



IRISH
MANUFACTURING
RESEARCH

Collaborative Robotics Adoption Survey

Irish Manufacturing Research

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Contents

Executive Summary	2
Background and Objective	3
Methodology	3
Survey results	1
Profiles of the survey participants	1
Size of the companies.....	1
Current level of Robotic engagement in their organisation	1
Level of robotics engagement depending on size.....	1
Level engagement with Collaborative Robotic Applications.....	1
Level of human-robot collaboration (as defined by IFR, 2018)	0
Ranked levels of concern.....	1
Challenges preventing meaningful engagements.....	2
Collaborative Robotics Adoption Survey.....	4

Executive Summary

IMR and the Robotics Executive Committee (REC) led this industry survey as primary research on the real reasons Collaborative Applications are not wide-spread. The results will allow IMR to guide the REC activities and solutions in that space, as well as to get Industry to consider Collaborative Applications.

The objective of the survey is to understand the current state of collaborative robotics applications in manufacturing and to identify the major concerns that engineering managers and manufacturing directors have which prevent the wider adoption of collaborative robotics applications.

The collaborative robotics adoption survey was disseminated as a paper form and as an online questionnaire between July 2019 and October 2019. Engineers and managers from manufacturing companies and technology providers were invited to fill-in the paper survey when visiting IMR's sites in Mullingar and Rathcoole. The online questionnaire was hosted on Google Forms and shared via IMR newsletter and professional social media platforms. Both survey forms were anonymous.

This industry survey indicates that while most of the surveyed have starting or have deployed collaborative robotics applications (73% of the participants), the level of human-robot collaboration is mostly limited to Sequential collaboration and below (12 participants over 16 who have started/already deployed HRC applications).

The lack of a clear and methodical process for Health & Safety sign-off and the lack of definitive reference documents/standards are the most prevalent concerns across the 23 surveyed individuals and have been the most frequently rated as preventing a meaningful engagement with human-robot collaborative applications at this time.

The results were presented to the Robotics Executive Committee (REC) and have been guiding the activities and solutions in that space (<https://imr.ie/pages/human-robot-interaction/>).

Background and Objective

The industry survey operated as a primary research on the real reasons Collaborative Applications are not wide-spread. The results will allow IMR to guide the REC activities and solutions in that space, as well as to get Industry to consider Collaborative Applications.

The objective of the survey is to understand the current state of collaborative robotics applications in manufacturing as well as to identify the major concerns that engineering managers and manufacturing directors have that prevent the wider adoption of collaborative robotics applications.

Methodology

The collaborative robotics adoption survey was disseminated as a paper form and as an online questionnaire between July 2019 and October 2019. Engineers and managers from manufacturing companies and technology providers were invited to fill-in the paper survey when visiting IMR's sites in Mullingar and Rathcoole. The online questionnaire was hosted on Google Forms and shared via IMR newsletter and professional social media platforms. Both survey forms were anonymous.

Participants were asked to provide information on

- their position and company;
- the current level of robotics engagement in their organisation;
- the level of engagement their organisation has with Collaborative Robotic Applications;
- if collaborative robotics applications were deployed, with what level of Human/Robot Interaction does it align (cf Figure 1).

