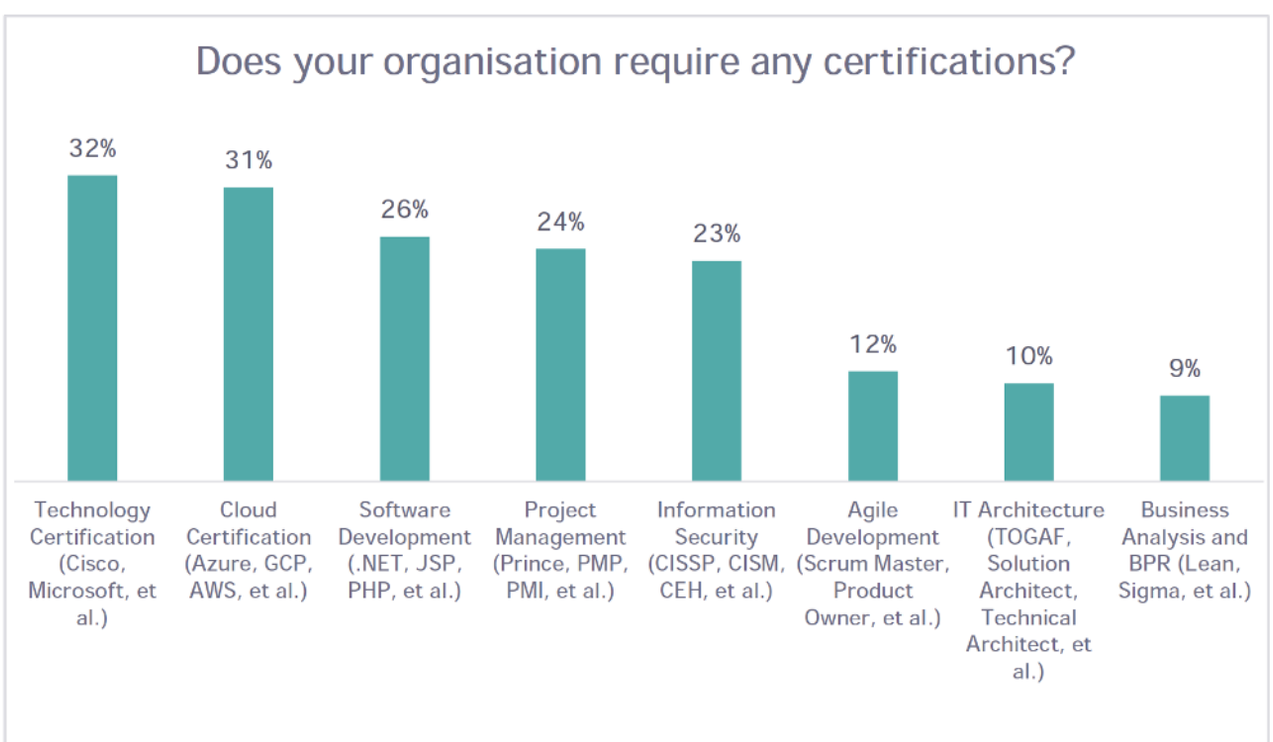


Figure 25 - Certification Demand from Demand Organisations

The observation noted above creates somewhat of a discrepancy between the offerings of supply organisations and the requirements of demand organisations. While the demand and supply of Technology certifications (32% demand, 32% supply) and Software Development certifications (26% demand and 23% supply) appear to be balanced, the demand and supply for Cloud certifications show the largest discrepancy with 31% demand and only 18% of supply organisations offering relevant training.

The respondent data on the topic of certification is in line with gathered responses on skill requirements, with Cloud Technology and vendor-specific skills being the most common, while also highlighting a wide adoption of Microsoft Technologies with Microsoft Azure, Hyper-V, Teams, Office 365, Microsoft SQL Server, .NET, .NET Core topping the charts in their respective categories, both in terms of required skills and most used technologies.

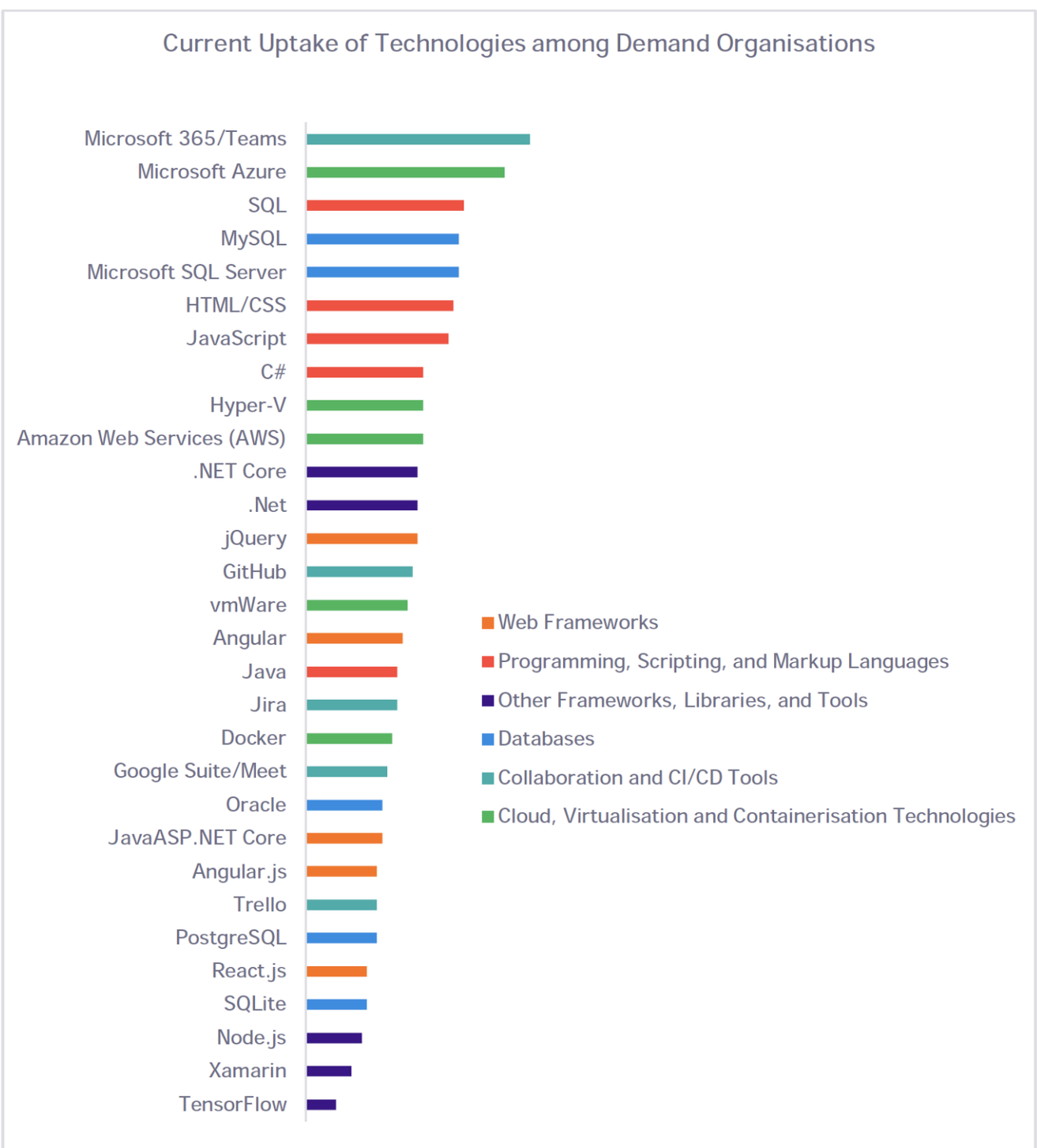


Figure 26 - Current Uptake of Technologies among Demand Organisations

Current:

Technology Skill Category	Technology	Demand Organisations
Cloud, Virtualisation and Containerisation Technologies	Microsoft Azure	39
	Amazon Web Services (AWS)	23
	Hyper-V	23
	vmWare	20
	Docker	17
Collaboration and CI/CD Tools	Microsoft 365/Teams	44
	GitHub	21
	Jira	18
	Google Suite/Meet	16
	Trello	14
Databases	Microsoft SQL Server	30
	MySQL	30
	Oracle	15
	PostgreSQL	14
	SQLite	12
Other Frameworks, Libraries, and. Tools	Net	22
	.NET Core	22
	Node.js	11
	Xamarin	9
	TensorFlow	6
Programming, Scripting, and Markup Languages	SQL	31
	HTML/CSS	29
	JavaScript	28
	C#	23
	Java	18
Web Frameworks	jQuery	22
	Angular	19
	JavaASP.NET Core	15
	Angular.js	14
	React.js	12

Figure 27 - Detailed Current Uptake of Technologies among Demand Organisations (absolute values)

In line with demand organisation responses, ICT practitioners observe similar demand for all categories, with a significant focus on Cloud Technologies, Software Development and Collaboration and CI/CD.

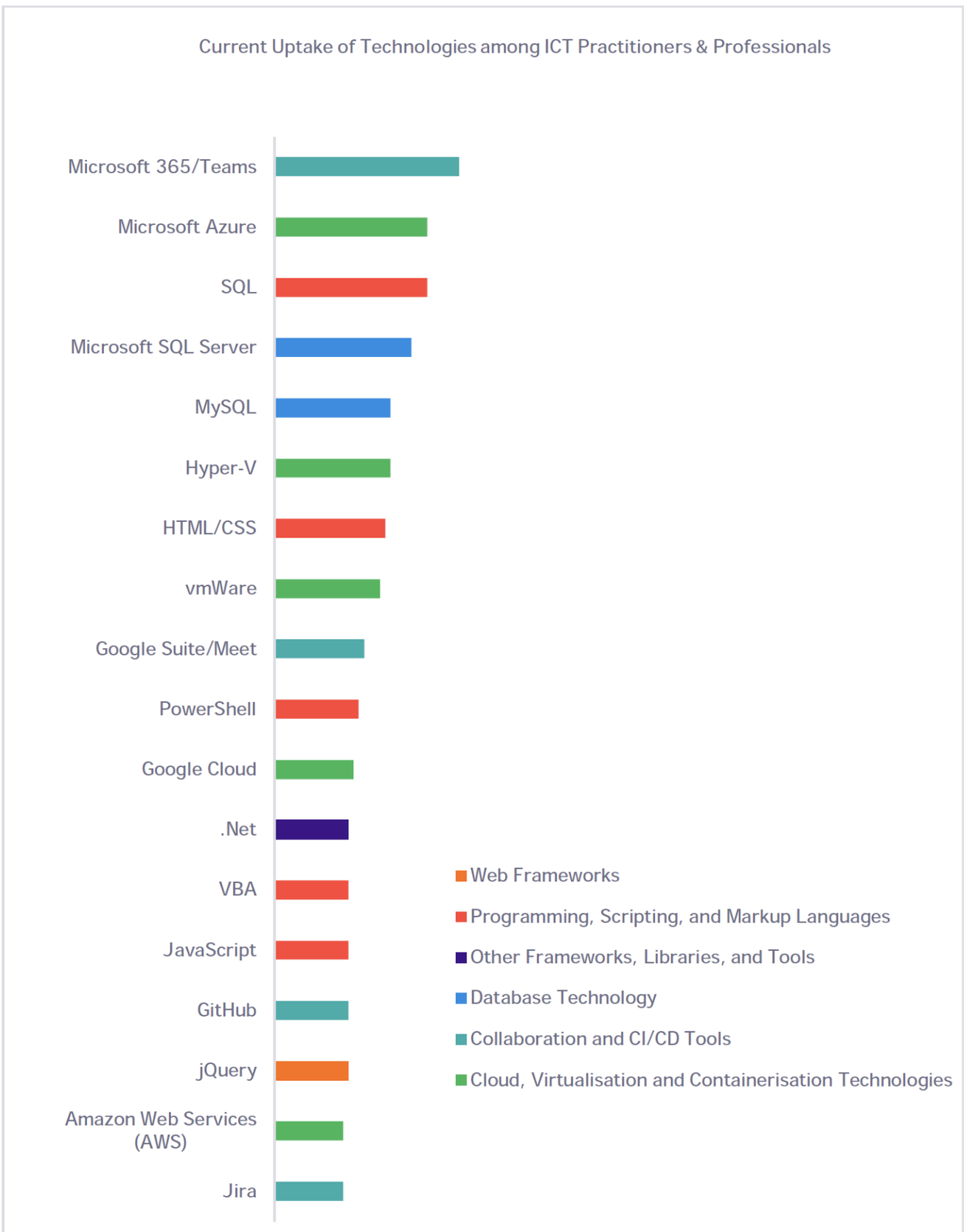


Figure 28 - Current Uptake of Technologies among ICT Practitioners & Professionals

Current:

Category	Technology	ICT Practioners & Professionals
Cloud, Virtualisation and Containerisation Technologies	Microsoft Azure	29
	Hyper-V	22
	vmWare	20
	Google Cloud	15
	Amazon Web Services (AWS)	13
Collaboration and CI/CD Tools	Microsoft 365/Teams	35
	GitHub	14
	Jira	13
	Google Suite/Meet	17
	Slack	10
Database Technology	Microsoft SQL Server	26
	MySQL	22
	MariaDB	9
	SQLite	7
	Oracle	6
Other Frameworks, Libraries, and Tools	Net	14
	.NET Core	8
	Node.js	5
	Apache Shark	4
	Xamarin	3
Programming, Scripting, and Markup Languages	SQL	29
	HTML/CSS	21
	Powershell	16
	JavaScript	14
	VBA	14
Web Frameworks	jQuery	14
	ASP.Net Core	10
	Java	10
	Angular.js	4
	Angular	3

Figure 29 - Detailed Current Uptake of Technologies among ICT Practioners & Professionals (absolute values)

Demand organisations foresee an increase mostly in the adoption of Cloud Technologies, Relational Database Technology and Web Development frameworks, with the latter being mainly focused around more classic frameworks, such as jQuery, as opposed more modern alternatives such as React.js and Vue.js.

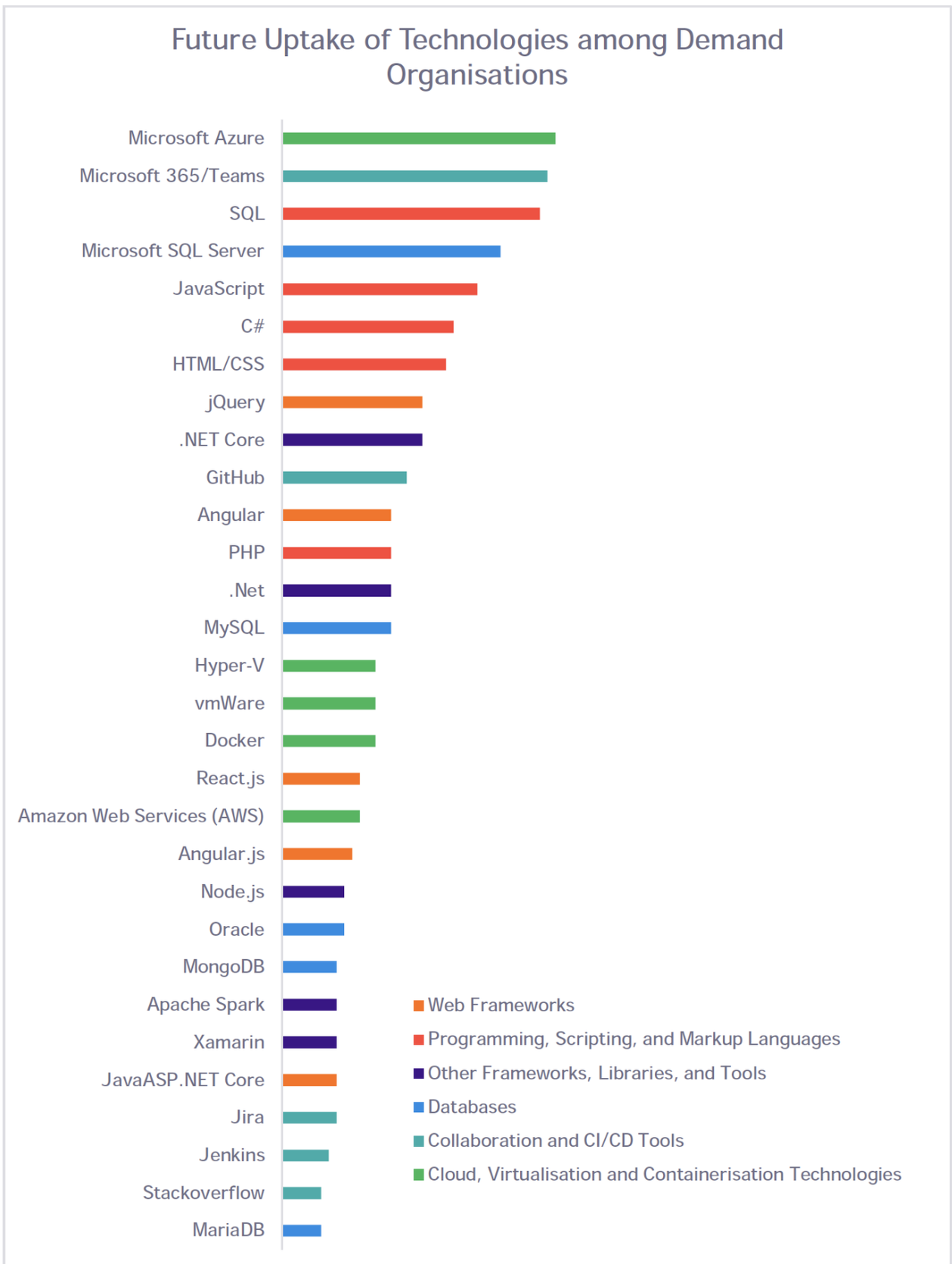


Figure 30 - Future Uptake of Technologies among Demand Organisations

Future uptake:

Category	Technology	ICT Practioners & Professionals
Cloud, Virtualisation and Containerisation Technologies	Microsoft Azure	35
	Hyper-V	12
	vmWare	12
	Google Cloud	12
	Amazon Web Services (AWS)	10
Collaboration and CI/CD Tools	Microsoft 365/Teams	34
	GitHub	7
	Jira	6
	Google Suite/Meet	16
	Slack	5
Databases Technology	Microsoft SQL Server	28
	MySQL	14
	MariaDB	8
	SQLite	7
	Oracle	5
Other Frameworks, Libraries, and. Tools	Net	18
	.NET Core	14
	Node.js	8
	Apache Shark	7
	Xamarin	7
Programming, Scripting, and Markup Languages	SQL	33
	HTML/CSS	25
	Powershell	22
	JavaScript	21
	VBA	14
Web Frameworks	jQuery	18
	ASP.Net Core	14
	Java	10
	Angular.js	9
	Angular	7

Figure 31 - Detailed Current Uptake of Technologies among Demand Organisations (absolute values)

ICT practitioners foresee a stronger focus on data science-oriented technologies, such as Hadoop, R and Python, an on growing discipline in the ICT sector. It is to be noted that in considering the uptake of technologies, demand organisations are more focused on overarching technologies, as opposed to ICT practitioners that focused on more technical solutions.

