



## IOR SKILLS SURVEY REPORT

Getting to Grips with Skills Gaps

Technocommercial |

Hard-to-fill vacancies | Collaborative CPD |

20 year skills shortage | Encouraging entrepreneurship |

Holistic approach | Impact on society | Risk taking |

Acting with professionalism | Safety approach | Core engineering skills

## Executive Summary

During 2016 the Institute of Refrigeration carried out a research project into current and future skills issues within the refrigeration, air conditioning and heat pump (RACHP) sector. The aim was to identify recommendations for a front-line approach in addressing the industry's needs. This report highlights the findings of the research based on a survey of 298 IOR members and non-members. The findings highlight the most industry critical skills gaps for new entrants to the sector and provide a basis for future action to bridge those skills gaps, address recruitment shortages and focus the content continued professional development (CPD) offerings from the IOR. Both graduates and apprentices entering the sector showed skills gaps across a range of 45 individual skills. These included core skills and principles such as identifying and solving engineering problems, testing & commissioning, acting with professionalism and integrity and designing systems to safety constraints.

Employers suggested that CPD offered collaboratively by manufacturers and professional institutions would be one of the most important solutions to skills gaps. A reliance on traditional methods of delivery of training, based on externally provided workshop based courses and printed materials however, signalled that the sector has not yet grasped the opportunities available from the use of innovative training such as e-learning or videos. This has prompted a further more detailed market investigation to be carried out in the coming months.

**Gordon C. Duncan, Youth Engagement Officer, Institute of Refrigeration**

*gordon@ior.org.uk*

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## Research Conclusions

- Core engineering skills deemed extremely important by industry are currently not being met by the recently recruited graduates and apprentices.
- Respondents emphasised the need for professional attitudes, core engineering skills, and keeping up for technology advancements. Understanding and applying new technologies and the need to educate the workforce on keeping costs low whilst maintaining high standards were also important.
- A strong understanding of the theoretical and practical implications of projects being managed, products being sold and application of systems designing were essential.
- Technicians need to have a basic business understanding for RACHP companies to thrive in the engineering sector.
- Small to medium sized enterprises often struggle most to facilitate or promote training to their current workforce.
- There is an urgent need for continued professional development (CPD) for those who have entered the workforce in the past 5 years to improve critical skills.
- CPD activities should be a collaborative effort between manufacturers, current available in-house training and institutions.
- The current preferred platform for CPD activities were traditional methods; short course workshops and printed material.
- RACHP hard-to-fill jobs included: managerial, design, sales and technical.

## Next steps

The next steps will be to obtain more information about the suitable delivery methods of “core skills” in engineering that industry is currently lacking in. An in-depth study with young people and employers on their experience of training or CPD, to analyse current perceptions and opportunities for the IOR to collaborate with industry on provision. The results will include the identification of which methods should be developed for trial and testing by IOR as a means of addressing skills gaps targeted to sector needs and sector suitable delivery methods, over the next three months.

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***A set of Appendices detailing the research responses is published separately***



# 1.0 Introduction

The purpose of this research was to delve into current and future issues within the RACHP sector with the view of producing actionable recommendations for the IOR to take a front-line approach in alleviating industry needs. This report is to convey key results from the recently conducted skills gaps survey on IOR members and non-members within the UK RACHP sector which reached a total of 298 respondents in a mixture of subsectors, career levels and size of company (for the demographic breakdown of respondents see Appendix A). The survey conducted identified quantifiable skills gaps on a list of 45 individual skills by comparing respondents' importance ratings and the satisfaction of new entrants into RACHP. The survey went on to gather opinions on future skills gaps concerns, preferred new entrant routes, current hard-to-fill job vacancies and continued professional development (CPD) opportunities.

# 2.0 Skill Importance

Table 1 shows each skill average rating in order of importance (from top to bottom), segmented into their importance groupings (extremely important to unimportant). Skills which were rated within the 'extremely important' group showed an industry led importance on core engineering skills, professionalism and the desire and ability to adhere to lifelong learning.

