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# CREATIVE ENGINE

AN ERASMUS+  
RESEARCH STUDY ON  
**THE STATE OF  
INNOVATION  
READINESS IN  
ENGINEERING  
COMPANIES**

EVIDENCE-BASED LEARNING OUTCOMES REPORT

Output type: Intellectual Objective I

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## INTRODUCTION

### Creative Engine Project Objectives and Target Groups

The project Creative Engine forms a Strategic Partnership to modernize contemporary engineering VET to address the growing need to bring the discipline of innovation (with creativity, ideas management and entrepreneurship) into the existing technical education and training that learners must command.

Although Engineering is inherently about problem-solving, there is a recognized disconnect between creativity, innovation and engineering education, borne, principally from the current focus of teaching Engineering in a narrow and deep technical way, rather than opening the subject up and embracing creativity and new innovative thought.

If this disconnected condition in engineering education is not addressed, VET providers will run the risk of producing engineers that are ill-prepared to meet the demands of business and industry that request for engineers to have a wider arsenal of skills especially those multidisciplinary skills and competencies in creativity and innovation. A 2014 Survey of Engineering and Technology Skills and Demand in Industry noted 30% of employer's report that graduates do not have enough practical experience in design, creativity and innovation (IET 2016). Being an engineer in the future is more than math and science, it's about mastering the innovation processes to take advantage of ideation through to commercial value creation. Thus, it is critical that educational initiatives are started to revitalize and invest in new curriculum, bringing together the knowledge, skills and attitudes that are so desperately needed to support Europe's economies.

In this context, the Creative Engine project, that brings together partners from Spain, Ireland, Belgium, Ireland, Northern Ireland and the UK has been developed to produce new pedagogical and teacher training materials focused on the integration of creativity and innovation into Engineering VET.

To enhance both learner and trainer's creativity and innovation capabilities, a blended learning approach will be employed, incorporating both formal and non-formal learning techniques. Project-based and games-based learning exercises will form an integral part of the modular training course and associated teacher training programme. Informal learning techniques will be designed on emerging technologies such as Rapid Prototyping/Smart Materials, 3D scanning and printing, and automation, in order to ensure both up to date currency of examples and exposure to creativity and innovation experiences that will deliver a strong learning impact.

Such learning programmes will ensure learners are equipped with the necessary knowledge to boost their employability, entrepreneurial capability and give them the ability to become innovative engineering leaders.



## Content of the Intellectual Output 1 – Evidence-Based Learning Outcomes

The Intellectual Output 1 (O1) of the Creative Engine project comprises learning outcomes on creativity and innovation for engineers, namely statements of what learners should know, understand, and be able to do to be really innovative engineers.

The validation of these Creative Engine learning outcomes is based on research detailing how engineering employers are using and managing the innovation process, their innovation priorities, areas of focus, need and pain, and where the gaps are in their capabilities

The compilation and interrogation of the analysis from the Survey by Questionnaire of Engineering companies across the partner countries provides evidence that has guided the development of the Creative Engine Learning Outcomes in this report, and, will inform and shape the Creative Engine learning units. Intellectual Output 1 relies on the European reference frameworks and standards (EQF and ECVET) to develop the learning outcomes in terms of definitions of knowledge, skills and competences.

### Purpose and Use of the Intellectual Output 1

O1 provides VET providers and other stakeholders across the EU with clarity on key stages of the innovation process, including creativity, idea generation and evaluation; sensing, trends and competitive analysis; business model development; prototyping and minimum viable proposition; and business/market growth strategies.

The purpose of this output is to make available creativity and innovation learning outcomes driven by actual industrial need, that are appropriate to be integrated into existing VET offerings for engineering disciplines. These evidence-based learning outcomes address modern skills needs of engineers who are required to be creative problem solvers, able to create new propositions, connect with customers and are able to drive up the pace and maturity of innovation in their businesses to boost growth in value.

### Methodology for the Development of the Intellectual Output 1

The O1 is based on a needs analysis research to examine the needs and focus of engineering and technology businesses with respect to creativity and innovation activities. The body of evidence has been secured through a survey by on-line questionnaire, together with discussions with sector employers, engineering bodies, VET education and training providers, creativity and innovation champions amongst others.

The O1 comprises two sequential phases made up from six tasks (this report focuses on T4) :

(A) identifying evidence-based learning outcomes for the Creative Engine modular training course

Tasks: (T1) Produce methodology guidelines for skills mapping exercise

(T2) Data collection and analysis

(T3) Production of infographic summarizing the research results

(T4) Definition of Learning Outcomes for Creative Engine based on the needs analysis

(B) development of 6 learning units for the modular training course that can be used to educate trainee or practicing engineers on the tools, techniques and practices associated with the discipline of creativity and innovation.



(T5) Development of 6 Learning Units and associated specifications for the Creative Engine course and linguistic review

(T6) Production of curriculum integration guidelines

### **(A) identifying evidence-based learning outcomes for the Creative Engine modular training course**

#### T1 - Produce methodology guidelines for skills mapping exercise

Research was conducted to identify the Engineering Companies. Research work included: identification of constituent elements such as – Using, Dependent or Intensive Engineering companies ensuring a representative balance of respondent information; supporting the design of methodology that other partners were able to use to identify sub sector engineering groups to target for the survey. Furthermore, the Engineering subsectors were identified giving an economic profile associated with productivity figures (a by-product of process innovation); and manufacturing engineering as a percentage of national employment to identify key regional areas that are in growth.

This enabled target stakeholders to be established, and for the type of questions and question areas to be identify. A period of consultation took place with engineering stakeholder groups to refine the questionnaire to focus on where the greatest innovation and creativity skills needs were arising within the Engineering target groups. Subsequent to these consultation meetings, the questionnaire for the survey was developed in six key areas, coded for online delivery and translated into Spanish and Dutch.

#### (T2) Data collection and analysis

The data collection was conducted through the methodology outlined in (T1) and management representatives in engineering businesses were invited to take part. As IKE Institute Advisors are the leading experts on innovation development, and, engage with both academia and business on their innovation needs, their up to date knowledge complemented the Online Survey responses, to validate engineering business need on creativity and innovation practices.

#### (T3) Production of infographic summarizing the research results

An infographic report to summarize the results of the data has been developed by Dublin City University. The report has been designed to be visually engaging, with exciting content (charts, graphs, illustrations and icons) to enable a greater understanding of the project, together with the skills and knowledge in creativity and innovation that engineers need to acquire to achieve business success in today's world.

#### (T4) Definition of Learning Outcomes for Creative Engine based on the needs analysis

The definition of the learning outcomes is based on the evidence collected, interrogated and analysed in IO1-T2. The learning outcomes is mainly addressed for VET providers and course designers in the engineering sector. This report, as core output of IO1, is intended to increase the capability of providing creativity and innovation within engineering VET provision for future engineers:

- a. Detailing the current and future skills, competencies and knowledge requirements for engineers in terms of creativity and innovation tool, techniques and practices
- b. Providing qualitative input for validating Creative Engine learning outcomes,
- c. Presenting definitions of learning outcomes in the form of statements of what engineers wanting to embrace creativity and innovation should know, understand and be able to do upon the completion of the Creative Engine course



- d. Providing guidelines, examples and templates on how to prepare corresponding learning materials

The report follows the EQF/ECVET methodology, standards and terminology, to ensure compatibility with different NQF systems.

## CONTEXT

The following analysis is based on the creativity and innovation Training Needs survey (questions in blue) conducted during February and March 2019 across the four partner countries. It highlights the Learning Outcomes and Capability Development statements that aim to inform and shape the creation of training and learning modules in six key areas as follows:

1. Creativity and Ideas Management
2. Innovation Process and Planning
3. Customer Analysis
4. Management of New Innovations
5. Business Case Development
6. Communications and Engagement

A total sample of 240 participating organisations representing micro businesses, small and medium enterprises to multinational businesses in the engineering-related fields was analysed.

## DEFINITION OF KEY TERMS

### CREATIVITY

Is the ability to imagine or invent something new (or use in a new situation). Creativity is an active process and a state of mind. It is part of the overall innovation process. It requires empathy and inspiration. Creative thinking is defined as the thinking that enables individuals to apply their imagination to generate ideas, questions and hypotheses, experiment with alternatives and evaluate ideas.

### INNOVATION

Is a process that combines discovering an opportunity, transferring or copying an idea to seize that opportunity, and implementing that idea to achieve results. It is the process where an idea or invention becomes a product, a service and/or a business model. Therefore, innovation is the discipline of value creation. It can occur in all parts of an organisation, throughout the value chain, and at all stages of product/service lifecycles: research; design; manufacture; distribution and marketing; servicing; maintenance; withdrawal; and the eventual disposal and recycling of products, as well as, reconfiguring an organisation's business model.

### INNOVATION PROCESS

The innovation process consists broadly of the following stages: identifying opportunities; creating concepts; evaluating concepts; developing solutions, deploying solutions, validating and integrating solutions.





## DATA COLLECTION AND RESEARCH METHODS

### Field research

The field research methodology employed an online structured questionnaire; this approach was time and cost-efficient, and facilitated the data collection, coding and analysis.

The questionnaire asked target groups within Engineering Manufacturing, a series of key questions pertaining to what, as a business they do across the innovation process, including innovation strategy, context, business development and communication. The respondent answers have been interrogated and analysed and those areas where responses indicated gaps or weaknesses have been addressed as a priority, and the areas where Creative Engine learning materials should mostly be focused. The online questionnaire was distributed via a survey hosting platform, namely Survey Monkey, and the recipients received the link by e-mail. Promotion of the Creative Engine Survey was also conducted on social media (Facebook and Twitter) with a reach of 84,000 with just over 1200 engagements from Engineering companies.

### Purpose and research questions

The purpose of the proposed methodology was to identify the areas of innovation need and thus develop six training modules to meet the Learning Outcomes that could be integrated into existing VET providers' engineering courses for engineers. The questionnaire aimed to collect and demonstrate the gaps in engineering companies within the innovation discipline, and this was achieved through a number of focused questions pertaining to creativity and innovation.

Target universe: Engineering Businesses as per the Tables below:

	Belgium (2016)		
	Total	> 250	% > 250
Total Business economy	611,708	912	0.1%
Manufacturing	34,132	307	0.9%
Manufacture of food products	6,500	62	1.0%
Manufacture of beverages	420	6	1.4%
Manufacture of tobacco products	24	:	:
Manufacture of textiles	1,170	9	0.8%
Manufacture of wearing apparel	693	:	:
Manufacture of leather and related products	127	0	0.0%
Manufacture of wood and of products of wood and cork, except furniture	1,654	:	:
Manufacture of paper and paper products	224	13	5.8%
Printing and reproduction of recorded media	3,873	:	:
Manufacture of coke and refined petroleum products	11	4	36.4%
Manufacture of chemicals and chemical products	562	41	7.3%
Manufacture of basic pharmaceutical products	99	12	12.1%
Manufacture of rubber and plastic products	758	20	2.6%
Manufacture of other non-metallic mineral products	1,617	24	1.5%
Manufacture of basic metals	306	15	4.9%
Manufacture of fabricated metal products, except machinery	7,342	15	0.2%
Manufacture of computer, electronic and optical products	397	9	2.3%
Manufacture of electrical equipment	581	15	2.6%
Manufacture of machinery and equipment n.e.c.	1,328	16	1.2%
Manufacture of motor vehicles, trailers and semi-trailers	365	15	4.1%
Manufacture of other transport equipment	99	5	5.1%
Manufacture of furniture	2,001	:	:
Other manufacturing	1,923	4	0.2%
Repair and installation of machinery and equipment	2,058	14	0.7%



**Table 1: Engineering Businesses in Belgium**

	Ireland		
	Total	> 250	% > 250
Total Business economy	243,433	448	0.2%
Manufacturing Engineering Companies	15,242	152	1.0%
Manufacture of food products	1,637	45	2.7%
Manufacture of beverages	123	4	3.3%
Manufacture of tobacco products	:	:	:
Manufacture of textiles	421	0	0.0%
Manufacture of wearing apparel	335	0	0.0%
Manufacture of leather and related products	65	0	0.0%
Manufacture of wood and of products of wood and cork, except furniture	947	0	0.0%
Manufacture of paper and paper products	203	:	:
Printing and reproduction of recorded media	1,177	:	:
Manufacture of coke and refined petroleum products	:	:	:
Manufacture of chemicals and chemical products	299	10	3.3%
Manufacture of basic pharmaceutical products	155	21	13.5%
Manufacture of rubber and plastic products	475	4	0.8%
Manufacture of other non-metallic mineral products	1,010	3	0.3%
Manufacture of basic metals	356	:	:
Manufacture of fabricated metal products, except machinery	3,041	3	0.1%
Manufacture of computer, electronic and optical products	377	14	3.7%
Manufacture of electrical equipment	262	4	1.5%
Manufacture of machinery and equipment n.e.c.	583	10	1.7%
Manufacture of motor vehicles, trailers and semi-trailers	133	:	:
Manufacture of other transport equipment	79	0	0.0%
Manufacture of furniture	1,110	:	:
Other manufacturing	878	29	3.3%
Repair and installation of machinery and equipment	1,245	:	:

**Table 2: Engineering Businesses in Ireland**





	Spain		
	Total	> 250	% > 250
Total Business economy	2,682,905	3,185	0.1%
Manufacturing	166,984	802	0.5%
Manufacture of food products	22,537	176	0.8%
Manufacture of beverages	4,908	26	0.5%
Manufacture of tobacco products	54	:	:
Manufacture of textiles	6,013	6	0.1%
Manufacture of wearing apparel	8,557	8	0.1%
Manufacture of leather and related products	4,696	:	:
Manufacture of wood and of products of wood and cork, except furniture	9,601	4	0.0%
Manufacture of paper and paper products	1,652	26	1.6%
Printing and reproduction of recorded media	13,456	5	0.0%
Manufacture of coke and refined petroleum products	18	4	22.2%
Manufacture of chemicals and chemical products	3,409	54	1.6%
Manufacture of basic pharmaceutical products	350	47	13.4%
Manufacture of rubber and plastic products	4,340	40	0.9%
Manufacture of other non-metallic mineral products	8,018	49	0.6%
Manufacture of basic metals	1,171	44	3.8%
Manufacture of fabricated metal products, except machinery	32,860	53	0.2%
Manufacture of computer, electronic and optical products	2,347	18	0.8%
Manufacture of electrical equipment	1,979	35	1.8%
Manufacture of machinery and equipment n.e.c.	5,427	37	0.7%
Manufacture of motor vehicles, trailers and semi-trailers	1,638	98	6.0%
Manufacture of other transport equipment	715	23	3.2%
Manufacture of furniture	11,802	9	0.1%
Other manufacturing	9,990	9	0.1%
Repair and installation of machinery and equipment	11,446	26	0.2%