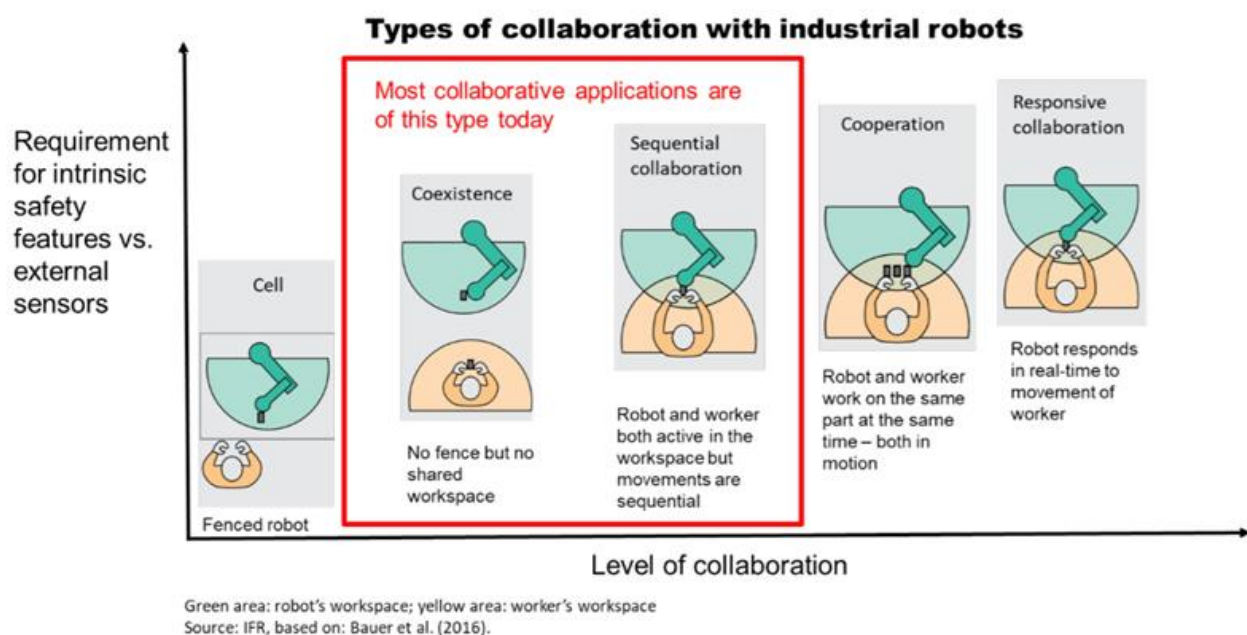


Figure 1 - Types of collaboration with industrial robots (IFR, 2018)¹

The participants were then asked to rate their level of concern over each of the proposed challenge addressing safety, workforce, and

organisation/business. The ratings were based on a scale from 1 to 5 according to defined anchoring statements:

1. Not concerned with this.
2. Slight concern but does not prevent us from engaging with this type of application/ technology.
3. Elements of my organisation have concerns.
4. This obstructs us from meaningfully engaging with this type of application/ technology.
5. This prevents us from meaningfully engaging with this type of application/ technology.

The full questionnaire is available in Appendix A.

Survey results

Profiles of the survey participants

The survey received 23 responses. The most represented surveyed profile is Engineer (8 over 23, i.e. 35% of the surveyed). In total 13 surveyed are either managers, C-suite, or directors (57%).

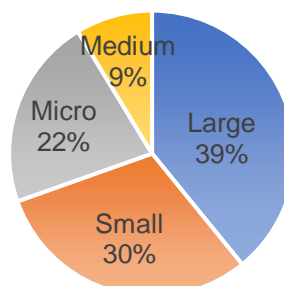
Categories	#
Engineer (Production, applications, automation, project)	8
Manager	4
Director of Technology or Innovation & Excellence / Domain leader	3
Researcher	2
General manager	2
Managing director	2
CTO - CEO	2
TOTAL	23

Table 1 - Profiles of the survey participants

Size of the companies

The majority of companies represented are large (39%), followed by small (30%) companies.

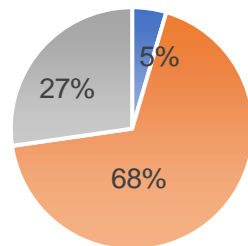
Size of surveyed companies



Current level of Robotic engagement in their organisation

68% of the surveyed have most of their processes robotised. 1 of the surveyed does not have any robotic applications in their organisation and is a micro organisation. It should be noted here that most of the surveyed responded while engaging with IMR and the Robotics & Automation group.