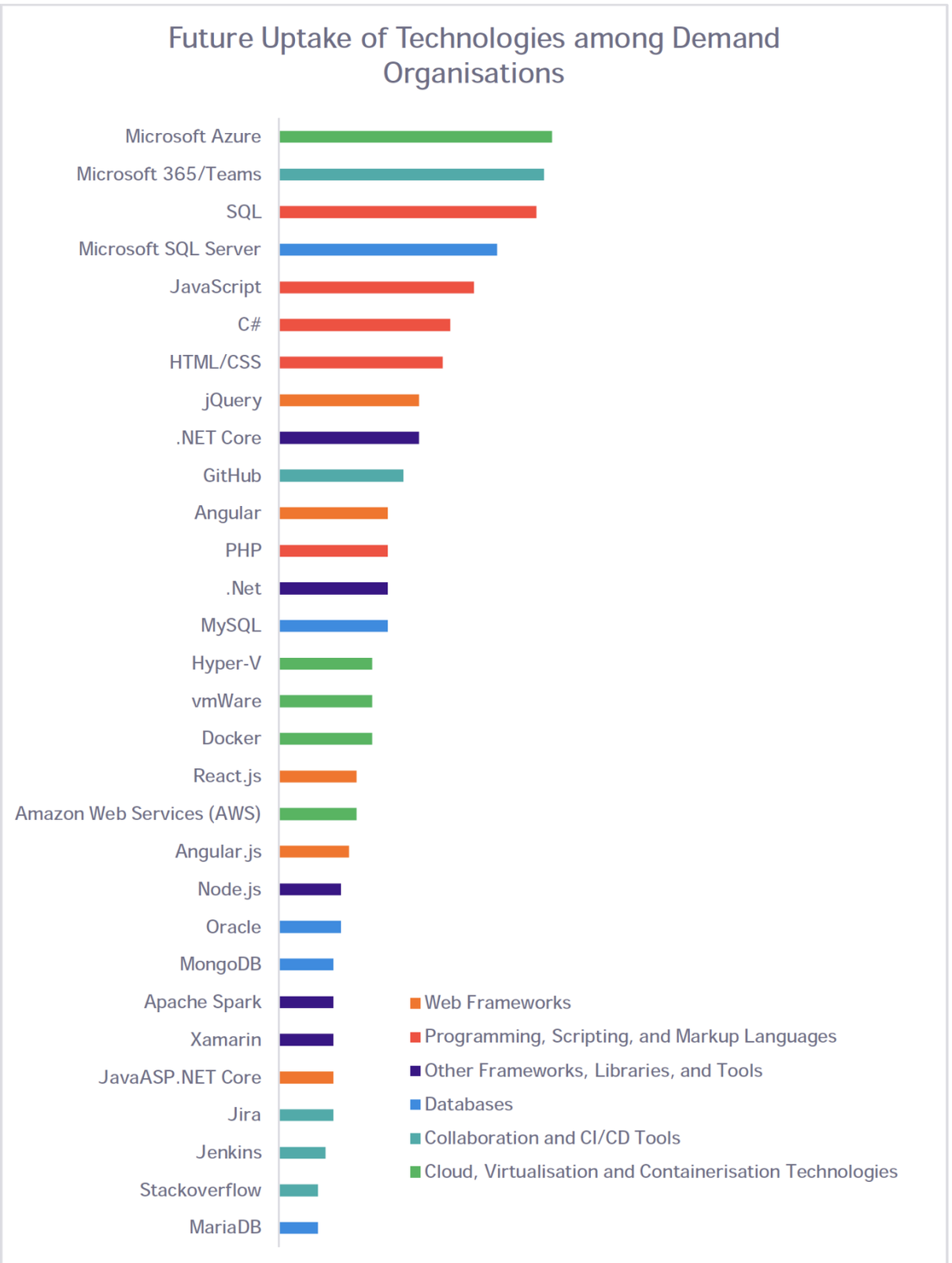


Figure 32 - Future Uptake of Technologies among ICT Practioners & Professionals

The minor disbalance between the demand and supply dimensions of certification offerings does not appear to represent the largest bottleneck, with 43% of demand organisations finding the lack of employee time resources for training and certification purposes to be by far the biggest challenge. This is confirmed by the responses provided by ICT professionals, of which 42% identify a lack of time resources as the main reason for not pursuing further training and certification. This is further illustrated by the fact that 53% of ICT professional respondents have not attended ICT-specific training in the past 6 to 12 months.

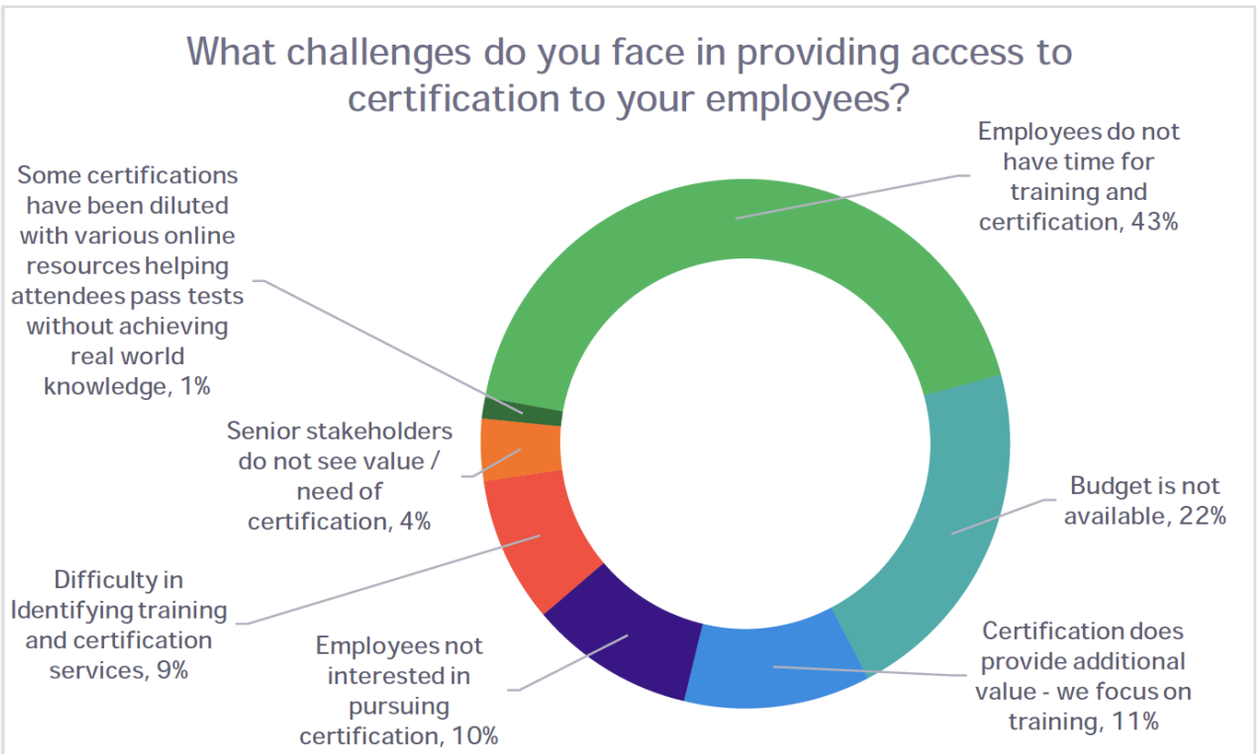


Figure 33 - Challenges faced in providing access to certification to employees (Demand Organisation perspective)

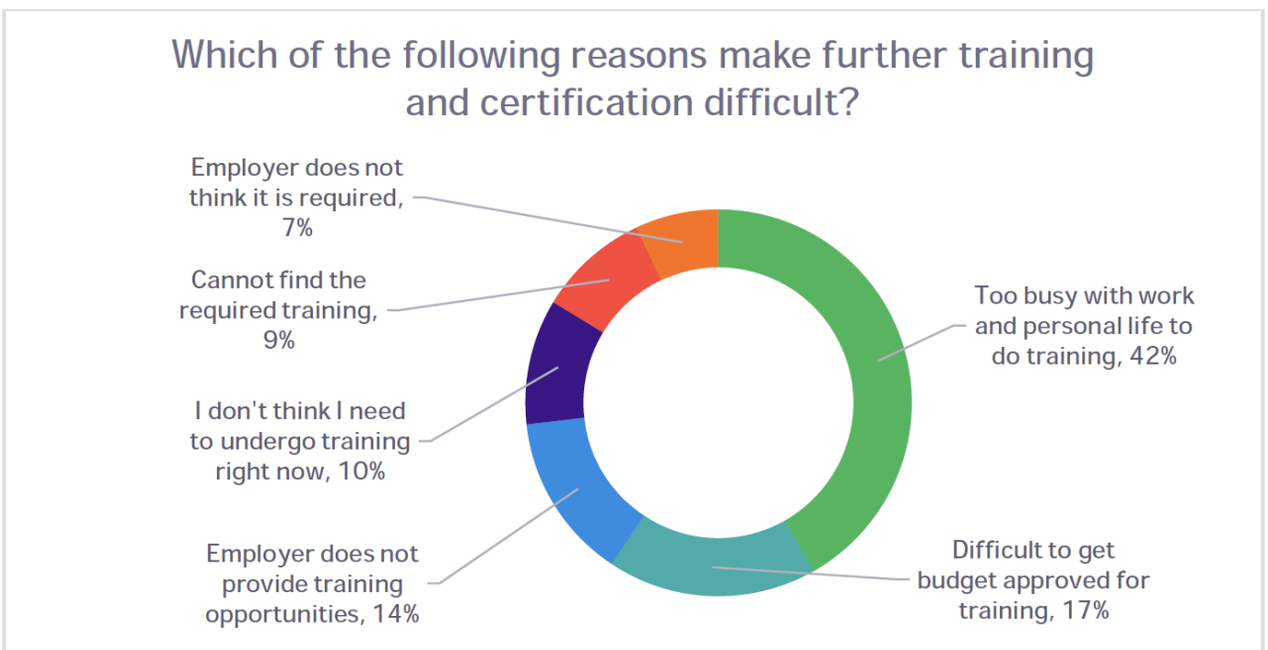


Figure 34 - Challenges faced in taking part in further training and certification (ICT Practitioner & Professional perspective)

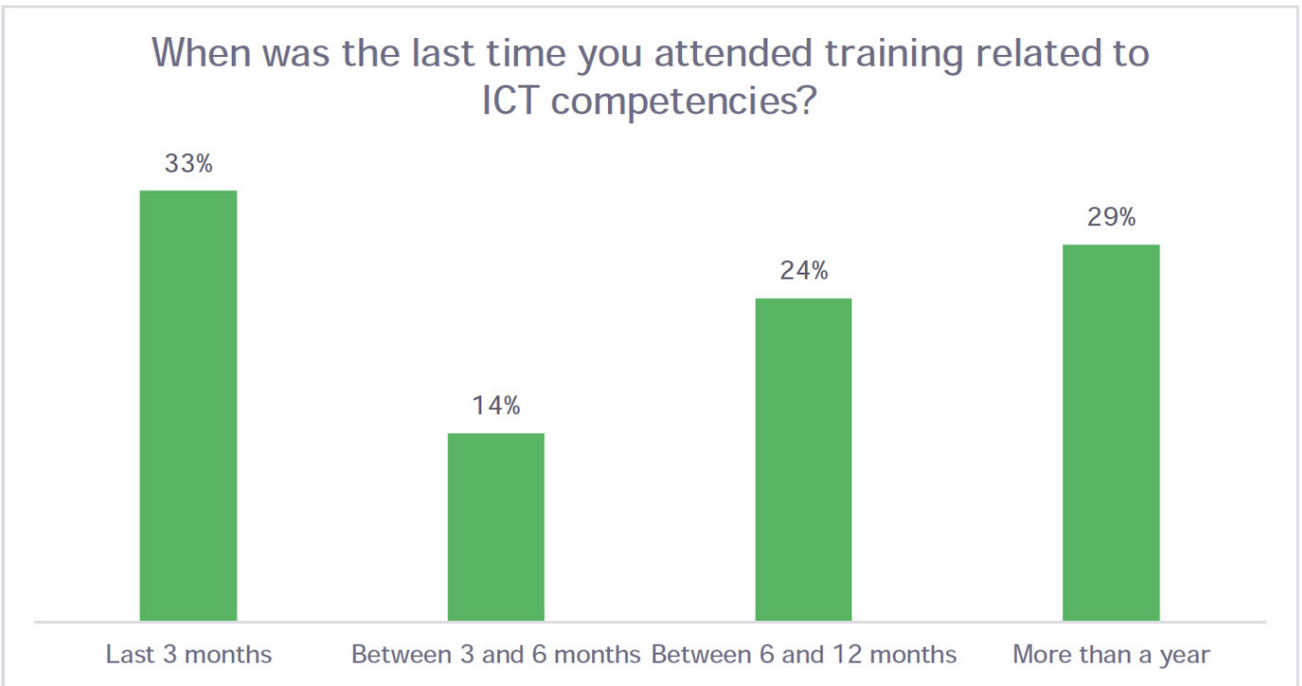


Figure 35 - Last time ICT Practitioners & Professionals attended training related to ICT competencies

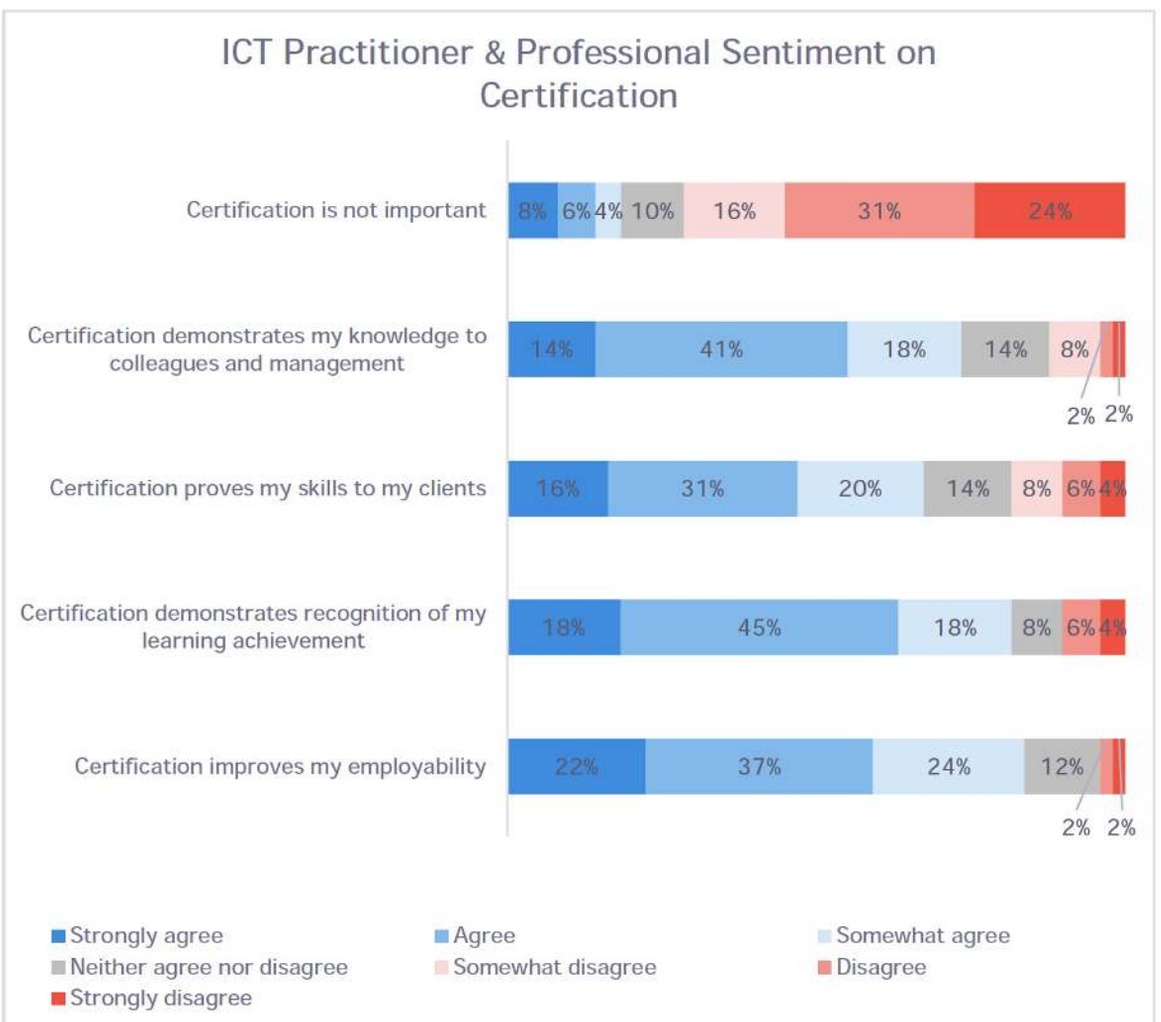


Figure 36 - ICT Practitioner & Professional Sentiment on Certification

Despite these bottlenecks, 49% of individual respondents hold vendor-specific Technology certifications (Cisco, Microsoft, etc.), 31% hold Project Management certifications (such as Prince, PMP, PMI, etc.) and a mere 16% hold Software Development certifications, despite 32% of demand organisations requiring this type of certification.

