



Review the IEA Graduate Attributes and Professional Competencies Framework. Result of Consultation Process

WFEO has an MoU with IEA which was renewed in November 2019 and which established a Working Group to review the IEA Graduate Attribute and Professional Competency Framework which is the basis for mutual recognition of engineering qualifications and professional credentials across more than 30 countries.

The Working Group has the following objectives:

1. Review of Global benchmark - for engineering graduate's outcomes – to reflect changes in societal needs and new thinking including:
 - UN Sustainable Development Goals
 - Diversity and Inclusion
 - Emerging technologies and disciplines in engineering
 - Rapidly changing technology environment and learning systems
 - Ethics
 - Lifelong learning
2. Review of Global benchmark - professional competencies – so graduates and engineering practitioners meet employer / employability needs/expectations including requirements for lifelong learning

The proposed changes to the GAPC Framework were presented to the IEA Annual meeting held in June 2020.

Webinars in July 2020

During July 2020 three consultation webinars were held, two hosted by WFEO for members and women engineers, and one hosted by WFEO partner, the International Federation of Engineering Education Societies (IFEES), for the information of engineering academics.

A consultation page with background information, recordings of the webinars, presentations and the proposed Framework are available on the WFEO web site at: <https://bit.ly/3fg8Fdh>.

A consultation page for IEA signatories has been established at <https://www.ieaagreements.org/about-us/iea-unesco-and-wfeo-collaboration/>

The webinars had a total of 750+ attendees, from 55 countries as summarised in the table below:

Continent	No.
Africa	65
Asia	525
Americas	92
Europe	38
Middle East	20
Oceania	11
Total	751

The detailed list of attendees by country is in Table 1 at the end of the report.

Attendees were invited to send feedback via the WFEO Secretariat. As at 31 August 2020, the following responses were received and have been collated for further review.

WFEO Members and Partners:

1. William Kelly ASCE, George Mason University, VA USA
2. Prof. James Trevalayan and Dr Sally Male, University of Western Australia
3. Dr Guna Gunalan, President, American Society of Civil Engineers, ASCE Body of Knowledge Version 3 (BOK3)
4. Allyson Lawless, South African Institution of Civil Engineers
5. Ms. Gail Mattson, President, International Network for Women Engineers and Scientists (INWES)
6. Prof. Tim Ibell and Prof. Dawn Bonfield, UK
7. Engineers Without Borders, Australia
8. Prof. Alfredo Soeiro, Civil Engineering Specialist Advisory Group, *CALOHEE project, Measuring and Comparing Achievements of Learning Outcomes in Higher Education in Europe*, funded with support from the European Commission, see <https://www.calohee.eu>
9. Prof. Dr. Gudrun Kammasch, IPE e. V., Ingenieurpädagogische Wissenschaftsgesellschaft, ipw-edu.org, info@ipw-edu.org
10. Prof. Khairiyah Mohd Yusof, PhD, Professor and Director, Centre for Engineering Education (CEE), Universiti Teknologi Malaysia, <http://tree.utm.my>

IEA Signatories:

1. Engineering Council UK
2. Institution of Professional Engineers, Japan
3. Engineers Canada, WFEO member
4. Board of Engineers Malaysia
5. Philippines Technological Council, Provisionals signatory, WFEO Member
6. The Hong Kong Institution of Engineers (The HKIE)