**Table 3: Engineering Businesses in Spain**



	United Kingdom (2016)		
	Total	> 250	% > 250
Total Business economy	2,116,132	6,196	0.3%
Manufacturing	135,396	1,229	0.9%
Manufacture of food products	7,811	219	2.8%
Manufacture of beverages	1,735	:	:
Manufacture of tobacco products	11	:	:
Manufacture of textiles	4,187	25	0.6%
Manufacture of wearing apparel	3,859	5	0.1%
Manufacture of leather and related products	608	6	1.0%
Manufacture of wood and of products of wood and cork, except furniture	9,015	21	0.2%
Manufacture of paper and paper products	1,441	37	2.6%
Printing and reproduction of recorded media	12,113	36	0.3%
Manufacture of coke and refined petroleum products	120	9	7.5%
Manufacture of chemicals and chemical products	2,826	67	2.4%
Manufacture of basic pharmaceutical products	608	39	6.4%
Manufacture of rubber and plastic products	5,779	91	1.6%
Manufacture of other non-metallic mineral products	3,688	48	1.3%
Manufacture of basic metals	1,963	36	1.8%
Manufacture of fabricated metal products, except machinery	27,281	76	0.3%
Manufacture of computer, electronic and optical products	6,078	67	1.1%
Manufacture of electrical equipment	3,054	48	1.6%
Manufacture of machinery and equipment n.e.c.	7,761	97	1.2%
Manufacture of motor vehicles, trailers and semi-trailers	3,222	89	2.8%
Manufacture of other transport equipment	2,327	57	2.4%
Manufacture of furniture	6,222	41	0.7%
Other manufacturing	9,427	28	0.3%
Repair and installation of machinery and equipment	14,015	60	0.4%

**Table 4: Engineering Businesses in the UK (including Northern Ireland)**

### Survey Population

The survey population was engineering and technology business covering the sectors in above charts.

From the population, 240 respondents came through:

Spain (Basque Country) – 54

Belgium (Flemish Region) – 53

Republic of Ireland – 49

United Kingdom – 60

Northern Ireland – 24

(Northern Ireland has been shown separately from the rest of the UK to reflect its specific economic structure).

## DEFINITION OF LEARNING OUTCOMES

### Methodology to develop the Creative Engine Learning Outcomes

All the information, collected through questionnaire and desk researches, was the basis to define the learning outcomes of the Creative Engine training offer. As requested by the Creative Engine project, the learning outcomes should match the requirements set out by the European Qualification Framework. The EQF comprises eight reference levels based on ‘learning outcomes’ – defined in terms of knowledge, skills and competences, thus shifting the emphasis from input (type and duration of learning experience) to actual learning, i.e. to what a person is able to do upon the completion of a learning process.

Moreover, learning outcomes are used as a basis for credit transfer and accumulation (ECVET) and are specified in the three categories of knowledge, skills and competence.

In the context of the Creative Engine project, the development of a VET curriculum focused on Innovation and Creativity for engineers and technologists in engineering businesses required knowledge, skills and competences in six key areas: Creativity and Ideas Management, Innovation Culture, Innovation Process and Planning, Innovation Strategy and Evaluation, Customer Analysis, and Market Analysis.

Each one of the eight EQF reference levels represents a different set of requirements, defining the associated level of knowledge, skills, and competences. The Creative Engine learning outcomes correspond to levels 4 and 5 of the EQF:

<b>Level 4</b>	Factual and theoretical knowledge in broad contexts within a field of work or study	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities
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<b>Level 5</b>	Comprehensive, specialized, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge	A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems	Exercise management and supervision in contexts of work or study activities where there is unpredictable change; review and develop performance of self and others
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## PRIORITY OF LEARNING AREAS

The priority ranking of need has been analysed from the total number of respondents who completed each of the 19 questions applicable to the analysis. The level of completion demonstrates both an understanding and an interest in the area being investigated. A question that has a poor level of completion 70% < demonstrates the area of the question was not understood and thus, a deficiency gap.

From IKE's own understanding of innovation gaps, the fact that the areas of metrics, evaluation and measurement, innovation strategy, customer analysis and strategic market analysis came up as areas of low question participation correlates back to a recognised skills/understanding deficiency in these areas. This aspect was further discussed during the Roundtable discussion to validate these findings and to attribute an appropriate priority ranking to innovation needs in Engineering Manufacturing companies. The breakdown of respondents is shown in Table 5 below:

**Table 5: Completion of Survey Questions**

Question	UK	Spain	Belgium	ROI	NI		
<b>1</b>	59	52	52	49	24	98.33	CONTEXT QUESTIONS
<b>2</b>	53	50	45	49	22	91.25	CREATIVITY & IDEAS MANAGEMENT Avg 86
<b>3</b>	47	48	43	45	22	85.42	
<b>4</b>	54	50	45	48	22	91.25	
<b>5</b>	50	48	44	47	21	87.50	
<b>6</b>	44	46	29	39	15	72.08	
<b>7</b>	53	49	44	48	22	90.00	
<b>8</b>	39	38	30	30	6	59.58	
<b>9</b>	54	50	44	49	22	91.25	
<b>10</b>	51	43	41	47	22	85.00	
<b>11</b>	51	42	41	46	22	84.17	
<b>12</b>	36	32	26	28	13	56.25	
<b>13</b>	51	42	40	41	21	81.25	
<b>14</b>	42	40	34	32	16	68.33	
<b>15</b>	50	42	41	43	22	82.50	CUSTOMER ANALYSIS Avg 73
<b>16</b>	45	27	28	37	15	63.33	
<b>17</b>	51	38	39	46	22	81.67	
<b>18</b>	51	39	41	45	22	82.50	MANAGEMENT OF NEW INNOVATIONS Avg 74
<b>19</b>	50	38	41	45	22	81.67	
<b>20</b>	41	22	31	34	16	60.00	
<b>21</b>	51	40	41	44	22	82.50	BUSINESS CASE DEVELOPMENT Avg 81
<b>22</b>	50	38	39	43	21	79.58	
<b>23</b>	50	40	38	40	20	78.33	COMMUNICATIONS & ENGAGEMENT



24	50	41	41	45	22	82.92	Avg 80
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**Table 6: Question Completion Rate & Priority Ranking**

<b>Creativity &amp; Ideas Management</b>	<b>Question Completion Rate %</b>	<b>Ranking of Need</b>
Awareness of creativity and how the brain works to promote thinking differently in others	91	19
Knowledge of Creative Problem Solving applied in an Engineering context	91	19
Competence in issues related to tools and techniques for Creative Problem Solving	85	15
Divergent and Convergent Ideation skills in creativity	85	15
Competence in issues related to the development of effective ideas management	72	6
Knowledge of the creative thinking process	91	19
Competence in issues related to coaching and mentoring for creativity and innovation	82.9	12
Knowledge of the conditions that support creativity and innovation in the workplace	91	19
Competence in team structure, dynamics and management to promote ideation	91	19
Awareness of knowledge management and its role in ideation	72	6
Competence in issues related to effective ideas capture, management and dissemination	72	6
Knowledge in planning, structuring and executing Innovation Portals in the Engineering sector	87	16
Skills in User Interface Design and Development for web and mobile applications	87	16
Awareness of communication methodologies to stimulate and motivate ideation in Engineering sector companies	87	16
Skills in Campaign/Initiative Design to support employee engagement in creativity and innovation	87	16
Knowledge of the stage-gating process to improve ideation management	72	6
Competence in issues related to stage-gate design for on and off-line delivery and management	72	6
Awareness of stage-gating to support and nurture the momentum of innovation	72	6



Competence in issues related to using the Value Proposition Board to support ideation	72	6
Knowledge of ideation aligned to business strategy and direction	84	13
Qualitative and Quantitative Assessment skills in developing and using metrics to progress ideas	59	2
Competence in issues related to understanding the customer and using tools for customer discovery to support ideas assessment and evaluation	63	4
Competence in issues related to appraising creativity and problem-solving as part of an employee's performance appraisal in the Engineering sector	91	19
<b>Innovation Process &amp; Planning</b>	<b>Question Completion Rate %</b>	<b>Ranking of Need</b>
Knowledge of what innovation is, the principles of innovation and the value of innovation to a business	85	14
Competence in issues related to designing and managing the innovation process in a business in the Engineering sector	85	14
Competence in issues related to effective planning for innovation	85	4
Knowledge of methods and techniques to create and instil an innovation culture in Engineering businesses	81	9
Management skills in people development to support an innovation culture	81	9
Awareness of the balance between strategy and culture in innovation and how to leverage each at different times for improved business performance	84	13
Knowledge of budgeting for innovation investment and return	56	1
Awareness of the value to a business in aligning business strategy with innovation strategy	84	13
Competence in issues related to Innovation Horizons Portfolio Mapping (Core/Incremental, Adjacency, Transformative)	84	13
Innovation planning skills related to developing new business models and new propositions	84	13
Competence in issues related to the use of tools and techniques used in innovation to business positioning (DPM, Ideal Spec)	84	13
Awareness of the use trends and patterns in determining innovation focus	84	13
Competence in issues related to Innovation Plan Performance Review	56	1



Assessment skills in metrics to evaluate and review innovation plans	56	1
Competence in issues related to Technology Road Mapping in the Engineering sector	85	14
Customer insight skills for exploring existing offers to shape new innovations	63	4
Knowledge of effective stakeholder engagement and communication methods to support innovation plan promulgation	81	9
Presentment and communication skills for both internal and external promotional focus	81	9
Competence in issues related to web and graphic design	81	9
Knowledge of active innovation leadership	85	14
Competence in issues related to the use of tools and techniques to stimulate and nurture knowledge generation in cross-functional teams	85	14
Knowledge of how to capture, share and collaborate ideas and experiences across different stakeholder groups	85	14
Competence in issued related to Innovation Ecosystem Mapping	85	14
Knowledge of how to track customer/market trends to validate innovation direction	84	13
Competence in issues related to Capability Mapping in Engineering sector to identify gaps and barriers to innovation developments	85	14
<b>Customer Analysis</b>	<b>Question Completion Rate %</b>	<b>Ranking of Need</b>
Awareness of Business Environmental (PESTLE) factors affecting products, services and markets	63	4
Competence in issues related to Customer Needs Analysis and Market Analysis to support innovation focus	63	4
Knowledge of Scenario Planning and the use of FTE (From-To-Exploration) Matrix	63	4
Data analytics skills for coding, using and interpreting customer data	63	4
Knowledge of data analytics platforms for collection and analysis (Google, Facebook, Power BI, Cognos etc)	60	3
Awareness of the fundamentals of Market Research	63	4





Competence in issues related to developing research methods for direct customer engagement and feedback	63	4
Knowledge of Focus Group composition design, activity structure, management and evaluation (including depth interview processes and observations)	60	3
Competence in issues related to design and development of prototypes/minimum viable propositions for customer feedback in Engineering sector businesses	63	4
Awareness of the relevance and importance of Strategic Marketing Management in relation to Innovation development	63	4
Knowledge of market differentiation and segmentation in strategic innovation development	63	4
Competence in issues related to the application of SWOT Analysis, BCG, Ansoff and DPM Matrices to determine market focus and where an Engineering business should innovate	63	4
Awareness of the importance of cross-functional team structures in the support of business development	81	10
Competence in issues related to pre and post Bid Analysis using a range of tools and techniques	81	10
Knowledge of effective team management and communication methodologies	85	14
Competence in issues related to Intellectual Property (IP) management and development, including IP Monetization and IP Busting	85	14
Awareness of IP legislation and policies within the Engineering industry	85	14
Knowledge of Competitive Analysis and tracking behaviours in the market space	63	4
<b>Management of New Innovations</b>	<b>Question Completion Rate %</b>	<b>Ranking of Need</b>
Competence in issues related to managing new innovations into existing route maps of products and services (offers), business processes and resources/capabilities	82.5	11
Skills in Value-Based Improvement Techniques to support new innovation developments	60	3
Design Thinking skills for new proposition development in Engineering businesses	60	3
Competence in issues related to User Experience Mapping in new proposition development in the Engineering sector	60	3
Competence in technical issues related to Customer Testing covering design, execution and management	60	3
Knowledge of customer-centric innovation	60	3



<b>Business Case Development</b>	<b>Question Completion Rate %</b>	<b>Ranking of Need</b>
Awareness of the need to employ Systematic Business Planning for Innovation	82.5	11
Skills in Business Case Development for innovation in Engineering businesses (Business Model Canvas etc.)	82.5	11
Competence in issues related to developing and using SMART metrics to determine innovation impact and value to a business operating in the Engineering Sector	79	8
Knowledge of Technology, Business and Customer Readiness Levels associated with new proposition development	84	13
Competence in issues related to condensing an Innovation Plan on to a single page for better communication and improved understanding of innovation goals	84	13
Competence in issues related to Balancing Innovation activities across a business in the Engineering sector	84	13
Knowledge of Team Design Formation to support an engaged innovation process in businesses in the Engineering sector	81	10
<b>Communications &amp; Engagement</b>	<b>Question Completion Rate %</b>	<b>Ranking of Need</b>
Competence in technical issues related to designing, building and managing platforms and content for innovation communications	78	7
Knowledge of frameworks to measure maturity and pace of innovation	56	1
Awareness of methods to promote openness, communication and sharing to support an innovation culture	78	7
Competence in issues related to designing and managing risk and reward processes in people innovation development	85	14



## CREATIVE ENGINE LEARNING OUTCOMES

The Creative Engine Six Learning Outcomes derive directly from the ranking, together with feedback from survey participants, Innovation Council Members<sup>1</sup> and further discussions with academics and practitioners that have reflected the combination of Knowledge, Skills and Competences of each Learning Outcomes.

### LEARNING OUTCOME 1 – CREATIVITY & IDEAS MANAGEMENT

Creativity is critical to innovation, and thus developing a capability in creativity and especially creative problem solving through a range of tools and techniques has been identified as part of a learning outcome.