Current level of robotic engagement in their companies

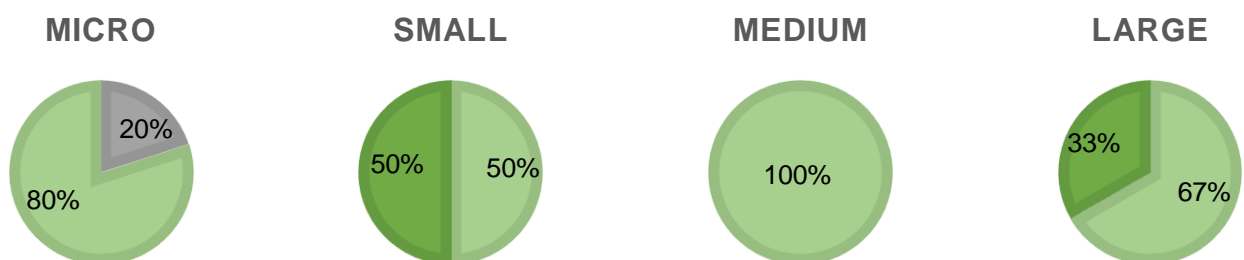


- We do not have any Robotic applications in our organisation
- Some of the processes in our organisation include Robotic Systems
- Most of our processes in our organisation include Robotic Systems

Level of robotics engagement depending on size

The surveyed companies whose most processes include robotics systems are small and large organisations.

- We do not have any Robotic applications in our organisation
- Some of the processes in our organisation include Robotic Systems
- Most of our processes in our organisation include Robotic Systems



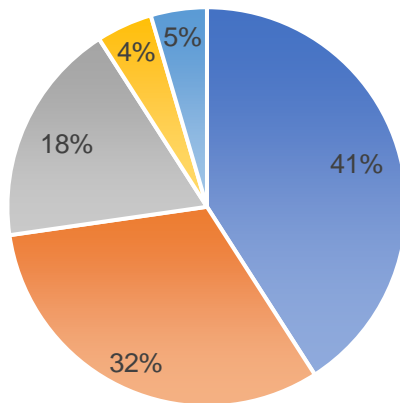
Level engagement with Collaborative Robotic Applications

73% of the surveyed are either starting (41%) or have deployed (32%) collaborative robotics applications.

83% of the organisations where the majority of their processes are robotised have already deployed multiple collaborative robotics applications – in contrast to 13% of organisations with only some of their processes robotised.

The only organisation surveyed that has no plans to integrate collaborative robotics applications does not have any robotic systems in their organisation.

Level of engagement with collaborative robotic applications



- We are starting to integrate one or more Collaborative Robotic Applications
- We have already deployed multiple Collaborative Robotic Applications
- We are thinking about integrating Collaborative Robotic Applications but we do not know where to start
- We have no plans to integrate Collaborative Robotic Applications into our organisation
- We thought about integrating Collaborative Robotic Applications into our organisation but it was not a good fit

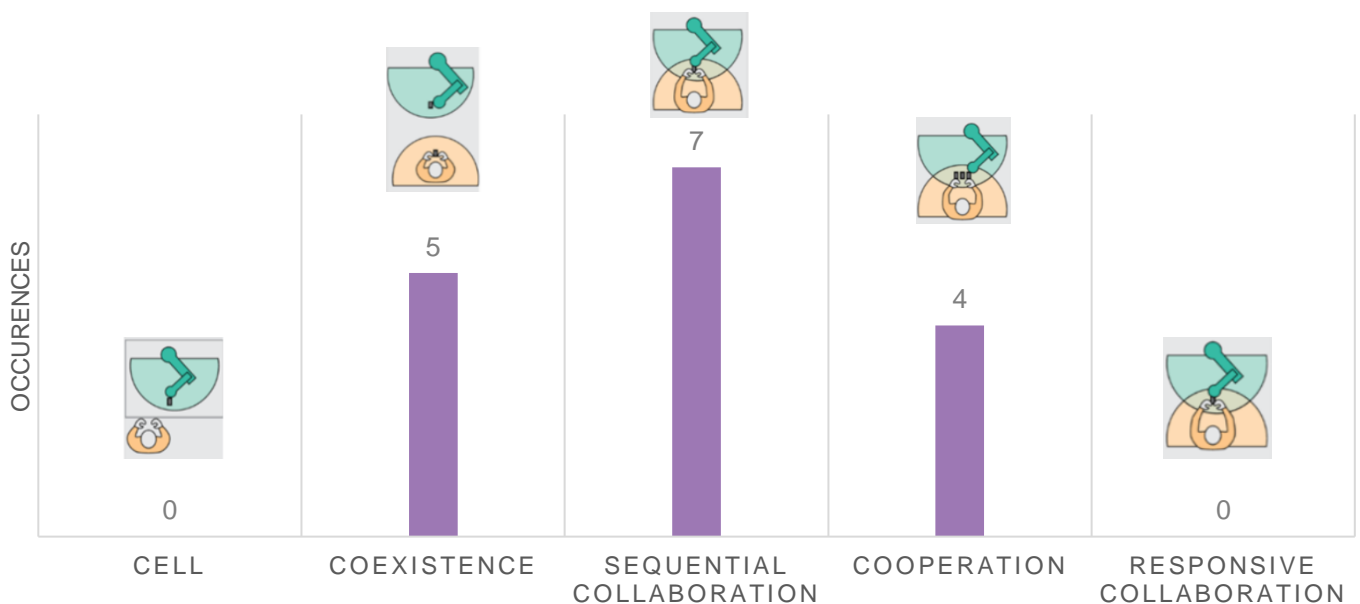
Level of human-robot collaboration (as defined by IFR, 2018)