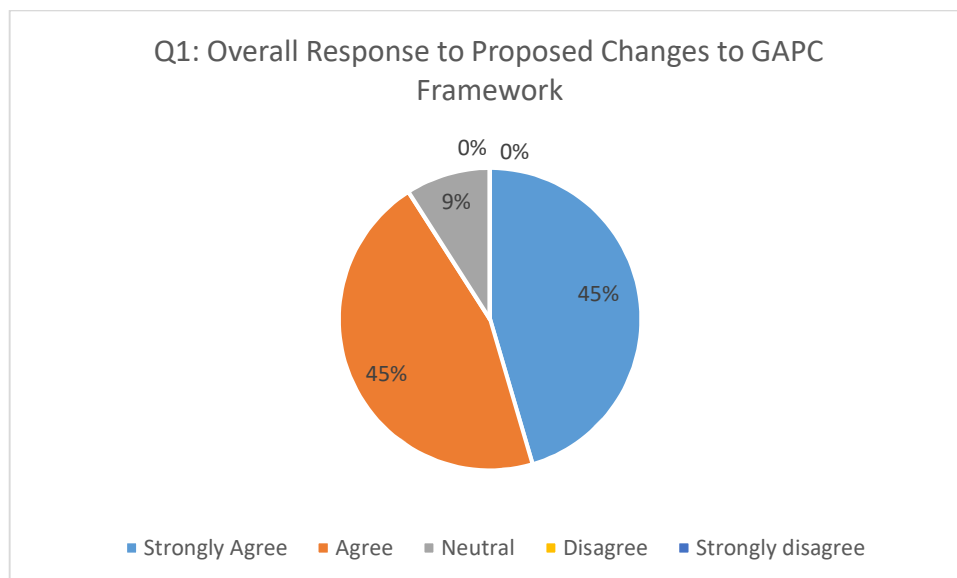
Results of Survey

A survey was sent to all WFEO members and webinar attendees. The questions in the survey were the same as those sent to the IEA Signatories in December 2019 - January 2020.

The survey closed on 4 September 2020. A total of 16 valid responses were received. One spurious response was rejected. One organisation responded with identical responses to every question 6 times under different names. These were considered as one response to avoid skewing the results due to the small sample.

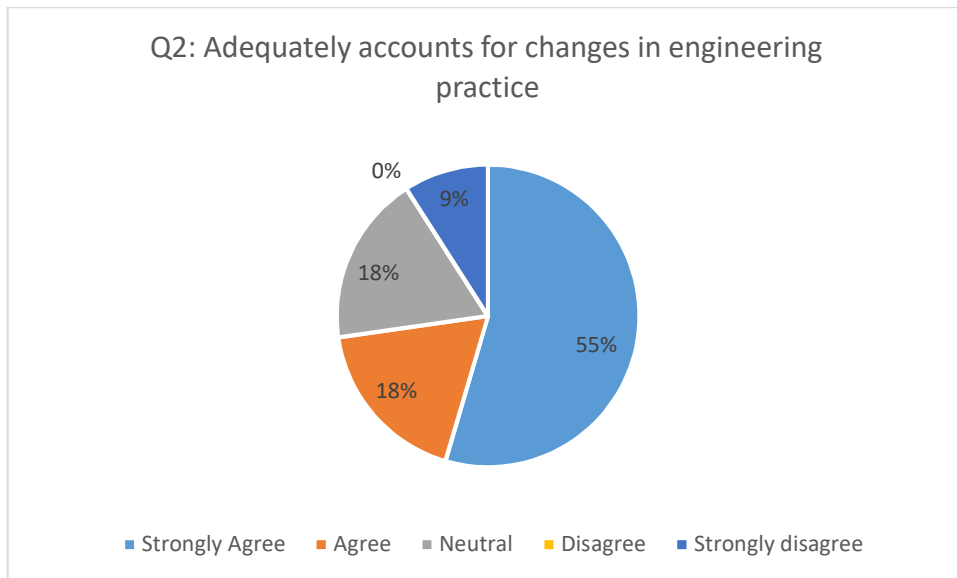
The results of the survey are summarized below.

Q1: What was your first reaction to the Proposed Revised Graduate Attributes and Professional Competencies (GAPC) Framework?



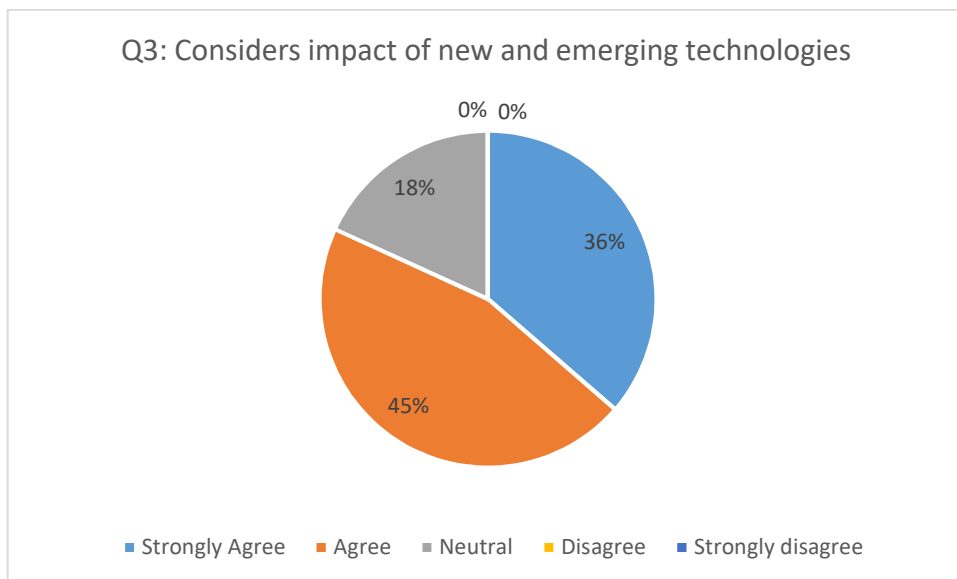
A total of **90% of respondents were positive** about the proposed changes and either “Strongly Agreed” or “Agreed” with the proposed changes. 9% were neutral. There were no negative responses.