In terms of the ability in companies to develop creativity, there is an almost equal balance across the Formal, Informal and Coaching and Mentoring, with a slight leaning towards Formal Training. In development of the learning module to support this learning outcome, provision should be made to provide a balance of underpinning knowledge with practical exercises and coaching support from in-house company innovation champions.

In the survey, respondents were questioned on whether their organisation encouraged cross-functional participation. It was good to see that cross-functional engagement was high at 90%, and this participation level warrants the need for effective idea generation (ideation) and evaluation, and thus having a competence in generating ideas, exploring them and building upon them is necessary and recognised within this learning outcome.

When asked about how ideas were collected Exchange During Group Discussions was the most popular with 61%, suggesting a need in both understanding how to balance a group for productive ideation and how to structure the meeting effectively to enable valuable output.

With over a quarter (26.5%) of respondents confirming that ideas or innovation portals are used in ideation, the knowledge in planning, structuring and executing such portals and platforms was underpinned as a need. From IKE's experience more companies, irrespective of size, are choosing to use digital means to support innovation development.

The question on the management of ideas saw almost fifty percent confirming to a structured process in managing ideas, followed by a Committee Review at 44%. The option of stage-gating was only cited by 7% of those who responded. Such results clearly infer inefficient, costly and time-consuming methods of ideas management that could be at the detriment of innovation. From the response stating 93% of respondents didn't use stage-gating, a competence in innovation stage-gate design, delivery and management has been considered critical as part of this overall learning outcome, to ensure better efficiencies are achieved and the momentum of innovation is moved forward in engineering organisations.

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<sup>1</sup> Innovation Council Members include c-suite representatives from the following organisations: 3M, ABC Electrification, AMEC, Arla Foods, BAE Systems, Balfour Beatty, BASF, BBC, Bosch, Britvic, BT, Bupa, Buro Happold, Cobham, Cobra, Costain, Crossrail, Dell EMC2, DHL, Dunhill, DuPont, EDF Energy, Extrinsic Global, GE Healthcare, GlaxoSmithKline, Horizon Nuclear Power (Hitachi), HP, Lego, MARS, MBDA, MedImmune (AstraZeneca), Medvivo, Microsoft, MITIE, National Grid, National Skills Academy for Nuclear, Network Rail, Panasonic, Plessey Semiconductors, Raytheon, Rolls-Royce, Royal Mail Group, Tate & Lyle, Telefonica, Thales UK, Transport for London, Petroleum Industry Association, Unilever.



As a result of this analysis, the following Learning Outcome has been developed:

Learning Outcome 1	EQF Level	Knowledge, skills & competence required
Understand the key concepts of creativity and ideas management, and, the role that digital plays in effective ideation	4	Ideation skills in using tools and techniques for creativity and problem solving in engineering
		Competence in ideas capture, management and dissemination
		Knowledge in planning, structuring and executing Innovation Communication Platforms and Portals
		Competence in innovation stage-gate design, delivery and management for ideation

## LEARNING OUTCOME 2 - INNOVATION CULTURE

From the survey, the respondents identified a relatively strong commitment to creative problem-solving, with 75% of respondents confirming their organisations had ensured all the right resources to support creativity. However, still one fourth claimed that they were not encouraged to think creatively, and the conditions were not there to support such thinking. Having the right conditions to support new thinking and creativity in terms of space, time, funding and resources in the workplace is an underlying requirement for an organisation developing an innovation culture, and thus knowledge of the conditions that support creativity and innovation in the workplace, is a critical component of this learning outcome.

Throughout the survey, questions were asked reflecting the elements of an innovation culture, such as: how ideas were collected and managed; how innovation was promoted and communicated, who was responsible for innovation, whether ideas were developed in cross-functional groups/teams etc. Given that, from the survey, the management of an innovation plan ‘by Committee’ was found to be the most popular option with 45% of all respondents who had an innovation plan, advising they handled responsibility of innovation in this way, an underlying requirement for such effective innovation management was found to be a capability in team design, dynamics and management and thus, this competence has been included as part of this learning outcome

Engagement in innovation within organisations is often down to internal communications. This was tested with a question to respondents about whether their innovation plan was presented and communicated. 38% of respondents holding an Innovation Plan confirmed it was presented and communicated across the business, however, almost a fifth said that it wasn’t and 42% said only in part. Communication in innovation is key to embedding practices and driving forward peoples’ understanding of the value of innovation to them personally, as well as to the company, and thus skills in developing Innovation Campaigns to support engagement internally and externally has been included as a key component of this learning outcome. In this learning outcome, presentment and communication of innovation, using tools and techniques that support this process, including web and graphics design, communication principles and showcase design will be addressed.



Managing people and their performance in innovation is essential to ensuring an innovation culture is embedded and people adopt the habit of innovation, rather than seeing it as a chore, ad-hoc to their primary work. In the survey, 56% of respondents stated that creative-problem solving (CPS) wasn't assessed as part of an employee's performance appraisal. In an engineering company, CPS is a critical skill in maintaining a company's ability and edge. Having the management skills to develop people in innovation and encourage the right beliefs and behaviours to persist is necessary to embedding an innovation culture. Therefore, the component of management skills in people development and performance to support an innovation culture has been incorporated in this learning outcome.

There are many methodologies that can be employed to support an innovation culture, including such areas as innovation leadership, Team X development, motivation triggers, risk and reward and stimulating innovation, knowledge capture, sharing and collaboration and innovation governance, and thus competence in issues related to methodologies used to create and instil innovation cultures is considered vital to this learning outcome.

As a result of this analysis, the following Learning Outcome has been developed:

Learning Outcome 2	EQF Level	Knowledge, skills & competence required
Understand the concepts of how to develop an innovation culture	4	Knowledge of the conditions that support creativity and innovation in the workplace
		Competence in team design, dynamics and management for promoting innovation and creativity
		Skills in developing Innovation Campaigns to support engagement internally and externally
		Management skills in people development and performance to support an innovation culture
		Competence in issues related to methodologies used to create and instil innovation cultures



### LEARNING OUTCOME 3 – INNOVATION PROCESS AND PLANNING

Perhaps, one of the essential elements of innovation is having clarity over what innovation means to a company. Experience has demonstrated that when everyone in an organisation is on the same page in their understanding of innovation, better and more consistent progress can be made in innovation development, thus deriving increased value for the organisation. Therefore, a key component of this learning outcome is to ensure a base line knowledge of what innovation is, the principles of innovation, and, the value that innovation presents to a business of any size. The context question in the survey has provided a good barometer on engineering companies appreciation of innovation, showing that the majority of respondents (70%) do not consider innovation to be chaotic and that it can be planned and managed.

In the survey, 25% of respondents confirmed having a structured approach to innovation, but over half (53.5%) preferred a combinational approach (part structured and part unstructured), with the remainder adopting an unstructured approach. Research in this area has demonstrated the value of having a more structured approach to innovation, as this helps assess the impact of innovations, and attribute metrics to improve<sup>2</sup>. The fact that over half still have a combinational approach infers a dilution in their innovation capabilities overall, as they are not fully measurable, and thus able to be improved upon. Within an innovation process, parts such as ideation may be more unstructured to allow for free-flowing thoughts, however, overall, if value is to be derived from innovation, there has to be a structure in its approach within an organisation. Thus, this learning outcome looks to skill up engineers in using models, tools and techniques to design, develop and manage an innovation process.

Just over half (56%) of respondents confirmed they had an Innovation Plan, and from these 87% advised that the review was annually undertaken. Having an innovation plan is essential for an organisation as it provides a way to align innovation focus to business direction and enables clear metrics to be put in place. Therefore, a competence in developing Innovation Plans, together with Stage-gate design, management and review has been incorporated into this learning outcome.

Over half (52%) of all respondents claimed that their focus was on technical innovation. This is unsurprising as the respondent population was engineering-technology companies. Developing a capability in understanding and managing Intellectual Property in the context of their product/process development and enhancement is critical for technical companies, and thus competence in issues related to Intellectual Property (IP) management and development has been incorporated into this learning outcome.

Within the context questions, 70% of respondents confirmed an innovation focus on continual improvement of existing products, and therefore a capability in incremental/core innovation needs to be built. 38% of respondents also cited that a fair proportion of turnover was being generated from new products introduced in the last three years, which identifies a new product development focus around innovation. Respondents were from Engineering and Technology companies, and thus it was considered that there would be a greater number using systematic business planning techniques, due to the complexity of their businesses. Around a third of all respondents claimed they did use such techniques, however just under a third (28%) claimed they did not. 40% of respondents said they only used the systematic business planning 'some of the time'. Whether this lack of focus to use such

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<sup>2</sup> Harvard Business Review, 2014, Analytic Services finds that 79% of organizations with innovative IT take a structured and managed approach to innovation.

<https://www.lead-innovation.com/english-blog/structured-innovation-process>.



systematic techniques all of the time can be attributed to: i) a gap in skills or ii) to an insufficient need to have to build new business cases for new propositions (preferring to continue with established cash cow offerings) is unknown from the responses.

It is however a concern, as what amounts to over two thirds of the respondents are not consistently using systematic business planning techniques to support the Business Case for their new offering. Business case development is a critical as part of the innovation process, and a way to ensure buy-in from stakeholders/customers for Customer Funded Research and Development (CFR&D) and senior managers responsible for Self-Funded Research and Development (SFR&D) allocation. Thus, skills in Business Case Development and Value Based Improvements for Innovation are a key component of this learning outcome.

As a result of this analysis, the following Learning Outcome was developed:

Learning Outcome 3	EQF Level	Knowledge, skills & competence required
Apply innovation process to support effective planning and development of innovation	5	Knowledge of what innovation is, the principles of innovation, and, the value of innovation to a business
		Innovation planning skills in using models, tools and techniques to design, develop and manage the innovation process
		Competence in developing Innovation Plans including Stage-gate design, management and review
		Competence in issues related to Intellectual Property (IP) management and development
		Skills in Business Case Development and Value Based Improvements for Innovation

#### LEARNING OUTCOME 4 – INNOVATION STRATEGY AND EVALUATION

An innovation strategy brings an organisation’s innovation goals to the forefront and helps it align more effectively with the business strategy. Innovation focus can be a combination of product/service, people and culture, business model and process, and can be plotted against different horizons representing time-investment and positioning with respect to the overall portfolio of innovation activities in an organisation. In the survey, the question asked about innovation focus, and 37% of respondents claimed improvements in product and process were a high priority, whereas only 24% claimed the same in new product development; only 8% stated new business models were a priority and 14% claimed priority in bringing new innovations for new markets. These results demonstrate the importance of being able to assert a balance of innovation within an organisation. Balancing innovation is a key part of an organisation’s innovation strategy, as it ensures appropriate resource for a properly identified return. Therefore, developing a competence in issues related to Balancing Innovation activities across an Engineering-related business has been included in this learning outcome.





Questions related to assessment, evaluation and measurement of innovation scored the lowest levels of participation overall in the survey (just over 50%). This situation demonstrates a lack of understanding about how to plan, budget, measure and evaluate innovation, and thus the elements of budgeting for innovation investment and return have been included within this learning outcome.

Innovators should be able to understand how to create qualitative and quantitative measures to assess an Innovation Plan’s performance. Knowledge around what an organisation should be measuring in terms of financial, business/organisational, internal process and customer, should be built into the innovators capability set.

When writing the Innovation Plan, there should be SMART targets incorporated into the objectives that have clearly defined timescales and resources attached, and this requirement in developing and using SMART metrics to measure the progress in innovation, its impact and value to the business have all been included in this learning outcome.

A key aspect of innovation is being able to use effectively strategic business models in the context of innovation, to help plan and strategize innovation developments that are aligned to strategic business intention. In innovation education, there are many models, tools and techniques that support such learning and thus, innovation skills in using strategic models and planning tools and techniques has been incorporated into this learning outcome.

Innovation has always to be seen with regard to current and existing product and service offerings, and therefore introduction and management of new innovations (even enhancements and process improvement) need to be managed in the context of existing constraints, product targets and stakeholder expectations. Therefore, developing a competence in issues related to management of new innovations into existing route maps of products and services (offers), business processes and resources/capabilities is crucial in the shaping of an innovator, and has been included as a key component within this learning outcome.

As a result of this analysis, the following Learning Outcome was developed:

Learning Outcome 4	EQF Level	Knowledge, skills & competence required
Understand the importance of aligning innovation strategy with the business strategy and evaluate using metrics to support business development and growth	5	Competence in issues related to Balancing Innovation activities across an Engineering-related business
		Knowledge of budgeting for innovation investment and return
		Innovation skills in using strategic models and planning tools and techniques
		Competence in issues related to management of new innovations into existing route maps of products and services (offers), business processes and resources/capabilities



		Qualitative and Quantitative Assessment skills in developing and using metrics to measure the progress in innovation
		Competence in developing and using SMART metrics to measure innovation impact and value to the business

## LEARNING OUTCOME 5 – CUSTOMER ANALYSIS

The survey showed that from the 82.2% of respondents who answered the question about whether they identified customer/market needs, 74% confirmed that they do use methods to identify customer/market needs. From those (81%) of respondents, 46% claimed that their engineering departments interacted directly with customers to identify and sense their needs/problems. In the question regarding testing offerings with customers to gain feedback and refinement to a value proposition, although 81% of respondents answered this question only 60% of respondents completed the techniques they used. Respondents were able to select multiple techniques, and overall, from those techniques, prototyping scored the highest level of engagement at 46%, customer testing was at 42% and interrogation of customer analytics came in at 30%. Given the significance of customers in the development of innovative propositions a focus on how to apply customer-centric innovation has been included within this learning outcome.

Developing a skillset in customer insight and discovery to support exploration and investigation of customer needs is vital to innovation developments. Ensuring innovators understand techniques used such as: Concept Diagrams and Story Boards to flesh out the prototype design, Test questions focusing on Desirability, Viability and Feasibility of a prototype’s offering, and appreciate how to Story Map a proposition to focus on features that are priority to the needs of the customer is required within their skillset. A/B Testing can benefit from an innovator being able make a walking skeleton and include different sets of features according to what offering is being tested; adding and subtracting features according to the customer feedback and learning gained. Prototypes in Engineering companies often focus on UX (user experience), and thus innovators should be proficient in understanding the techniques employed in UX including Moderated/Unmoderated Usability Testing, Testing Logic and Navigation (Card Sorting, Tree Testing and Keystroke Level Modelling), Design Testing (A/B Testing, First Click, Blur and Eye Tracking). All these techniques provide valuable learning back to innovators, to refine their offerings in line with user expectations and perceptions. Thus, the skills that support this customer insight and discovery using a range of models, tools and techniques have been incorporated into this learning outcome.