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**Extremely Important**

Act with professionalism

Design systems within safety constraints and with safety in mind

Identify and solve engineering problems

Testing & Commissioning

Act with integrity

Desire to continuously learn

Acquire new skills and knowledge on a continuous basis

**Very Important**

Communicate effectively with customers

Function as a team member

Understand environmental responsibilities

Accept constructive feedback

Possess sound engineering ethics

Communication skills

Speak and present ideas clearly

Give constructive feedback

Analyse data

Use modern engineering tools and techniques

Apply engineering science knowledge

Manage time

Take directions well from superiors

Teamwork

Work with individuals from other fields or disciplines

Customer orientation

Write effectively

Design engineering systems

Use modern communication technology

Use modern computer software

Motivation or need for achievement

Understand the impact of engineering solutions on society

Act with awareness of global issues

Innovation

Apply mathematical knowledge

Understand concepts from engineering fields other than their own

Leadership

Set personal learning targets

Lead a team

<b>Quite Important</b>
Posses basic management abilities
Possess basic business planning skills
Evaluate performance of others
Possess basic finance knowledge
Posses basic economics knowledge
Risk taking (in non-dangerous situations)
Entrepreneurship
Possess basic marketing knowledge

<b>Somewhat Important</b>
Speak more than one language

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**Table 1. *List of Skills by Importance Rank***

The survey gathered industry respondents' ratings on 45 individual skills including; technical skills, business acumen, personal development and interpersonal and professionalism skills, the full list of skills in their subsectors can be found in Appendix B. Respondents were given the task to rate each skill between 1 (unimportant) and 5 (extremely important) on a Likert scale with an additional option of 0 to signify no opinion. All mean numbers below were produced removing respondents which had 'no opinion' to give a fair average industry ranking. This approach was used on all mean numbers used within the data analysis.

## 3.0 Skill Satisfaction

Table 2 shows the 5 highest and lowest skills rated by respondents for both graduates and apprentices.

- Graduates received highest employers satisfaction in their use of:
  - o Modern computer software,
  - o Modern communication technology and
  - o Modern engineering tools and techniques.
- Graduates were also ranked highly on their desire to continuously learn
- Apprentices shared high rankings on their use of modern communication technologies
- Both graduates and apprentices were ranked highly on their ability to function as a team member
- Apprentices were ranked highly on 'extremely importance' skills such as:
  - o Their ability to acquire new skills and knowledge,
  - o Acting with integrity and
  - o Acting with professionalism
- Both graduates and apprentices received lower rankings within business acumen skills such as:
  - o Basic management abilities,
  - o Basic marketing knowledge,
  - o Basic economics knowledge,
  - o Basic finance knowledge,
  - o Multilingualism,
  - o Risk taking and
  - o Entrepreneurship.



**Table 2. Five Highest and Lowest Ranked Skills for Graduates and Apprentices on Satisfaction by Industry**

	Graduate	
	Skill	Ranking
<b>Highest Ranked (Skills)</b>		<b>Very Satisfied</b>
	Use modern computer software	
	Function within a team	
	Use modern Eng. tools and techniques	
	Use modern comm. tech.	
	Life long learning desire	
<b>Lowest Ranked (Skills)</b>		<b>Quite Satisfied</b>
	Possess basic economics knowledge	
	Speak more than one language	
	Risk taking	
	Entrepreneurship	
	Possess basic marketing knowledge	

	Apprentice	
	Skill	Ranking
<b>Highest Ranked (Skills)</b>		<b>Very Satisfied</b>
	Use modern comm. tech.	
	Life long learning ability	
	Function within a team	
	Act with intergrity	
	Act with professionalism	
<b>Lowest Ranked (Skills)</b>		<b>Quite Satisfied</b>
	Possess basic management abilities	
	Possess basic marketing knowledge	
	Possess basic economics knowledge	
	Possess basic finance knowledge	
	Speak more than one language	<b>Somewhat Satisfied</b>

**Table 2. Five Highest and Lowest Ranked Skills for Graduates and Apprentices on Satisfaction by Industry**

Respondents were asked whether they had hired a graduate trainee or apprentice in the last 5 years. A total of 89 respondents had hired an apprentice and 60 respondents had hired a graduate out of the 298 respondents. The respondents then identified their working relationship with the graduate or apprentice on whether they were involved in the employment or worked closer with the individual as a trainer, mentor or were shadowed. Respondents then had to rate the individual on the same set of 45 individual skills from 1 (unsatisfied) to 5 (extremely satisfied), with the option of 0 signifying no opinion (for the full list of satisfied rankings please refer to Appendix C).