Q2: The Proposed GAPC Framework adequately accounts for changes in engineering practice in the future.



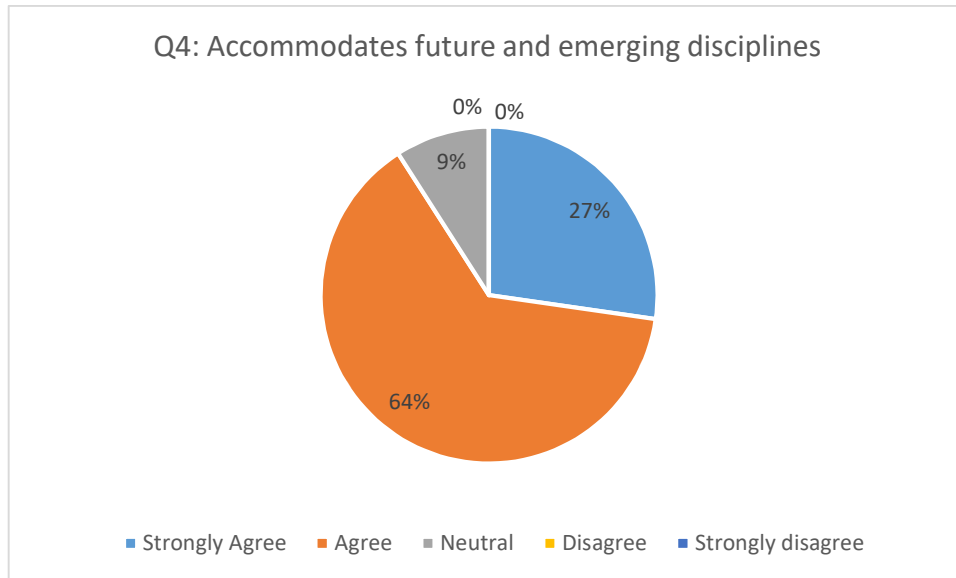
A total of **73% of respondents were positive** about the proposed changes and either “Strongly Agreed” or “Agreed” that the changes adequate accounted for future changes in engineering practice. 18% were neutral. **9% were strongly negative.**

Q3: The Proposed GAPC Framework considers the impact of new and emerging technologies (AI, ICT, Industry 4.0 etc.) on engineering practice



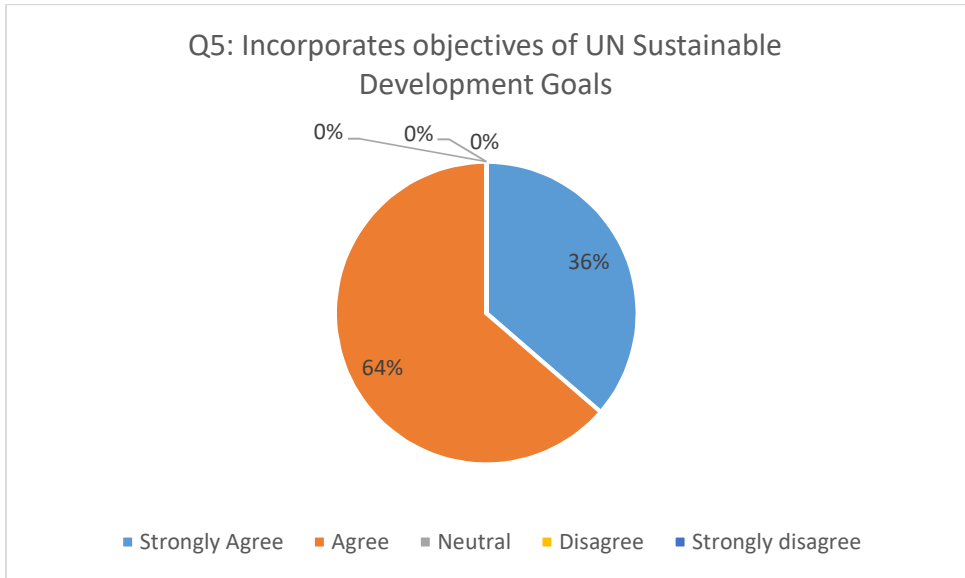
A total of **81% of respondents were positive** about the proposed changes and either “Strongly Agreed” or “Agreed” that the changes adequate accounted for the impact of new and emerging technologies. 18% were neutral. There were no negative responses.