With the growing focus on big data and its use in determining customer behaviour and needs, skills that develop a capability in Customer Analytics, including capture methods, interrogation and analysis, to enable Scalable Insights to be determined from customer response data and associated market performance data, are needed. Understanding how to use data analytics platforms such as Google Analytics, Facebook Analytics, Tableau, Cognos (IBM), Looker, SAS, Microsoft Power BI etc. and analytics tools and coding using such programmes as R, SAS, Apache Spark, Excel and RapidMiner etc. is required. As such, technical and marketing (data analytics) skills for capture, coding, using and interpreting customer data have been included as a component of this learning outcome

Market research was identified by 42% of respondents as their most popular method of identifying



key intelligence to determine customer/market need, and thus, a knowledge of market research methods and techniques, together with focus group composition design, activity structure, management and evaluation has been built into this learning outcome.

The deployment of Design Thinking has since hailed many new innovations borne out of customer interactions, learning and feedback. It follows a five-stage structure that is designed for new or improved proposition development and as such, these skills have been included as a vital component of this learning outcome.

As a result of this analysis, the following Learning Outcome was developed:

Learning Outcome 5	EQF Level	Knowledge, skills & competence required
Understand the concepts of Customer Discovery and how this supports new innovation development	5	Competence in how to apply customer-centric innovation
		Customer analysis skills using customer insight and discovery models, tools and techniques
		Data analytics skills for capture, coding, using and interpreting customer data
		Knowledge of market research methods and techniques
		Design Thinking skills for new value proposition development
		Knowledge of Focus Group composition design, activity structure, management and evaluation (including depth interview processes and observations)

## LEARNING OUTCOME 6 – MARKET ANALYSIS

A key stage in an innovation process is listening. In practical terms, this listening equates to watching, sensing and observing the market and tracking trends, patterns and behaviours. When respondents in the survey were questioned about ways to identify market needs, 29% valued PESTLE assessment and 31% said Scenario Planning was one of the methods used for identifying need. For Scenario Planning, innovators need to be skilled up in using various tools such as the From-To Exploration Matrix (FTE), enabling a powerful way to imagine a Future State based on analysis of Trends and PESTLE factors.

The FTE Matrix is among one of many tools and techniques that innovators need to skill themselves in that support to building a picture of vital market intelligence. As such, these analysis skills in market sensing and market intelligence have been built into this learning outcome.

For engineering companies, the focus on technical innovation is great, and therefore the capability of being able to map new propositions, aligning external expectation and technical/technology market



trajectory and customer need against internal capabilities, investment and resources is vital to ensure innovation return. Having an understanding of Technology Readiness in relation to the Business and Customer will help to develop the technology roadmaps for better market positioning and innovation investment. Alongside of Business, Technology and Customer analysis to support innovation planning, an innovator in an engineering company should have an appreciation of Ecosystem Mapping to identify where possible connections, independencies and paths could offer further opportunities. Therefore, this learning outcome has built in a competence in both Technology Road Mapping and Ecosystem Mapping.

Interpretation of big market data with respect to plotting where a market is going, is crucial for an innovator, helping to build a strategic picture of addressable markets for development, and therefore a knowledge of data analytics platforms for collection, analysis and reporting in the context of market analysis has been incorporated into this learning outcome.

In engineering companies, technical innovation is often at the fore. As a way to both protect and remain competitive, it is vital to understand the emerging technologies environment, and as such develop a competence in horizon scanning and technology watch, clustering and prioritisation, and thus, this has been built into this learning outcome.

As a result of this analysis, the following Learning Outcome was developed:

Learning Outcome 6	EQF Level	Knowledge, skills & competence required
Understand the concepts of environmental sensing and market intelligence to support new innovation developments	5	Analysis skills in market sensing (trends and patterns) and market intelligence using tools and techniques
		Competence in Technology Road Mapping and Ecosystem Mapping
		Knowledge of data analytics platforms for collection, analysis and reporting
		Competence in issues related to horizon scanning and technology watch



## CREATIVE ENGINE LEARNING UNITS

From the requirements given in the previous section for students/learners to achieve the stated learning outcomes in each of the six areas, the following learning units outline descriptions have been formulated by partners Tknika (Learning Units 1-2), Dublin City University (Learning Units 3-4) and South West College (Learning Units 5-6).

### TKNIKA - LEARNING UNIT 1

Title	Creativity and Ideas Management
Description	This learning unit introduces the learner to creativity and ideas management and provides basic facts and principles that develop a process towards another way of thinking.
Overall Learning Outcome	Learners should understand key concepts of creativity and ideas management in order to be able to go through an innovation process later on.
EQF level	4/5
Duration	20 hrs NLT
ECVET credits	1
Prerequisites	General
Assessment	1 assignment: case-study (5 open-ended questions and/or multiple choice test)
<i>On successful completion of this learning unit, a student will be able to:</i>	
Learning Outcome 1	To identify internal dynamics and to hidden relationship of things.
Learning Outcome 2	To describe the possible opportunities that a situation presents.
Learning Outcome 3	To recognise problems as opportunities.
Learning Outcome 4	To practice doing things in a different ways.
Learning Outcome 5	To be demonstrate the ideas management process



## TNIKA-LEARNING UNIT 2

Title	Innovation Culture
Description	This learning unit covers the key concepts of how to develop an innovation culture, including the knowledge of the conditions that make an innovation culture, the barriers to innovation, skills needed to develop effective communication in innovation, and creation of multi-disciplinary teams.
Overall Learning Outcome	Learners should understand the conditions including the behaviours and beliefs that make an innovation culture and how to overcome barriers to innovation, including risk. Learners will appreciate how to use multi-disciplinary teams to expand new thinking and ideas, and understand how develop more effective communication campaigns to promote innovation internally and externally.
EQF level	4/5
Duration	20 hrs NLT
ECVET credits	1
Prerequisites	General + Learning Outcomes of Learning Unit 1
Assessment	1 assignment: case-study (5 open-ended questions and/or multiple choice test)
<i>On successful completion of this learning unit, a student will be able to:</i>	
Learning Outcome 1	To recognise the conditions that make an innovative culture.
Learning Outcome 2	To identify the barriers to innovation in an organisation.
Learning Outcome 3	To demonstrate within a multi-disciplined team divergent and convergent thinking
Learning Outcome 4	To discuss the characteristics of what makes an innovative culture within a case-study
Learning Outcome 5	To demonstrate key communication skills required to develop innovation campaigns.



### DCU – LEARNING UNIT 3

Title	Innovation Process and Planning
Description	This learning unit provides the learner with a baseline knowledge of what innovation is and the value this can bring to an organisation if it is managed in a systematic way and linked to a business case for the innovation.
Overall Learning Outcome	The ability to apply a systematic process for the effective planning and development of an innovation that is supported by the business case.
EQF level	5
Duration	20 hrs NLT
ECVET credits	1
Prerequisites	General + Learning Outcomes of Learning Units 1 and 2
Assessment	1 assignment: Development of a business plan and 5 self-assessment multiple choice questions
<i>On successful completion of this learning unit, a student will be able to:</i>	
Learning Outcome 1	Describe what the principles of innovation are and the value that innovation presents to a business
Learning Outcome 2	Explain Innovation planning skills, such as models, tools and techniques to design, develop and manage the innovation process
Learning Outcome 3	Demonstrate competence in developing Innovation Plans
Learning Outcome 4	Demonstrate competence in issues related to Intellectual Property (IP) management and development
Learning Outcome 5	Identify skills used in Business Case Development and Value Based Improvements for Innovation





## DCU-LEARNING UNIT 4

Title	Innovation Strategy and Evaluation
Description	On successful completion of this learning unit, students will have developed a competence in issues related to the management of new innovations by balancing these activities across the business and aligning the innovation strategy with the business strategy.
Overall Learning Outcome	Recognise the importance of aligning innovation strategy with the business strategy and evaluating this strategy using metrics to support business development and growth.
EQF level	5
Duration	20 hrs NLT
ECVET credits	1
Prerequisites	General + Learning Outcomes of Learning Units 1, 2 and 3
Assessment	1 assignment: case-study (5 open-ended questions and/or multiple-choice test)
<i>On successful completion of this learning unit, a student will be able to:</i>	
Learning Outcome 1	Recognise the issues related to Balancing Innovation activities across an Engineering-related business
Learning Outcome 2	Describe the fundamental principles of budgeting for innovation investment and return
Learning Outcome 3	Apply strategic models and planning tools and techniques for innovation development
Learning Outcome 4	Describe the issues related to the integration of the management of new innovations into existing route maps of products and services (offers), business processes and resources/capabilities
Learning Outcome 5	Identify the Qualitative and Quantitative Assessment skills that are used in developing and using SMART metrics to measure the progress in and impact of innovation



## SWC - LEARNING UNIT 5

Title	Customer Analysis
Description	This learning unit introduces the learner to customer-centric innovation tools and techniques to support exploration and investigation of customer needs.
Overall Learning Outcome	Learners should be able to apply tools that aid exploration and investigation of customer needs including market research and focus groups. Learners will also understand and apply the 5 step Design Thinking methodology, ensuring end users' needs and expectations are consistently met.
EQF level	5
Duration	20 hrs NLT
ECVET credits	1
Prerequisites	General + Learning Outcomes of Learning Units 1,2, 3 & 4
Assessment	1 assignment: case-study (5 open-ended questions and/or multiple-choice test)
Learning Outcome 1	Select and explain a range of tools, models and techniques used by innovators to gain insight and discovery of customer expectations and perceptions.
Learning Outcome 2	Describe the use of customer centric tools in the development of the User Experience.
Learning Outcome 3	Discuss various market research methods and techniques including focus groups.
Learning Outcome 4	Evaluate the Design Thinking process as a customer centric development tool.



## SWC – LEARNING UNIT 6

Title	Market Analysis
Description	This learning unit introduces the learner to the concepts of environmental sensing and market intelligence to support new innovation developments.
Overall Learning Outcome	Learners should be able to apply key tools of markets needs and trend analysis, technology road mapping and ecosystem mapping with a view to making strategically important decisions and supporting new innovative developments. Learners will also have an appreciation for the importance of Intellectual Property (IP) protection and the routes to provide such.
EQF level	4 – 5
Duration	20 hrs NLT
ECVET credits	1
Prerequisites	General+ Learning Outcomes of Learning Units 1,2, 3, 4 & 5
Assessment	1 assignment: case-study (5 open-ended questions and/or multiple-choice test)
Learning Outcome 1	Identify and describe appropriate tools used in the process of market sensing.
Learning Outcome 2	Discuss the need for examining technology readiness in relation to the business and customer, in order to support Technology Road Mapping and Ecosystem Mapping.
Learning Outcome 3	Evaluate appropriate data analytical tools for collection, analysis and reporting in the context of market analysis.
Learning Outcome 4	Explain the importance of IP and the various options available.



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# APPENDICES



## APPENDIX A: QUESTIONNAIRE BY ONLINE SURVEY

### Organisational Innovation & Creativity Context

Where is your organisation on these issues? Mark an 'x' in the relevant box on the scale

Innovation is inherently chaotic, so it's not amenable to management or planning	1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
We concentrate on continual improvement of existing products	1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
We cannot afford failure, so we avoid innovation at all costs	1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
All skills needed to succeed exist within our organisation	1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
We focus on technical innovation on products	1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Innovation is a powerful means of creating the future, so we make every effort to harness it for the benefit of our organisation	1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
We ensure that a fair proportion of turnover is generated from completely new products introduced in the last three years	1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
We accept failure as part of striving for newness and place great stress on learning from experience	1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
We constantly seek new skills, especially those relating to innovation, through skills audits	1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Our holistic perspective seeks innovation in all aspects of the organisation and its value-chain (suppliers, customers and partners etc.)	1 2 3 4 5 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>



### **Creativity and Idea Management**

*(Please tick the appropriate boxes)*

1. My organisation encourages creative problem-solving through ensuring space, time, funding and resources are appropriately allocated:  
 Yes     No
  
2. We develop Creativity through:  
 Formal Training (Courses including Online/eLearning)  
 Informal Learning (including Web Based)  
 Coaching & Mentoring  
 Other \_\_\_\_\_
  
3. We encourage employee participation from different functions when we search for new ideas and solutions:  
 Yes     No
  
4. My organisation collects ideas through:  
 Idea/Innovation Portal  
 Submission via Email  
 Exchange during Group Meetings  
 Suggestion Box  
 Other \_\_\_\_\_
  
5. Submitted ideas made by people in my organisation are managed through:  
 A formal structured process  
 Committee Review  
 Online stage-gating process  
 Other \_\_\_\_\_
  
6. My organisation uses metrics to determine which ideas go forward:  
 Yes     No  
  
If Yes, we use the following projected metrics:  
 Growth in Sales Revenue/Profit  
 Return on Investment/Value for Money  
 Increased Customer Satisfaction  
 Enhanced Brand Awareness  
 Growth in Market Share  
 Other \_\_\_\_\_
  
7. We assess creative problem-solving as part of employee's performance appraisal.



Yes    No

**Innovation Process and Planning**

*(Please tick the appropriate box)*

8. My organisation's approach to innovation is:

- Structured
- Unstructured
- Combination

9. We have an innovation plan that is aligned to the business strategy:

Yes    No

10. We review the Innovation Plan:

- Annually
- Every 3 years
- Other \_\_\_\_\_

11. The Innovation Plan is presented and communicated across the business and its stakeholders to gain their input and commitment:

Yes    No    In part

12. The responsibility for managing and executing the Innovation Plan in my organisation lies with:

- a Dedicated Innovation Manager/Director
- a Committee that includes a Senior Manager
- Innovation Champion(s)
- Other \_\_\_\_\_

13. We use different methods to identify customer/market needs:

YES    No

If Yes, these methods include:

- Market Research
- PESTLE (Political, Economic, Social, Technological, Legal/Regulatory, Environmental) Assessment
- Scenario Planning
- Other \_\_\_\_\_

14. Our Engineering Departments/Functions (not Sales) interact with customers directly to sense and identify their business needs and problems:

Yes    No    In part



15. When we develop solutions and offerings, we mainly focus on the following:  
(Mark an 'x' in the relevant box on the priority scale with 1– low priority and 5 – high priority)