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## 4.0 Skill Gaps

Skills Gaps were identified by comparing respondents' importance rankings to the satisfaction rankings. Most respondents appear to prefer the apprentice route for new entrants into RACHP.



- Apprenticeships (college & work based)
- On the job learning
- University
- College (Non-Workbased Qualification)
- Other higher education (please specify)

## 4.1 Graduate Skill Gaps

There were only two skills to which graduates are outperforming the importance ranking by industry. Those skills were; speaking more than one language and the use of modern computer software. The highest skills gaps recorded were:

- **Testing & commissioning,\***
- **Identify and solve engineering problems,\***
- Communicate effectively with customers,
- **Design systems within safety constraints and with safety in mind,\***
- Manage time,
- **Act with professionalism,\***
- Speak and present ideas clearly,
- Customer orientation and
- Possess sound engineering ethics.

*\*Rated 'extremely important' skills by employers  
The full graph highlighting the graduates' skills gaps is shown in Appendix D.*

## 4.2 Apprentice Skills Gaps

The only skill which didn't record a skill gap when comparing apprentice satisfaction rankings to industry importance means was the ability to speak more than one language. The highest recorded skills gaps were:

- **Identify and solve engineering problems,\***
- **Design systems within safety constraints and with safety in mind,\***
- **Testing & commissioning,\***
- Analyse data,
- Design engineering systems and
- Apply engineering science knowledge.

*\* Rated 'extremely important' skills by employers  
The full graph showing Apprentices' Skills Gaps can be found on Appendix E.*

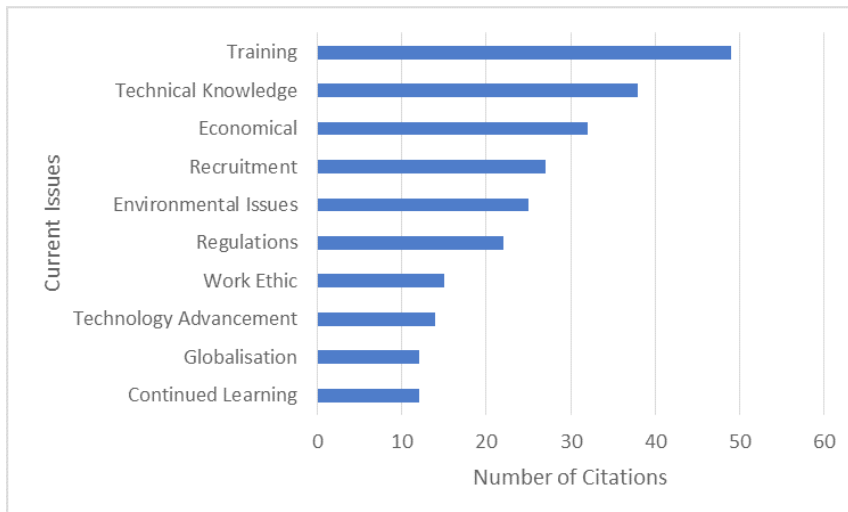
# 5.0 Future Skills

Respondents were asked to describe current & future issues they believed will be needed 5 to 10 years from now and beyond. Figure 2 indicates:

- Training as the highest cited current issue (this includes: business acumen, interpersonal, personal skills, technical knowledge and application).
- Technical knowledge was the second highest cited current issue (in the context of training new entrants such as graduates and apprentices).
- The need for engineers who can understand and practice the right solution for the right price, as one respondent said:

*R1: “Constant drive to keep costs low while driving to keep standards of engineering high.”*

- The attraction of new entrants into RACHP employment was also a high concern. A number of respondents had highlighted that the industry needed more apprenticeships and a focus on creating more public relations about the industry to build general knowledge of what an RACHP engineer does and how the industry impacts the modern world.