Q4: The Proposed GAPC Framework accommodates emerging and future engineering disciplines and practice areas (e.g. synthetic biology, sustainable energy, mechatronics, digital technologies, smart cities, artificial intelligence, big data etc.)



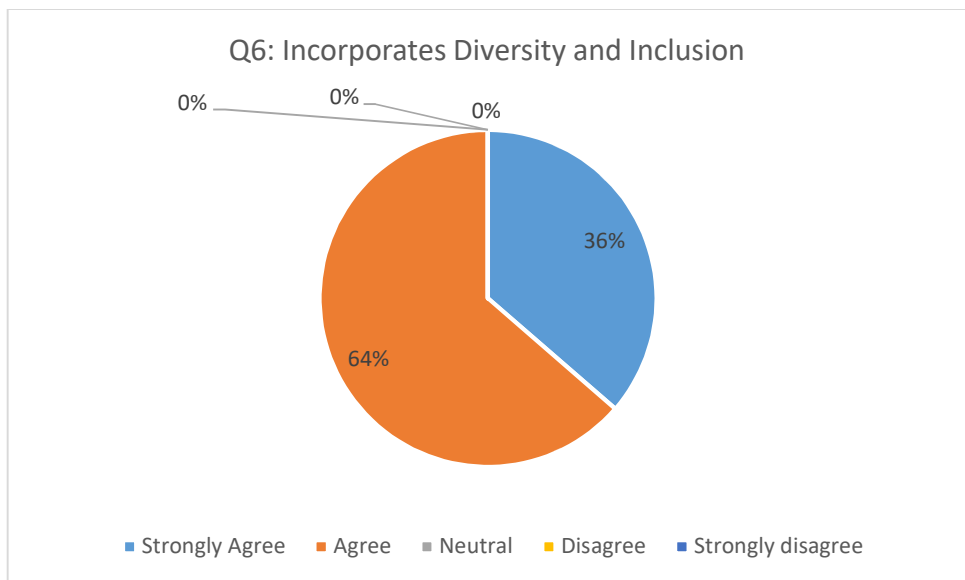
A total of **91% of respondents were positive** about the proposed changes and either “Strongly Agreed” or “Agreed” that the changes adequately covered emerging and future engineering disciplines. 9% were neutral. There were no negative responses.

Q5: The Proposed GAPC Framework accounts for the objectives of the UN Sustainable Development Goals (no poverty, zero hunger, good health and well-being, quality education, gender equality, clean water and sanitation, affordable/clean energy, decent work/economic growth, industry, innovation, and infrastructure, reducing inequality, sustainable cities and communities, responsible consumption and production, climate action, life below water, life on land, peace, justice, and strong institutions, and partnerships)