The survey participants that indicated that they are starting or have deployed HRC applications were asked to indicate the highest level of human-robot interaction that their applications have. In this survey, the level of HRC is defined based on the interaction between human and robot.

The most represented HRC level amongst the highest level of HRC at the surveyed companies is sequential collaboration (7), followed by coexistence (5), and cooperation (4).

No organisation surveyed had a responsive collaboration application and all surveyed had at least some level of human-robot interaction.

HIGHEST LEVEL OF HRC FOR COMPANIES STARTING/HAVING DEPLOYED HRC APPLICATION(S)



Ranked levels of concern

Participants were asked to rate pre-identified challenges on a scale from 1 to 5 according to the participant's level of concern. A rating of 1 corresponds to un-existing concerns, whereas a rating of 5 corresponds to a challenge preventing the surveyed from meaningfully engaging with HRC application at this time.

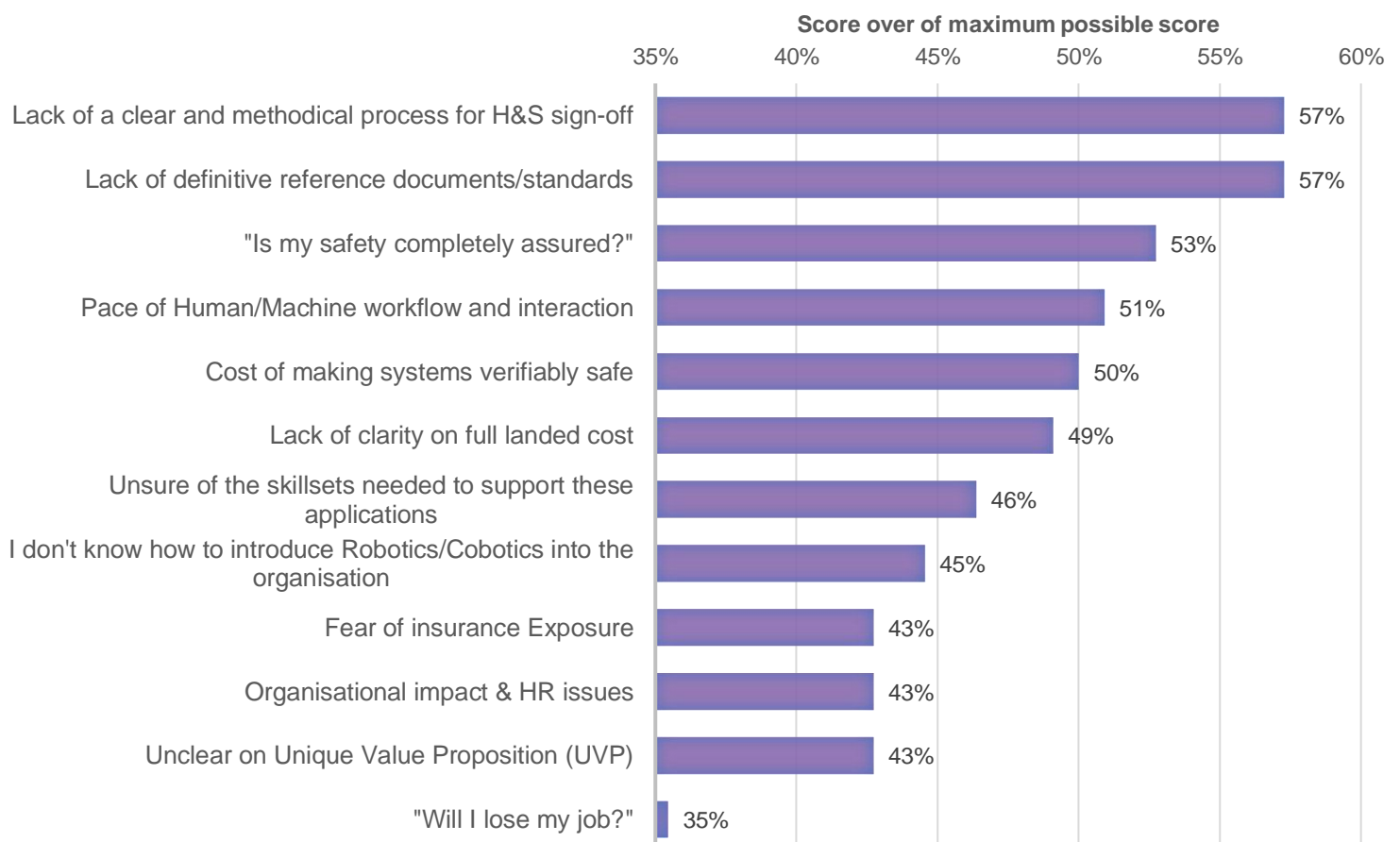
The scores for each of the 12 challenges were summed up and divided by the maximum score possible (5 x number of participants). Results are shown in the "Ranked concerns over Cobotics application adoption" bar chart below.