**Figure 2. Citations of Current Issues within RACHP**

## 5.1 Skills for the Next Five Years

Respondents were then asked to describe skills that universities, apprenticeship schemes and continuing professional development (CPD) programmes should be focusing on in the next five years. The majority of answers included:

- Practical engineering skills,
- Training (with specific view of the modern and ever changing world market),
- The use of technological advanced software and applications (not just theoretical understanding but an applied practical experience),
- Environmentally friendly and sustainability (with view on environmental and political pressures),
- Skills in dealing with customers (such as communication skills),
- Management and specifically project management skills and
- Skills which reinforce their current issues of being more economical within the RACHP industry.

**One respondent said:**

*R2: "Encouraging entrepreneurship creativity innovation & sustainability."*

## 5.2 Technology Advancements

Technology advancements in the RACHP industry have led to new skills issues:

- The use of modern day technology has affected engineers' ability to perform fault finding activities with engineering systems and
- That experienced engineers in the later career stages are not being considered for courses on modern technology.
- That smart technology and building information modelling (BIM) were expensive and challenging to move to without additional investment.

**One respondent said:**

*R3: "I can't think of a skills issue other than a client requesting a technology is used (like BIM) but you're unable to meet their needs as you're not trained for it. This can push some smaller companies out as they don't have the time or resources to train."*

## 5.3

### Skills for the Next Ten Years and Beyond

R4: “Closing this twenty year skill shortage.”

Respondents were asked about the state of the industry in the next ten years, most respondents identified similar skills to those highlighted in both the questions about current issues and the next five years. This suggests that the RACHP industry sees the evolving environment being a very slow process for most of them. Respondents stated that ‘keeping up’ with the fast growth of environmental issues and technology advancements will be an issue still affecting the RACHP industry in ten years.

Communication, interpersonal skills, people skills, management skills, finance skills, technology understanding and use, data analysis, teamwork, multidisciplinary and adaptability, were all high cited skills needed for the RACHP industry in the next 10-15 years.

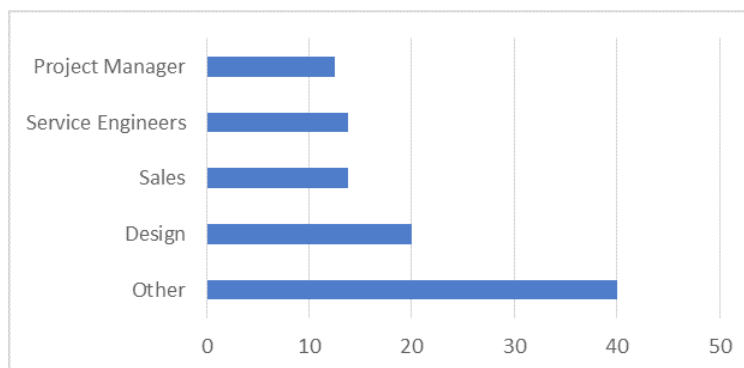
#### One respondent said:

R5: “‘Technocommercial’ skills. Everything needs to have a holistic approach. No single skill is useful.”

## 6.0

### Hard-to-Fill Vacancies

The questionnaire asked all respondents whether the company they work for currently has any open vacancies, with view of hard-to-fill vacancies. Just under half of the managers at top level, middle management and first level managers had reported a hard-to-fill current vacancy within the place of work (49.5%). Figure 3 below shows the most cited hard-to-fill jobs. ‘Design’ includes: design engineers, design/product development, plant designers, industrial design, junior design and system design. Just over 25% of respondents, specifically stated “experience” as a description of the hard-to-fill job. The ‘Other’ category was made up of many specialised roles which couldn’t be categorised. Moreover, less than 20% mentioned multi-disciplinary as a requirement showing the need of highly specialised roles.



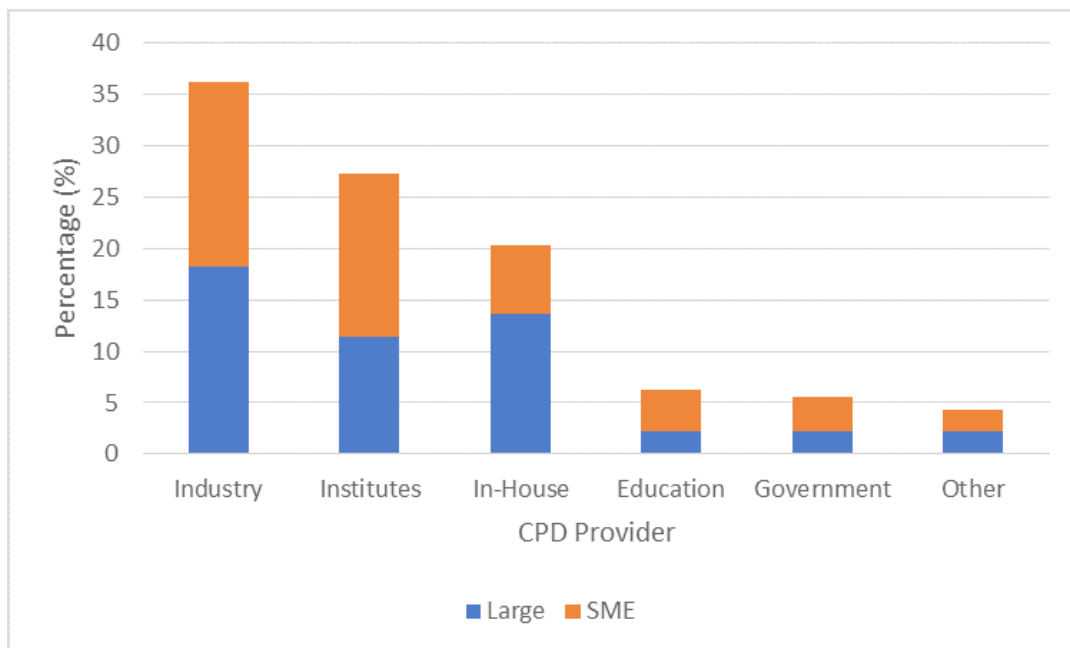
**Figure 3. Most Cited Hard-to-fill Jobs from Respondents**

## 7.0 Continued Learning Preferences

Lastly the research investigated continued learning activities of the respondents. Respondents were asked whether they provided in-house training, 53% said no, of which 83% were small to medium sized enterprises (SMEs). Figure 4 shows where respondents believe the responsibility of creating and providing continued professional development (CPD) content and platforms falls:

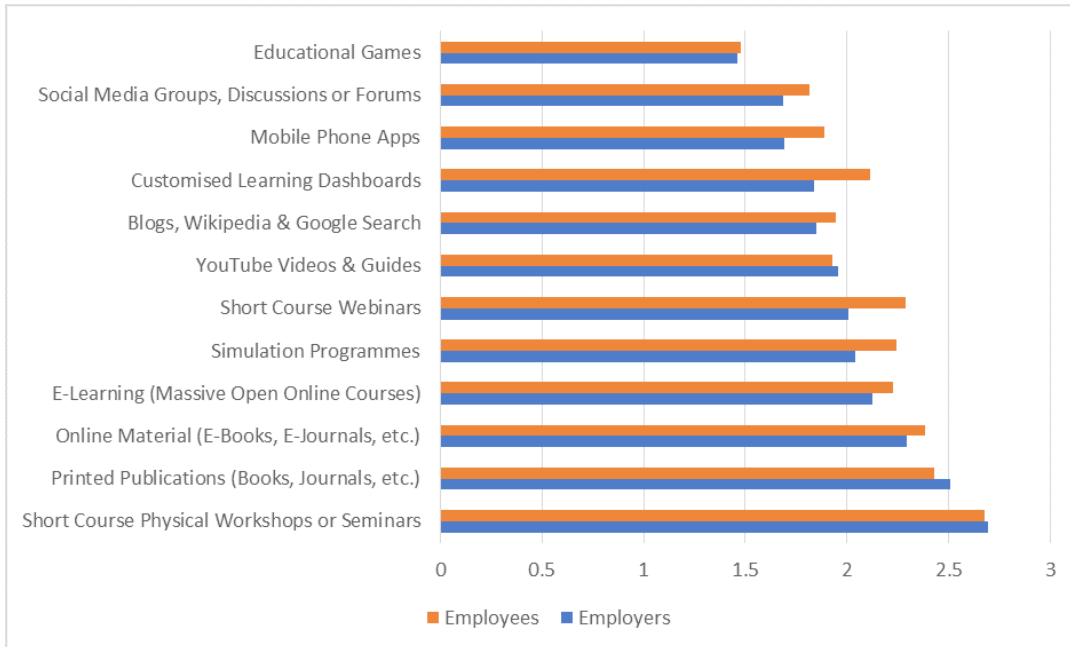
- Respondents see the responsibility of course content for technical advancement to come from industry,
- In particular to product based training from manufacturers,
- Professional Institutions with in-house and employer based training platforms and content.

Many respondents believe it should be a collaborative effort between manufacturers on product based training (industry), professional institutions and involvement of current in-house training methods and content already being used.



**Figure 4. Who Should Create and Supply CPD by SME and Large Enterprises**

Figure 5 below shows the preferred platform for CPD content by respondents. Respondents were asked to rate the appropriateness of each platform. Online platforms such as; simulation programmes, short course webinars, customisable learning dashboards, mobile phone apps and even social media and discussion forums, all had higher rated appropriateness for their employees than themselves.



**Figure 5. Platform for CPD Preferences**



## 8.0 Conclusion

8.1 – What is most apparent from the data gathered are **core engineering skills deemed ‘extremely’ important by industry respondents are currently not being met** by the recently recruited graduates and apprentices. These include core skills such as: identifying and solving engineering problems, testing & commissioning, designing systems within safety constraints and the ability to handle oneself and act with professionalism.

8.2 – Respondents emphasised the need for **professional attitudes, core engineering skills, and keeping up for technology advancements** to include the understanding and application of new technologies and the need to educate the workforce on keeping costs low whilst maintaining high standards. The latter showing a need for basic business understanding underpinned with technical excellence.

8.3 – Respondents highlighted the need for individuals who understood the **theoretical and practical** implications of the projects they were managing, products they were selling, application of systems they were designing and for **technicians to show basic business understanding for RACHP** companies to survive an ever more demanding engineering sector.

8.4 – The study also highlighted that **SMEs, of which make up the bulk of the RACHP industry struggles to facilitate or promote training** to their current workforce and trainees.

8.5 – There is an **urgent need for CPD for those who have entered the workforce in the past 5 years** to improve critical skills. Government changes to focus on employer-led Trailblazers for apprenticeships and graduate apprenticeships is addressing gaps within the training of new entrants. However, those who joined the industry over the last five years showed significant skill gaps on almost all skills, except for multilingualism, and some of the highest skills gaps were recorded within skills deemed ‘extremely important’.

8.5 – **CPD activities should be a collaborative** effort between manufacturers, current available in-house training and institutions.

8.6 – **The current preferred platform for CPD activities were traditional methods;** short course workshops and printed material, showing a need for physical content, with less significance given to online materials. However, this isn’t to state that online material cannot be encompassed within or beside physical course content as an assistant to the learning environment.

8.7 – This is again made clear when analysing their views on future skills. Respondents highlighted similar issues and skills in 5 years’ time and 10 years’ time indicating a **belief that bridging the issues will be slow.**

8.8 – RACHP hard-to-fill jobs included: **managerial, design, sales and technical.**