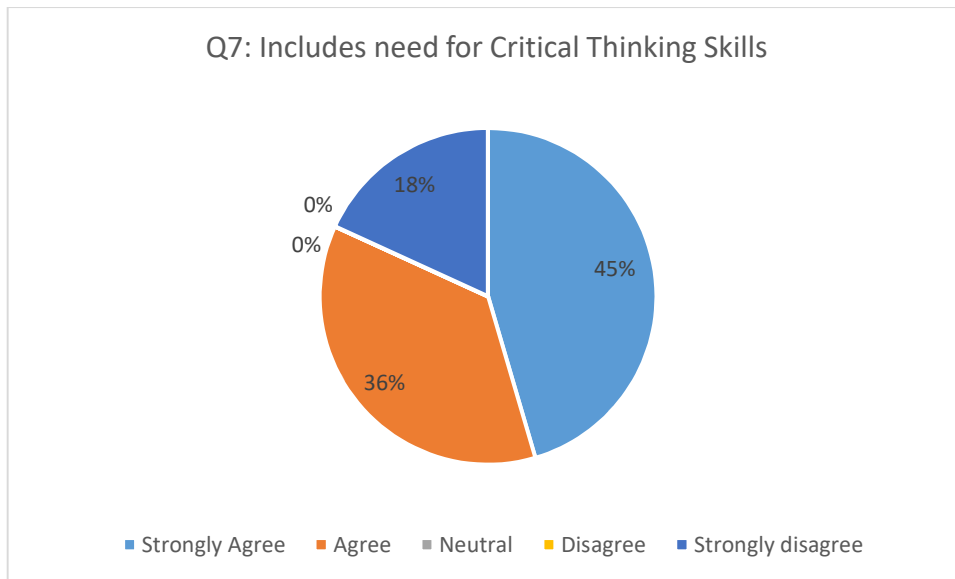
100% of respondents were positive about the proposed changes and either “Strongly Agreed” or “Agreed” that the changes adequately addressed the objectives of the UN Sustainable Development Goals. There were no negative responses.

Q6: The Proposed GAPC Framework addresses Diversity and Inclusion (Diversity includes visible differences such as gender, race and ethnicity and visible disabilities and non-visible differences such as sexual orientation, social class, heritage, religion, unseen disabilities, and age.)



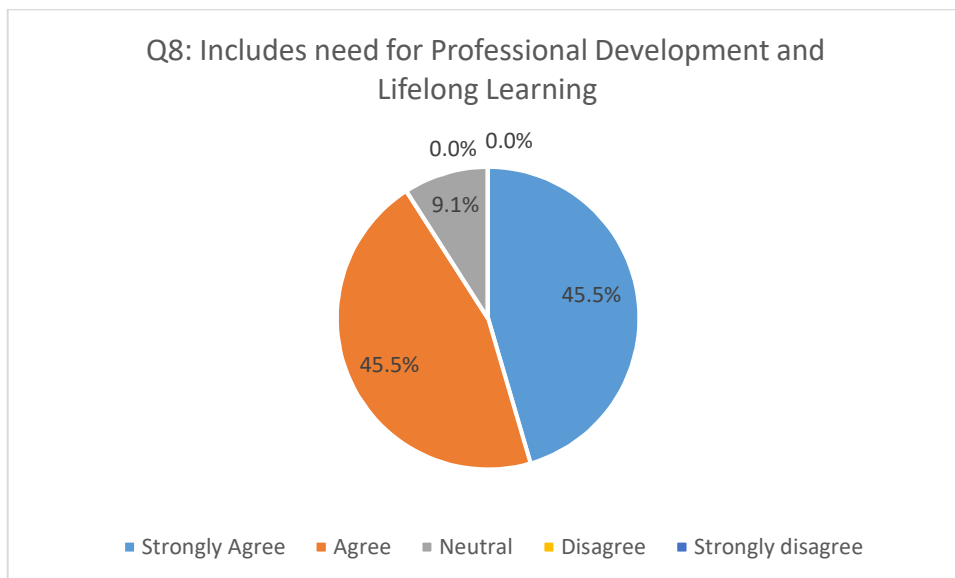
100% of respondents were positive about the proposed changes and either “Strongly Agreed” or “Agreed” that the changes adequately addressed diversity and inclusion in engineering. There were no negative responses

Q7: The Proposed GAPC Framework ensures that the future engineer's decision will use critical thinking and be compelled towards more acuity, creativity and innovation



A total of **81% of respondents were positive** about the proposed changes and either “Strongly Agreed” or “Agreed” that the changes adequately covered the need for critical thinking skills. **18% were strongly negative.**

Q8: The Proposed GAPC Framework ensures that the practicing engineer will continue professional development and lifelong learning to be meet evolving industry needs, new technologies and community needs.



A total of **91% of respondents were positive** about the proposed changes and either “Strongly Agreed” or “Agreed” that the changes supported continuous professional development and lifelong learning. disciplines. 9% were neutral. There were no negative responses.

Q9: The additional areas that should be addressed, as provided by the respondents, are listed below.