The two highest scoring concerns over collaborative robotics applications are:

- Lack of a clear and methodical process for Health & Safety sign-off (57% score)
- Lack of definitive reference documents/standards (57% score)

The least severe concern according to the participants is the concern over job replacement "Will I lose by job?".

RANKED CONCERNS OVER COBOTICS APPLICATION ADOPTION



Challenges preventing meaningful engagements

The bar chart below indicates the number of occurrences where a challenge has been rated as “preventing a meaningful engagement at this time” (score 5 out of 5).

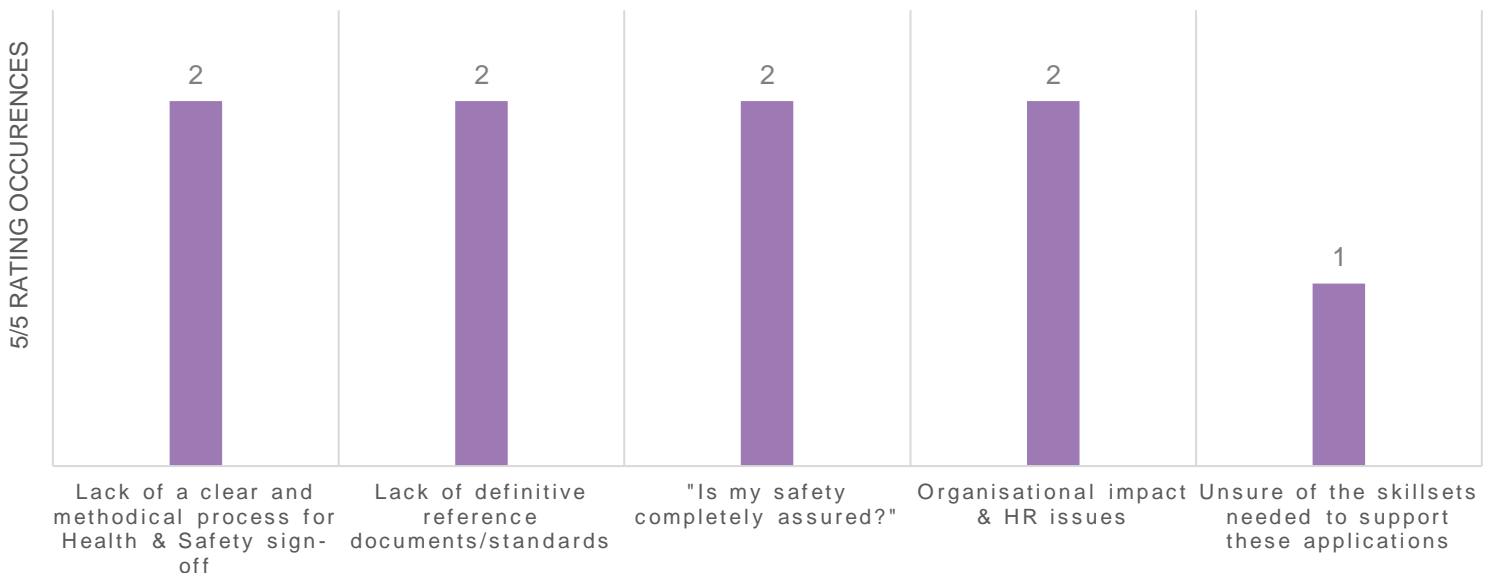
The two highest scoring concerns, i.e. Lack of a clear and methodical process for Health & Safety sign-off and Lack of definitive reference documents/standards, have both been rated as most severe in 2 occurrences.