Product and Process Improvements	1	2	3	4	5
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
New Product Developments	1	2	3	4	5
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
New Business Models	1	2	3	4	5
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
New Innovations for New Markets	1	2	3	4	5
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Other _____					

16. We test our solutions and offerings on customers and obtain feedback to refine our propositions:

Yes  No

If Yes, we use techniques such as:

- Customer Testing  
 A/B Testing  
 Prototyping/Piloting  
 Customer Analytics  
 Other \_\_\_\_\_

17. We use systematic business planning techniques to build the Business Case for the new solution/offering:

Yes  No  Sometimes

18. My organisation measures the progress of its Innovation Plan through using (one or more) of the following:

- Key Performance Indicators (KPIs)  
 General Assessment Review  
 Collection and Analysis of Feedback Data  
 Other \_\_\_\_\_

19. Our innovation activities are communicated and recognised through the following:

Innovation events and awards





- Newsletters
- Blogs
- Other \_\_\_\_\_

20. Our creativity and innovation training needs are:

- Fulfilled
- Not fulfilled
- In Part

Please specify: \_\_\_\_\_



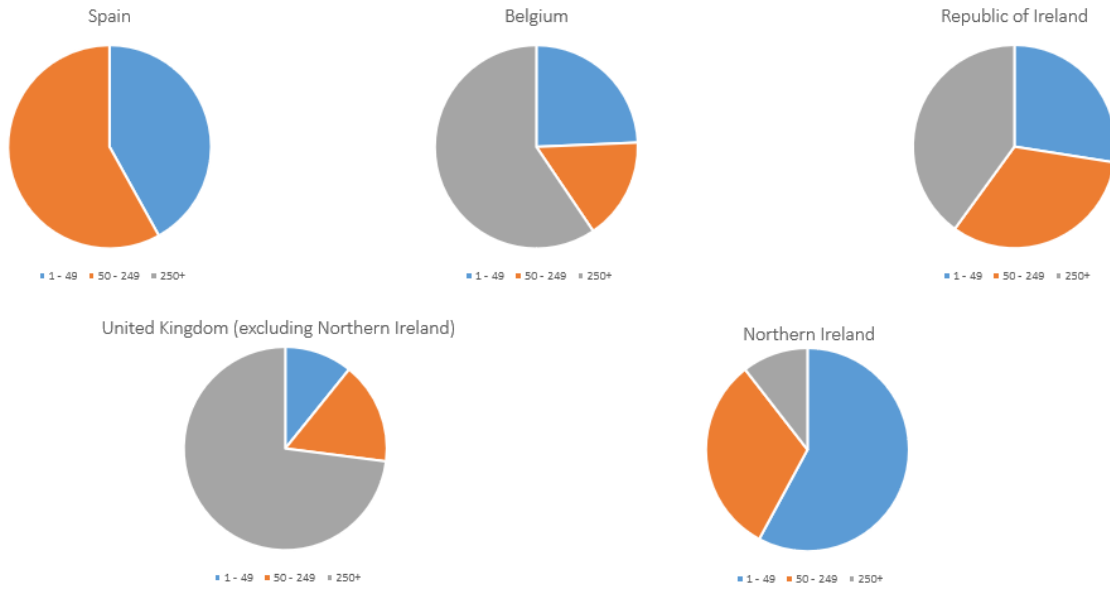
## APPENDIX B:            ANALYSIS OF CREATIVE ENGINE SURVEY CONDUCTED DURING FEBRUARY AND MARCH 2019

### NOTES:

1. SPAIN HAS A RESPONSE SKEWED TOWARDS THE SMALL AND MEDIUM SIZED COMPANIES. WHILE THE UK'S RESPONSE IS SKEWED TOWARDS THE LARGER COMPANIES. THIS MEANS THAT MUCH OF THE DIFFERENCE IN RESPONSE BETWEEN SPAIN AND THE UK COULD BE DUE TO DIFFERENTIAL SIZE OF RESPONDENTS.
  
2. A TOTAL SAMPLE OF 240 PARTICIPATING ENGINEERING-RELATED ORGANISATIONS FROM:
  - A) SPAIN (BASQUE COUNTRY) – 54
  - B) BELGIUM (FLEMISH REGION) – 53
  - C) REPUBLIC OF IRELAND – 49
  - D) UNITED KINGDOM – 60NORTHERN IRELAND – 24  
*(NORTHERN IRELAND HAS BEEN SHOWN SEPARATELY FROM THE REST OF THE UK TO REFLECT ITS SPECIFIC ECONOMIC STRUCTURE).*

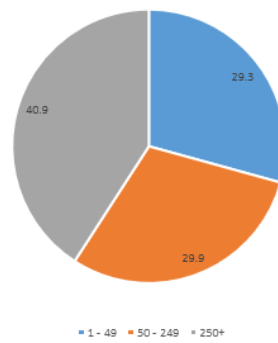


### Sample Composition by Organisation Size (Employment)



### Percentage of Size of Organisations Participated (by Employment) across the sample

Percentage of Participants by Size of Organisation

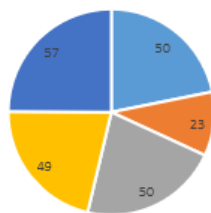




## INNOVATION CONTEXT

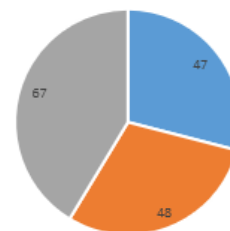
### **Innovation is inherently chaotic, so it's not amenable to management or planning**

Innovation is inherently chaotic



■ Spain ■ Northern Ireland ■ Belgium ■ Republic of Ireland ■ United Kingdom

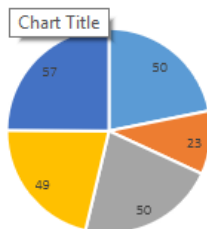
Innovation is inherently chaotic (by Org. Size)



■ 1 - 49 ■ 50 - 249 ■ 250+

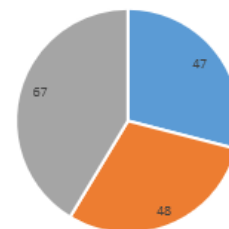
### **Innovation is inherently chaotic, so it's not amenable to management or planning**

Innovation is inherently chaotic



■ Spain ■ Northern Ireland ■ Belgium ■ Republic of Ireland ■ United Kingdom

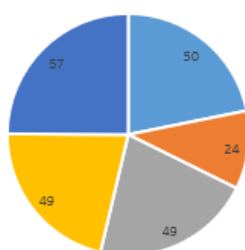
Innovation is inherently chaotic (by Org. Size)



■ 1 - 49 ■ 50 - 249 ■ 250+

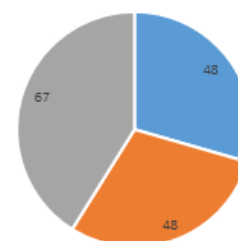
### **Innovation is a powerful means of creating the future, so we make every effort to harness it for the benefit of our organisation**

Innovation is a powerful means of creating the future



■ Spain ■ Northern Ireland ■ Belgium ■ Republic of Ireland ■ United Kingdom

Innovation is a powerful means of creating the future by Org Size

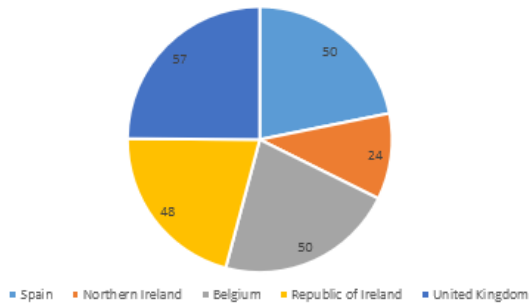


■ 1 - 49 ■ 50 - 249 ■ 250+

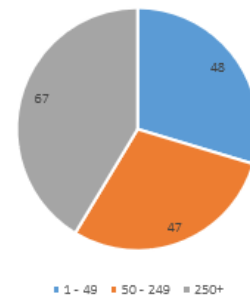


**We concentrate on continual improvement of existing products**

concentrate on continual improvement

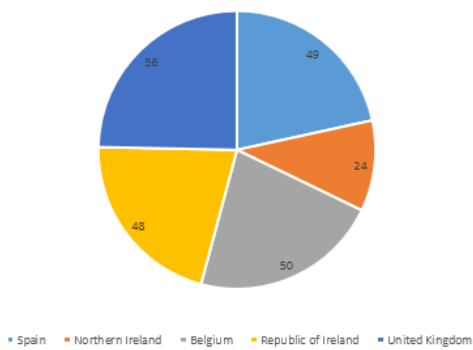


Concentrate on continual improvement

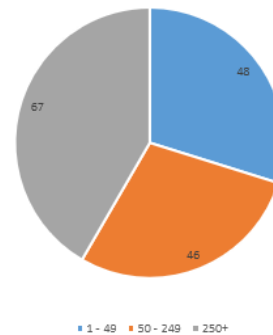


**We ensure that a fair proportion of turnover is generated from completely new products introduced in the last three years**

Proportion of turnover is generated from completely new products



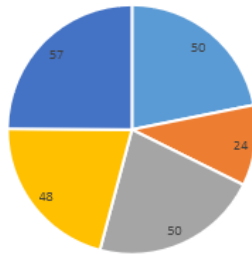
Proportion of turnover is generated from completely new products by Org Size



**We focus on technical innovation on product**

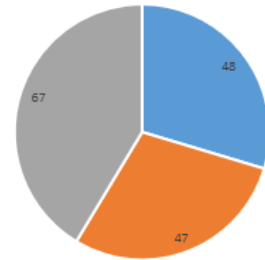


Focus on technical innovation



Spain Northern Ireland Belgium Republic of Ireland United Kingdom

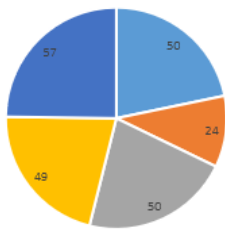
Focus on technical innovation



1 - 49 50 - 249 250+

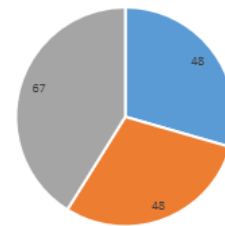
**Our holistic perspective seeks innovation in all aspects of the organisation and its value-chain (suppliers, customers and partners etc.)**

We seek innovation in all aspects of the organisation



Spain Northern Ireland Belgium Republic of Ireland United Kingdom

We seek innovation in all aspects of the organisation (by Org Size)

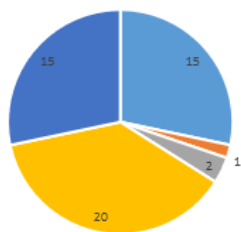


1 - 49 50 - 249 250+

**CREATIVITY & IDEA MANAGEMENT**

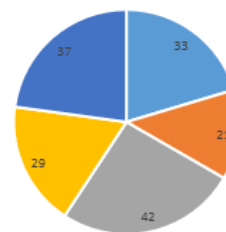
**My organisation encourages creative problem-solving through ensuring space, time, funding and resources are appropriately allocated**

No



Spain Northern Ireland Belgium Republic of Ireland United Kingdom

Yes

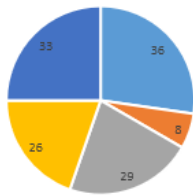


Spain Northern Ireland Belgium Republic of Ireland United Kingdom

**We develop Creativity through:**

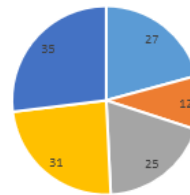


Formal Training (courses)



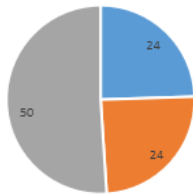
■ Spain ■ Northern Ireland ■ Belgium ■ Republic of Ireland ■ United Kingdom

Informal Learning



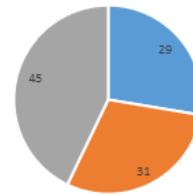
■ Spain ■ Northern Ireland ■ Belgium ■ Republic of Ireland ■ United Kingdom

Size of Organisation (Employment)



■ 1 - 49 ■ 50 - 249 ■ 250+

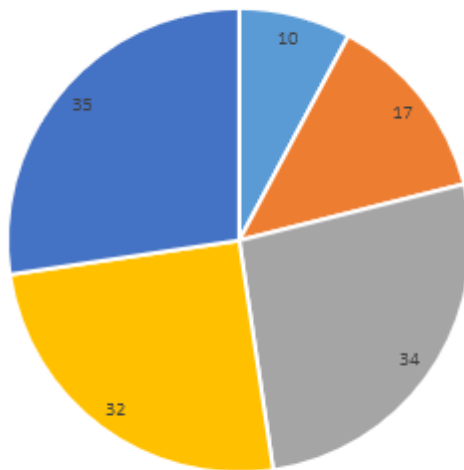
Size of Organisation (Employment)



■ 1 - 49 ■ 50 - 249 ■ 250+

**We develop Creativity through:**

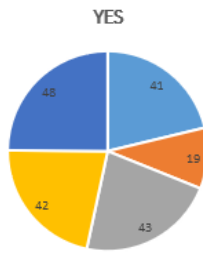
Coaching & Mentoring



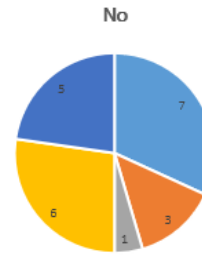
■ Spain ■ Northern Ireland ■ Belgium ■ Republic of Ireland ■ United Kingdom

**We encourage employee participation from different functions when we search for new ideas and solutions**



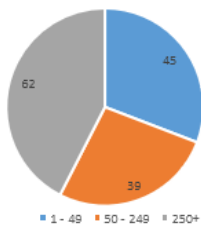


Spain Northern Ireland Belgium Republic of Ireland United Kingdom



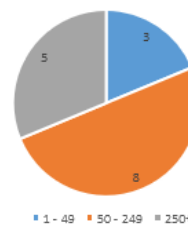
Spain Northern Ireland Belgium Republic of Ireland United Kingdom

**Yes**  
Size of Org (Employment)



1 - 49 50 - 249 250+

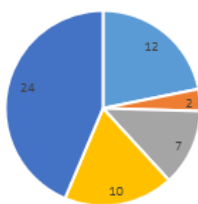
**No**  
Size of Org (Employment)



1 - 49 50 - 249 250+

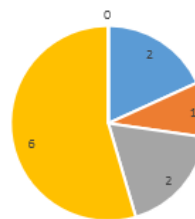
### My organisation collects ideas through

Idea/Innovation Portal



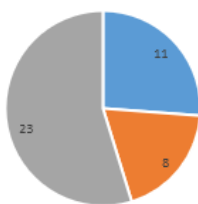
Spain Northern Ireland Belgium Republic of Ireland United Kingdom

Submission via Email



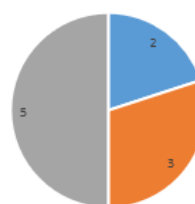
Spain Northern Ireland Belgium Republic of Ireland United Kingdom

Portal



1 - 49 50 - 249 250+

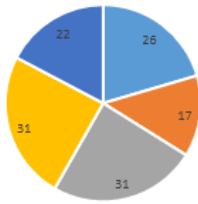
Email



1 - 49 50 - 249 250+

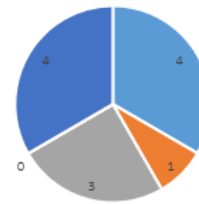


Exchange during group meetings



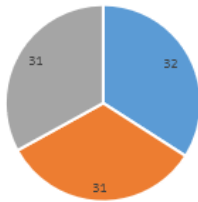
Spain Northern Ireland Belgium Republic of Ireland United Kingdom

Suggestion Box



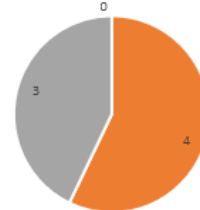
Spain Northern Ireland Belgium Republic of Ireland United Kingdom

Exchange



1 - 49 50 - 249 250+

Suggestion Box

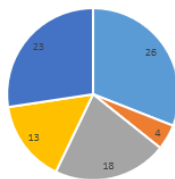


1 - 49 50 - 249 250+

## ASSESSING IDEAS

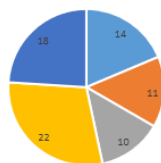
Submitted ideas made by people in my organisation are managed through:

A Formal Structured Process



Spain Northern Ireland Belgium Republic of Ireland United Kingdom Spain Northern Ireland Belgium Republic of Ireland United Kingdom Spain Northern Ireland Belgium Republic of Ireland United Kingdom

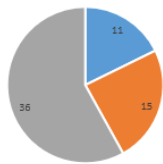
Committee Review



Online Stage-gating

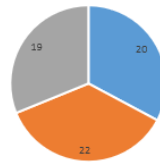


A Formal Structured Process



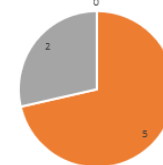
1 - 49 50 - 249 250+

Committee Review



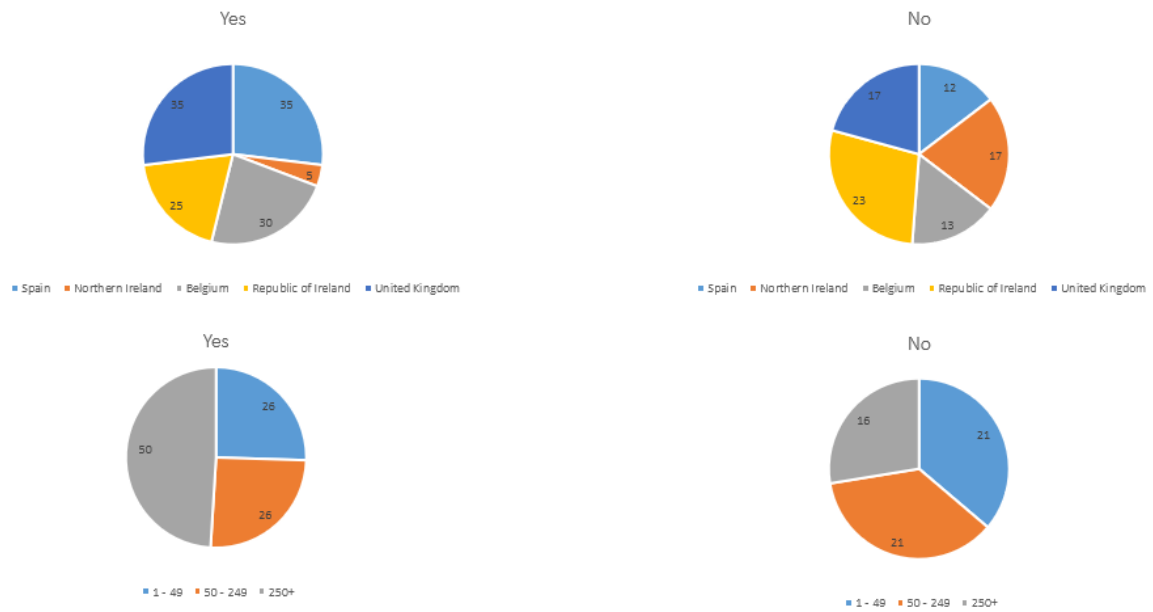
1 - 49 50 - 249 250+

Online Stage-gating



1 - 49 50 - 249 250+

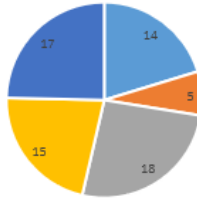
My organisation uses metrics to determine which ideas go forward:





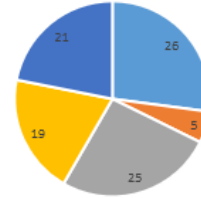
**If Yes, we use the following projected metrics:**

Growth in Sales Revenue/Profit



Spain Northern Ireland Belgium Republic of Ireland United Kingdom

Return on Investment/Value for Money



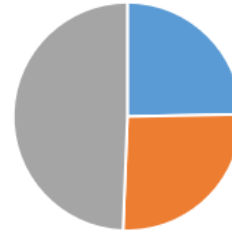
Spain Northern Ireland Belgium Republic of Ireland United Kingdom

Growth in Sales Revenue/Profit (Org Size)



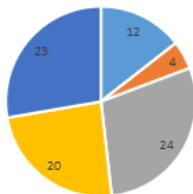
1 - 49 50 - 249 250+

Return on Investment/Value for Money (Org Size)



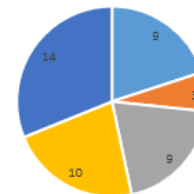
1 - 49 50 - 249 250+

Increased Customer Satisfaction



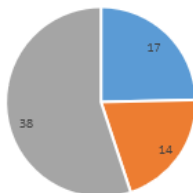
Spain Northern Ireland Belgium Republic of Ireland United Kingdom

Enhanced Brand Awareness



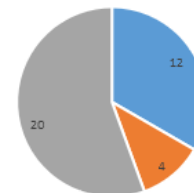
Spain Northern Ireland Belgium Republic of Ireland United Kingdom

Increased Customer Satisfaction (Org Size)



1 - 49 50 - 249 250+

Enhanced Brand Awareness (Org Size)

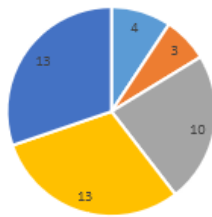


1 - 49 50 - 249 250+



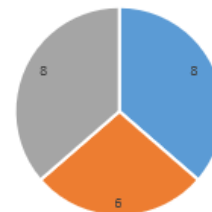
**If Yes, we use the following projected metrics (Continued):**

Growth in Market Share



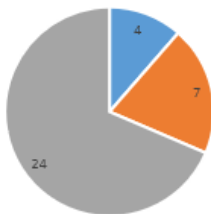
■ Spain ■ Northern Ireland ■ Belgium ■ Republic of Ireland ■ United Kingdom

Other (company specific)



■ Belgium ■ Republic of Ireland ■ United Kingdom

Growth in Market Share (Size of Org)

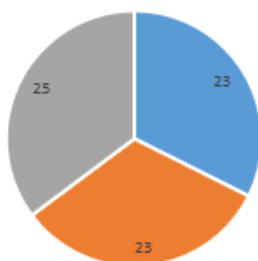


■ 1 - 49 ■ 50 - 249 ■ 250+

**INNOVATION-FOCUSED HR**

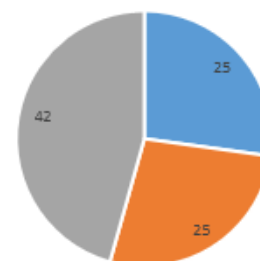
**We assess creative problem-solving as part of employee’s performance appraisal:**

Yes



■ 1 - 49 ■ 50 - 249 ■ 250+

No

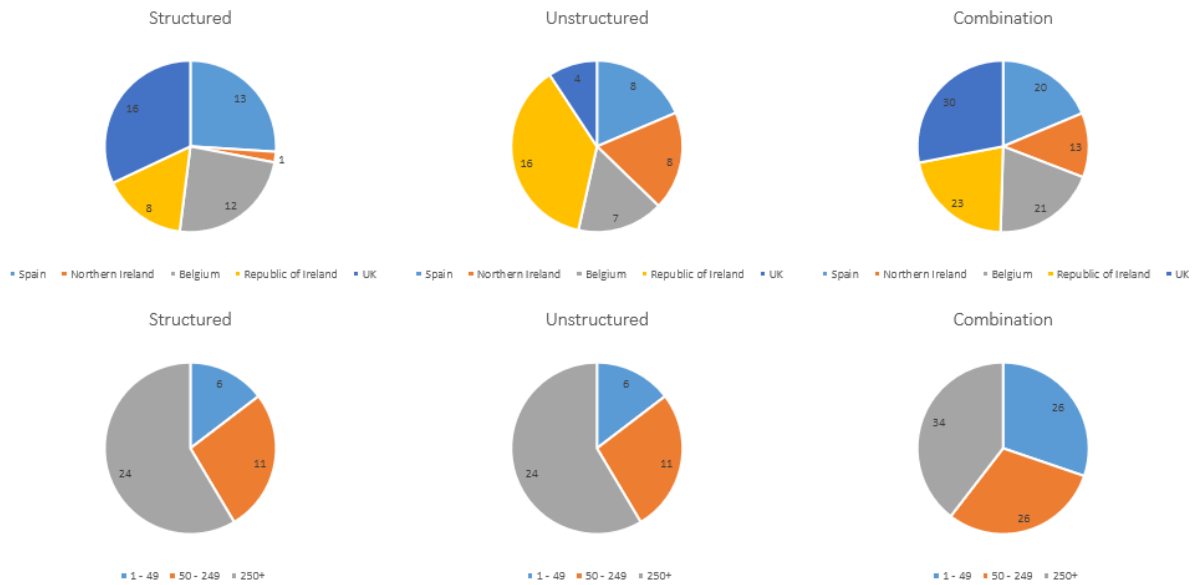


■ 1 - 49 ■ 50 - 249 ■ 250+

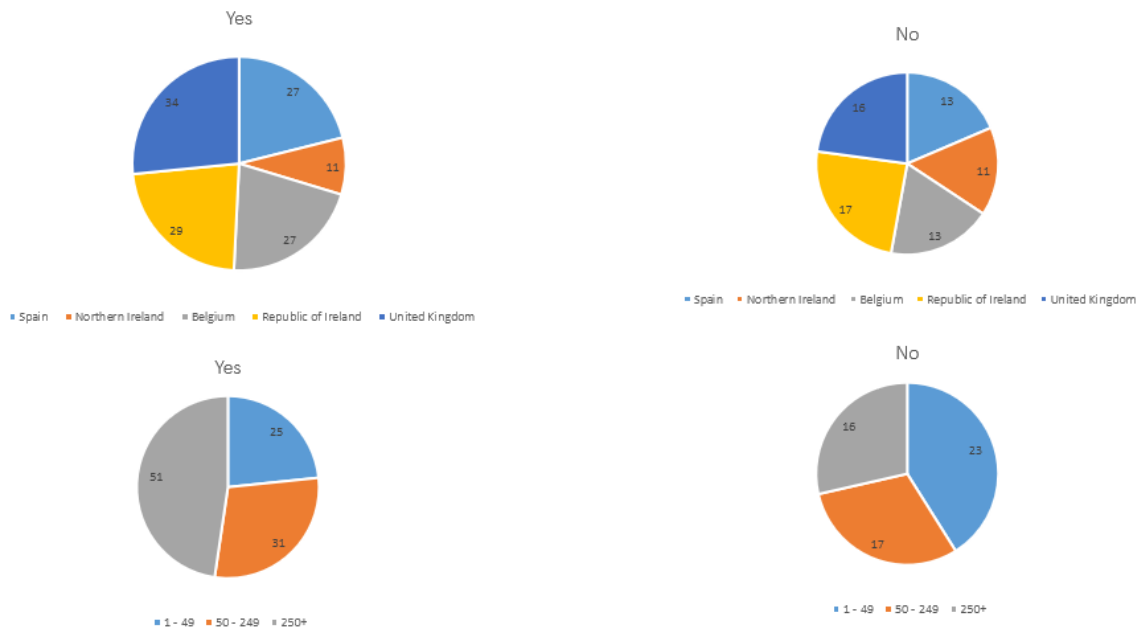


## INNOVATION PLANNING

My organisation's approach to innovation is:

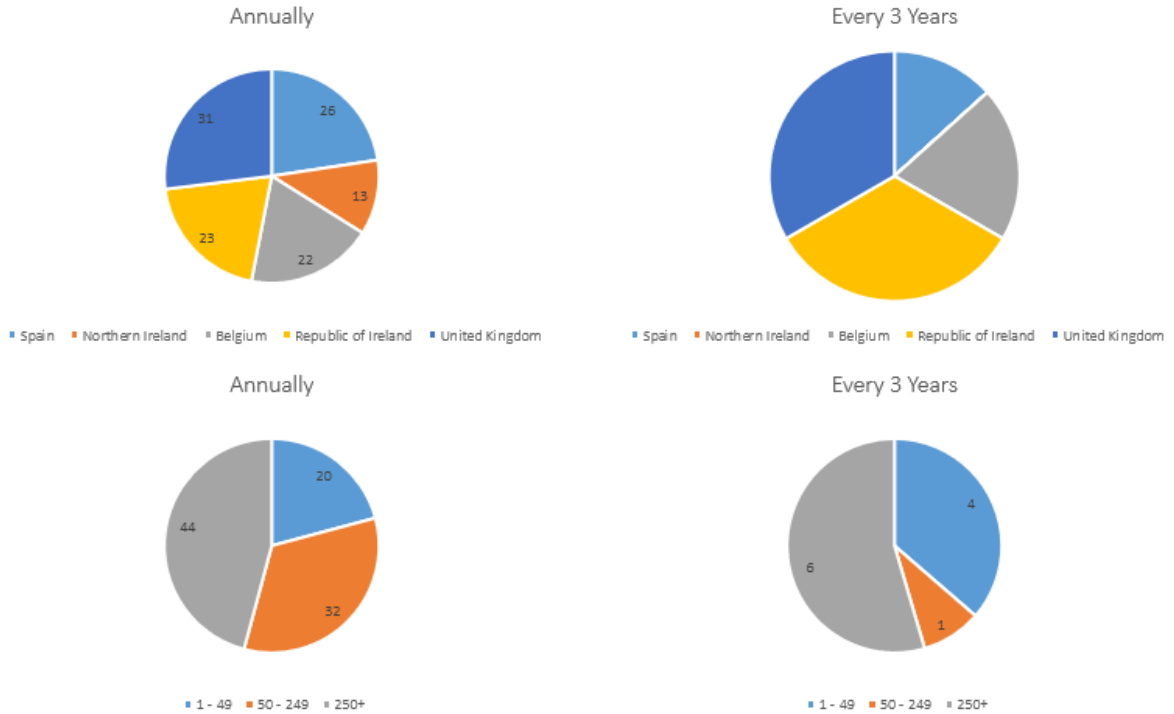


We have an innovation plan that is aligned to the business strategy:

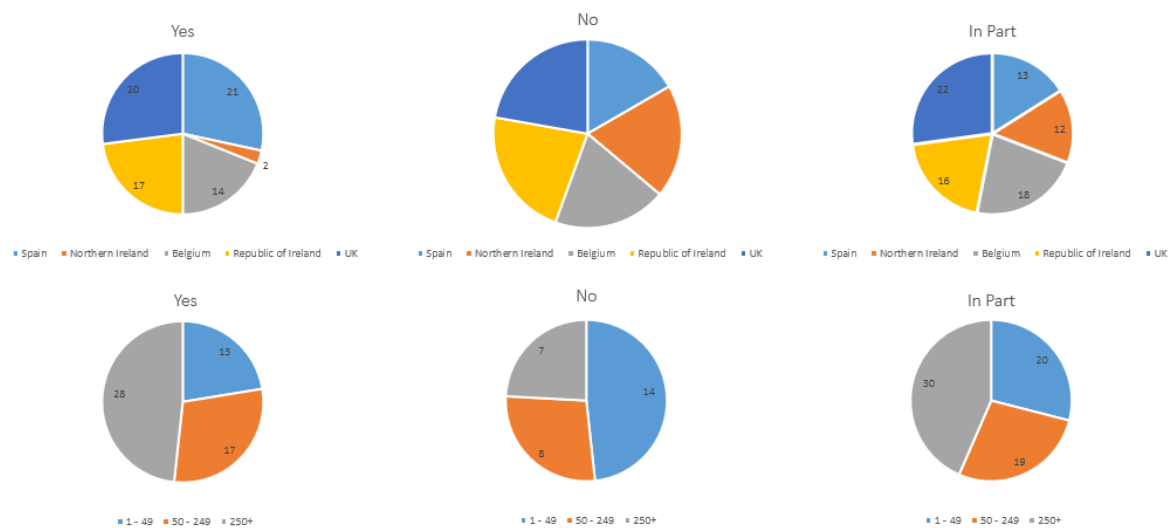




**We Review the Innovation Plan:**



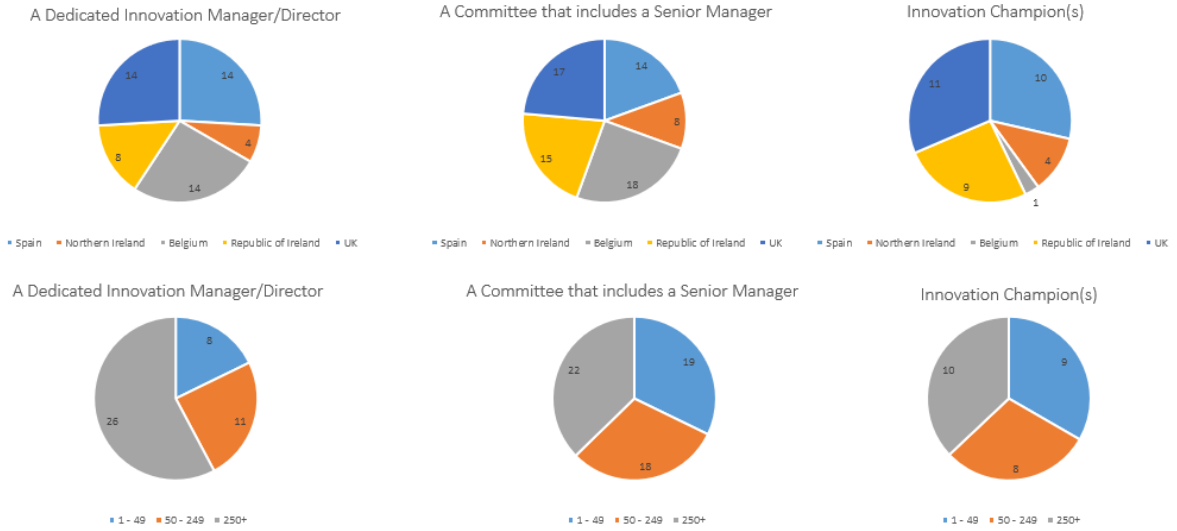
**The Innovation Plan is presented and communicated across the business and its stakeholders to gain their input and commitment:**





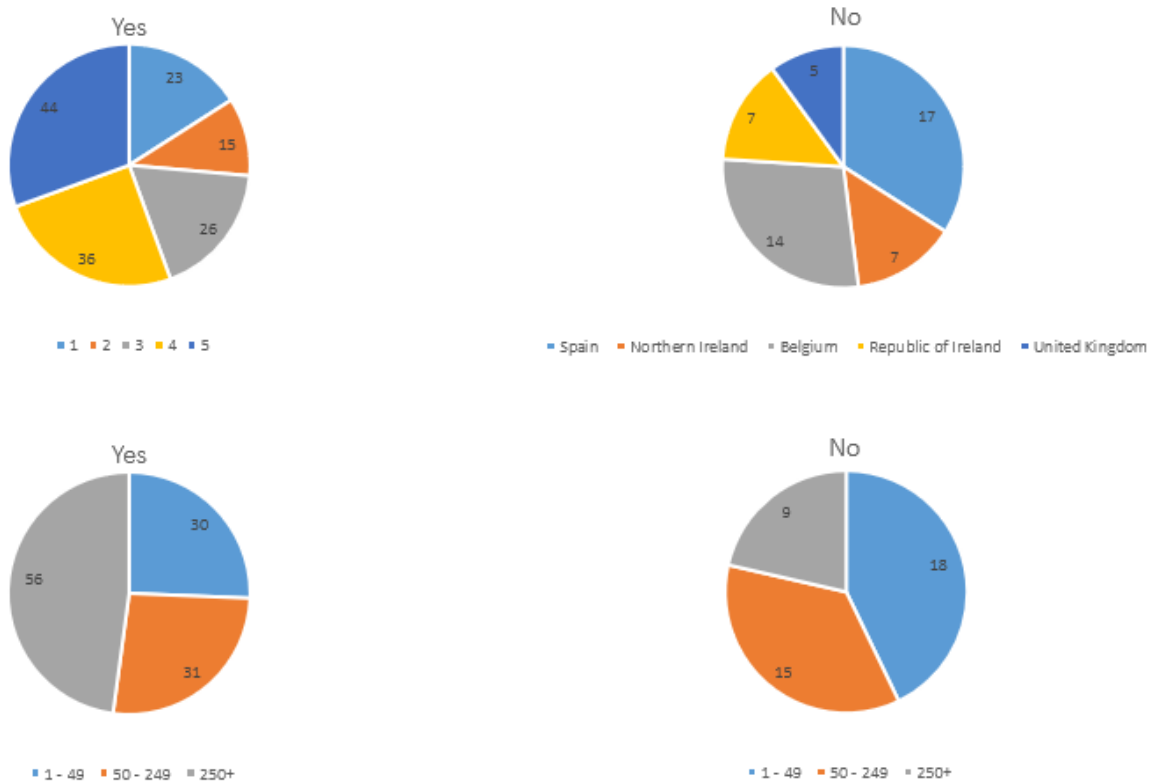


**The responsibility for managing and executing the Innovation Plan in my organisation lies with:**



**HORIZON SCANNING**

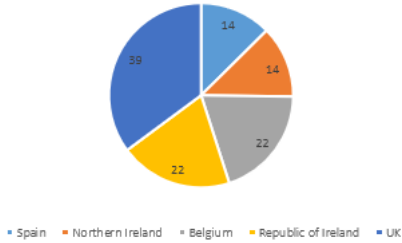
**We use different methods to identify customer/market needs:**



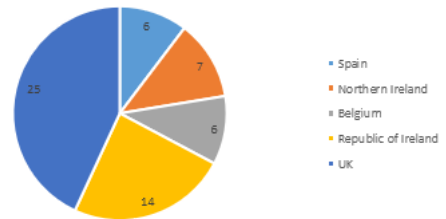


**If Yes, these methods include:**

Market Research

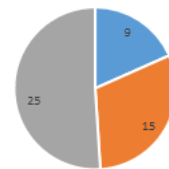


PESTEL

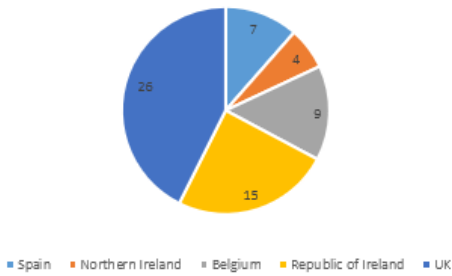


PESTLE (Political, Economic, Social, Technological, Legal/Regulatory, Environmental) Assessment

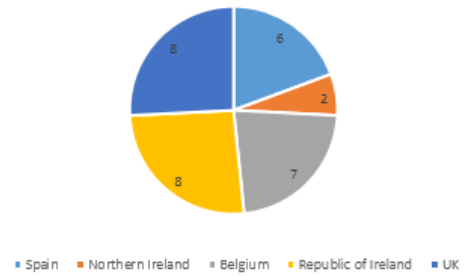
Market Research



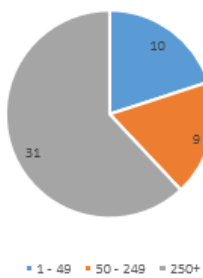
Scenario Planning



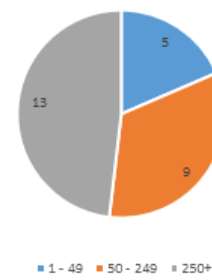
Other



Scenario Planning

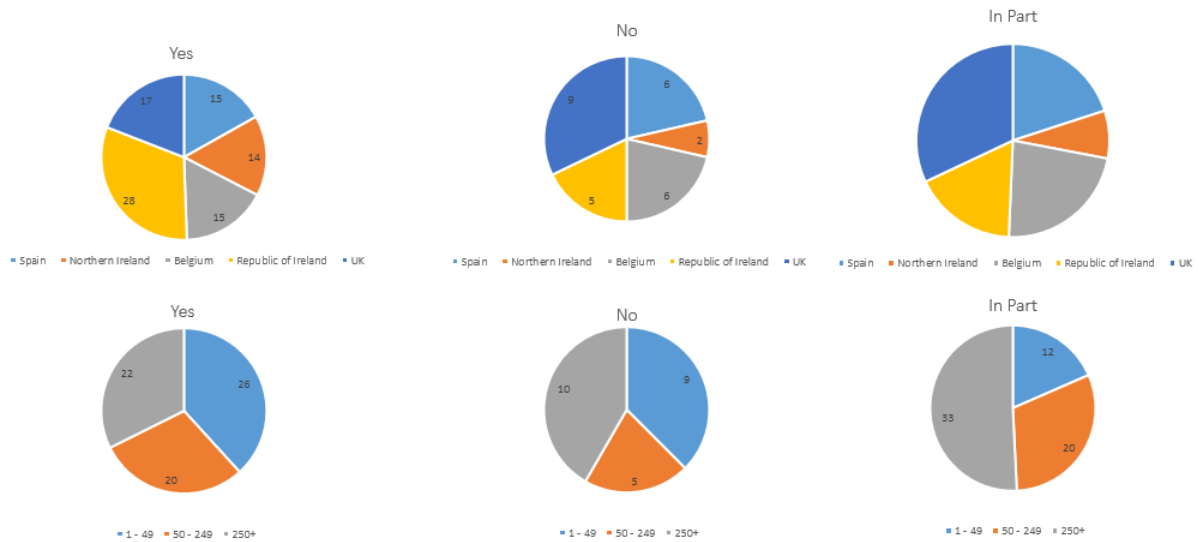


Other



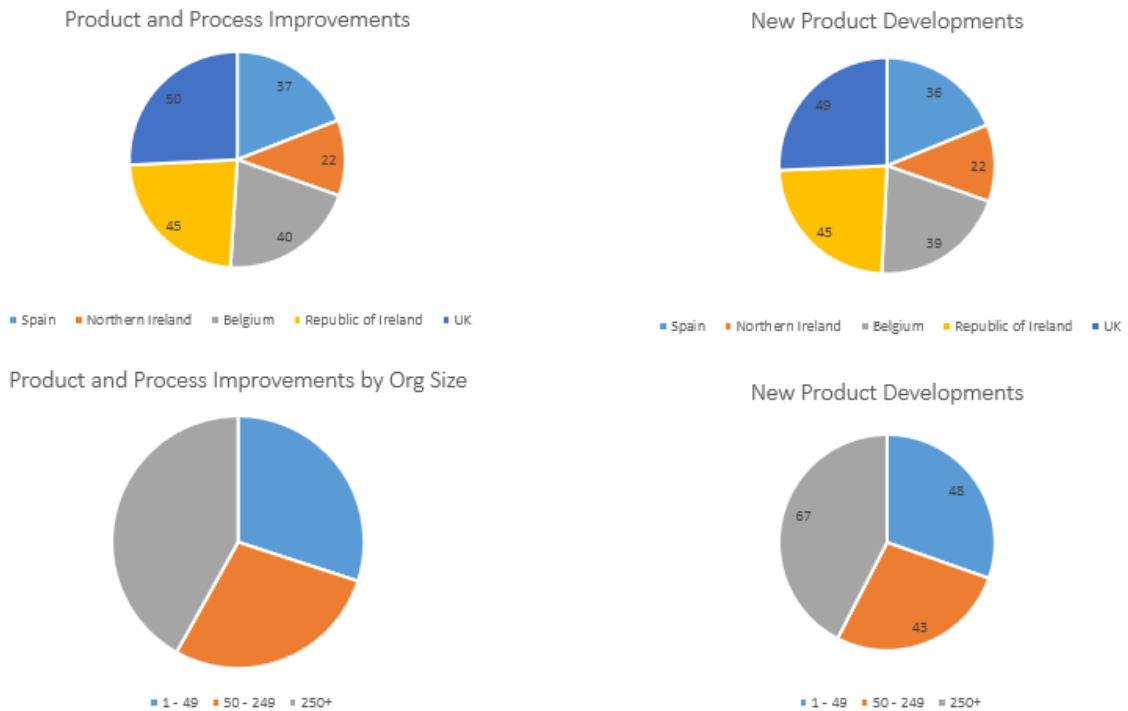


**Our Engineering Departments/Functions (not Sales) interact with customers directly to sense and identify their business needs and problems:**



**INNOVATION FOCUS – PRODUCT, PROCESS & BUSINESS MODEL**

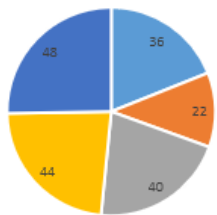
**When we develop solutions and offerings, we mainly focus on the following:**





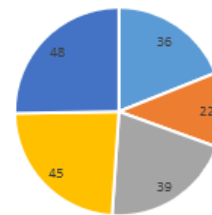
**When we develop solutions and offerings, we mainly focus on the following:**

New Business Models



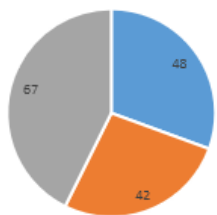
■ Spain ■ Northern Ireland ■ Belgium ■ Republic of Ireland ■ UK

New Innovations for New Markets



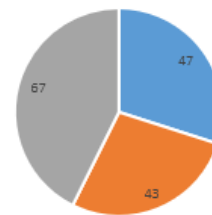
■ Spain ■ Northern Ireland ■ Belgium ■ Republic of Ireland ■ UK

New Business Models



■ 1 - 49 ■ 50 - 249 ■ 250+

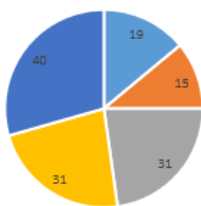
New Innovations for New Markets



■ 1 - 49 ■ 50 - 249 ■ 250+

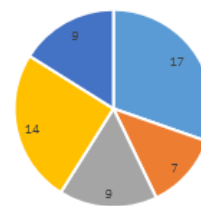
**We test our solutions and offerings on customers and obtain feedback to refine our propositions:**

Yes



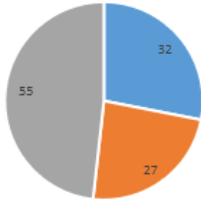
■ Spain ■ Northern Ireland ■ Belgium ■ Republic of Ireland ■ UK

No



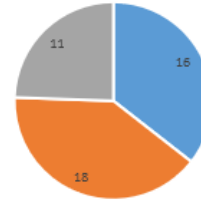
■ Spain ■ Northern Ireland ■ Belgium ■ Republic of Ireland ■ UK

Yes



■ 1 - 49 ■ 50 - 249 ■ 250+

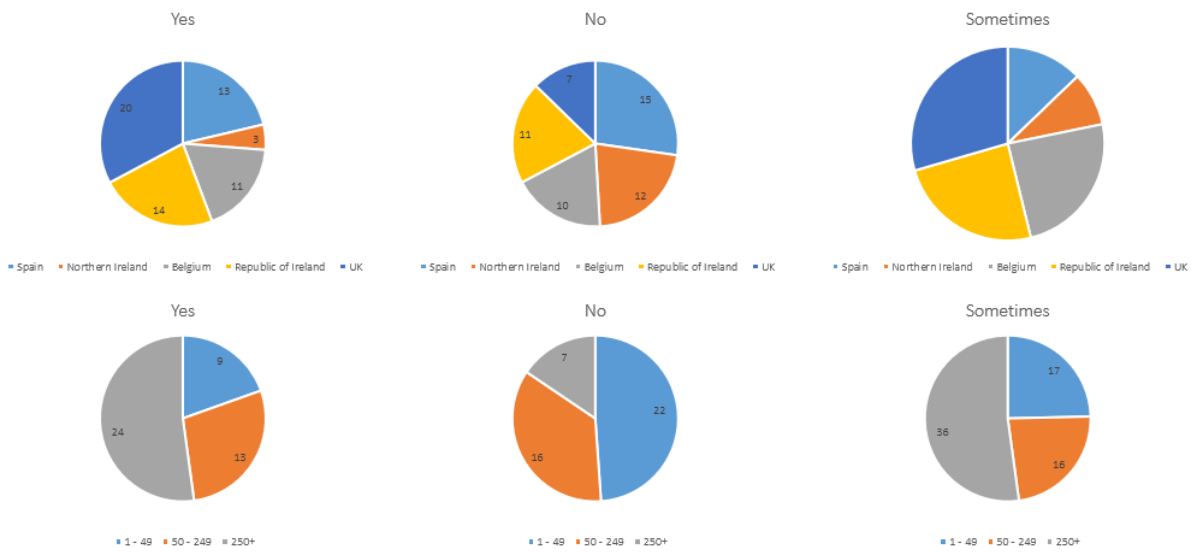
No



■ 1 - 49 ■ 50 - 249 ■ 250+



**We use systematic business planning techniques to build the Business Case for the new solution/offering:**

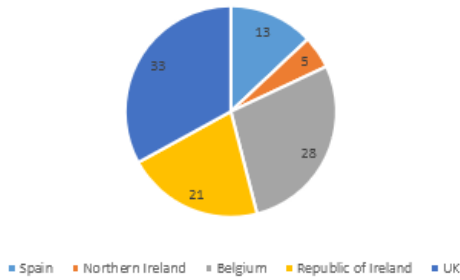


**MEASURING INNOVATION EFFECTIVENESS**

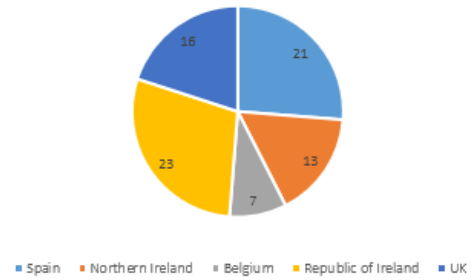
**My organisation measures the progress of its Innovation Plan through using (one or more) of the following:**



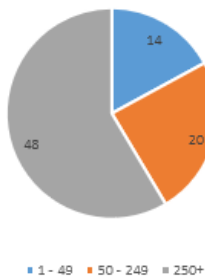
Key Performance Indicators (KPIs)



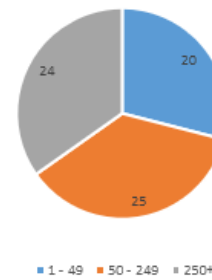
General Assessment Review



Key Performance Indicators (Org Size)

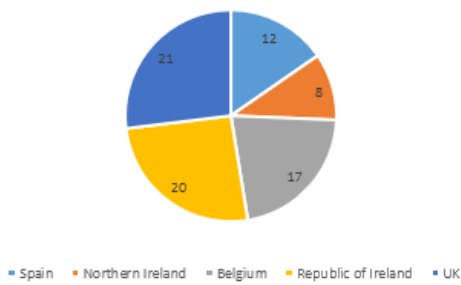


General Assessment Review

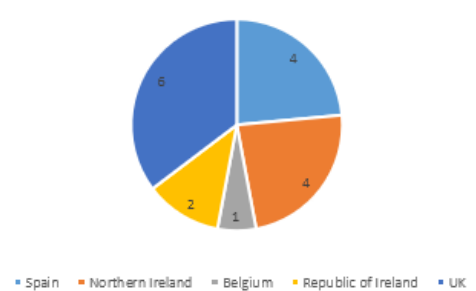


**My organisation measures the progress of its Innovation Plan through using (one or more) of the following (Continued):**

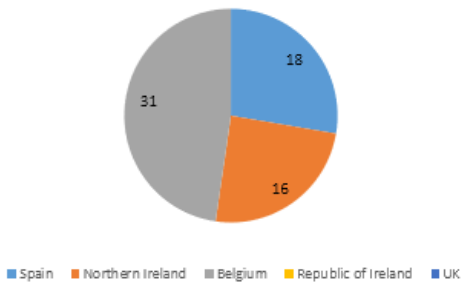
Collection and Analysis of Feedback Data



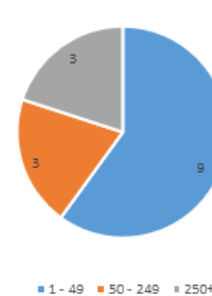
Other



Collection and Analysis of Feedback Data (Org Size)



Other

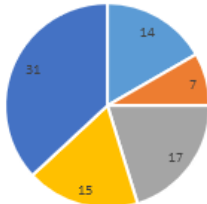




## COMMUNICATING INNOVATION

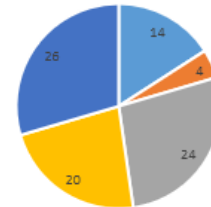
**Our innovation activities are communicated and recognised through the following:**

Innovation Events and Awards



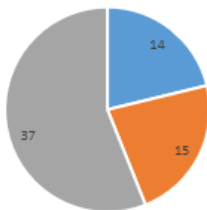
■ Spain ■ Northern Ireland ■ Belgium ■ Republic of Ireland ■ UK

Newsletters



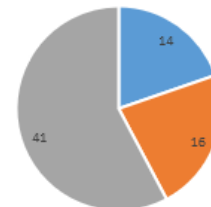
■ Spain ■ Northern Ireland ■ Belgium ■ Republic of Ireland ■ UK

Innovation Events and Awards (Org Size)



■ 1 - 49 ■ 50 - 249 ■ 250+

Newsletters (Org Size)

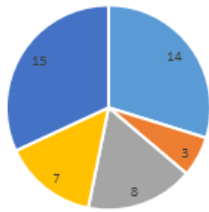


■ 1 - 49 ■ 50 - 249 ■ 250+

**Our innovation activities are communicated and recognised through the following (Continued):**

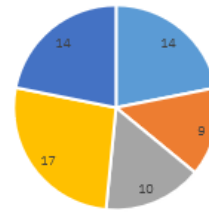


Blogs



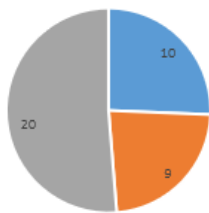
Spain Northern Ireland Belgium Republic of Ireland UK

Other



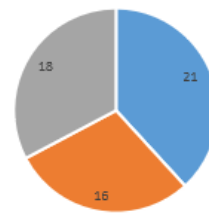
Spain Northern Ireland Belgium Republic of Ireland UK

Blogs (by Org Size)



1 - 49 50 - 249 250+

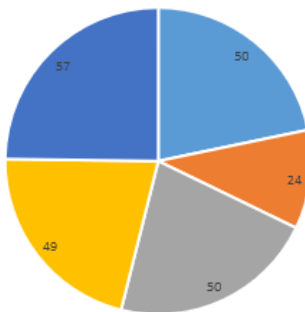
Other (by Org Size)



1 - 49 50 - 249 250+

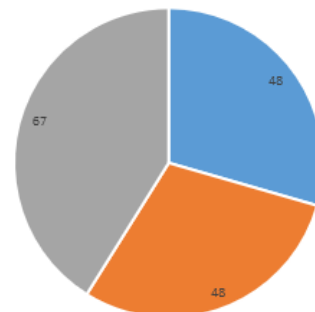
## CREATIVITY AND INNOVATION TRAINING NEEDS

Skills exist within our organisation



Spain Northern Ireland Belgium Republic of Ireland United Kingdom

Skills exist within our organisation (by Org Size)



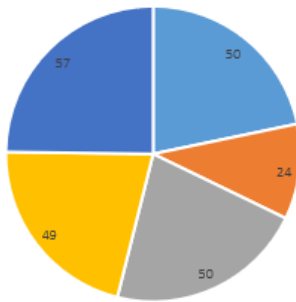
1 - 49 50 - 249 250+





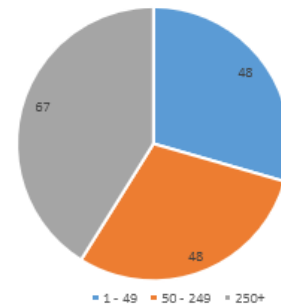
## We constantly seek new skills, especially those relating to innovation, through skills audits

Seek new skills relating to innovation



■ Spain ■ Northern Ireland ■ Belgium ■ Republic of Ireland ■ United Kingdom

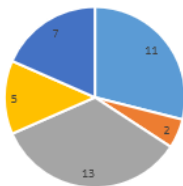
Seek new skills relating to innovation



■ 1 - 49 ■ 50 - 249 ■ 250+

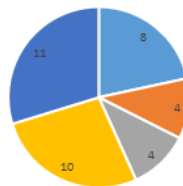
## Our creativity and innovation training needs are:

Fullfilled



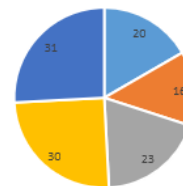
■ Spain ■ Northern Ireland ■ Belgium ■ Republic of Ireland ■ UK

Not Fullfilled



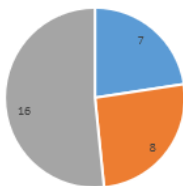
■ Spain ■ Northern Ireland ■ Belgium ■ Republic of Ireland ■ UK

In Part



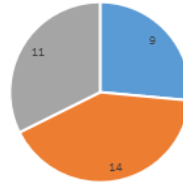
■ Spain ■ Northern Ireland ■ Belgium ■ Republic of Ireland ■ UK

Fullfilled



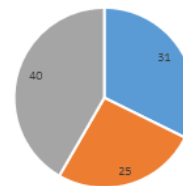
■ 1 - 49 ■ 50 - 249 ■ 250+

Not Fullfilled



■ 1 - 49 ■ 50 - 249 ■ 250+

In Part (by Org Size)



■ 1 - 49 ■ 50 - 249 ■ 250+