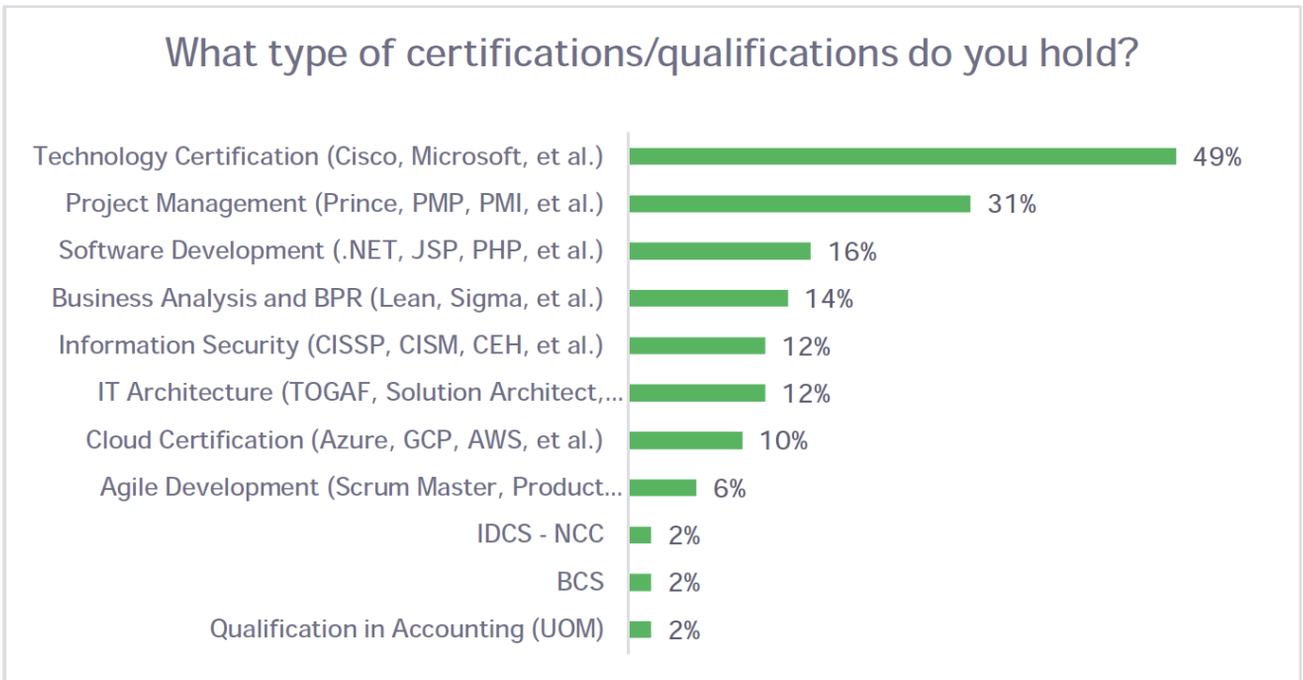


Figure 37 - Certifications & Qualifications held by ICT Practitioners & Professionals

The certification type that most stands out in the results of this survey is, however, Business Analysis and BPR with supply organisations recognising this as the most in-demand certification at the moment, with only 14% of respondents holding such certification and only 9% of these organisations offering relevant training. This does not necessarily align with the responses of demand organisations' requirements, with only 9% requiring this certification, which, given the type of respondents in this survey, may indicate that this may be a requirement for non-ICT roles within these organisations.

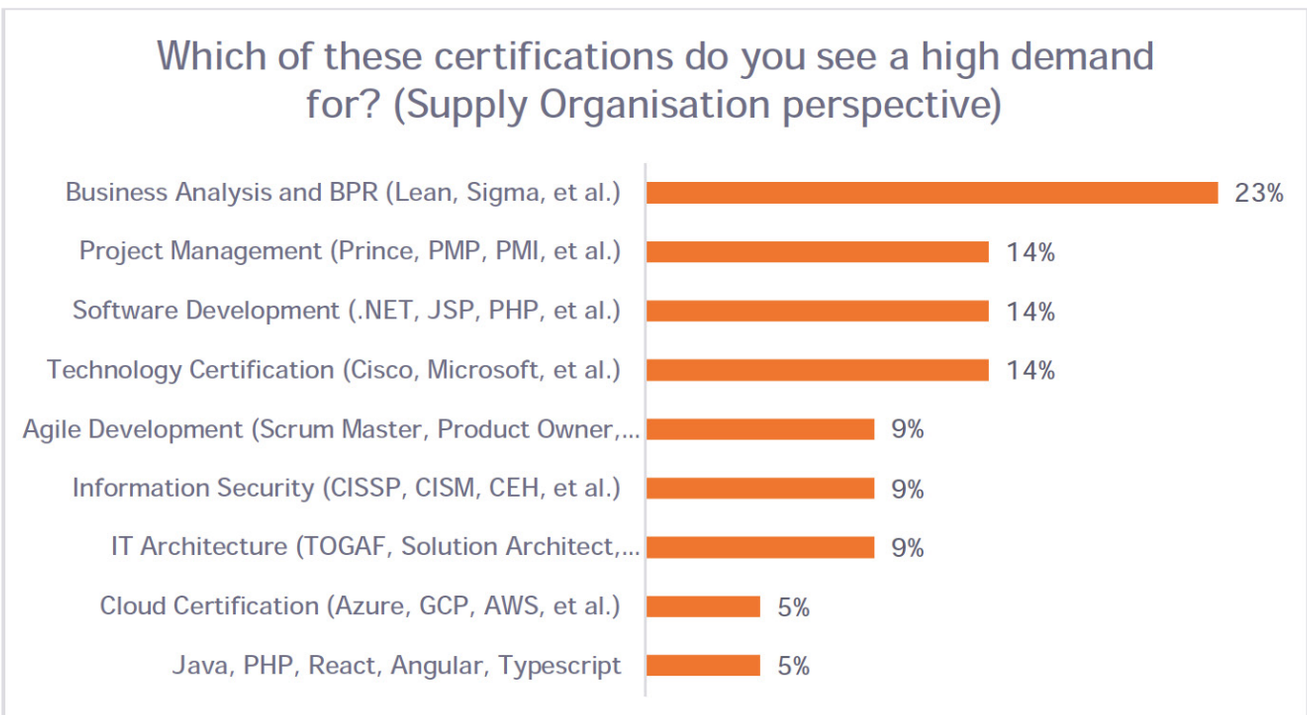


Figure 38 - Certification Demand observed by Supply Organisations

The discrepancies between the demand and supply dimensions of certification and training appear to be, at least partly, a result of a lack of training opportunities offered within demand organisations. While the demand for certification exceeds the number of currently certified professionals, only 45% of demand organisations offer custom training on a case-by-case basis and only 42% offer access to paid online learning resources. Even by aggregating the results and doing a median distribution of the results with some interpretation, a number of between 25% and 40% of demand organisations do not offer sufficient learning opportunities.

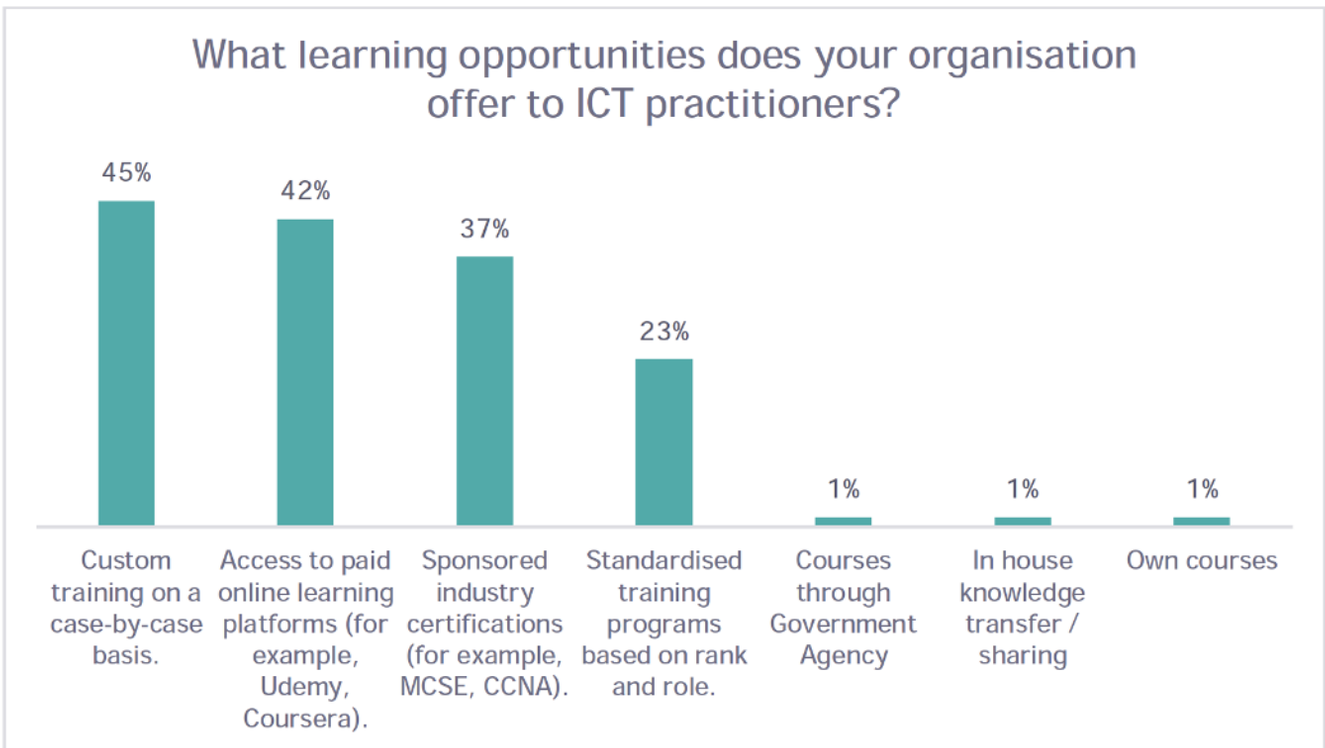


Figure 39 - Learning Opportunities provided to ICT Practitioners by Supply Organisations

This is further supported by the fact that 75% of ICT professional respondents agree that organisations should provide access to training and education for their ICT practitioners, with only 41% of demand organisations being in agreement.

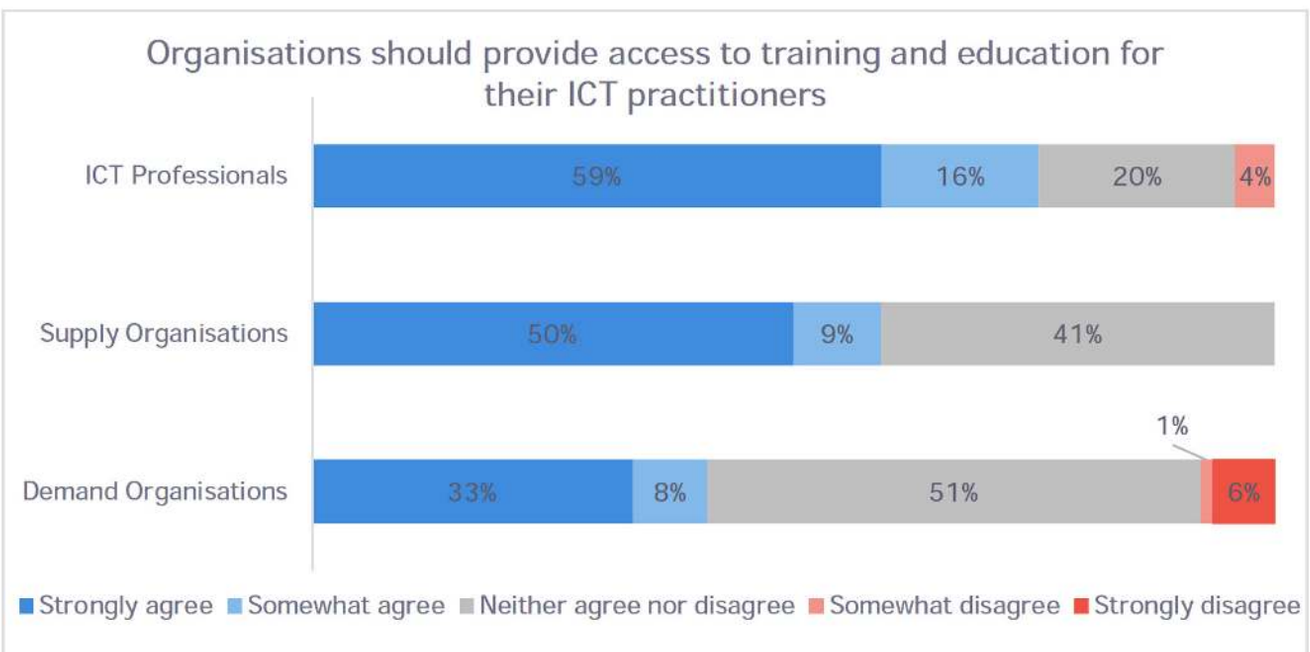


Figure 40 - Statement: Organisations should provide access to training and education for their ICT Practitioners

Soft skills are an essential component of the ICT capability set that enable individuals, teams and organisations to leverage the full range of their potential, with a majority of ICT professionals considering them critical for success according to the Solarwinds IT Trends report[19].

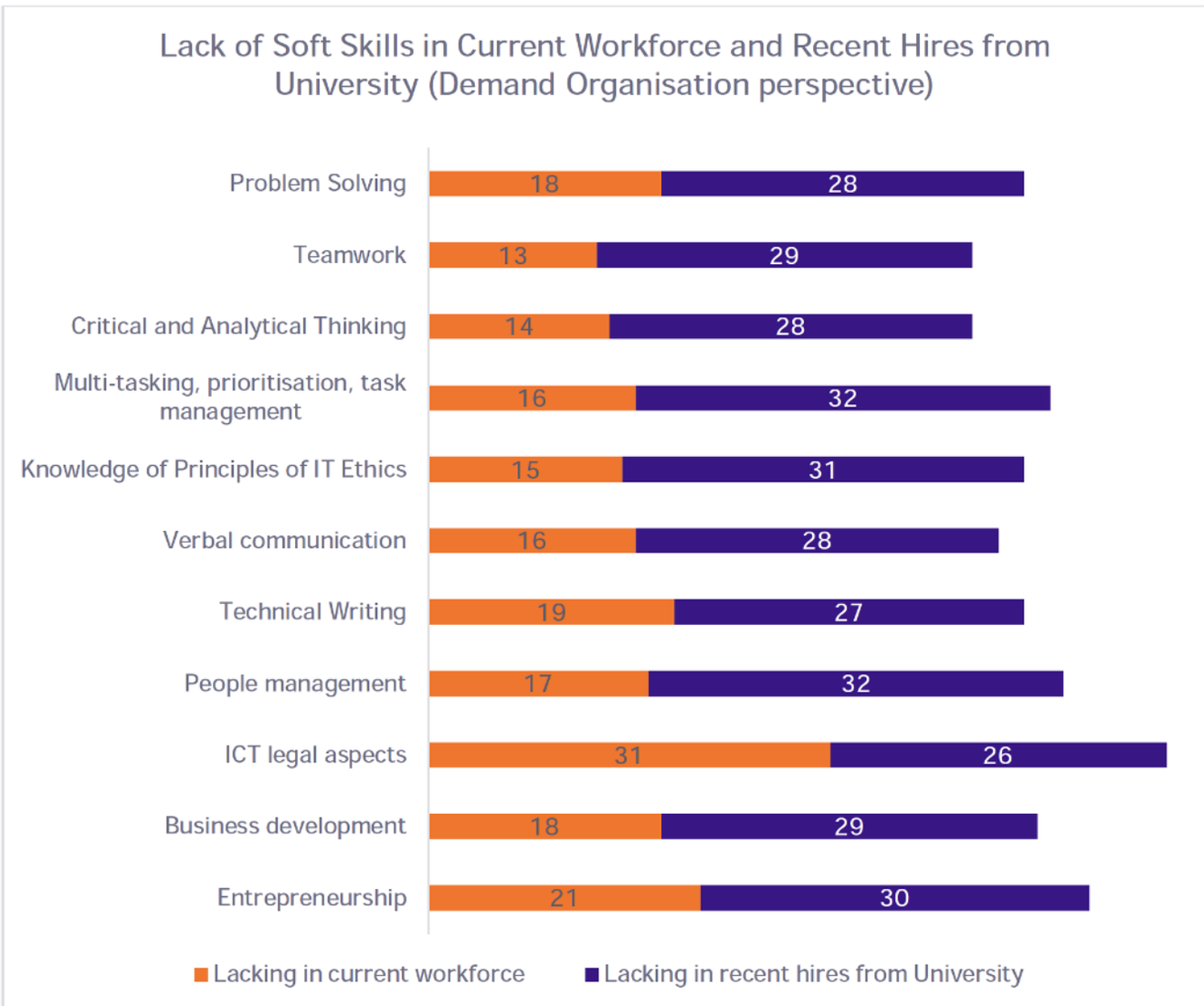


Figure 41 - Lack of Soft Skills in Current Workforce and Recent Hires from University (Demand Organisation perspective) (absolute values

A significant number of demand organisation respondents to our survey consider most ICTrelevant critical soft skills to be lacking in both the current workforce and recent hires from University.

And while these soft skills are intended to be developed as a by-product of technical training methods and offerings, there appears to be a significant lack of specific, soft skill-oriented training offerings on the market, an issue identified at a more international level.

[19] SolarWinds IT Trends Report 2020

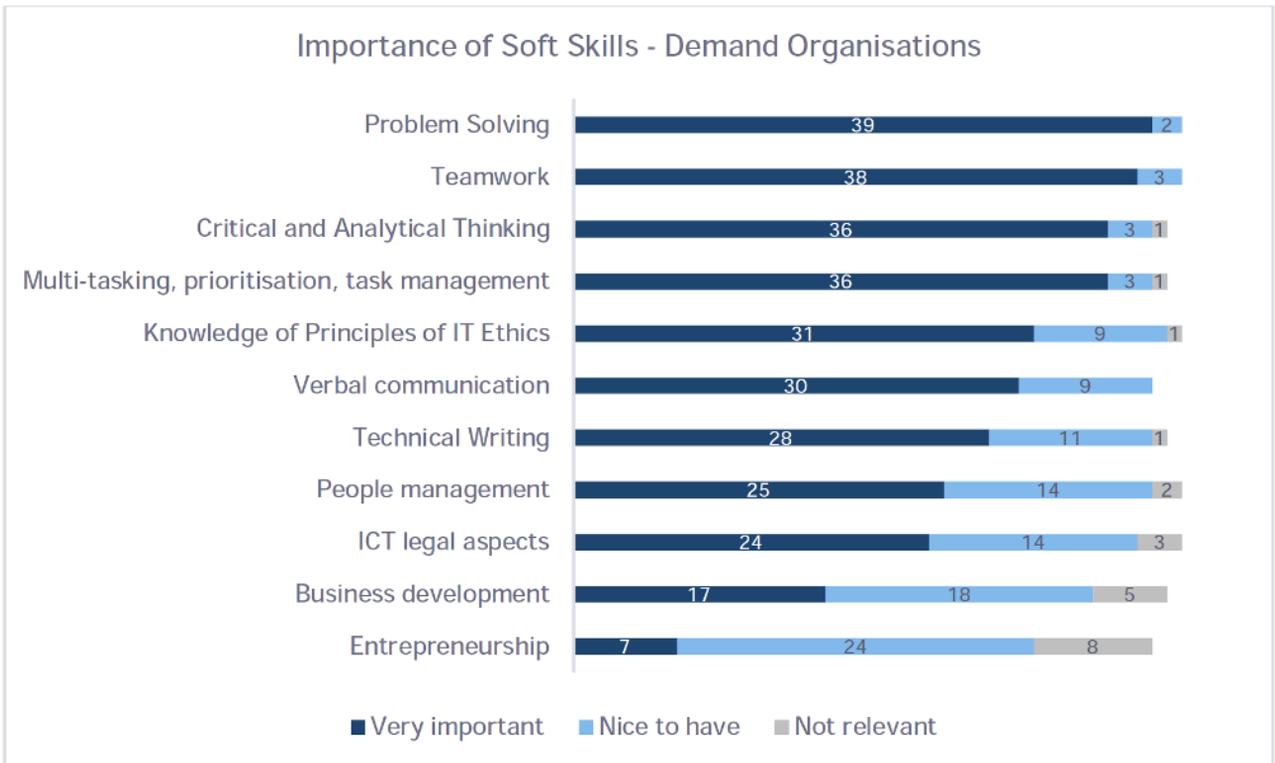


Figure 42 - Importance of Soft Skills (Demand Organisation perspective) (absolute values)

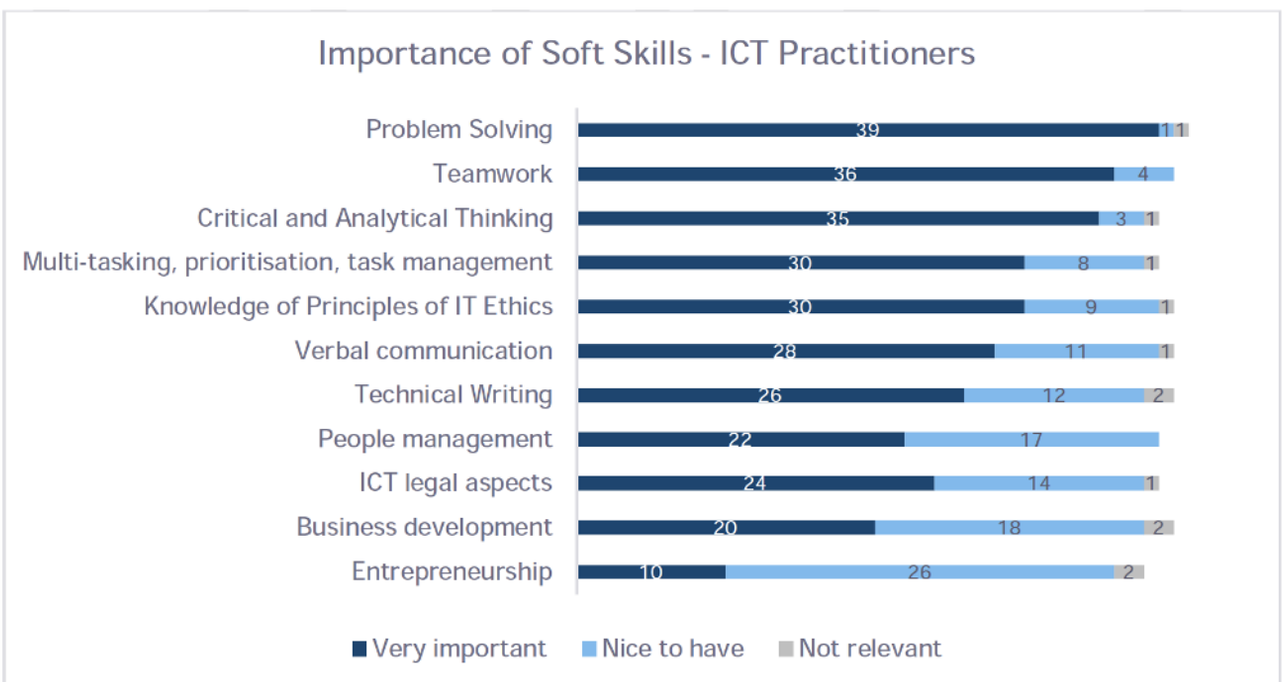


Figure 43 - Importance of Soft Skills (ICT Practitioner & Professional perspective) (absolute values)

Ultimately, there appears to be a large discrepancy between demand and supply in terms of certification training, particularly in the most demanded disciplines, namely Technology Certification, Information Security, Software Development, Project Management and Cloud Certification.

Survey response data also indicates that supply organisations and demand organisations are not in line with each other regarding the necessary certification training offerings required on the market, which suggests that more efficient communication channels need to be established to bridge this gap.

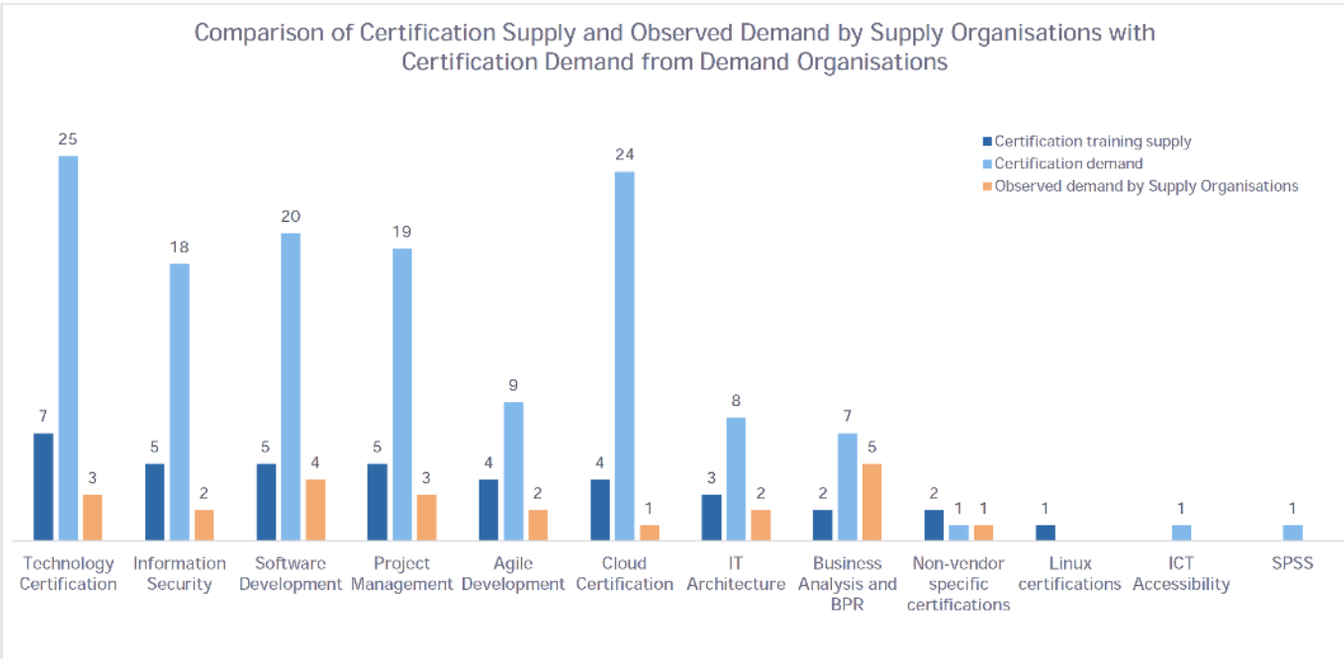


Figure 44 - Comparison of Certification Supply and Observed Demand by Supply Organisations with Certification Demand from Demand Organisations (absolute values)

8.2.4 Technologies

The 2020 Stack Overflow survey[20] identified JavaScript, HTML/CSS, SQL, Python and Java as the 5 most popular programming, scripting and markup languages among developers, jQuery, React.js and Angular as the most popular web frameworks, Node.js, .NET, and .NET Core as most popular among other frameworks and MySQL, PostgreSQL and Microsoft SQL Server as the most popular database technologies.

These results are in line with this survey's results for the most in demand technologies, with the sole exception of Python, which ranked joint 5th, on par with Bash/Shell and C++.

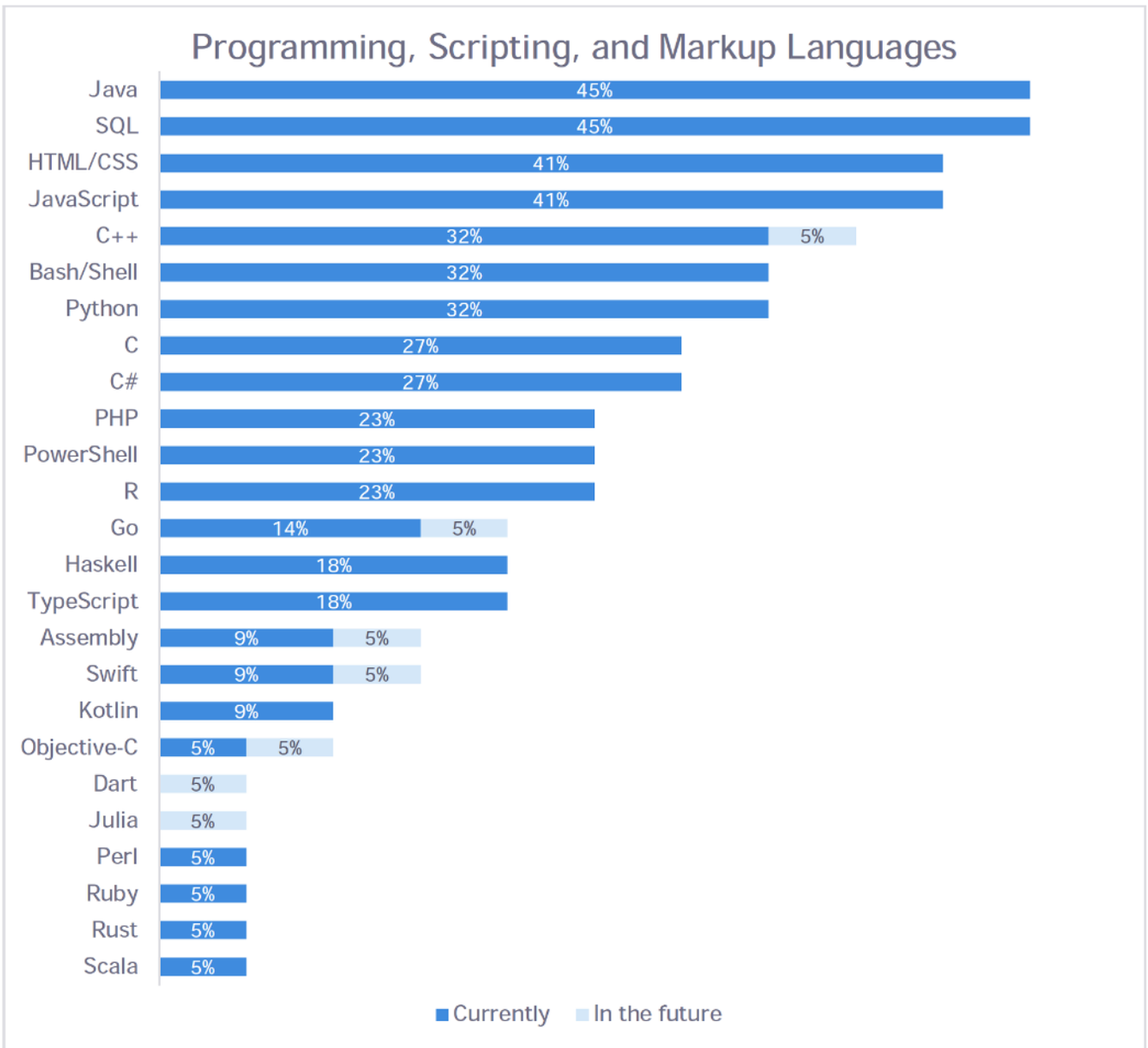


Figure 45 - Adoption of Programming, Scripting, and Markup Languages among Demand Organisations

Python has become the go-to programming language for data-driven development and ML/AI (Machine Learning / Artificial Intelligence) applications, this may indicate a different focus or delayed adoption by the local ICT market.

[20] https://insights.stackoverflow.com/survey/2020

In terms of Web Frameworks, ASP.NET Core appears to be the dominating technology on the Maltese ICT market, with a comfortable lead on Angular, Angular.js, jQuery and React.js, further strengthening the popularity of Microsoft Technologies in Malta.

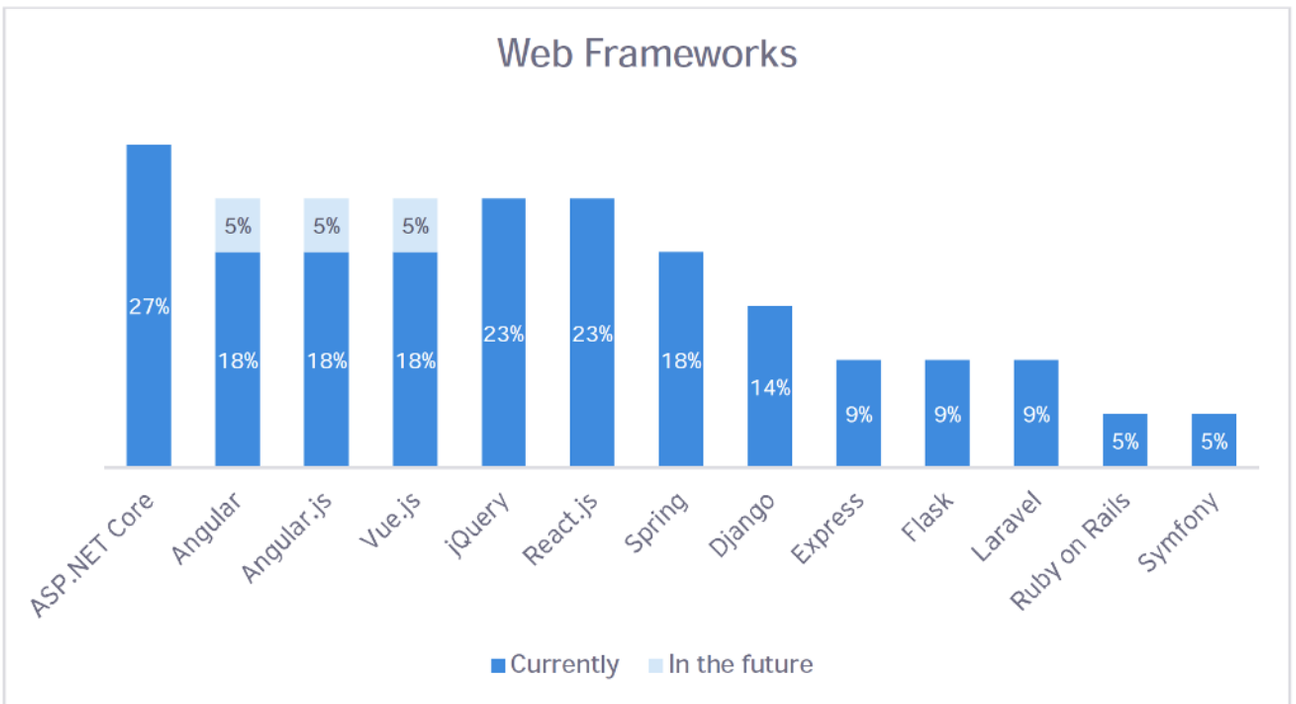


Figure 46 - Adoption of Web Frameworks among Demand Organisations

This is further reinforced by .NET and .NET Core prevailing in the "Other Frameworks, Libraries & Tools" category, closely followed by Apache Hadoop, TensorFlow, Apache Spark, Keras and Node.JS. Somewhat surprisingly, despite Python fairing modestly in popularity, Python-centred frameworks and libraries are predominant in this category.

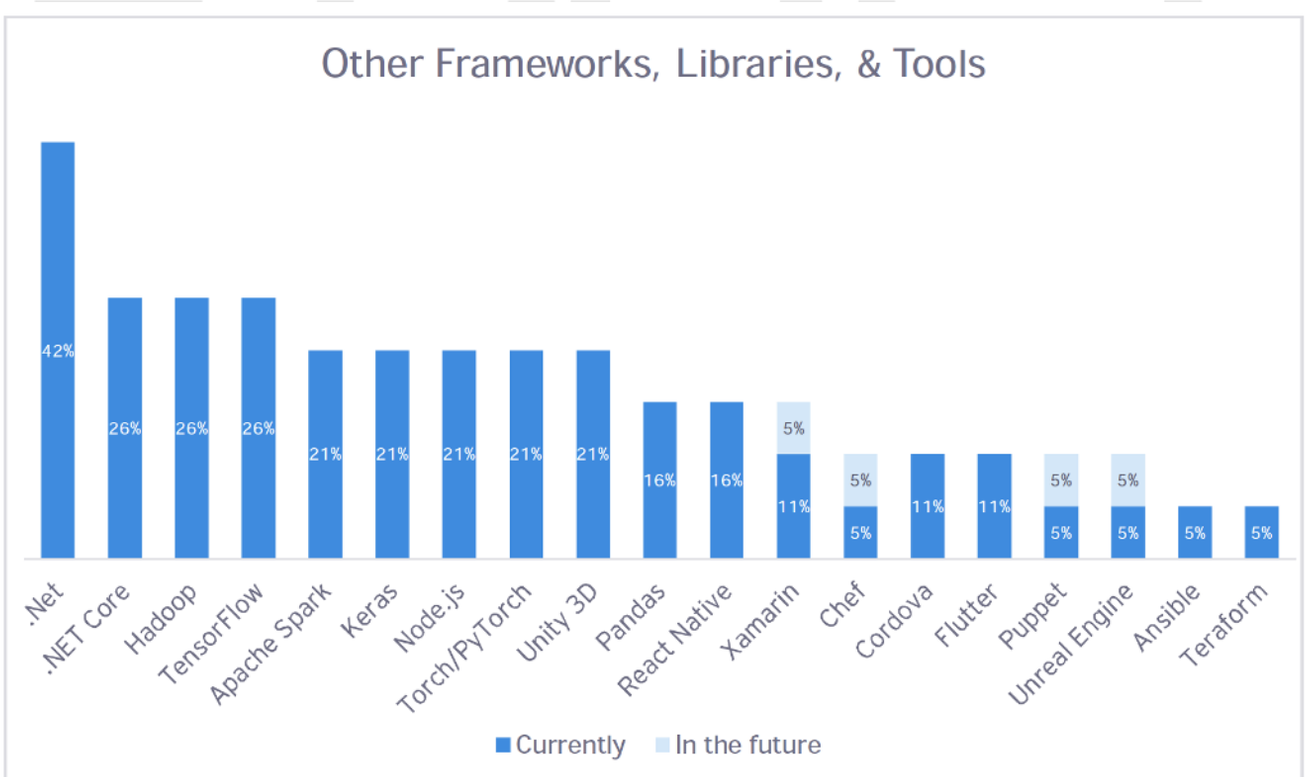


Figure 47 - Adoption of Other Frameworks, Libraries, & Tools among Demand Organisations

Microsoft SQL Server and MySQL are the most popular Database Technologies, with the former having a projected 5% increase in demand in the future. The largest projected increase in demand is estimated to for Redis with 11%, which reflects the overall trends in the international market.

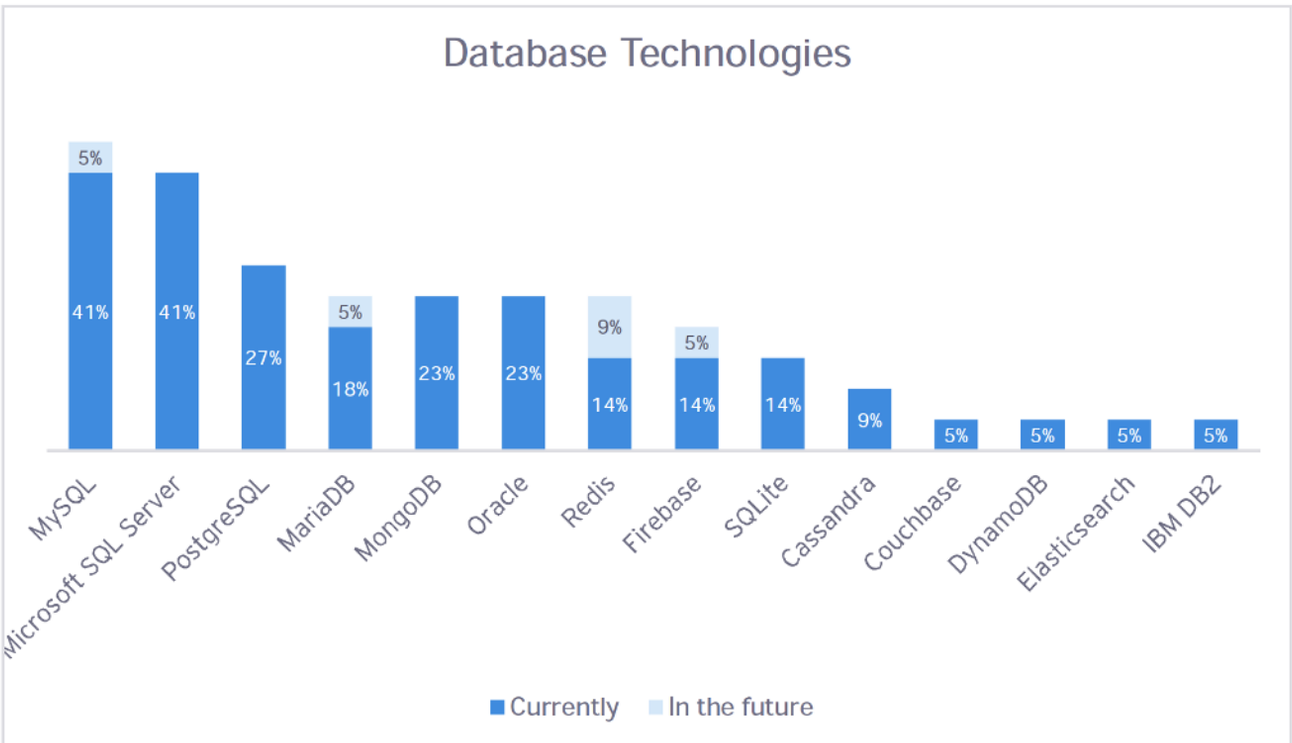


Figure 48 - Adoption of Database Technologies among Demand Organisations

With Microsoft Azure dominating the Maltese Cloud Market, Google Cloud appears to be more and more in demand, with AWS maintaining a healthy market share and Oracle Cloud struggling to compete.

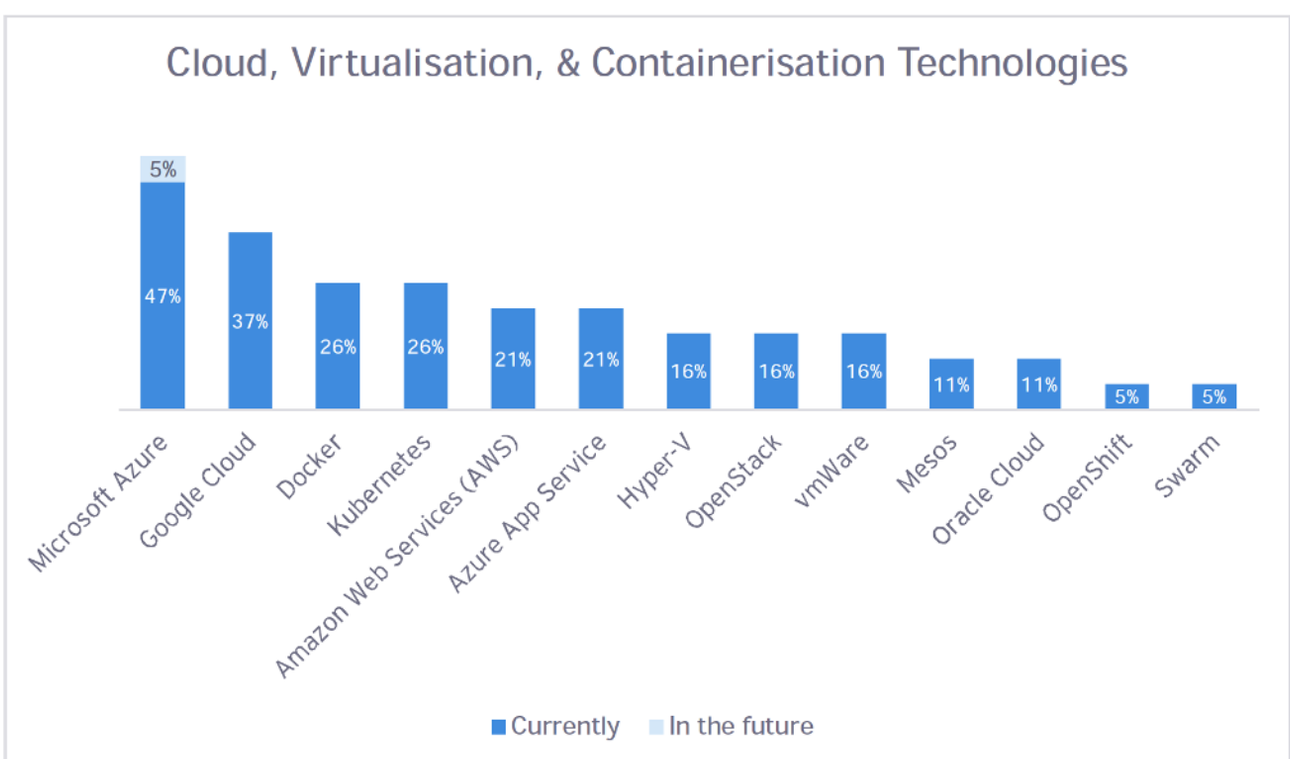


Figure 49 - Adoption of Cloud, Virtualisation, & Containerisation Technologies among Demand Organisations

Finally, Google and Microsoft are, as expected the most in demand collaboration platforms in Malta. As this survey has been created at the very beginning of the pandemic situation, Zoom, Cisco WebEx, GoToMeeting and other collaboration platforms that have become popular over the course of the pandemic have not been part of this survey.

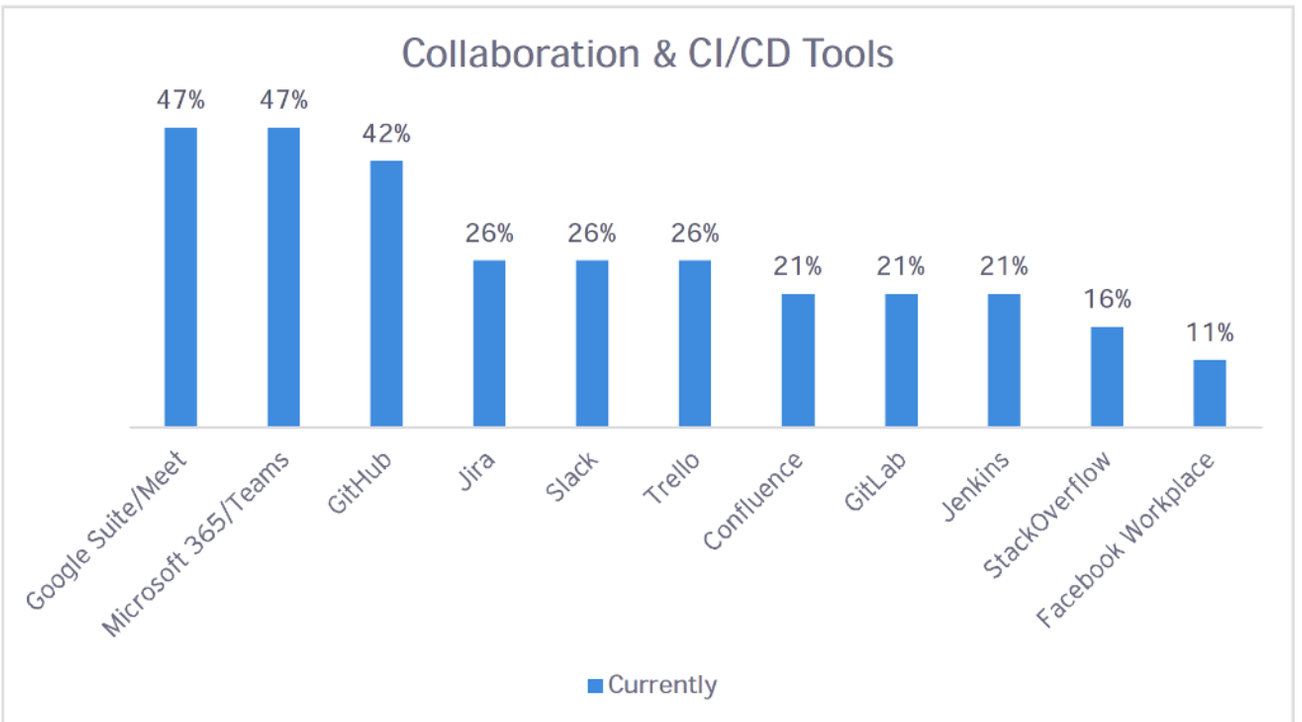


Figure 50 - Adoption of Collaboration & CI/CD Tools among Demand Organisations

The above illustrated results are partially out of sync with global trends. While Microsoft Azure has seen significant growth in popularity among skills according to Udemy's "Workplace Learning Trends" report21, so has Artificial Intelligence and its tangent technology stacks and applications, a fact that is not reflected in our results. Given the results of the "Emerging Technology" section of this report (see page 58), we may ascertain that it is merely a delay in adoption, potentially caused by a lack of proper training and certification resources.

[21] 2020_Workplace_Learning_Trends_Report.pdf (udemy.com)

8.2.5 Professional bodies

The number of professional bodies for ICT professionals has steadily been growing over the past decades with a large variety of organisations at local, state and national levels worldwide helping their members establish legitimacy and offering a large number of perks and resources, such as networking, grants, career opportunities, advocacy and training.

The majority of ICT professionals and supply organisations that responded to our survey agree that both ICT practitioners and organisations benefit from the latter belonging to professional bodies, with the majority of demand organisations not having a definitive opinion either way, slightly leaning toward agreement.

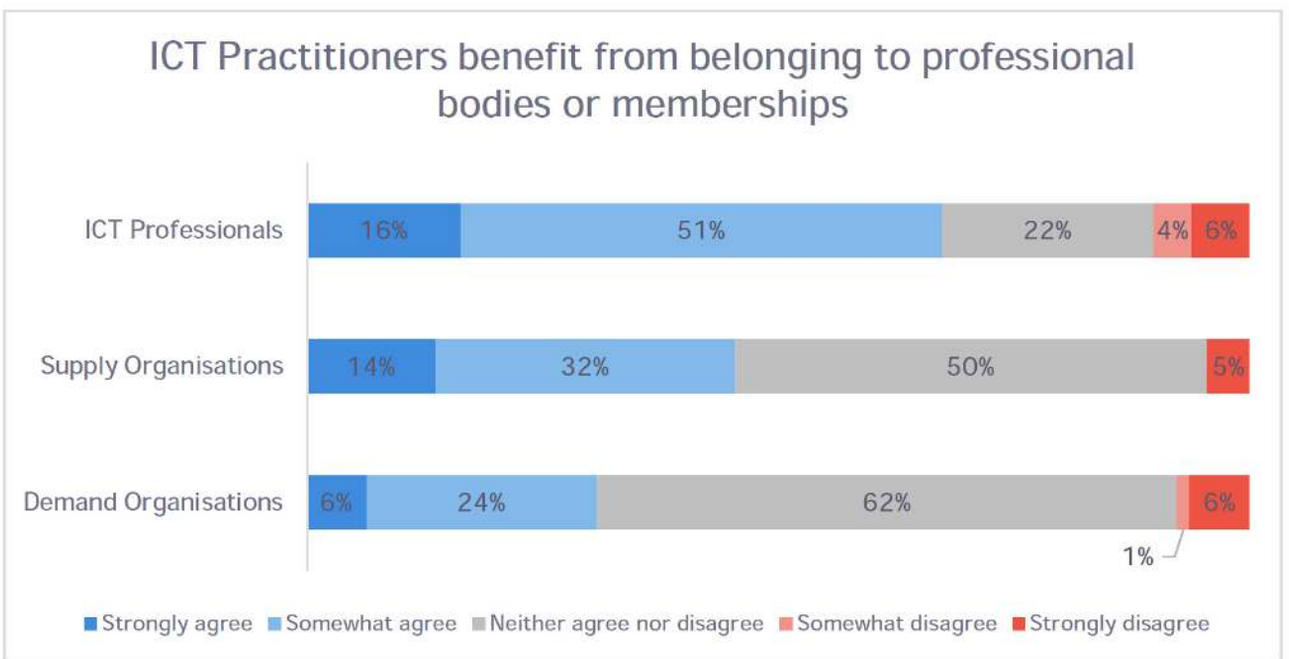


Figure 51 - Benefits of Professional Body Memberships to ICT Practitioners

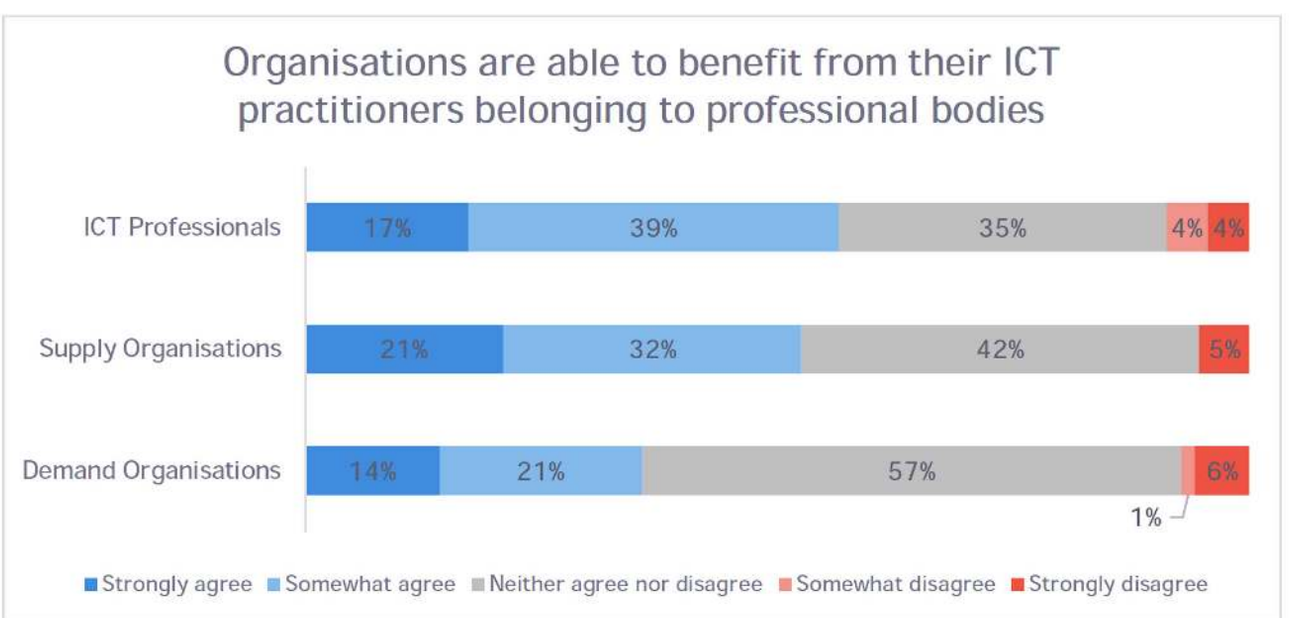


Figure 52 - Benefits of Professional Body Memberships to Organisations

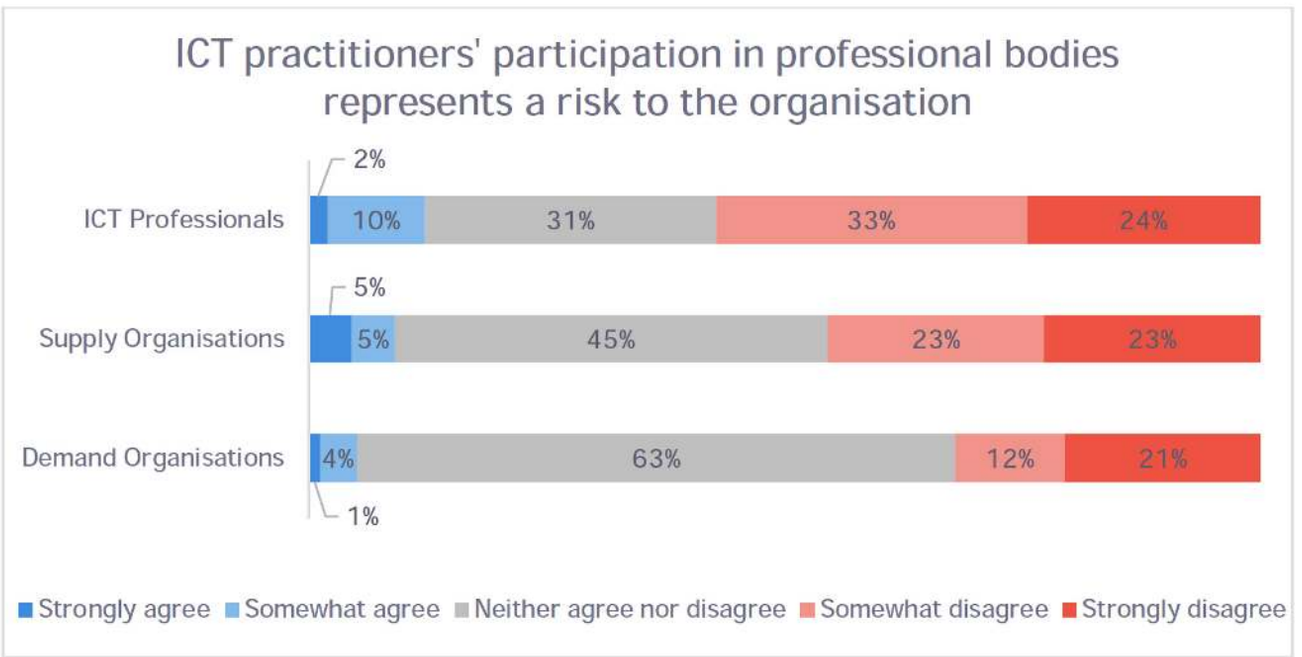


Figure 53 - Organisational Risk presented by Practitioner Membership in Professional Bodies

And yet, despite a majority of respondents favouring membership to professional bodies, 53% of respondents do not belong to any such organisation.

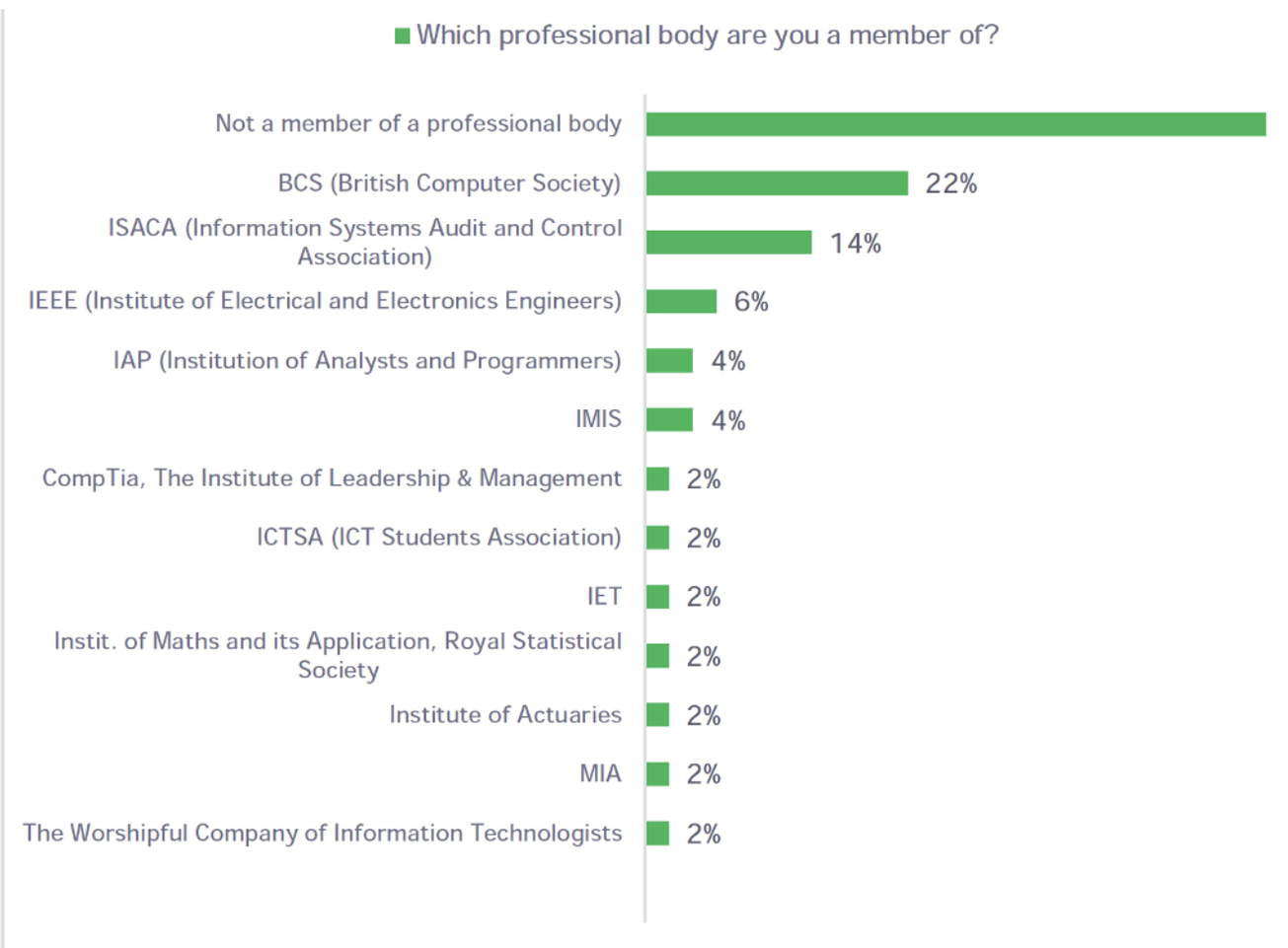


Figure 54 - ICT Practitioner Membership in Professional Bodies

8.2.6 National recognition

The proposition that ICT professionals be nationally recognised by way of a professional warrant, similar to architects or electrical engineers, has been a long-debated topic among professionals in the industry and also across Government[22]. In 2004 it was proposed to recognise ICT Professionals under the Engineering Profession Act[23]. To date this did not come to fruition. Based on the responses to this survey, we may ascertain that both ICT professionals and organisations agree that this would positively impact the future of the local ICT market.

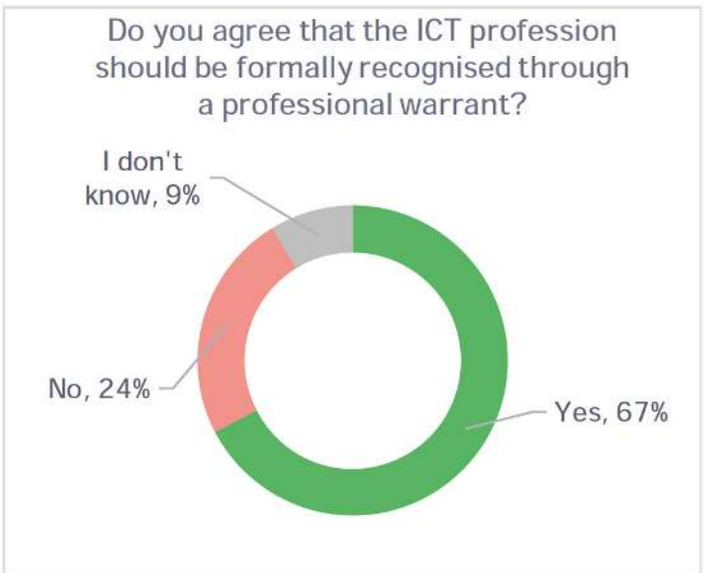


Figure 55 - Agreement towards formal recognition of the ICT Profession through a professional warrant

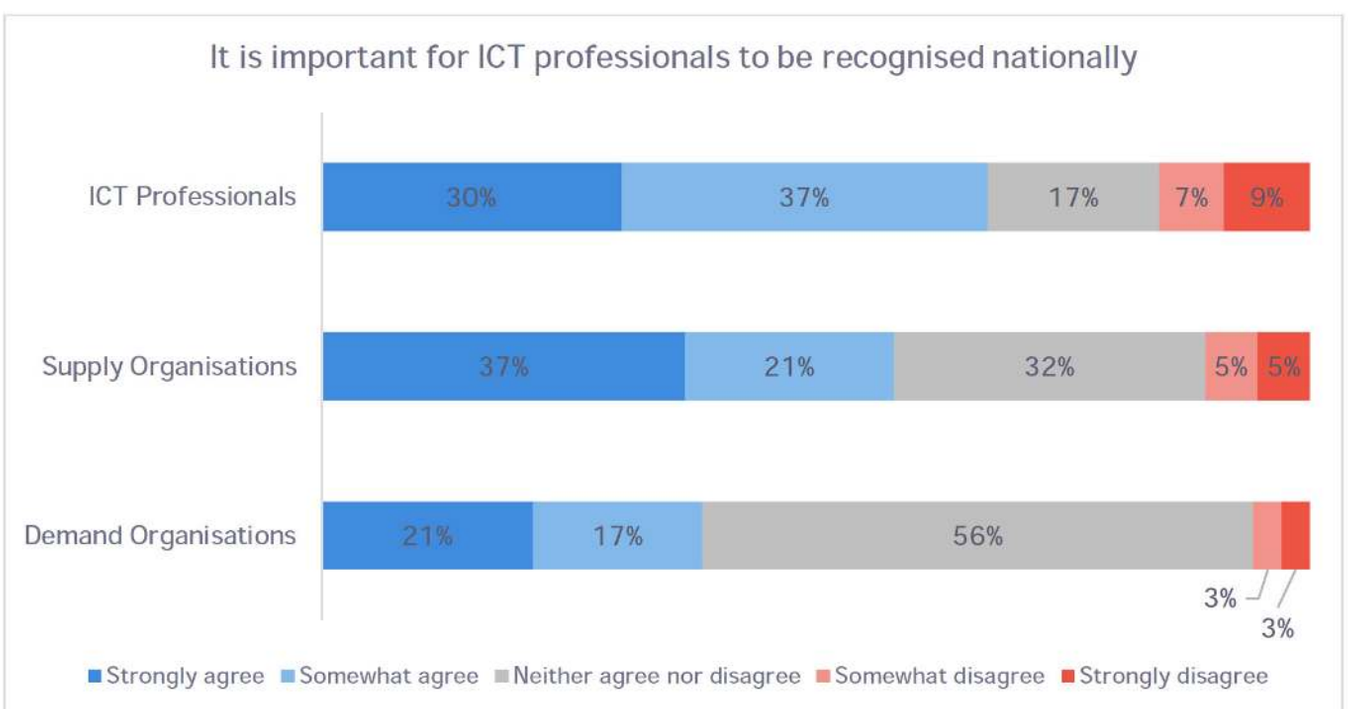


Figure 56 - Importance of National Recognition for ICT Professionals

The main drivers are the impact of technology to all aspects of society, commerce, industry and the economy and the adherence to a code of ethics for ICT professionals, both matters that have been intensely debated worldwide as the ICT market has seen exponential growth in the past decade.

[22] IT and the engineering warrant (timesofmalta.com)
[23] ENGINEERING PROFESSION ACT (gov.mt)

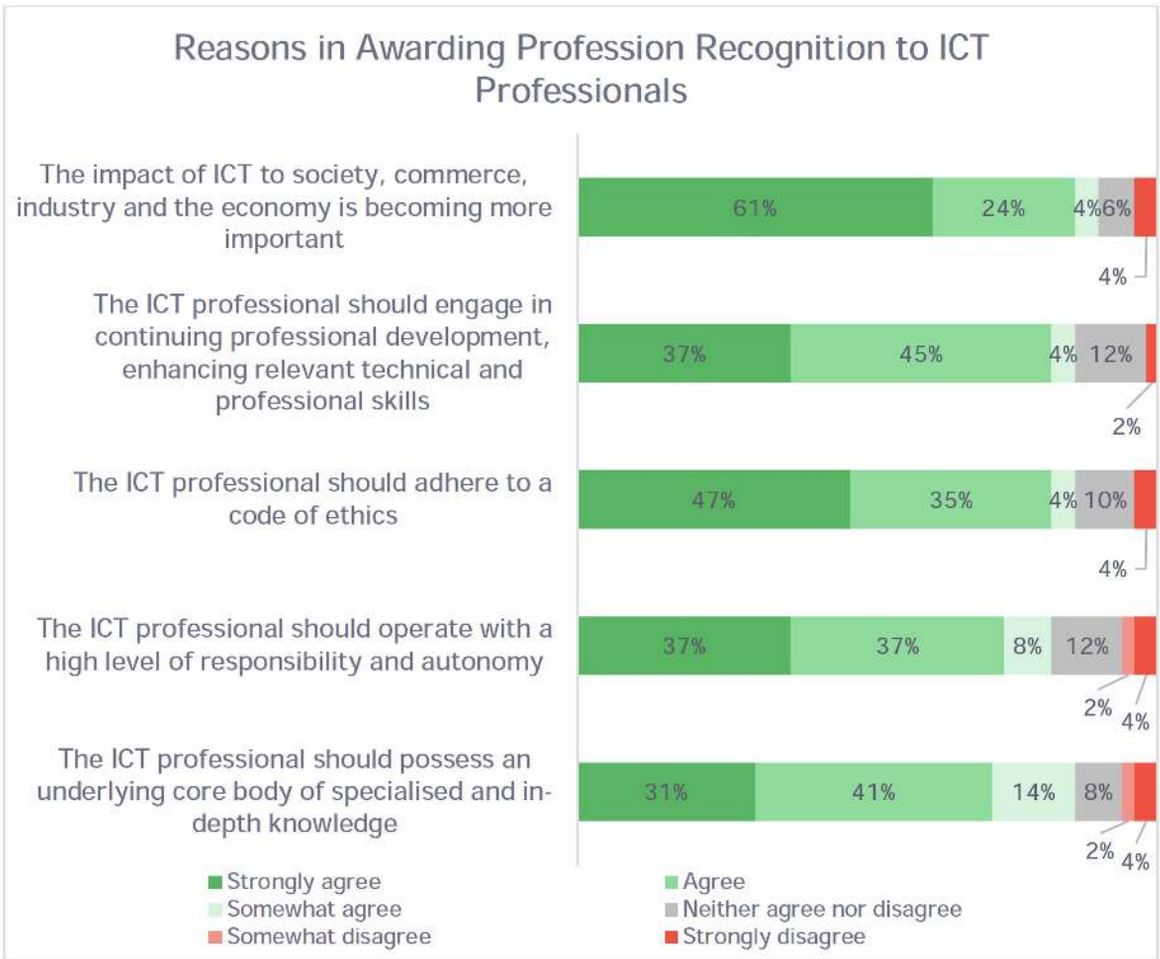


Figure 57 - Reasons in Awarding Profession Recognition to ICT Professionals

Figure 58 - Benefits in Issuing a Formal Profession Recognition

While the majority of respondents to our survey agree on the benefits of granting such a warrant to ICT professionals, the majority are also concerned with the costs required to obtain and maintain such a certification.

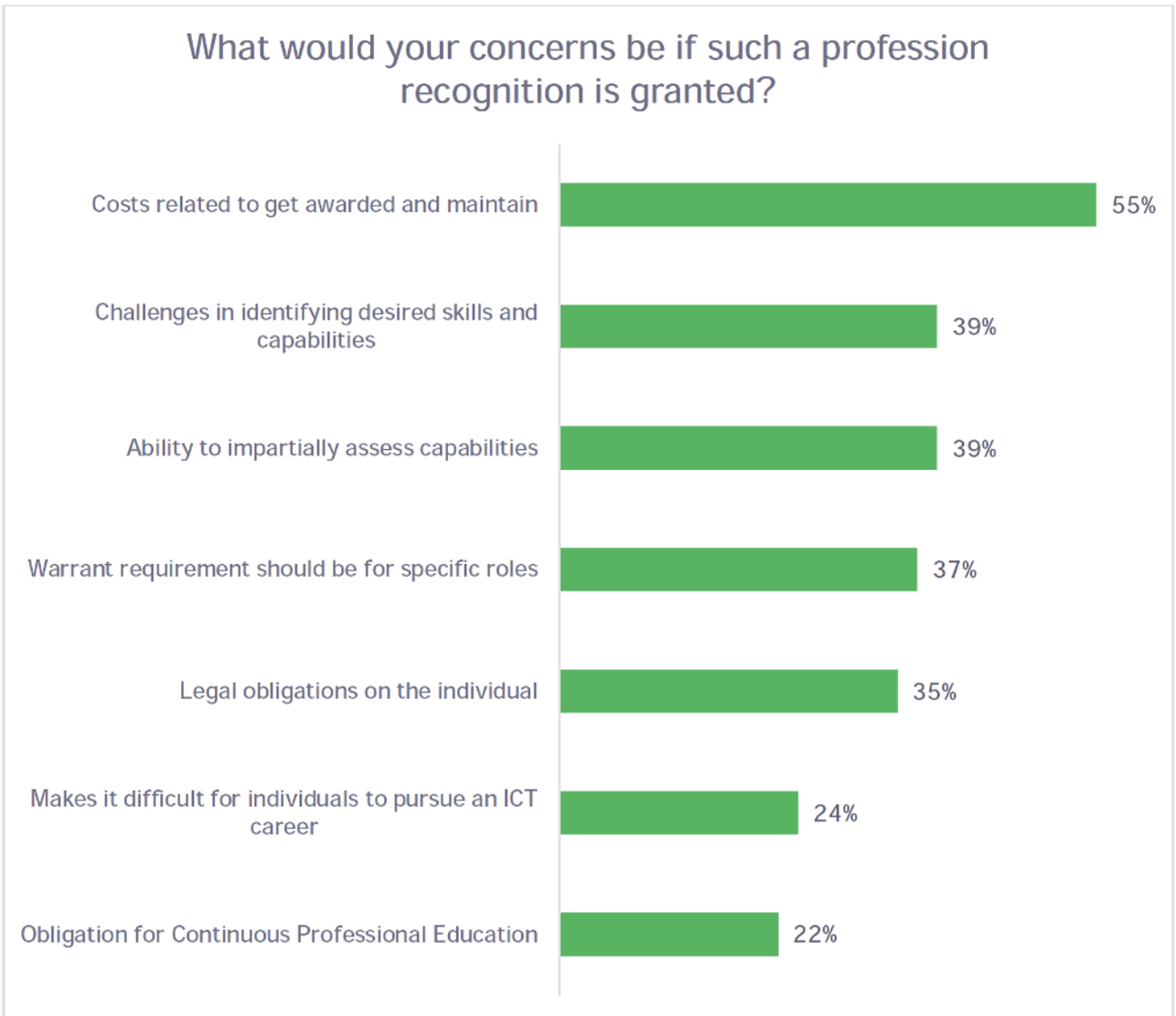
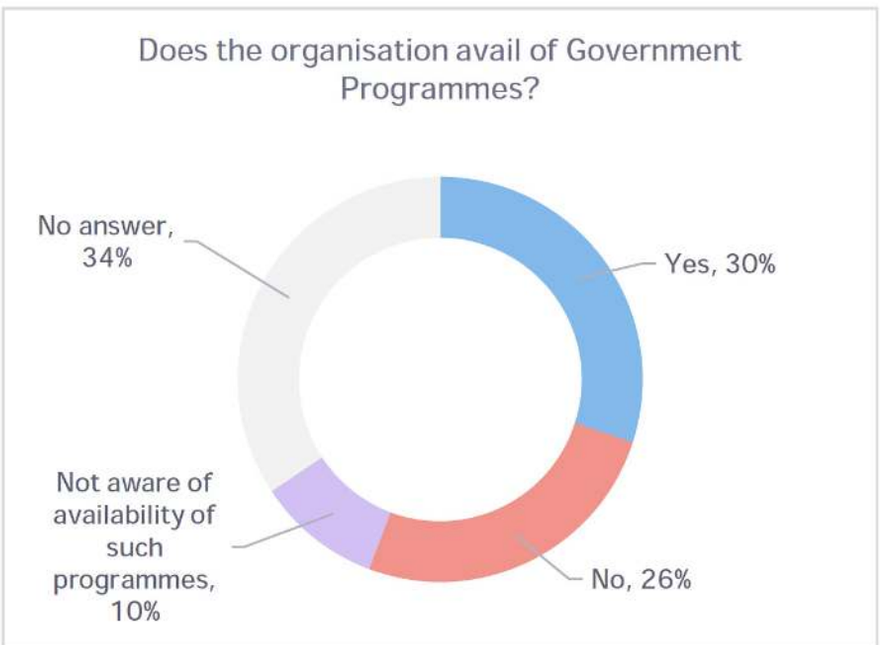


Figure 59 - Concerns in Issuing a Formal Profession Recognition

8.2.7 Government Programmes

The Maltese Government has a number of initiatives in place to support business, ICT organisations, professionals and students. The eSkills Malta Foundation's large number of initiatives[24], Student Placement Programme[25] and the Digital Malta strategy initiatives[26] are some examples in this regard.



And yet, despite the large number of initiatives, only 30% of our respondents report availing of these Government Programmes, with 33% of organisations supporting the introduction of a "dualeducation apprenticeshipstyle" programme and 24% already having an ICT internship programme.

Figure 60 - Use of Government Programmes among Demand Organisations

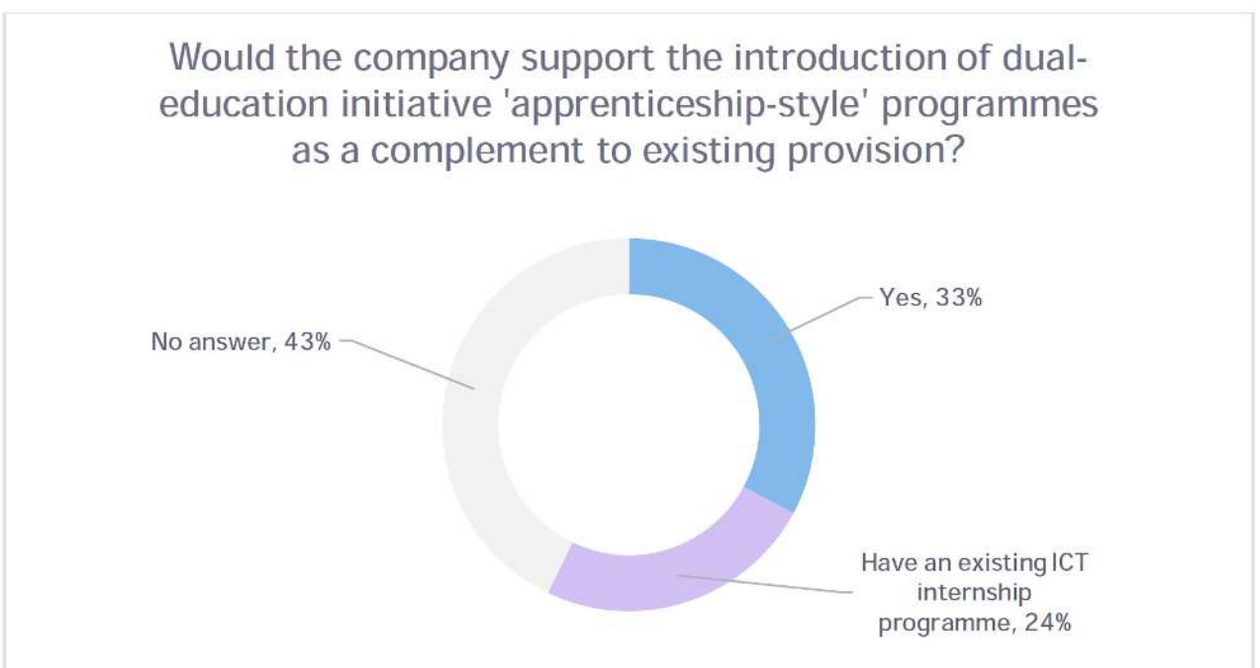


Figure 61 - Support of Dual-Education Initiatives

[24] Initiatives Register (eskills.org.mt)
[25] Student Placement Programme - MITA (gov.mt)
[26] Digital Malta Programme of Initiatives 2016

Training programmes and internship programmes represent the most requested Government initiatives despite a number of such initiatives being already in place, potentially indicating a re-assessment of the current initiatives to address more specific needs that still need to be identified.

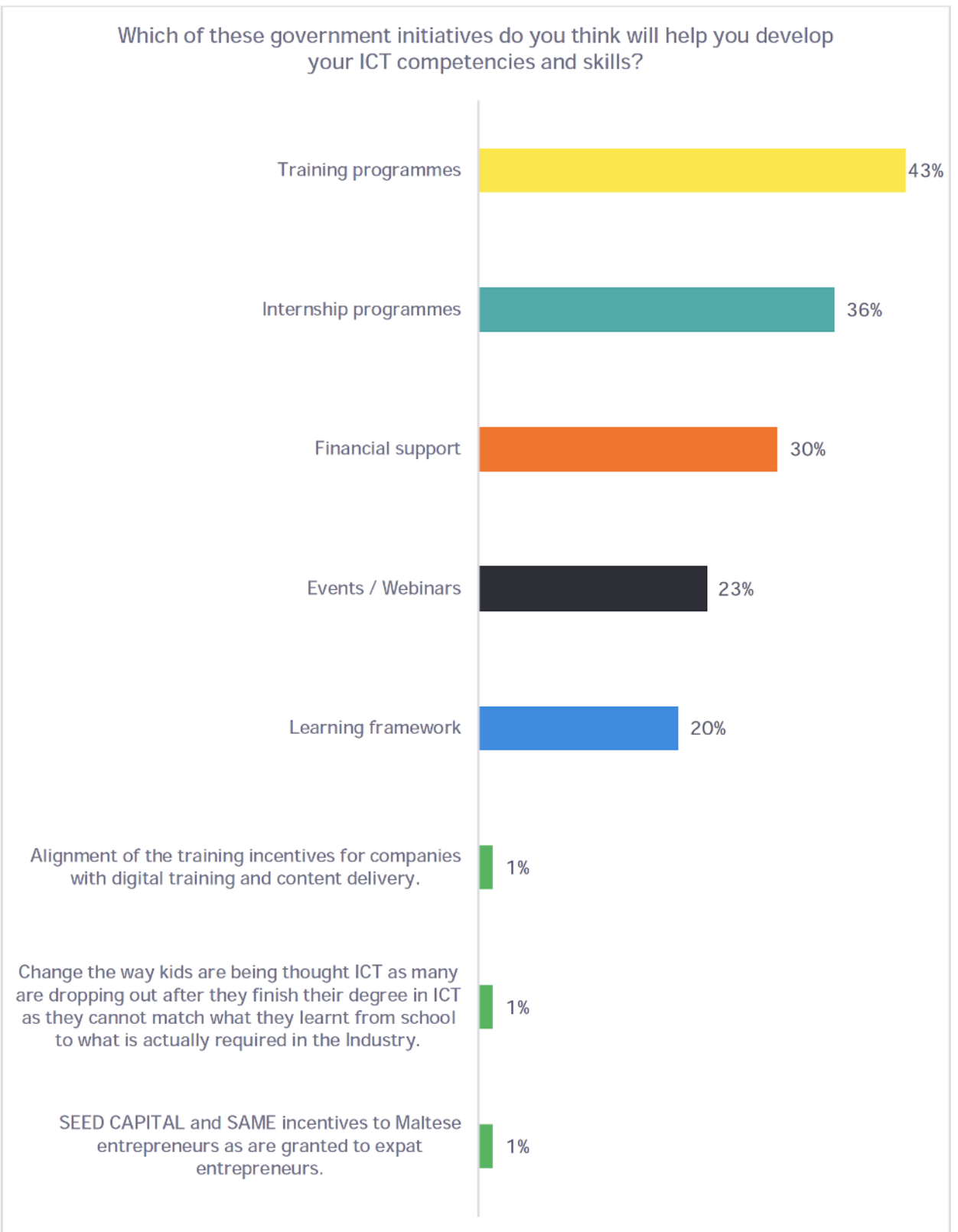


Figure 62 - Government Initiatives that provide support in developing ICT competencies and skills

8.2.8 ICT Student Perspective

The future of Malta's ICT sector and business digitalisation efforts are highly dependent on the development of future ICT practitioners. This development is ongoing, and while the educational component is reinforced by a strong education system, the professional onboarding and development phases are just as critical to the development of a strong, capable ICT workforce.

When asked about which aspects students would prioritise when pursuing employment postgraduation, their main priorities hovered around work-life balance, long-term career development, and learning and training opportunities.

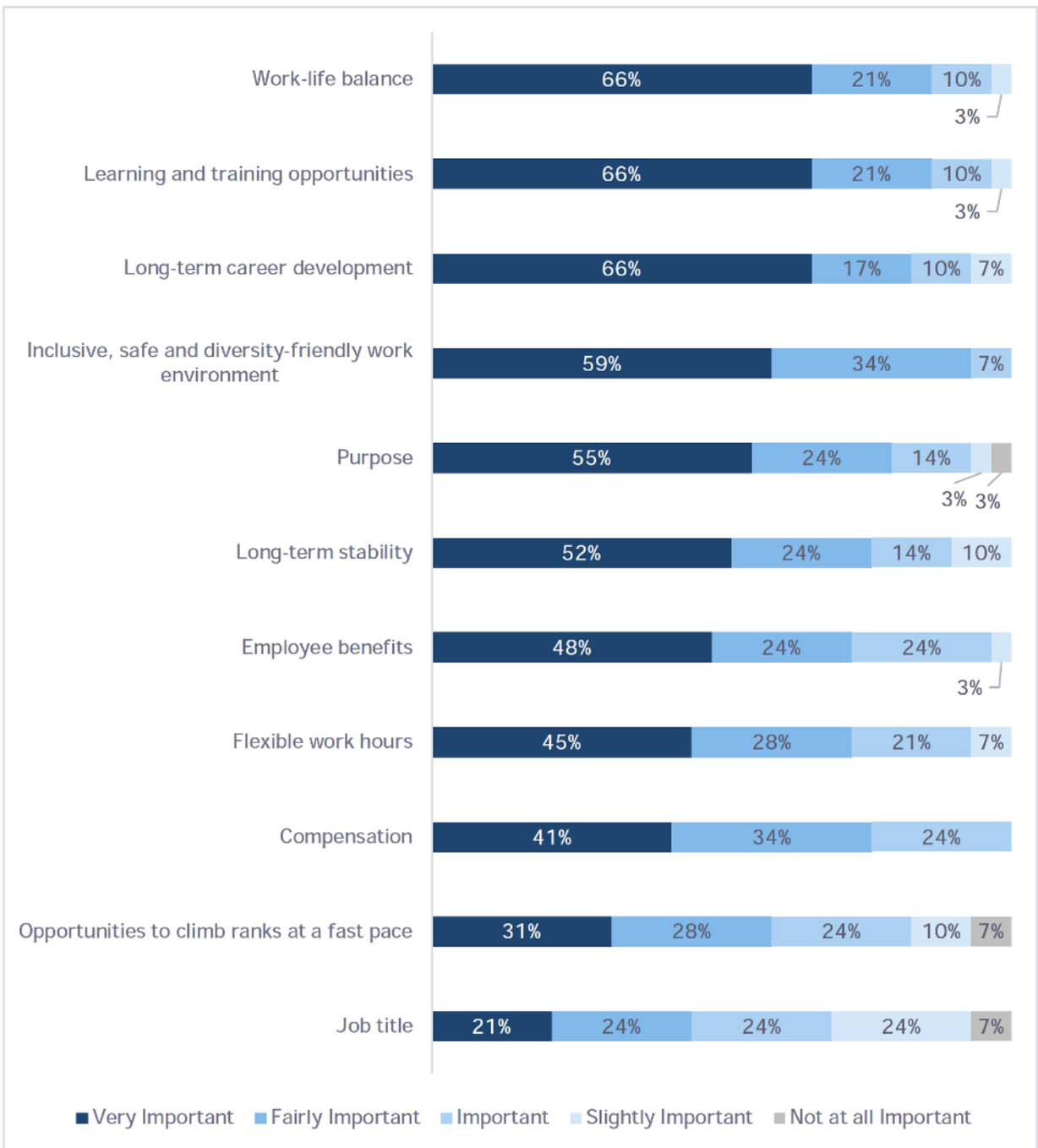


Figure 63 - Student priorities when pursuing employment

While work life balance and learning and training opportunities may be subjective to each individual branch of the sector or individual employers, the latter has been highlighted by the results of this survey to be lacking within demand organisations, coupled with a lack of interest on their side to provide further learning and training opportunities in the future (see page 38).

One reassuring aspect is that students prioritise pursuing roles that are highly in demand postgraduation, with Development, Cyber Security and Business and Data Science roles being among the favourites.

The largest interest in pursuing additional certification postgraduation is expressed in these same areas, promising that at least a portion of the demand will be met by emerging professionals.

Figure 64 - Prioritisation of pursuit of roles after graduation

Figure 65 - Prioritisation of pursuit of certifications after graduation (absolute values)

8.2.9 Diversity and work environment

The 2020 "Women in Tech" study[27] conducted by the European Commission gave Malta a 51/100 score based on three dimensions: 1. Use of internet (33.3%), 2. Internet users skills (33.3%), 3. Specialist skills and employment (33.3%).

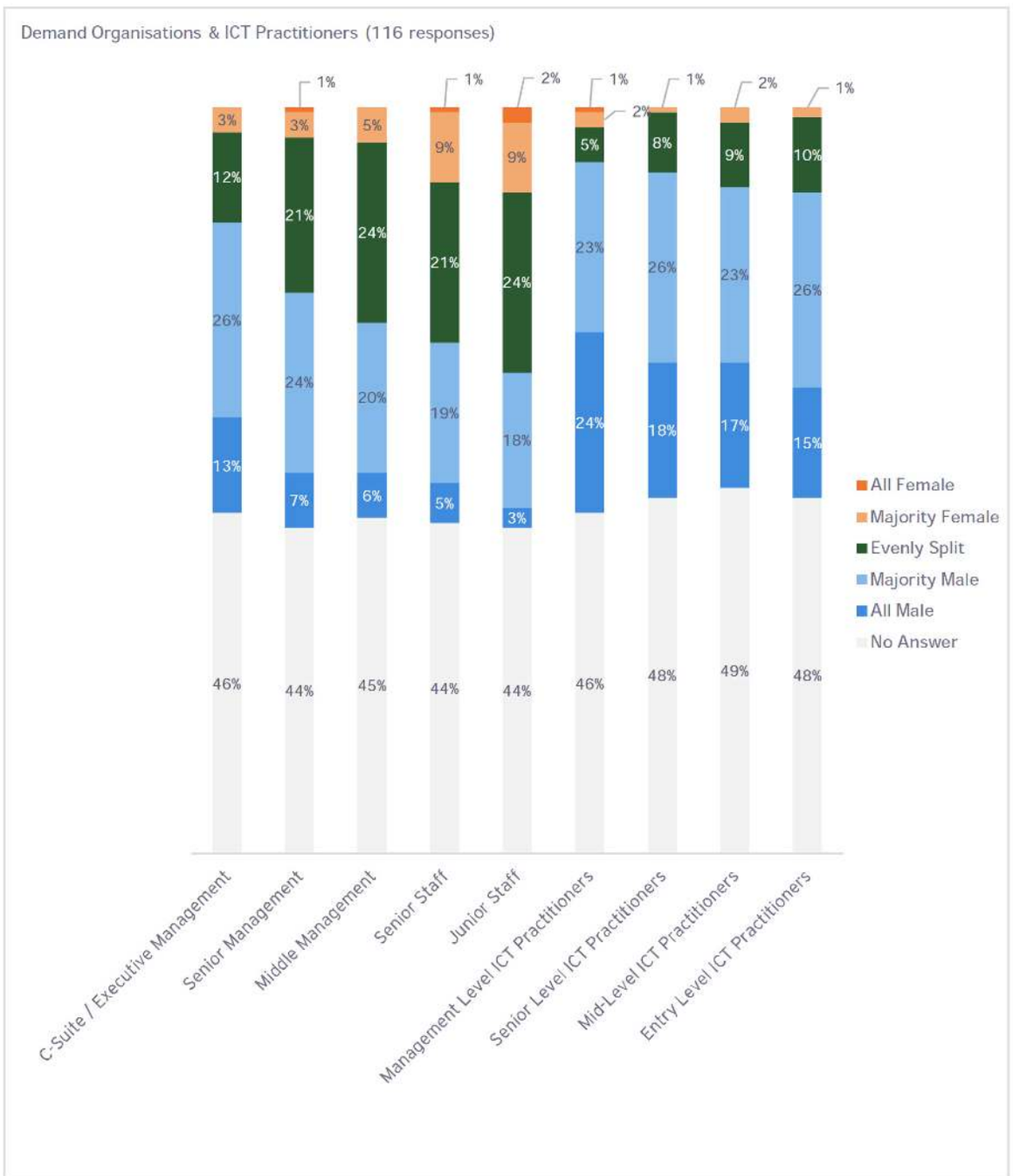


Figure 66 - Diversity among Demand & Practitioner Organisations

[27] Women in Digital Scoreboard 2020 | Shaping Europe's digital future (europa.eu)

The results of our survey show general roles in organisations more evenly split between male and female professionals, while the ICT dimension is dominated by male practitioners.

With the overwhelming majority of ICT student respondents to this survey being of male gender, it may be ascertained that a shift in this regard may not happen in the near future and that further action may be needed to ensure a more diverse ICT work environment in the future. This issue has been further analysed in the TrustRadius "Women in Tech" report[28], which indicates that the COVID-19 pandemic has contributed significantly to an increasing lack of diversity in the ICT sector.

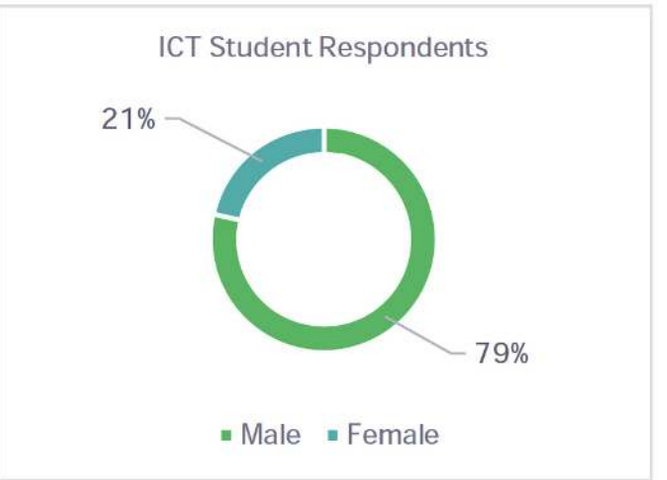


Figure 67 - Student Survey Gender

Figure 68 - Diversity Statements

[28] 2021 Women in Tech Report - Research and Statistics from TrustRadius

Diverse workforces bring diverse viewpoints and perspectives to organisations, elements which enable organisations to both operate more efficiently and provide services and products that cater to a wider variety of customers. And while the results of our survey indicate a positive trend in how organisations handle inclusivity and diversity, they also indicate a large need for improvement with an average of 42% of respondents not conclusively agreeing with statements regarding the positive actions of organisations to ensure an inclusive, supportive and diverse work environment.

8.2.10 Emerging Technologies

With the accelerated advancements in emerging technologies observed in the past 5 years, it has actually come to pass that a number of emerging technologies referenced in this survey, such as Machine Learning (ML), Artificial Intelligence (AI) and the Internet of Things (IoT), have seen a wide international adoption rate, thus becoming established technologies since the inception of this survey, but may still be seen as emerging given the ongoing development and technological capabilities still untapped.

Unsurprisingly, the current Maltese ICT market sees AI, ML, Digital Ledger Technologies & Blockchain, Big Data & Analytics and IoT as the most probable to be adopted and used in the next 1 to 3 years.

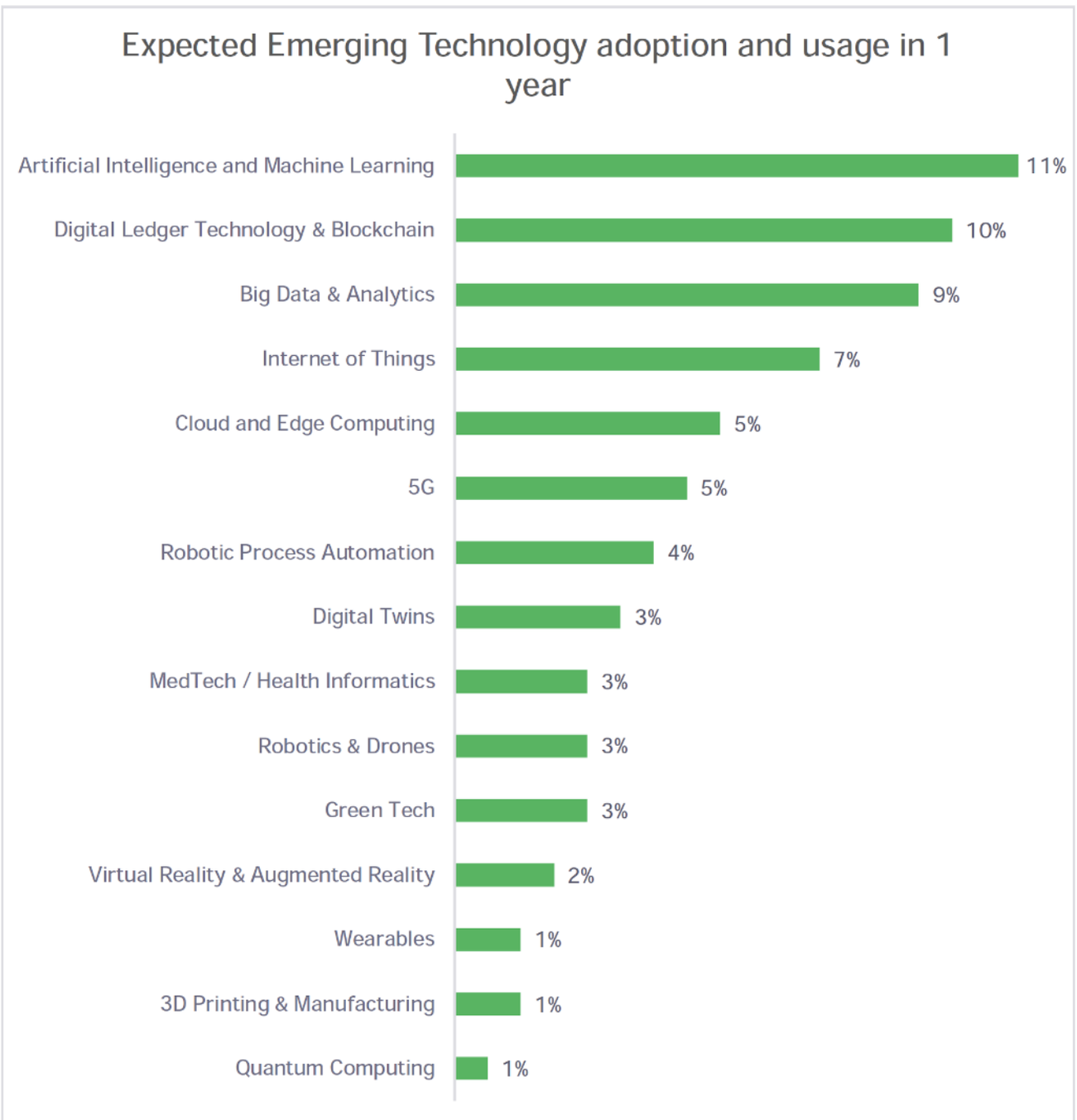


Figure 69 - Emerging Technology Adoption and Usage in 1 Year

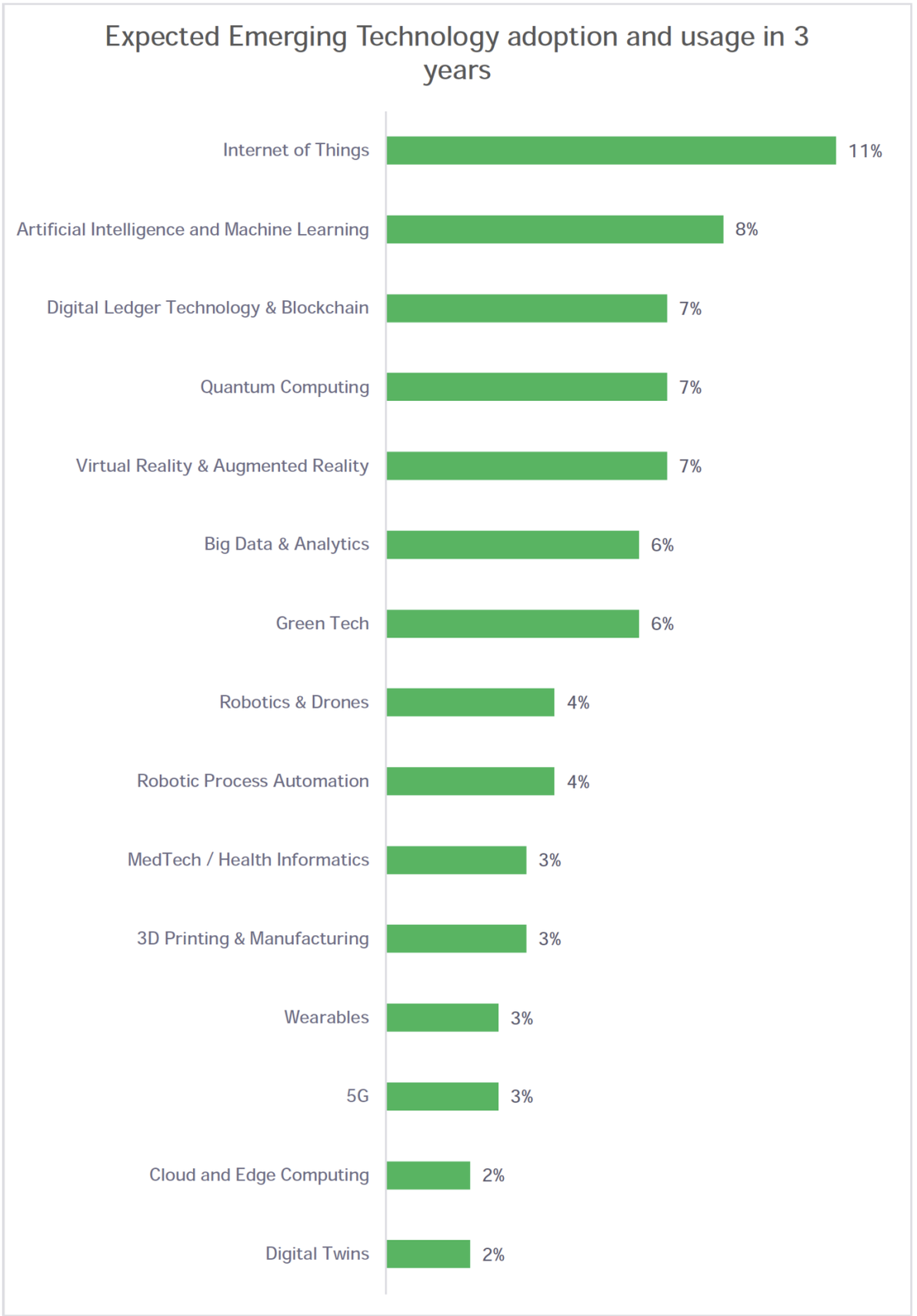


Figure 70 - Emerging Technology Adoption and Usage in 3 Years

Similarly, these technologies see the highest demand for training as they continue to progress and see widespread adoption in across several industries and sectors.

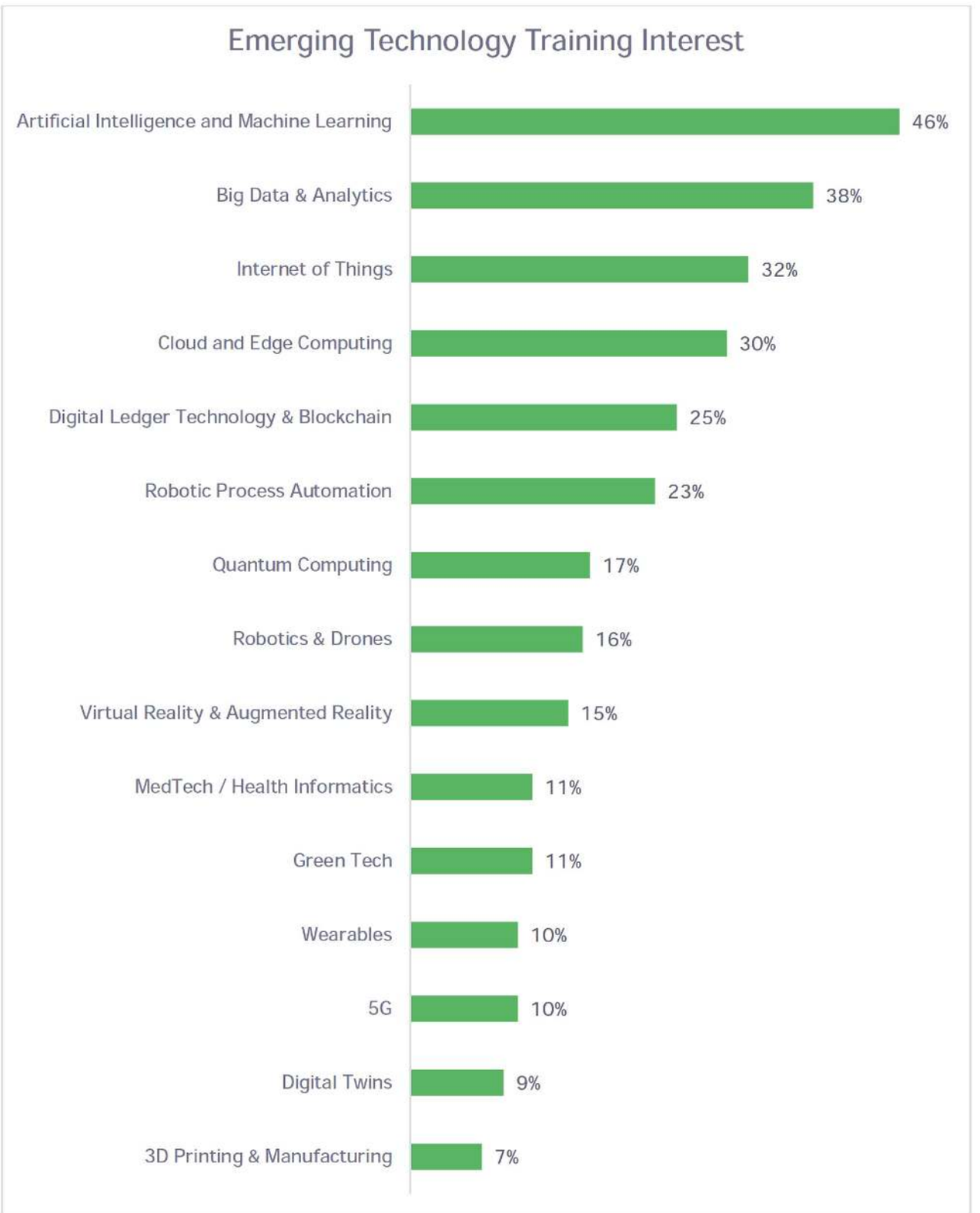


Figure 71 - Emerging Technology Training Interest

According to Gartner's "Hype Cycle" 2019 report[29], the world of finance and investments funds is seeing a sharp increase in AI adoption with 35% of America's stock market being digitally managed with the help of Artificial Intelligence and Machine Learning.

The availability of Big Data & Analytics training is a prerequisite for the widespread adoption of AI, as employing a data-driven model is essential for organisations to be able to leverage the full scope of Artificial Intelligence.

A significant interest in Robotic Process Automation is also indicative of the technological trends being seen at a global scale, with a significant increase in adoption being forecasted as the technology offerings in this area continue to grow and penetrate the mainstream market.

Figure 72 - Emerging Technology Interest among Demand Organisations

[29] Hype Cycle for Emerging Technologies, 2019 (gartner.com)

Figure 73 - Emerging Technology Interest among ICT Practitioners & Professionals

9 Concluding Remarks

With the Maltese ICT market poised to see significant growth in the coming years, it is imperative that a pro-active approach continues to be taken to capitalise on the projected growth, support business digitalisation efforts and keep Malta competitive on the international ICT scene.

The biggest challenges currently faced mainly revolve around human resources and continuous development, with a scarcity of ICT professionals in relation to market demand, and existing ICT professionals lacking required learning and development opportunities, such as training and certification.

The current demand cannot be met solely by relying on the local tertiary education pipeline. The number of ICT students is not growing proportionally to the demand, in the shorter term we need to look onward to potential resources stemming from the much wider international talent pool. It is thus highly recommended that Malta's ICT market appeal be highlighted and given more international exposure, as well as be potentially enhanced by exploring and pursuing initiatives that have proven to be successful on the international stage.

In order to remain competitive, the adoption of emerging technologies must be kept in focus and supported by providing ICT professionals with relevant training and certification opportunities, as a lack of specialised human resources could potentially lead to a stall in adoption, and, subsequently, in the width and quality of market offerings. Providing such opportunities needs to be supported by initiatives to incentivise both ICT professionals and ICT organisations through support, clarity, purpose, legitimacy and exposure.

Enabling and streamlining key stakeholder communication across the field is essential in ensuring the market can evolve homogenously and in line with international trends, and a more centralised approach is highly recommended. While this study sheds light on a number of developments and provides context for some key considerations, an ongoing dialogue between key stakeholders needs to be facilitated by centralising communication through a national platform.

The progress made on the Maltese ICT market across all dimensions over the past decade sets a precedent that sorely needs to be succeeded by a pro-active approach to the market's continuous development in order to realise its existing potential and accelerate the path to growth and evolution.

10 Table of Figures

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