The two other concerns most frequently rated as “preventing a meaningful engagement at this time” are:

- "Is my safety completely assured?" (ranking 3rd in the ranked concerns bar chart above)
- Organisational impact & HR issues (ranking 10th in the ranked concerns bar chart above)

Overall, lack of clear guidance and methodology are the most prevalent concerns across the 23 surveyed individuals.

CONCERNS MOST FREQUENTLY RATED AS MOST SERIOUS



Conclusion

This industry survey indicates that while most of the surveyed have starting or have deployed collaborative robotics applications (73% of the participants), the level of human-robot collaboration is mostly limited to Sequential collaboration and below (12 participants over 16 who have started/already deployed HRC applications).

The lack of a clear and methodical process for Health & Safety sign-off and the lack of definitive reference documents/standards are the most prevalent concerns across the 23 surveyed individuals and have been the most frequently rated as preventing a meaningful engagement with human-robot collaborative applications at this time.

The results were presented to the Robotics Executive Committee (REC) and have been guiding the activities and solutions in that space (<https://imr.ie/pages/human-robot-interaction/>).

References

¹ Demystifying Collaborative Industrial Robots, IFR, December 2018. https://ifr.org/downloads/papers/IFR_Demystifying_Collaborative_Robots.pdf

Appendix A – Survey Questions

Collaborative Robotics Adoption Survey

Interviewee Company

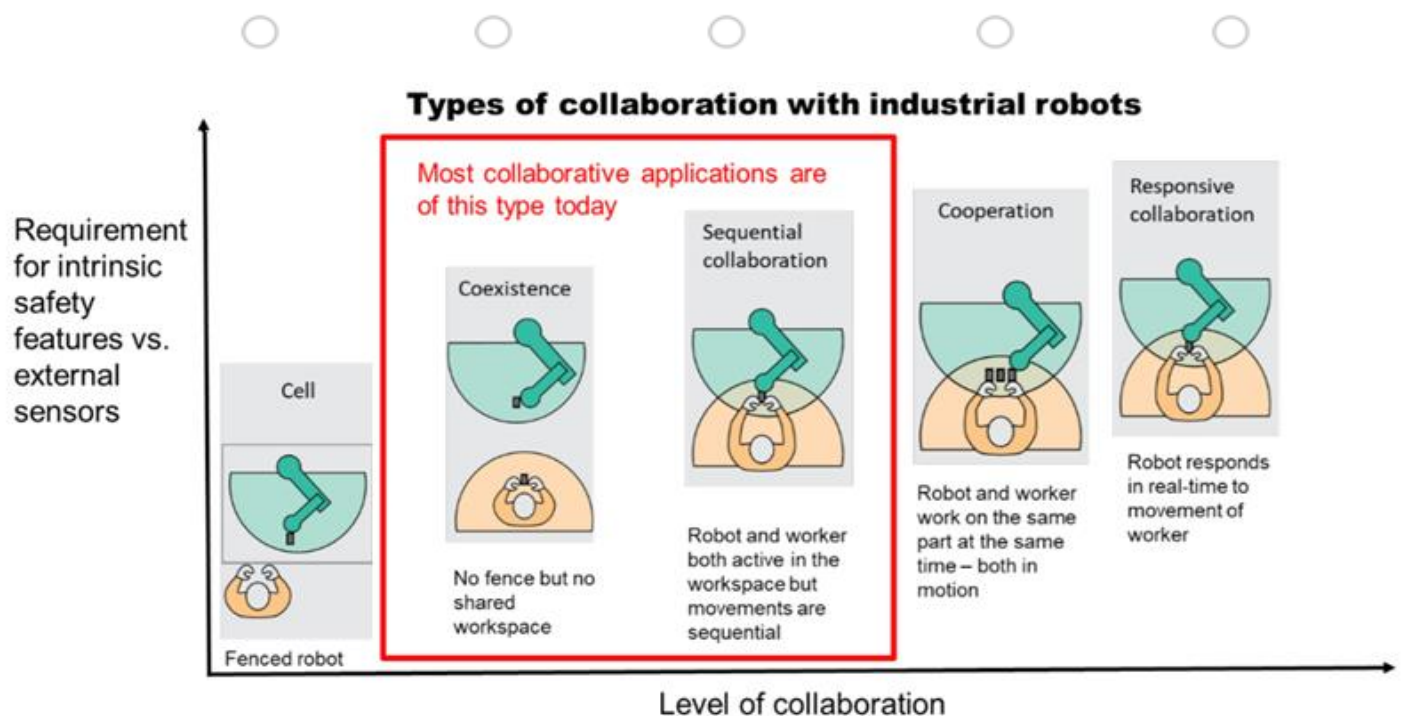
Interviewee Position

General

- What is the current level of Robotics engagement in your organisation?
 - We do not have any Robotic applications in our organisation
 - Some of the processes in our organisation include Robotic Systems
 - Most of our processes in our organisation include Robotic Systems

- What is the level of engagement your organisation has with Collaborative Robotic Applications?
 - We have no plans to integrate Collaborative Robotic Applications into our organisation
 - We thought about integrating Collaborative Robotic Applications into our organisation but it was not a good fit
 - We are thinking about integrating Collaborative Robotic Applications but we do not know where to start
 - We are starting to integrate one or more Collaborative Robotic Applications