1. Green project management
2. Circular economy
3. NBS Natural Based Solutions
4. Critical thinking
5. Engineering areas
6. future technology
7. More framework for engineering field
8. Framework for diversity
9. Emerging technologies
10. soft skills
11. Sustainability
12. Ethics
13. Problem Analysis
14. Automatization in engineering process
15. Big Data
16. Machine Learning
17. Specifying the Sustainable Development Goals is too specific and time stamps the documents - the elements listed such as hunger, infrastructure delivery for all, sustainability etc. should be included which will stand the test of time - we have had three international changes - 2003, then Millennium Development Goals and now SDGs and they will continue to change, but the underlying issue is sustainability and the well-being of all.
18. Design thinking should be incorporated to be able to handle real time problems
19. Community Service and interdisciplinary should be integrated in the proposed attributes
20. The values of socio-economic sciences should be incorporated in understand the ever-changing demands by the engineers
21. Building the capabilities of engineers in a modern way that keeps pace with global developments
22. Incentives and job opportunities for distinguished engineers
23. Framework does not adequately address the need for engineers to reflect on and think critically about engineering itself (Engineers Without Border x 6)
24. The complex relationship between engineering and society should also be more integrated into the tables (Engineers Without Border x 6)
25. More explicit acknowledgement of the value of the social sciences in helping engineers understand the implications of their work would go far in helping emphasize the need for critical thinking (Engineers Without Border x 6)
26. Lifelong learning versus continual professional development good opportunity to clarify this CPD is defined in appendix lifelong learning is not and many faculty say they don't understand what it means
27. Consider defining terms in appendix
28. Ethics - need to ensure all graduates have a basic understanding of ethics principles and issues relevant to field of practice

Q10 Analysis of respondents

Countries: 12 including:

Americas	Chile x 2	Mexico	USA x 2	Brazil	Canada
Asia	India x 2	Philippinesx2	Myanmar		
Africa	South Africa				
Middle EAST	Jordan				
Oceania	Australia				
Europe	UK				

Type of Organisation:

Type of Organisation	Number
Universities	7
NGOs	7
Professional Engineering Institutions	2

All respondents provided email contact addresses.

Prepared by: Dr Marlene Kanga, Immediate Past president WFEO, 25 Sept 2020

Table 1: Summary of attendances at UNESCO WFEO IEA GAPC Consultation webinars July 2020

	Country	Numbers attending			Total
		15 July (IFEES) - Engineering Educators	18 July (WFEO) WFEO Members	31 July (WFEO & INWES) - women engineers	
1	Cameroun	1	0	0	1
2	Cote d'Ivoire	0	1	0	1
3	Ghana	0	2	6	8
4	Kenya	4	13	3	20
5	Nigeria	2	0	5	7
6	Mauritius	0	7	0	7
7	Rwanda	0	1	0	1
8	Senegal	0	0	1	1
9	Sierra Leone	0	3	3	6
10	Somalia	0	1	0	1
11	South Africa	0	5	4	9
12	Zambia	0	1	0	1
13	Zimbabwe	0	2	0	2
1	Argentina	6	0	0	6
2	Bolivia	0	0	1	1
3	Brazil	1	0	1	2
4	Canada	4	4	4	12
5	Chile	0	26	0	26
6	Colombia	9	0	0	9
7	Costa Rica	0	2	3	5
8	Dom. Republic	1	0	0	1
9	Mexico	3	2	1	6
10	Peru	1	2	0	3
11	USA	8	8	4	20
12	Venezuela	1	0	0	1
13	Bangladesh	0	1	0	1
14	China	1	7	3	11
15	Hong Kong	0	1	2	3
16	India	371	2	2	375
17	Japan	0	1	1	2
18	Malaysia	1	17	1	19
19	Pakistan	1	7	0	8
20	Philippines	0	19	6	25
21	Myanmar	0	49	5	54
22	Singapore	0	4	0	4
23	Sri Lanka	6	6	1	13
24	South Korea	1	4	1	6
25	Taiwan	0	0	2	2
26	Thailand	0	2	0	2
27	Finland	0	1	0	1
28	Germany	1	2	2	5
29	France	1	0	1	2
30	Ireland	0	0	1	1
31	Switzerland	0	0	1	1
32	UK	2	8	5	15
33	Malta	0	1	0	1
34	Turkey	1	5	6	12
35	Iraq	11	2	0	13
36	Israel	1	0	0	1
37	Kuwait	0	1	0	1
38	Oman	2	1	0	3
39	Tunisia	0	0	1	1
40	UAE	1	0	0	1
41	Australia	4	4	2	10
42	New Zealand	0	0	1	1
	Total Attending	446	225	80	751
	Not attending	24	146	83	253
	Total registered	470	371	163	1004