 - We have already deployed multiple Collaborative Robotic Applications

- If you have deployed Collaborative Applications, with which level of Human/Robot Interaction does it align? Select the corresponding interaction level below:



4. Please rate each of the following Collaborative Robotics Applications challenge according to your level of concern:

1 – Not concerned with this 2 – Slight concern but does not prevent us from engaging with this type of application/ technology 3 – Elements of my organisation have concerns 4 – This obstructs us from meaningfully engaging with this type of application/ technology 5 – This prevents us from meaningfully engaging with this type of application/ technology

	1 – Not concerned with this	2 – Slight concern but does not prevent us from engaging with this type of application/ technology	3 – Elements of my organisation have concerns	4 – This obstructs us from meaningfully engaging with this type of application/ technology	5 – This prevents us from meaningfully engaging with this type of application/ technology	
Safety	Lack of a clear and methodical process for Health & Safety sign-off	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Lack of definitive reference documents/standards	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Cost of making systems verifiably safe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Fear of insurance Exposure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Workforce	"Will I lose my job?"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	"Is my safety completely assured?"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Pace of Human/Machine workflow and interaction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	I don't know how to introduce Robotics/Cobotics into the organisation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Org/Business	Unclear on Unique Value Proposition (UVP)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Org/Business	Lack of clarity on full landed cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Org/Business	Organisational impact & HR issues	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Thanks for your input!

If you would like an IMR expert to follow up with you on engaging with Collaborative Robotics, please indicate your email address below: