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CRANE
4.0

QUESTIONNAIRE REPORT

**“A Digital Trainers Toolbox To Help Crane Operators Update
Their Skills for Industry 4.0 Environments – CRANE4.0 ”.**

Project No: 2019-1-ES01-KA202-065956

SGS

i-Box
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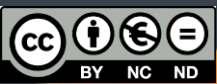
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Changelog

Revision	Date	Author/Organization	Description
v 1.0	14/03/2020	Paulina SPANU / UPB	Draft version
v 1.1	28/03/2020	Paulina SPANU / UPB	Reviewed version after partner feedback
v 1.2	16/04/2020	Paulina SPANU / UPB	Final version



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1. Introduction

The questionnaire report was carried out within the project entitled " **A Digital Trainers Toolbox To Help Crane Operators Update Their Skills for Industry 4.0 Environments – CRANE4.0**" - 2019-1-ES01-KA202-065956. This is the result of the research that involved the following project partners:

- SGS TECNOS – Spain
- I BOX CREATE, SOCIEDAD LIMITADA – Spain
- UNIVERSITATEA POLITEHNICA DIN BUCURESTI – Romania
- MACDAC ENGINEERING CONSULTANCY BUREAU LTD - MECB – Malta
- Confindustria Veneto SIAV S.p.A. – Italy
- SQLEARN AE - Greece

The main objective of the research was to identify the main requirements related to learning needs and competencies of crane operators in the new 4.0 industrial setting. This study aims to highlight the main skills that mobile crane operators need to acquire in existing training processes, in the current context of 4.0 crane operations for mobile cranes.

Based on the studies and research carried out on the requirements imposed on crane operators, a questionnaire was created and the methodology to be followed for data collection and analysis was established. The professional profile of the existing crane operator and the specific skills required by the industry were also analyzed to be included later in the questionnaire (https://ec.europa.eu/growth/tools-databases/regprof/index.cfm?action=regprof&id_regprof=49417&tab=general)

<https://cjraetm.ro/images/meserii/macaragiu.pdf>

<https://ec.europa.eu/social/main.jsp?catId=1215&langId=en>

<http://legislatie.just.ro/Public/DetailiiDocument/116199>)

To find out skills demands, and skills needs in the specific Sector, the consortium started from analyses already done by important organizations of VET research - such as CEDEFOP, the European Vocational Training development center as much as descriptions of development in the world of work and detailed reasons and demands for skills needed and future projection of skills needs.

Afterward, partners went forward by asking a preselected representative number of companies and experts from the field of Mobile Crane to realize their very specific sight of skills demand and skills needs. This specific action was used to corroborate the desktop analysis findings that will be presented hereafter, in this report. The research covers aspects such as the:

- type and duration of the research methodology,
- main research questions that needs to be answered through the research,
- survey sampling method,
- data collection



- involved partners and target groups
- building of questionnaire
- dissemination of questionnaire
- evaluation, presentation and further usage of the findings

The survey was developed based on a procedure that was set up by a group of experts from the project consortium. The data were collected through an online questionnaire, which was elaborated based on databases of occupations, inquiries, and in-depth interviews with relevant stakeholders (companies/SMEs, intermediary organizations, RTCs, universities etc.), and analyzed accordingly. The results demonstrate the need to design and develop an innovative system to improve work-based and initial/continuous learning of crane operators to adapt their skills to the Industry 4.0 skills requirements.

Definition of Skills Demands - Need Analysis

Initially, the target group of employees was identified in order to clarify the requirements for skills. These skills will also determine the educational needs for the creation of the course.

Identifying the skills needed by the labor market also played an important role in the initial analysis, since the professions are transformed and influenced by changes in the labor market, policies etc.

New skills emerge (e.g. green skills) and affect all occupations. In addition, central EU policies are defining future skills needs.

Target group's training needs identification

The target group can be defined as “Persons with some formal qualification and/or with good experience in the field” of Mobile Cranes. This means, that special requirements, going beyond routine and standard work and that higher requirements must be trained, particularly concerning autonomy and responsibility for work processes and decisions. Purpose is to find out and to describe these training needs.

Labor skill needs identification

Modernization, technological development and environmental requirements produce continuously new demands for new skills. This means, that lifelong learning is a standard in all fields of work.

Labor skill needs in the framework of this project will concentrate on the sector of Mobile Crane Operators. Mobile cranes are used in many industry sectors. They are very commonly used in the construction of buildings and the assembly of large equipment.



To bring it to a common result and to an affordable outcome of this limited project, partners had to decide on the items and fields they were considering. Carried-out Interviews with experts highlighted the following fields of skills for training:

- ✓ **Safety/Tools and Equipment**
 - safety
 - communications for hoisting
 - high voltage electrical fundamentals
 - trade related documents
 - tools and equipment
- ✓ **Rigging**
 - wire rope
 - rigging hardware
 - introduction to rigging and hoisting
 - sling configurations
 - advanced rigging and hoisting
 - reeving operations
 - multi-crane lifts
- ✓ **Load Charts**
- ✓ **Load Weight Calculations**
- ✓ **Pre-operational Checks, Inspections and Maintenance**
 - engines and drive systems
 - mechanical systems
 - hydraulic systems
 - continual checks
- ✓ **Mobile Crane Set-up**
 - crane setup
 - assembly and disassembly (lattice boom crane)
 - assembly and disassembly (telescopic boom crane)
 - transportation
 - pre-lift planning
 - worksite preparation
- ✓ **Mobile Crane Operations**
 - lifting theory and forces
 - introduction to crane operations
 - introduction to computerized operational aids
 - job planning
 - introduction to mobile cranes
 - hydraulic telescopic boom operation
 - hydraulic drive lattice boom operation
 - friction drive lattice boom operation



- specialty crane operations.

2. Regional characteristics

The partners from each country conducted five interviews with people from companies that are involved in crane operation activities.

Country	Company
Greece	KONECRANES HELLAS
Italy	Barellas & Sartore Ergamatia srl
Malta	Malta Freeport Tal-Maghtab Construction Farstone Construction and Restoration Ltd. SJ Tower Cranes
Spain	Empresa Eurogruas Algeciras TRANSGRUMA TRANSPORTES LUJAN GRUAS RIGAR ANAGRUAS
Romania	SC Conelectro. SRL

The general managers, assistant managers, commercial managers, sales engineers, trainers, construction site safety managers, responsible for corporate training and safe work, training agency managers, self-employed, and crane operators have participated in this study.

The analysis of this study resulted in the following conclusions:

- in the field of crane operation, there is a need for online training courses for staff to improve their skills and knowledge;
- given the changes due to technological / digital development, companies want to introduce methods of developing digital skills in a 4.0 perspective in training programs;
- companies are willing to pay for these courses;
- the main training needs that are taken into account are, unfortunately, those required and provided for by the legislation in force;
- training, both initial and periodic, for each crane operator and testing.
- face-to-face training is more effective;
- virtual reality could help load / unload tasks and also calculate angles, avoid overturning
- educational tools based on virtual reality or augmented reality would be useful in the training process especially for problems related to the safe operation of cranes.



In general, the deficiencies that crane operators have are the following:

- correct estimation of loads without exceeding the nominal load;
- safe handling of loads;
- crane control;
- hand-eye coordination;
- inspection of crane and equipment before operation;
- correct crane configuration
- knowledge of loading graphs.

The major areas of interest at the National level

The main purpose of this study was to identify the current situation at national level in Spain, Romania, Malta, Italy and Greece regarding the emerging training needs of crane operators and other companies involved in the continuous training of the crane industry. Research on the main areas of interest of crane operators and other companies involved in the ongoing training of the crane industry was carried out by each partner. The results were obtained by applying online questionnaires and implementing interviews with relevant stakeholders to identify the current situation and training needs of the crane industry.

The analysis at national level include the relevant aspects regarding following major areas of interest:

1. Main training needs
2. Perception of the effectiveness of the actual training offered
3. Most effective training delivery methods
4. Main obstacles preventing access to training
5. Most relevant competences for a crane operator
6. In which area the crane operators need to be offered more training or better training
7. Which emerging skills are the most relevant

SPAIN

Main training needs

Most of the respondents (15 out of 23) indicated that there exist within their company a process to identify the training needs of the employees which in most of the cases was judged as effective by the respondents.

With an open ended question, respondents were given the chance to indicate the three most important training needs they could identify. Most of the respondents reported that the main skills deficiency can be found in the safety and load handling sectors:

- Occupational Risk Prevention,



- Theory / Practice in Lifting Equipment,
- Safety at work.

Very few respondents addressed the need to engage the operators in a more innovative and technology-driven training:

- Development of work techniques and training in new technologies applicable to work development.

Effectiveness of the actual training offer perception

According to the gathered results, respondents were generally satisfied with the training offer. The majority of them reported that there is a process to identify the training needs at company level, demonstrating that there is a great attention on the professional training of the operators. Identifying the most common training offer across Spain is quite difficult since many of the respondents did not reply to this question and those who did were equally split – a third of them indicated that the human resources department indicates the training an operator needs to attend, a third said that they individually and by themselves spot their skills deficiency and one third said their company decides which are the training needs to be covered by the operators.

Only three persons out of 23 indicated that they are not confident that the existing process offered by their organisation will meet their future training/professional development needs and aspirations. The rest of the respondents were generally confident about it.

Most effective training delivery methods

The respondents were then asked about the method of training they felt it would be **most effective** for their job role. They were given the chance to express more than one method. The results show that the majority of the respondents chose Classroom and Workshop as the most effective training method for their job (respectively 10 and 11 respondents). 7 respondents chose Computer based training, 6 of them chose Online training and only 3 chose Video as a training delivery methodology. None of the respondents opted for Web conferencing (live streaming of the class). These outcomes demonstrate that most of the crane operators and sector experts consider as most effective training methodologies the face-to-face and practical ones.

A good share of the interviewed also consider the online and computer based learning as effective approaches, demonstrating the confidence of the participants with digital and technological tools. Videos and web conferencing were barely mentioned, which shows a low familiarity and reliance on the streaming and recording of classes. It is worth mentioning that only one respondent replied *Other* and indicated *practical sessions with equipment* which is very close to the Workshop training method.

On the same topic, respondents were also asked what method of training they felt would be **most convenient** to attend. The results are almost equal to the ones gathered for the previous



question, demonstrating that the effectiveness and convenience aspect of the training method were judged in the same way by the interviewed. For this second question the results were:

- Classroom: 12 respondents
- Video: 4 respondents
- Online: 6 respondents
- Computer Based: 6 respondents
- Workshop: 9 respondents
- Web conference: 0 respondents
- Other: 0 respondents.

Main obstacles preventing access to training

Question number 15 asked the interviewed persons to indicate which of the factors prevented them from meeting or achieving their training or professional development. For this question the respondents were asked to indicate more than one answer as well and choose among the following factors:

- Cost
- Capacity of workforce
- Geography and location of venue
- Lack of managerial support
- Length of training
- Personal circumstances
- Training not available
- Other.

Capacity of workforce (translated into Spanish as *Time availability* of the workers) has gathered the most votes (13 out of 23) followed by Geography and location chosen by 7 respondents. This testifies that most of the crane operation stakeholders find it difficult to combine their professional development and training with their work, because of the lack of time and the geographical obstacle which impede them to reach the location of the training.

4 respondents indicated the Length of training and the Non-availability of the training as two of the reasons preventing them to update their skills. Only 3 persons expressed that the main obstacle is the cost of the training and 1 indicated his/her personal circumstances. It is worth noticing that none of the respondents pointed out Lack of managerial support as an obstacle preventing them from accessing further training. This means that from the managerial side there is the will and the interest in keeping their operator trained.

Two persons replied that there are no obstacles in their access to training while one person indicated that the main obstacle is the fact that the training hours fall within the working time.

Most relevant competences for a crane operator



When asked to indicate the most important competencies among the enlisted ones basing their judgement on their professional experience, all the respondents agreed on the importance of each of the proposed competence:

- Legislation on lifting operations;
- Roles and Duties of Personnel in Lifting Operation;
- Lorry crane operation;
- Emergency response procedures;
- Safe operating Procedures of Lorry crane;
- Pre-lift inspection of lifting accessories;
- Selection and use of rigging equipment;
- Load Estimation and Centre of Gravity;
- Lorry crane Operating Practice (Practical Experience).

Each of these tasks were evaluated as Important or Very important by the responders, a sign that when it comes to crane operations, none of the tasks can be underestimated.

In which area the crane operators need more training or better training offer

The questionnaire asked with an open-ended question to the respondents three ways to improve the training offered by their organisations. The main suggestions were to:

- Increase the face-to-face workshops,
- Improve the information regarding the mandatory legal requirements,
- Boost the collaboration with the crane manufacturers in the training of the operators,
- Increase the practical training, with less theoretical sessions and more qualified trainers,
- Facilitate the SMEs to become training centres to avoid that the operators need to relocate to attend the classes, in this way they can train and work in the same place,
- Facilitate the collaboration with the Administration and the Public Authority especially when in the scheduling of the training and exam hours, which usually collide with the working hours,
- Evaluate continuously the work and the results of the workers, not just during the examination sessions,
- Include more technology in the sessions,
- Carry out personal training plans, adapted to each operator deficiency.

Furthermore, the partners of the project included a more specific and closed question to understand which are the topics the respondents wished to be trained about. The most voted items were:

- Research & Development,
- Computer Skills,
- People Management Skill and
- Stress management.



These were the most voted items which testify the importance crane operation stakeholders confer to technology advancement and computer knowledge, but also to the human factor.

The second most voted aspects that respondents chose as the ones they wanted to be trained about are:

- Workplace Ethics,
- Supervisory Skills,
- Engineering Maintenance and
- Leadership.

These answers show the same results as the previous ones: the need to be trained in specific crane operation tasks, but also on people management, leadership and workplace wellbeing.

Among the emerging skills, which are the most relevant

The last aspect investigated by the Crane 4.0 project was related to the emerging skills which will affect the training and the workplaces in the Crane operation settings. Respondents were asked to indicate the emerging skill which would in their opinion affect their job in the future. 11 out of 21 indicated the following:

- Implementation of new technologies, new software or machines and equipment, including those for sustainable, ecological and energy efficient production.
- Thus the technological and environmental changes are those that most concern the crane operation stakeholders, more than the changes in the consumer market, legal and regulatory framework and the organizational culture of their company.

ROMANIA

Main training needs

The analysis of the perception of the interviewed persons regarding the main training needs highlighted the discrepancy between the current level of competences and abilities of the crane operators and the stage desired by the managers or owners of the companies. At the organizational level, in general these discrepancies are identified and solutions are sought to be resolved both at the individual level and at the organizational level.

The identification of the needs and the evaluation of the performance of the personnel involved in the handling of the cranes is considered as the solution of harmonization of the needs and interests of the operators with the representative needs of the company.

The analysis of the results highlighted the existence of aspects regarding the structure of training courses available at national level, which are generally not updated to the new technologies available on the new crane models or specific to work tasks.



Within the organizations, the training courses are promoted by the specialized departments of the companies according to the specific needs and the priorities of the future actions. Thus, managers had related that in their companies, the development personal strategies and individual training plans for crane operators are periodically established.

The processing and analysing of the data collected by applying the questionnaire and the interview applied at national level have suggests some aspects that should be improved. Managers, business owners and people involved in the training activity pointed out that traditional methods and teaching-learning means should be adapted to the requirements of Industry 4.0. They must allow the study of the content in the individual's rhythm, and outside the work schedule. Specific practical applications with simulations performed in Virtual or Augmented Reality would improve the performance of the operators according to the identified objectives.

They pointed that it is absolutely necessary to have an accessible, attractive, competitive and relevant training system for the requirements of the labour market.

Effectiveness of the actual training offer perception and Most effective training delivery methods

At present, in Romania there are companies that provide courses for crane operators both online and at the employer's headquarters for larger groups of people bellowing the same company.

Most of the interviewees pointed out that not all methods of providing courses ensure the development of the skills and abilities necessary for the safe handling of the crane. Workplace safety and quality assurance in the exercise of their duties are topics that should not be missing from the training program of crane operators, according to the statements of those who provide training courses.

Many companies offer courses that have a deep applicative character, and which aims to assimilate information easily and correctly. The training techniques and methods used are channelled to stimulate the operator's creativity and interactivity. The courses content are generally updated to include all legislative changes in the crane field.

Several negative aspects were identified in this study. Not all existing courses have a structure cantered on the type of crane. There are courses where the training framework does not include first aid measures in case of accident. Training needs should also focus on the degree of security to be ensured, and other components necessary to ensure operational safety.

Main obstacles preventing access to training

One of the obstacles faced by companies that has resulted from the analysis of questionnaires and the interview is the long duration of the courses, which would lead to the removing



employees from the activity with negative consequences on labour productivity. Also, the lack of companies that offer online or blending courses is a real problem, especially for smaller companies.

Another issue is the refusal of employees with a greater seniority in operating cranes to participate in training courses. For new cranes, equipped with modern technologies, they prefer to discover the new functions available on the crane, in the workplace, rather than participate in training courses.

Other difficulties that prevent access to training that were mentioned by the interviewees are: lack of an offer of courses that allow individual study, high price of courses, unavailability of lecturers for small groups of people interested in training crane operation, low interest of employees, the employees limit only to the courses required for compulsory certification.

Most relevant competences for a crane operator

The simplest and most economical way to improve safety and productivity while reducing costs is to train employees to acquire the competences needed to operate cranes.

The analysis of the data collected from the application of the interview and the questionnaires revealed the following basic competencies that crane operators must acquire:

- Preparing and checking the machine for work.
- Carrying out the transport and handling of goods.
- Proper centring of objects and making precise lifts.
- Minimizing the load balance.
- Identification of defects.
- Safe and efficient use of the crane.

In which area the crane operators need more training or better training offer

The area for which the interviewees need more training is the safe handling of the load. The operators encountered difficulties in correctly estimating the workspace and the weight of the manipulated objects.

Another area that would require more training is related to knowledge of first aid measures and current legislation.

Among the emerging skills, which are the most relevant

From the point of view of crane operators, the most relevant skills refer to the adaptation to the new technologies imposed by the labor market.



Obviously, it is necessary to adapt the training methodologies to the specifics and requirements of the companies, in continuous change.

Considering the industry dynamics, it is necessary to adapt the courses to the training needs of the crane operators accompanied by simulations and practical activities. Undoubtedly, VR and AR applications would increase the attractiveness of courses and facilitate a faster and more efficient understanding of theoretical and practical notions.

MALTA

Main training needs

In the questionnaires and in the face-to-face interviews the three most important fields which require training were health and safety, crane setup and loads. Unfortunately, at the moment in Malta training for crane operators is very limited, and also not very practical as training is given by an engineer, someone who has theoretical experience in crane operation but not necessarily someone who has practical experience. All three of these training needs are very important to ensure the safe operation of cranes.

Perception of the effectiveness of the actual training offered

Most of the responders said that their training needs were mostly met. Only two participants stated that the training did not meet their needs in all regards or not at all. When the issue was discussed further and also during the face-to-face interviews, the fact that sometimes training is not given by someone with experience was once again brought up. Other participants mentioned that no real additional training is offered except for the obligatory training and that the training offered needs to be improved. In Malta no other training is offered apart from what is stated to be obligatory by the Government, unless it is offered by the employing company in-house.

Most effective training delivery methods

When asked about the most effective training delivery methods, most responder indicated workshops or classroom-based training, as it would give them the opportunity to be focused and to ask questions if needed. A few also said that they preferred computer-based training, as it would give them the flexibility to carry out the training in their own time and at their own pace. Some responders also indicated that a mix of theoretical and hands-on training would be ideal.

Main obstacles preventing access to training

The four greatest obstacles indicated with regards to the prevention of access to training were the cost, the lack of availability of training, the capacity of the workforce and the length of the training. The most common issue is that very often, unless training is offered in-house, no training is available locally. This means, that in order for crane operators to attend additional training, they must go abroad. This is an issue as often they would have to pay for



training themselves, and they would also need to book their personal work leave to be able to attend the training, which in return affects the length of the training as most workers are not willing to attend long training at the cost of their leave. Additionally, as the building industry locally is very much in demand, it is not always possible for crane operators to attend training as this would mean that there aren't enough workers to carry out the necessary work.

Most relevant competencies for a crane operator

When asked about the most relevant competencies for crane operators, many replied that most of the competencies indicated were very important. One particular aspect that emerged from the questionnaires and the face-to-face interviews was that of safety, in fact the most highly voted competencies were those about safety, such as Emergency Response Procedures, Workspace Health and Safety and Safe Operating Procedures. When asked about this during the face-to-face interviews, interviewees stated that many crane operators know how to operate a crane, but have little knowledge of how to handle emergencies when they occur and recently locally there have been a few incidents involving the construction industry. Another aspect that was indicated as very important was that of practical experience. Interviewees stated that while it is possible to know how to operate a crane in theory, the best way to know how to operate a crane in a safe manner is through practical experience.

In which area the crane operators need more training or better training offer

Responders indicated that the areas which require more or better training are health and safety, compliance with current legislation, engineering maintenance and job processes or machinery functioning. It was also indicated that training needs of crane operators would be best addressed through the provision of refresher courses for current crane operators together with courses which would help them keep up to date with new technology.

Among the emerging skills, which are the most relevant

Among the emerging skills were considered as the most relevant from our responders was the importance of the implementation of new technologies, new software or machines and equipment, including those for sustainable, ecological and energy efficient production.

ITALY

Main training needs

In general, it is possible to say that the most frequently encountered needs concern **safety in the performance** of tasks and the **organization of work**. In fact, many workers ask to be able to carry out their work safely and, therefore, to be adequately trained on these topics. Furthermore, they believe that a more careful organization of the daily work and a more



precise assignment of tasks would drastically improve the quality of the work itself, increasing its effectiveness and efficiency.

It is interesting to specify how both the needs highlighted foresee and wish the **use of technology** to increase performance in terms of safety and quality / speed of work.

In fact, many people interviewed do not identify **innovation** as a primary need but, if explicitly requested, consider it only a mean to achieve the set standards.

Another important request is that the training courses be more **specific and updated**; therefore, they are in line with changes in the world of work as well as with the specific characteristics of each company. In order for this to happen, the worker would like **practical lessons** (more examples and simulations) and training that is detached from classical methods in favor of **work-based activities**.

A final aspect includes all those general needs of the worker who hopes that the training courses will be **promoted directly by the company** and that this will result in **less free time and costs** for the staff. In addition, some would like these courses to **facilitate the growth** of people within the company in which they operate, thanks to the new skills acquired.

Effectiveness of the actual training offer perception and Most effective training delivery methods

The current training framework, both perceived and not, is not very encouraging. Many interviewees, starting from the training agencies themselves, highlighted some problems such as:

- training needs should be strictly connected to the state of the art of work, technological and regulatory progress but today in Italy it is so rare;
- it is a rather underrated area, an "obligatory" activity to which companies and workers do not want to devote more than the necessary time;
- as for the training of crane operators, the methods currently most used are classroom training courses, with an approach from one to many, but many users interviewed think that there are better approaches, more interactive and innovative.
- the use of digital technologies is not taken into consideration, although many believe that, in light of the technological changes, it is necessary to introduce digital skills development paths in a 4.0 perspective, both in the company and in the training offer.

However, it should be specified that, despite the fact that the updated and training courses currently mainly use traditional methodologies, many companies are already working with a view to 4.0 trying to implement their potential and offer competitive tools for workers and their needs. For example, working closely with highly innovative and experimental companies.



Despite the initial reticence, therefore, both workers and trainers agree on the need to innovate technologically, designing training courses that combine the theoretical framework with new practical simulations (**field training, conducted by people of the trade**) focused on the location and role.

Main obstacles preventing access to training

The first cause of obstacle to access to training is the difficulty that many companies encounter, more often in small businesses, to divert workers from their duties thinking that learning skills and knowledge take place through work; therefore is widespread the concept that "learning by doing" is sufficient for the professional growth of workers.

This principle is even more valid for updating in the digital and technological field since, in addition to the aforementioned difficulties in diverting workers from their activities, there is still a mental refusal to develop apparently "difficult" skills.

Another problem that hinders advanced training in the technological sector is the lack of a quality offer from consultancy companies that often use a teaching staff who is not up to or at rates considered excessively high by companies.

A further evident problem from the answers to the questionnaire is also linked to the duration of the training which often appears too long.

For these reasons, companies often limit themselves to making workers carry out only compulsory training, postponing the development of more advanced skills to their personal initiative.

Most relevant competences for a crane operator

The type of professionalism that a mobile crane operator must have is mainly related to safety. This logical consideration is also evident from the answers on what training and updating needs are most requested by workers. In this sense we must certainly understand the correct use of the means but also the maintenance and correct use of the protection devices.

The need to adapt to laws and regulations, which often refer precisely to the field of security, is also very felt.

A further topic of interest is related to the efficient use of operating machines and to the knowledge of work processes and logistics.

It therefore appears, also in this case, that training for the enhancement of technological skills is not considered so important. That is, the need is felt but evidently these skills are not considered useful enough for this type of job.



Even less importance is given to skills related to management and those related to well-being and quality of life in the workplace.

In which area the crane operators need more training or better training offer

The survey highlighted, as previously anticipated, a partial awareness of the usefulness of training in the technological / digital field both for reasons related to the not always adequate training offer and for a lack of sensitivity and an insufficient orientation towards innovation. So, this is definitely a first area where operators need more training and more quality. This aspect should probably be attributed to the lack of knowledge of the positive effects that these new skills would have on workers and the organization and therefore should be stimulated and encouraged in some way.

Another area that would require more training is that related to some transversal skills often considered marginal and not useful for actual productive work. In particular, we refer, as shown in the questionnaires and in-depth interviews, to stress management, the management of human resource workloads, problem solving and, more generally, aspects of communication.

It should be noted that, for example, the use of 4.0 technologies such as virtual reality could support this type of training by placing workers in simulated contexts of high stress or in which the rapid and effective solution of problems is crucial.

Among the emerging skills, which are the most relevant

Without a doubt, the most relevant area among emerging skills is that relating to those of new technologies. The evidence is given both by the answers given in the survey and by the awareness that the world is going in this direction and training, in all sectors, will have to adapt to this trend.

This however implies that not only the contents of the courses will have to innovate but above all the training methodologies must reinvent themselves to adapt to this new situation. Traditional face-to-face training is no longer enough, it is known, therefore training agencies and teachers will have to innovate their offer first.

From a business point of view, this also entails a change in attitudes towards training, no longer considering it an unnecessary obligation imposed by the law but seeing it as a resource to make workers grow and, consequently, the business.

In short, and this also emerges from the results of the questionnaire, the culture of the companies must also be changed: the fact that the management system has no impact on the quality and safety of the work stands out for the 20 workers questioned.



GREECE

Main training needs

The main training needs of crane operators in Greece, as reflected via the online questionnaires distributed and the in-depth interviews, are focused on training related to safety regulations and procedures as well as activities related to loads handling, machinery and equipment usage and lifting and rigging procedures. Maintenance and supervision of machinery and equipment are also considered important skills. Besides the on-the-job knowledge and skills, another interesting thing that was pointed out by many responders, mainly by the interviewees, is the fact that crane operators consider also highly important for their profession, to have good communication skills, so as to communicate properly with the ground team for example, as well as be able to recognize when one needs to stop operating if things seem to extend their limits, not only for the safety of themselves but also for others.

Effectiveness of the actual training offer perception and most effective training delivery methods

The responders were generally positive with the perspective of using a VR application for their training. Of course some of them were quite sceptical of how effective or realistic would this training environment be, as they are not familiar with this technology. But even those were curious to explore how this application would work. Generally the feedback we got was positive and encouraging.

Regarding the most effective training delivery methods, on the top of the list of our responders' preference was the face to face/classroom training method. Of course this is reasonable as people in general are mostly used to this traditional training method and they are familiar with its procedures. But what needs to be also mentioned is the fact that the responders of the questionnaires and interviews were also positive at a high percentage to either a workshop or a computer-based training delivery.

Main obstacles preventing access to training

Our responders of the questionnaires and the participants in the in-depths interviews pointed multiple reasons as obstacles preventing access to training. One of them was the length of training, as most of them highlighted that they do not have the required time to invest in an extended training seminar or activity. Geography and location of training venue was also pointed as an obstacle preventing access to training, again because of the lack of the necessary time to travel to another location. Last but not least, the high costs of relative training as there are not many free training offers, was also mentioned from our responders as an obstacle for accessing a training activity on their field of action.

Most relevant competencies for a crane operator



Activities related to selection and use of rigging equipment (e.g. Slings methods, Effects of sling angles, Selection of correct sling & slinging method to different loads, Rigging guidelines) and Load Estimation and Centre of Gravity (e.g. Lorry crane capacity chart interpretation, Estimation of loads, Safe working load, Estimating loads) where the two competencies that our responders pointed as very important at a highest percentage (42,9%). Also, activities related to pre-lift inspection of lifting accessories (e.g. Construction of wire ropes, Types of slings, Types of end fittings & connections, Wire rope clips) was also mentioned as very important competencies (38,1%).

In which area the crane operators need more training or better training offer

“Engineering Maintenance” (61,9%) and “Health and Safety” (42,9%) are the two areas that our responders pointed that they need more training or better training offer. “Job processes or machinery functioning” (38,1%) was also pointed by our responders as a topic on which they need more or better training offer.

Among the emerging skills, which are the most relevant

Among the emerging skills that are considered as the most relevant from our responders were mainly those related to the implementation of new technologies, new software or machines and equipment. Emerging technologies are creating a great demand for specific skills that are currently lacking in the sector’s labor force .

The aim of the CRANE 4.0 project to develop an innovative training and methods for teaching, learning and assessing the learning outcomes of Crane operators 4.0, through the use of Virtual Reality, will support the educators and learners in using digital technologies in creative, collaborative and efficient ways and thus develop new digital competences.

From the results of the questionnaires and the in-depth interviews it is highlighted that despite the fact that the traditional face-to-face training is considered to be the most trusted and popular type of training, it turns out to be insufficient. Both the context of the training to be developed in the framework of this project as well as the innovative use of VR will be an added value for all those public and private VET providers who want to offer upskilling pathways to their educators and training.

3. Research Methodology

Purpose statement

This report presents the research on possible factors that contribute to adapt the crane operators' skills to Industry 4.0.

The research was directed at the definition of 4.0 crane operations for Mobile Cranes (the most standard and used in construction) - hydraulic cranes with steel truss or telescopic boom mounted on a mobile platform, which could be a rail, wheeled, or even on a cat truck..



The report provides the results of a series of in-depth interviews with relevant stakeholders (companies/SMEs, intermediary organisations, RTCs, universities etc.) and surveys run in the partner countries which will highlight the main requirements related to the learning needs and competencies of crane operators in the new 4.0 industrial setting.

The method chosen for this study is a quantitative survey, based on a closed-ended questionnaire. The aim of the research is to gather a sample from the countries participating in the project. This result will help to choose the corner points for the development of a curriculum to be developed within the projects lifetime.

The questionnaire was handed through e-mail, targeting all participating partners' countries. The field period was for around a month.

For the participation to be enhanced, project's partners disseminated and invited representatives of the targeted groups to participate in the survey.

Measurement Tool

Quantitative research was conducted to collect data from relevant stakeholders (companies/SMEs, intermediary organizations, RTCs, universities etc.). Each partner collected questionnaires and carry out in-depth interviews to conduct the research analysis. The result of this research will be used for the development of the Curriculum and the Course Plan adapted to the Industry 4.0 crane operation settings. .

The questionnaire consists of two sections (Appendix 1). The first section of the questionnaire includes questions that are related to personal details. The second section includes a set of questions focused on the collection of data for analyzing training needs from the crane industry and companies.

The conduction of the research aims at answering several questions directly related with the overall scopes of the project such as:

- Identifying skill needs for Crane Operators
- Mapping potential differentiations between participating countries,
- Identifying training needs,
- Presenting possible trajectories for achieving necessary competencies
- Evaluating potential differentiations between participating countries

Creation of the questionnaire

Initially, the creation of the questionnaire was based on the findings of the research (i.e. duration, main variables, involved partners, ways of dissemination, means of enhancing participation) in order to follow the real identified needs of the sector. The list of skills for



Mobile Crane Operators, based on already conducted researches, created curricula, professional profiles and data referring to the main characteristics of the job.

Among others the questionnaire included and monitored issues such as needed skills, training needs. Finally, the questionnaire included the demographic characteristics of the participating members such as the field of activity.

Project's partners invited companies from their countries to fill in the questionnaire. Under this precondition, 98 questionnaires were distributed.

Data collection

First, the project partnership prepared a letter of consent, which included the purpose of the study, procedures, confidentiality and duration, potential risks/discomforts, data handling, processing and uses, and the right to refuse and to withdraw.

The research was carried out in three main stages. In the first stage, the English version of the questionnaire was reviewed by the experts of each partner. They tested the instrument and indicated if the questions were fully understood or needed some corrections. Then, the final English version of the questionnaires were translated into the individual partner languages and sent to the target group to participate in the research. Each partner used their own methods and contact database to send the survey link to potential respondents and to manage the interviews with relevant stakeholders from companies, and universities.

In the second stage, the persons in the target group received the links of the questionnaires. They were informed about the purpose of the research and made sure that all the data of the participants will remain anonymous and confidential. The data collection process took approximately one month. At the end of this process, we received 98 questionnaires from the respondents and 25 interviews. The number of questionnaires per country is highlighted in the table below.

Country	No. of questionnaires	No. of interviews
Spain	22	5
Romania	20	5
Malta	16	5
Italy	20	5
Greece	20	5
TOTAL	98	25

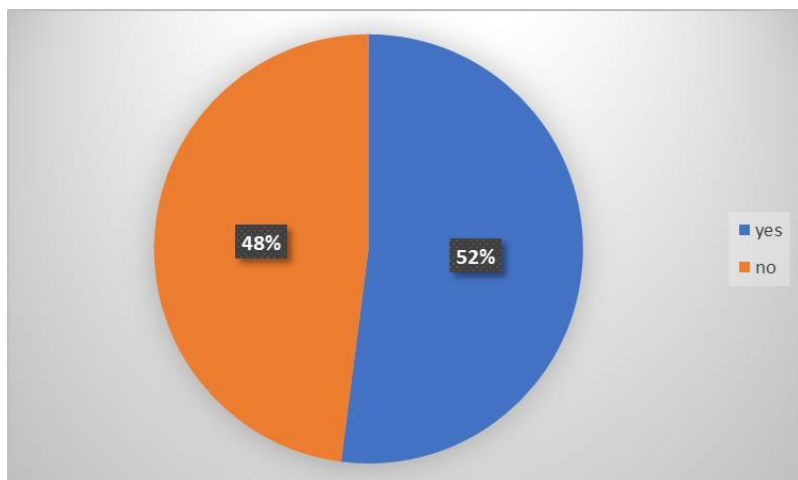
In the third stage, the collected data were analyzed.

Data analysis

3. Does a process for identifying future training and professional development needs exist within your company?.

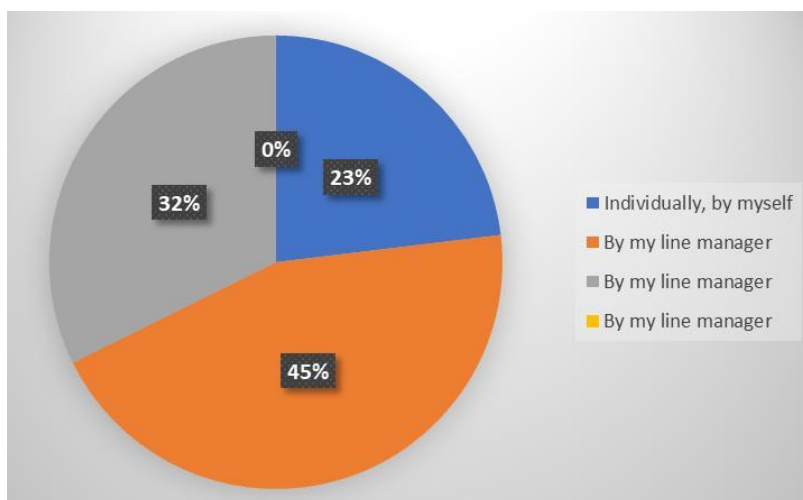


yes	51
no	47



4. Which of the following statements best describes how your future training and professional development needs are assessed?

Individually, by myself	15
By my line manager	29
By the Human Resources department	21
Other (Please Specify)	0

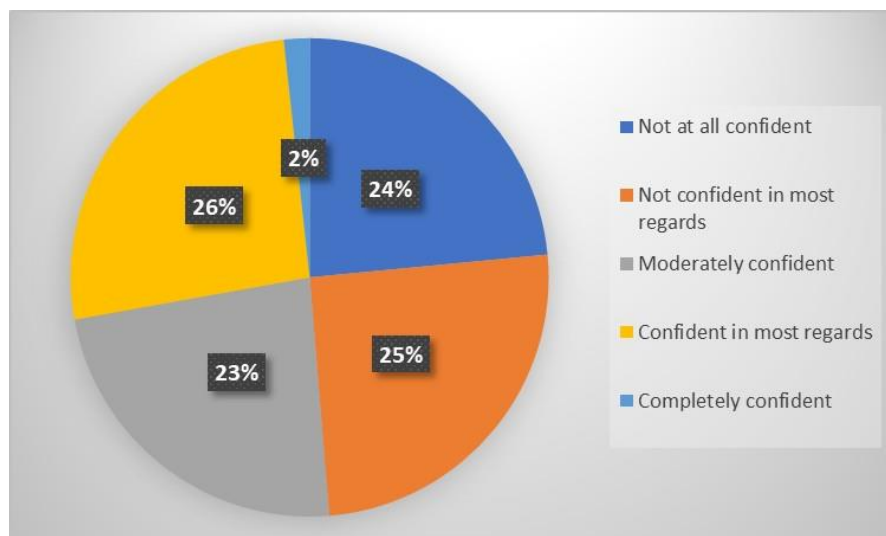


5. On a scale of 1 to 5 (1 being the worst and 5 being the best.) within your organisation how confident are you that the existing process will meet your future training/professional development needs and aspirations?

Not at all confident	27
Not confident in most regards	29
Moderately confident	27



Confident in most regards	30
Completely confident	2

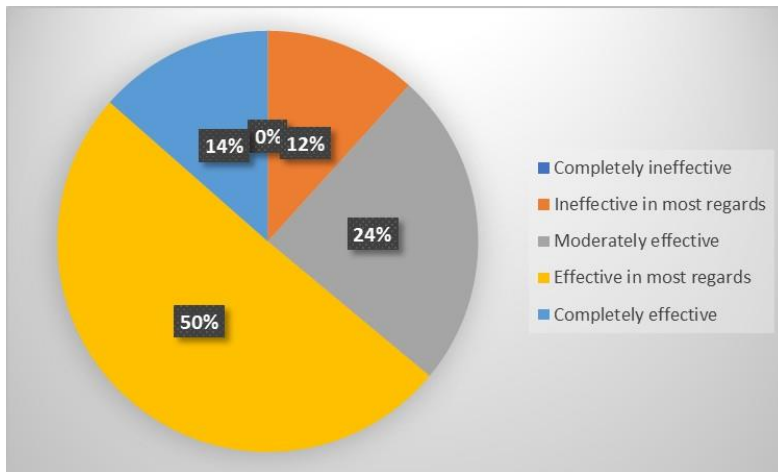


6. If you answered 1, 2 or 3 for question 5 please give a brief explanation of why you believe this to be so.

- Constant analysis of the training needs and requirements of the workers.
- We are the Canary Islands, which means that we are delayed in formation. In fact, it is difficult to find licensed cranes or experienced truck crane professionals.
- There are not enough qualified personnel
- For the needs of the market and the regulations that are being produced
- Very varied and changing legislation for working in many work centers with different legal and client requirements.
- Lack of time for training
- Difficult to say unless they are implemented
- The time margins for training are increasingly small

7. On a scale of 1 to 5 (1 being the least effective and 5 being the most effective) how would you rate the *effectiveness* of the *process* used to identify your training and professional development needs?

Completely ineffective	0
Ineffective in most regards	13
Moderately effective	27
Effective in most regards	56
Completely effective	15



8. If you answered 1, 2 or 3 for question 7 please give a brief explanation of why you believe this to be so. If not go directly to question 9...

- To date, all workers have the training required for their job.
- Because the current regulations demand to be very up-to-date in terms of training, also customers demand that this be met, as it can not be otherwise
- we based on the average age of the staff and the trends in the labor market
- the trajectory proves it
- For this to work, a direct confrontation between manager and worker is necessary
- There is no effectiveness evaluation system

9. What are the three most important Training needs you would identify?

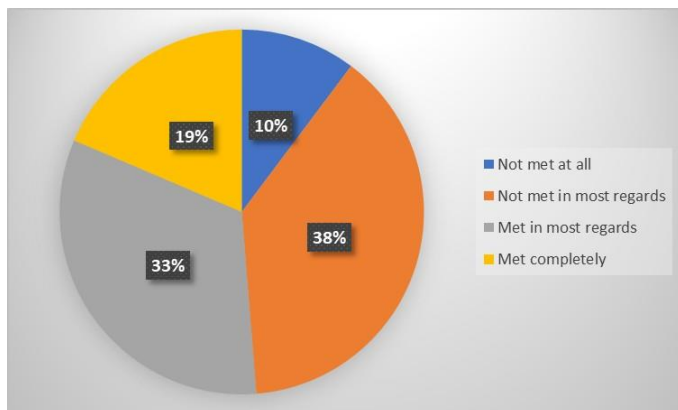
- First aid, Electrical risks, Load handling
- Occupational Risk Prevention - Theoretical / Practice in Lifting Equipment Self-Propelled Cranes and Articulated Hydraulic Crane Trucks.
- Training with a loader crane and training for a self-propelled crane.
- time, practice and simplicity
- safety at work, development of work techniques and training in new technologies applicable to work development.
- Mobile crane operators, basket truck operators, crane truck operators
- Middle managers, Crane operator, mechanic, Excell, Autocad
- Maneuvering heads, spoilers and signalmen with minimum requirements set by the competent legal body or, failing that, the EU standard.
- Safety training: work at height and prior safety checks (check list) and beacons. Training in mobile crane driving programs, use of locks, use of "crab", etc.
- Meet the requirements, knowledgeable about the sector, Safety and precautionary skills
- Security and work-related risks, knowledge of derailed hoisting, study of diagrams and loading programs
- Asses the weight limit of the crane
- Setting up the crane
- Environmental construction sector legislation
- Innovative methods
- Customized courses
- Not time consuming
- updating of improvement processes
- Internal company courses
- Growth prospects

- Safety integration systems in product design processes
- During job time
- Focused on innovation
- Focused on time-saving
- Focused on productivity
- Technological innovation
- technological update on waste treatment and treatment
- Generational exchange
- Customized courses
- Practical examples
- New methods
- Technical training
- Process improvement training
- First Aid
- Rigging
- Best practices for safe operation
- Load estimation

10. Thinking back over the last 12 - 18 months, how well during that time on a scale of 1 to 4 (1 being not at all and 4 being completely) do you feel your identified training and

professional development needs were actually met?

Not met at all	16
Not met in most regards	60
Met in most regards	51
Met completely	29



11. If you answered 1, 2 or 3 for question 10 please give a brief explanation of why you believe this to be so. If not go directly to question 12...

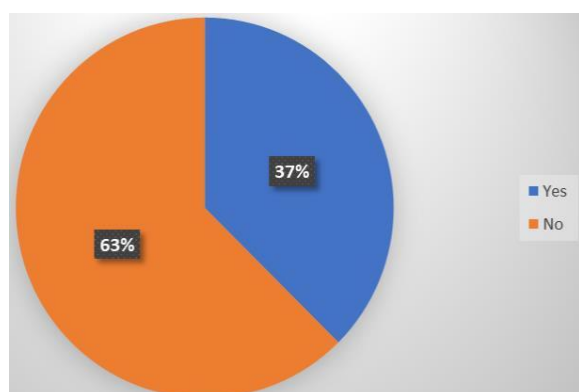
- All workers have the training required for their job.
- Most new crane operators are not agile with the crane and it is a responsibility to leave heavy machinery loaded with value.
- For the cost of some of them.
- in SMEs there is no possibility of development and expansion of knowledge if the experience does not give it.
- The existing training courses are very precarious
- the training does not match what we need
- We have turned to private Training Schools to get the required training



- in 2020 we have started the training plans. have been made of prl
- I have not got the personnel I have to get the category "a" or "b" self-propelled crane card.
- Difficulty in training the person responsible for mechanics
- The ability to adapt training to the non-productive times of production operators
- Lack of time or organization
- Course delivered by someone who does not necessarily have hands-on knowledge
- no real training was offered
- System needs to be improved
- We carried out regular training for the staff.
- not many initiatives
- no possibility of growth
- there are no dedicated programs
- I would have needed more time to devote
- there are no dedicated programs
- all planned training activities were carried out
- the company has no interest in investing in training
- The training partially answered my need
- I have lost interest

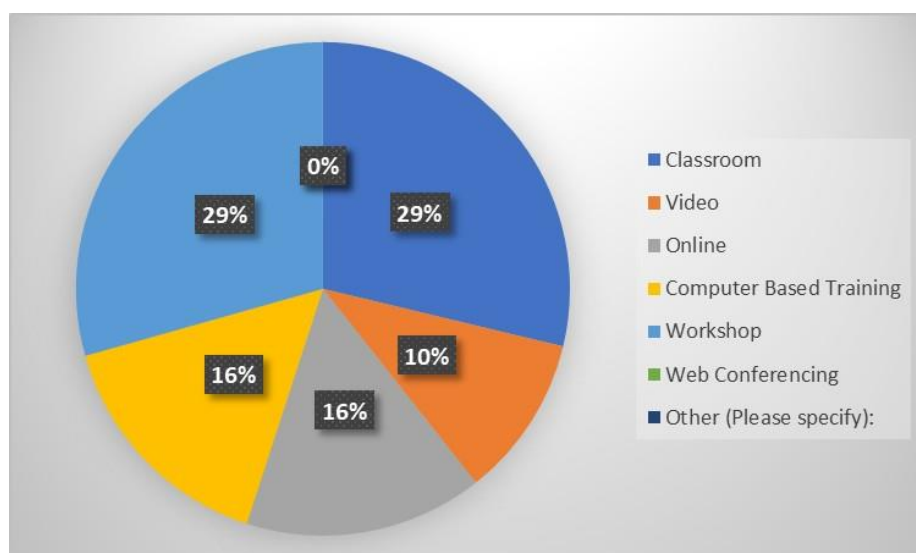
12. If you have had a performance review, do you recall whether you discussed Training needs and/or Career development plans with your Manager?

Yes	39
No	65



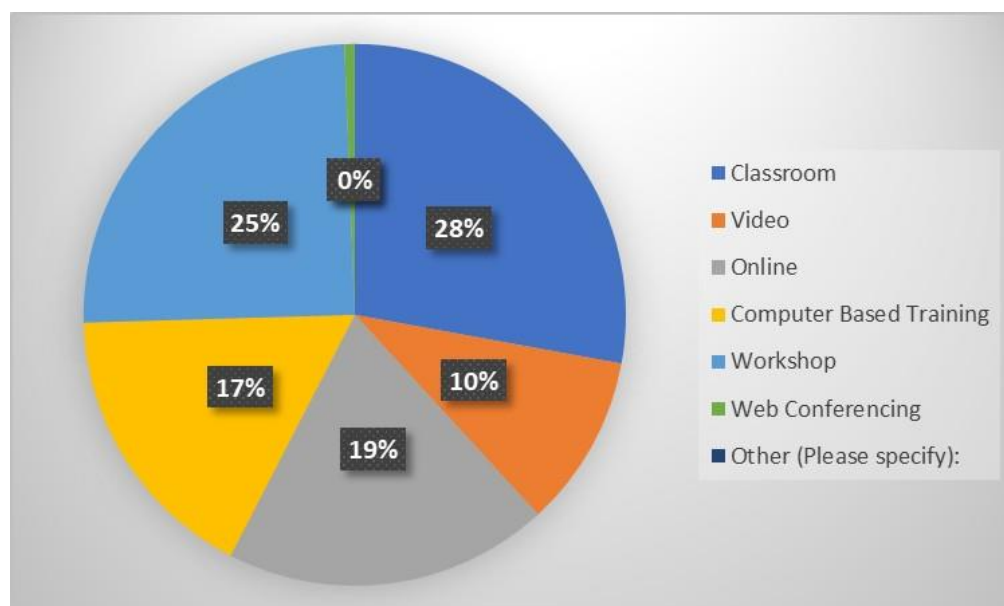
13. What method of training do you feel would be most effective for your job role?

Classroom	46
Video	17
Online	25
Computer Based Training	25
Workshop	47
Web Conferencing	0
Other (Please specify):	0



14. What method of training do you feel would be most convenient to attend?

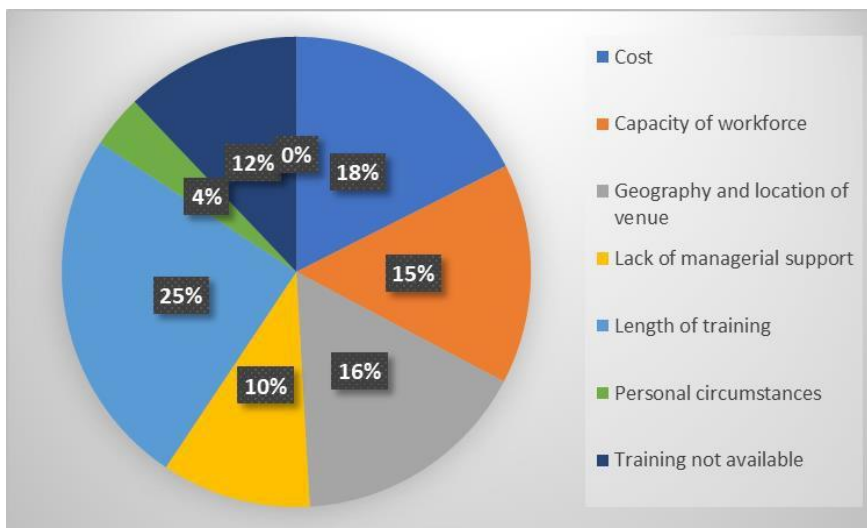
Classroom	46
Video	17
Online	32
Computer Based Training	28
Workshop	41
Web Conferencing	1
Other (Please specify):	0



15. Do any of the following factors prevent you from meeting or achieving your training/professional development needs?

Cost	29
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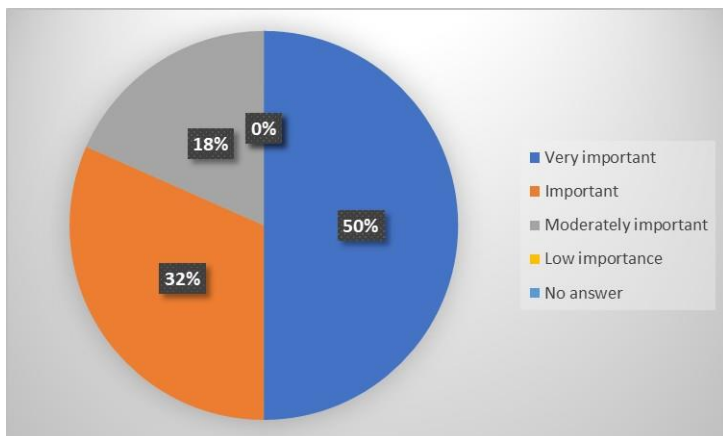
Capacity of workforce	25
Geography and location of venue	27
Lack of managerial support	17
Length of training	41
Personal circumstances	6
Training not available	20
Other (Please specify):	0



**16. Based on your experience, please appreciate the importance of the following competencies whereby “No answer” =Neutral
Legislation on Lifting Operation**

- Workplace Safety and Health Act,
- WSH (Construction) Regulations,
- Regulations concerning Lifting Equipment,
- Codes of Practice for Traffic Control at Work Zone)

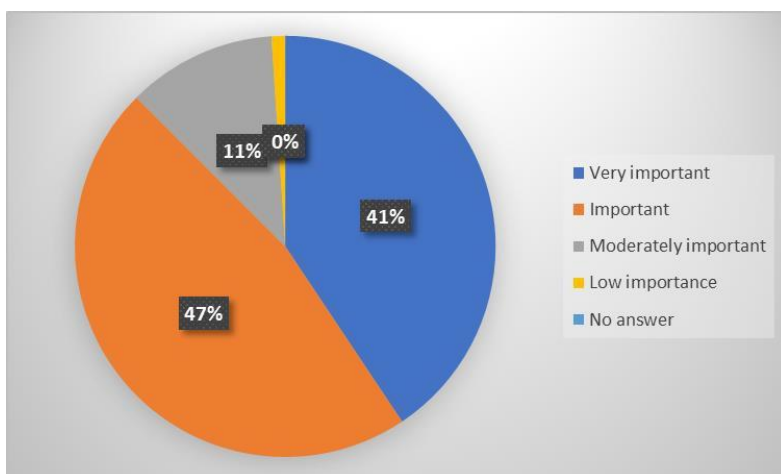
Very important	49
Important	31
Moderately important	18
Low importance	0
No answer	0



Roles and Duties of Personnel in Lifting Operation

- Roles and Duties of lifting team (Rigger, signalman, Lifting Supervisor, Lorry crane operator)
- Use of Personal Protective Equipment (PPE)

Very important	39
Important	45
Moderately important	11
Low importance	1
No answer	0



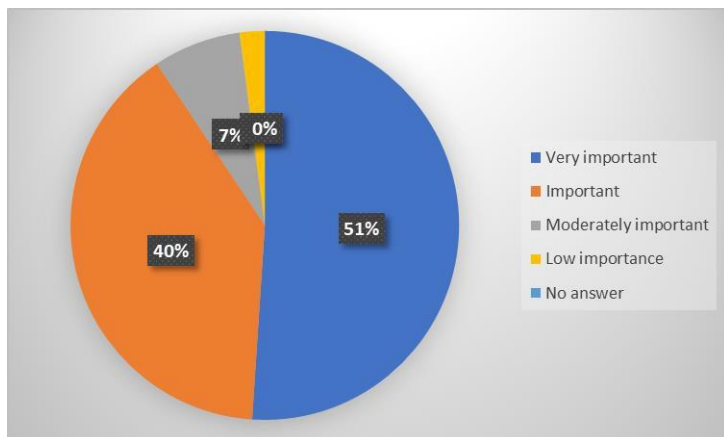
Lorry crane operation

- Construction of wire ropes
- Types of slings (Direct attachment, Choker Hitch, Basket Hitch, Loose Load)
- Types of end fittings & connections
- Wire rope clips
- Inspection of wire rope slings
- Inspection of webbing slings
- Inspection of chain sling

Very important	49
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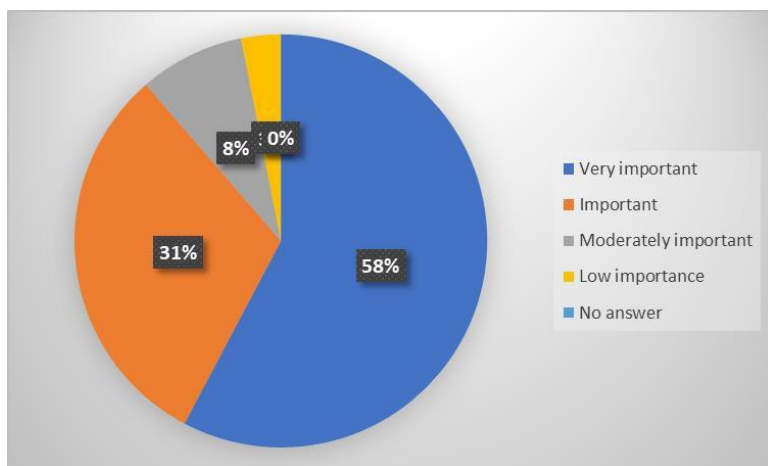
Important	38
Moderately important	7
Low importance	2
No answer	0



Emergency response Procedures

- Emergency Response Procedures

Very important	56
Important	30
Moderately important	8
Low importance	3
No answer	0



Safe operating Procedures of Lorry crane

- Selection of lorry crane -- capacity and usage
- Basic ground assessment
- Setting up of lorry crane outriggers
- Stowing of lorry crane & its work equipment / accessories
- Interpretation of operation manual

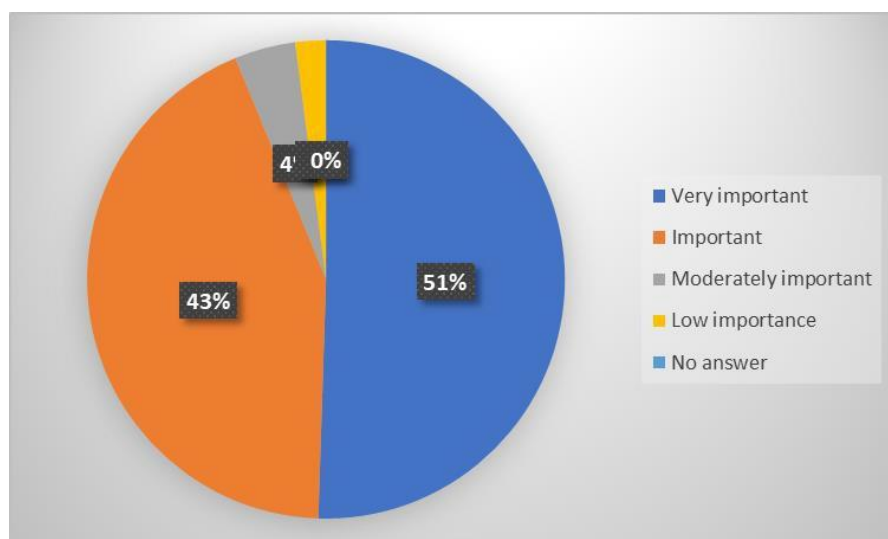


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- Hazards related to Lorry crane operation
- Operational and maintenance checks
- Safety precautions and safe work practices

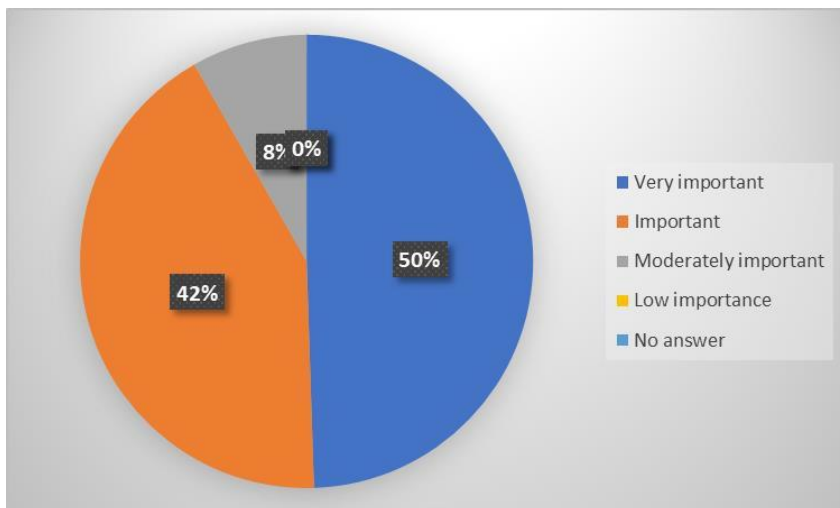
Very important	49
Important	42
Moderately important	4
Low importance	2
No answer	0



Pre-lift inspection of lifting accessories

- Construction of wire ropes
- Types of slings (Direct attachment, Choker Hitch, Basket Hitch, Loose Load)
- Types of end fittings & connections
- Wire rope clips
- Inspection of wire rope slings
- Inspection of webbing slings
- Inspection of chain sling

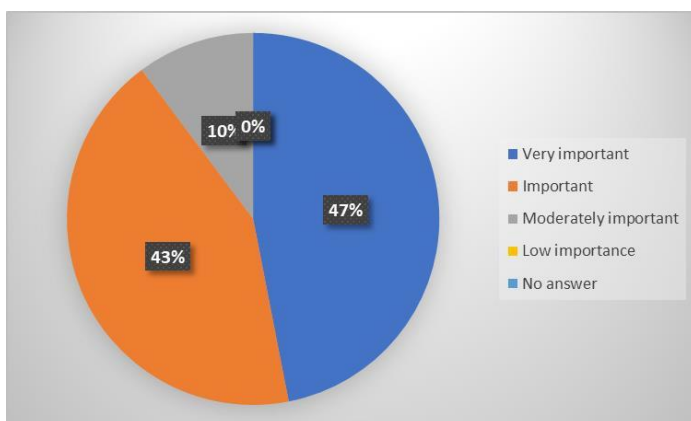
Very important	48
Important	41
Moderately important	8
Low importance	0
No answer	0



Selection and use of rigging equipment

- Slinging methods
- Effects of sling angles
- Selection of correct sling & slinging method to different loads
- Rigging guidelines
- Precautions during rigging

Very important	46
Important	42
Moderately important	10
Low importance	0
No answer	0



Load Estimation and Centre of Gravity

- Lorry crane capacity chart interpretation
- Estimation of loads
 - o Safe working load
 - o Estimating loads
 - o Centre of Gravity for regular and irregular loads

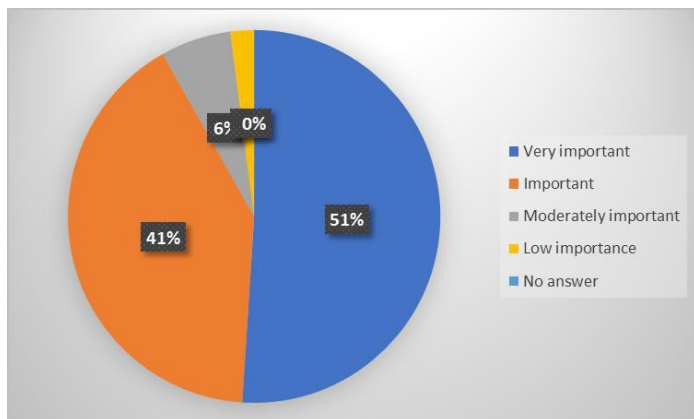
Very important	50
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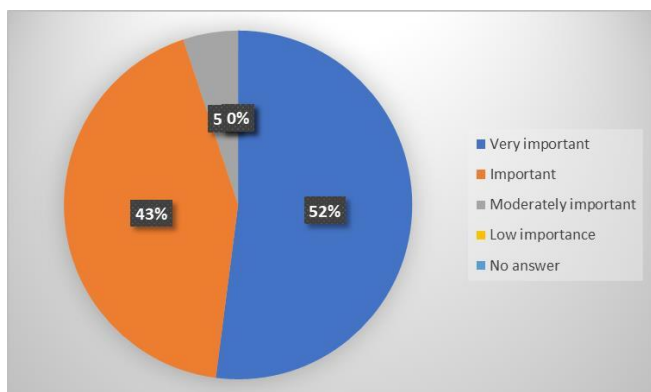
Important	40
Moderately important	6
Low importance	2
No answer	0



Lorry crane Operating Practice (Practical Experience)

- Checking of ground condition and proximity hazards
- Setting up of Lorry crane outriggers
- Positioning of safety notice and cordoning off area of work
- Identification and selection of lifting shackles
- Rigging of load (with estimation of loads)
- Hoisting & placement of loads
- Ground / below ground level onto a platform
- Stowing of Lorry crane and its work equipment
- Final check before travel to public road

Very important	51
Important	42
Moderately important	5
Low importance	0
No answer	0



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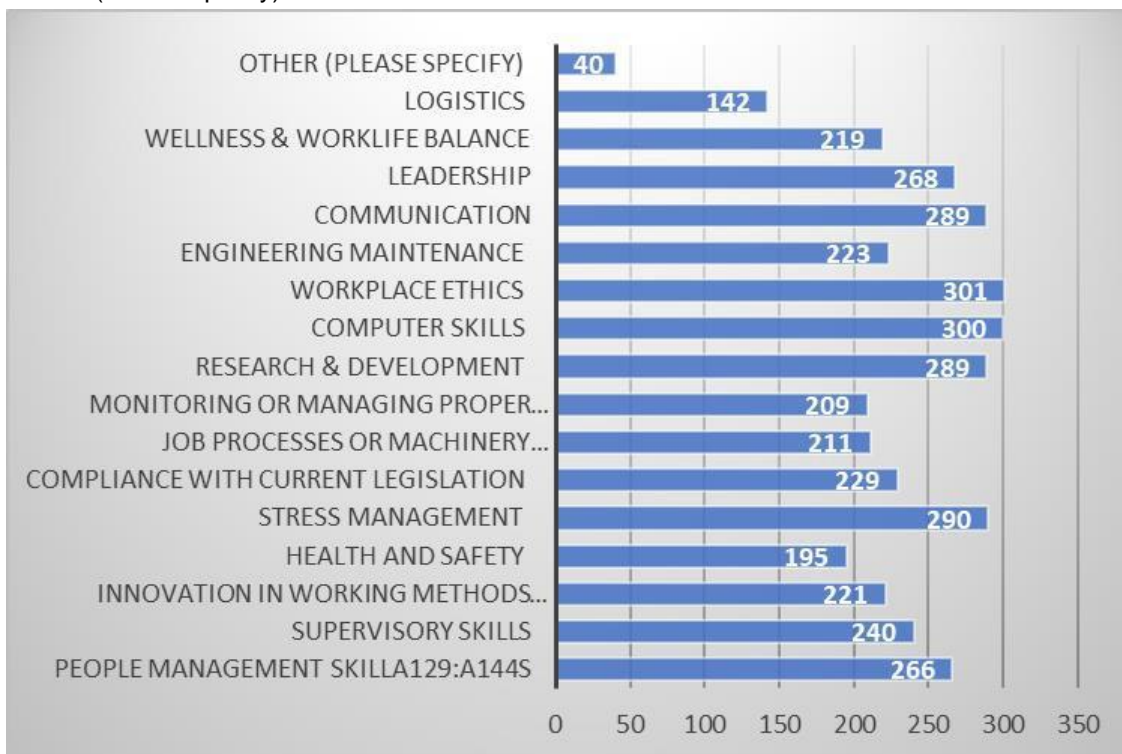
17. Please list 3 ways, in your opinion, that the training needs process used within your organisation could be improved. (Please answer this question even if no planning process exists within your organisation)

- More training offer, more training schedules and more face-to-face workshops
- Information on mandatory legal requirements in training by the Association / Administration.
- Verification, repetition, validation
- There is no training process, because there are no professionals to deliver it.
- Simplicity, time and practice
- We do not have a training department
- Scope of training through daily work with support staff and not theoretical courses.
- The training is given by the own work; in SMEs it is the usual.
- Analysis of the works, Knowledge of lifting materials
- More flexible, the training and exam tests should be more in accordance with the times of the company and not that the administration fix the dates of the courses and exams. Take advantage of the times of lower activity for training.
- 2nd More training centers or training entities.
- 3º Facilitate and provide means for companies to become training centers.
- Continuous evaluation
- Carrying out an own training plan, identifying training deficiencies in incidents, own licence
- Use the down-times for training, achieve better planning and raise awareness among all staff that training manages to drive many fundamental company processes
- Participation of company personnel (middle managers: manager, workshop manager, etc.). Training through short videos of quick instructions and modes of use. Summary brochures "instruction manual" in complex operations: driving programs, tractions and locks, jib assembly and work at height, etc.
- The training must be within the working hours, every year the employer should tell his/her operators which were the main accidents to learn from them
- Training needs according to legislation
- Training of usage for any machinery that is of risk
- Keeping track of when certification expires
- Ongoing coaching
- Experienced leader
- When selecting a candidate for a job the management takes into consideration the type of crane certification one has. If the candidate does not have crane certification and experience they are not selected.
- Regular refresher courses
- Poll, feedback survey, management
- Suggestions box, speak to the employees, consult with manager
- Bottom-up communication
- Safety oriented
- It takes someone who only deals with training and updating
- Organization of steering and sharing committees
- Improve the system for monitoring training needs also through moments of sharing
- Easily accessible
- Based on the worker's needs
- Practical exercises
- Insertion of training in the process of planning and designing activities
- Helpful material/manuals
- Free seminars, open training
- Retraining

18. To help us understand your continuing training/education needs, what topics listed below would you like to see training on? Rank the following training/education needs from 1 (most important) to 5 (least important):

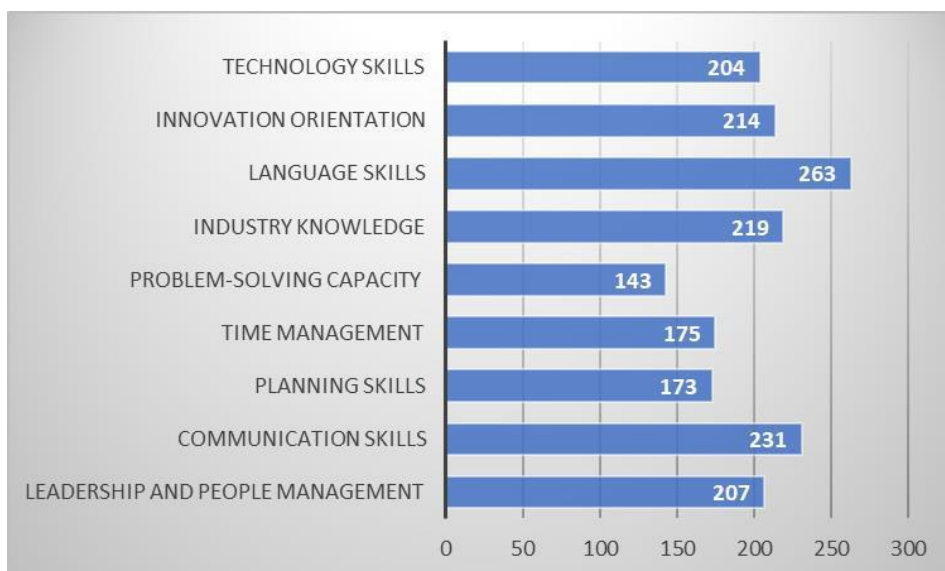


People Management SkillA129:A144s
 Supervisory Skills
 Innovation in working methods and/or
 optimisation of activities
 Health and Safety
 Stress management
 Compliance with current legislation
 Job processes or machinery functioning
 Monitoring or managing proper implementation
 of safety rules
 Research & Development
 Computer Skills
 Workplace Ethics
 Engineering Maintenance
 Communication
 Leadership
 Wellness & Worklife Balance
 Logistics
 Other (Please specify)

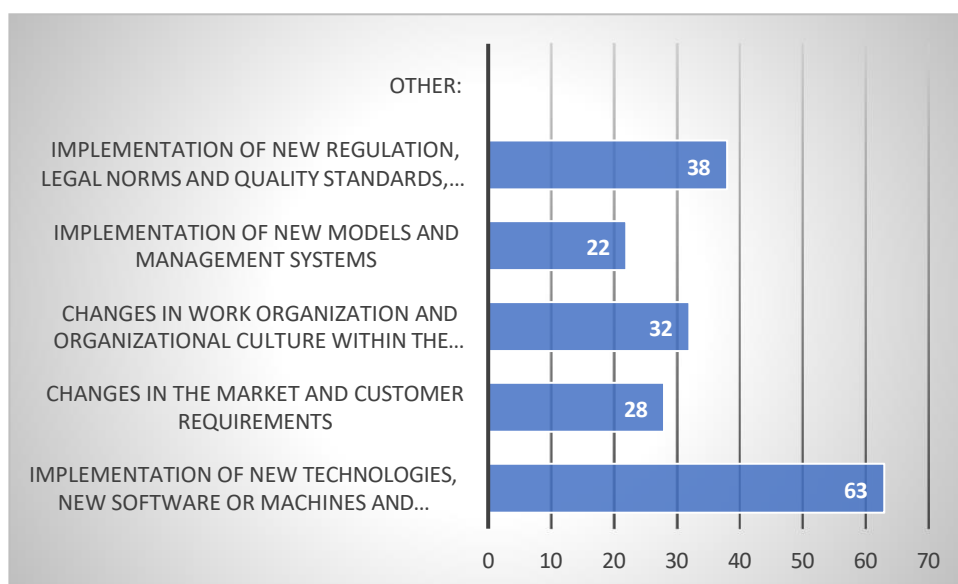


19. Based on your experience, please appreciate the importance of the following competencies whereby “No answer” =Neutral





20. Please indicate the specific skills emerging that affect the quality of the work of people employed in construction sector, quality assurance and safety of crane operation



21. COMMENTS: Please add any other comment, recommendation or suggestion, that you consider interesting in relation with the improvement of the qualification of employees in crane operation and construction sector.

- More information and collaboration from manufacturers and associations on the training requirements necessary for the training of operators of Lifting Equipment, Self-Propelled Cranes and Articulated Hydraulic Trucks.
- Vocational Training
- Improve the professional learning channel
- Create a clear and stable regulatory framework for a period at least in the medium
- The courses that take place must be with qualified teachers and with real machinery.
- Availability of tools and instruments at a lower cost

- Training, qualification and safety at work is essential for employers and workers. Workers must become aware that they must always be in continuous training and updating of knowledge. Entrepreneurs must be able to access these operator training and retraining processes more easily, especially in geographical areas far from large cities.
- Allow training of the operator by working with a real crane and together with an experienced operator
- It would be interesting to standardize, like with the crane operator licence the maneuvering leader, signalman and shredder formations.
- To sensitize everyone from the top down about the importance of having continuous training processes
- Concrete and concise training, minimizing the dedication of time, with methodologies accessible from any mobile device, for example

Conclusions

The results for the questions lead to the following conclusion:

Many companies have implemented a training and professional development plan. The training and professional development needs at company level are mainly established by the managers and the human resources department. In general, the existing plan in companies meets the needs and aspirations of the training / professional development of employees. Only two persons claim that it does not meet their requirements. 50% of respondents consider the process used to identify training and professional development needs to be effective and only 12% consider it inefficient.

The most important training needs identified were the following: prevention of occupational hazards and safety at work, handling and estimating the weight of the load, operation of different types of cranes, study of diagrams and loading programs, providing first aid, best practices for safe operation.

In terms of meeting the training needs of the last two years, there is some balance, about half say it meets the expectations of employees.

Some employees stated that the existing training courses are very precarious and the practical activity does not correspond to their needs. There are employees who have appealed to private training schools to obtain the necessary training. In addition, there are courses offered by trainers who have no practical knowledge or the company has no interest in investing in training.

In addition, approximately 65% of the people who participated in this study do not discuss training needs and / or career development plans with the manager.

Approximately 60% of the people who participated in this study consider that participating in the course or workshops are effective methods of training and only 10% appreciate the courses presented in the video and only 16% online training method. The main factors that prevent the satisfaction of training / professional development needs are the length of training, cost, and the geography and location of the venue.



The competencies that the people who participated in this study considered very important at work, in descending order of the score obtained are:

- Emergency response Procedures - 56%
- Lorry crane Operating Practice (Practical Experience) - 51%
- Load Estimation and Centre of Gravity - 50%
- Legislation on the lifting operation - 49%
- Lorry crane operation - 49%
- Safe operating Procedures of Lorry crane - 49%
- Pre-lift inspection of lifting accessories - 48%
- Selection and use of rigging equipment - 46%
- Roles and Duties of Personnel in Lifting Operation - 39%

To acquire these skills competencies, employees need free, accessible courses, brochures, and simple textbooks accompanied by movies.

The course content should be mainly focused on computer skills, workplace ethics, stress management, and communication.

The employees appreciate the following competencies being very important: language skills, communication skills, and industry knowledge.

The specific skills emerging that affect the quality of the work of people employed in the construction sector, quality assurance and safety of crane operation are the implementation of new technologies, new software or machines, and equipment, including those for sustainable, ecological and energy-efficient production implementations of new regulation, legal norms, and quality standards.

Appendix 1

QUESTIONNAIRE about TRAINING NEEDS AND COMPETENCIES

DATA PROTECTION NOTICES AND INFORMED CONSENT

I have read all information below and I understand them completely. All of my questions regarding this study have been answered to my complete satisfaction.

I agree to participate in this research.

YES

NO

Purpose of the Study

The following questionnaire is developed under the work programme of the European project CRANE 4.0 co-financed in the context of the ERASMUS+ programme. The project aims to improve work-based and initial/continuous learning of crane operators to adapt their skills to the Industry 4.0 skills



requirements. The purpose of this survey is the collection of additional data for analysing training needs from crane industry and companies (concerning academic education, training and Continuing Professional Development).

Please, respond from the employee point of view.

Procedures, confidentiality and duration

In the course of this study, you will be asked to complete the survey expressing your preferences from the perspective of company you represent. Your responses will be kept completely confidential and anonymous.

The data you are providing will be kept by the Consortium until the end of the project.

Potential Risks/Discomforts

No risks or discomforts are anticipated from taking part in this study. If you decide to quit at any time before you have finished the questionnaire, your answers will NOT be recorded.

Data Handling, Processing and Uses

Questionnaire/survey and respondent will be identified by specific codes to keep participant confidentiality. The personal data, will be accessed only by the person who will process them during the course of the project and are optional. Separate files will be made with the results of the questionnaire/survey and the email addresses of senders such that a respondent's specific responses cannot be linked back to his/her e-mail address. The personal data will be kept inside the European Economic Area. The Working Package coordinator is responsible for protecting the personal and survey against unauthorised access.

Right to refuse and to withdraw

I understand that my participation is voluntary and I may refuse to participate, or may contact the consortium to remove my personal data from kept records at any time.

QUESTIONNAIRE about TRAINING NEEDS AND COMPETENCIES

1. Contact data (optional)

First name:

Surname:

Organisation/Company:

Street:

City:

Zip code:

Tel:

Fax:

Email:

2. Country:



3. Does a process for identifying future training and professional development needs exist within your company?

Check any that apply

- Yes
 No

If No go directly to question 9...

4. Which of the following statements best describes how your future training and professional development needs are assessed?

Check any that apply

- Individually, by myself
 By my line manager
 By the Human Resources department
 Other (Please Specify):

5. On a scale of 1 to 5 (1 being the worst and 5 being the best.) within your organisation how confident are you that the existing process will meet your future training/professional development needs and aspirations?

Check any that apply

- 1 Not at all confident
 2 Not confident in most regards
 3 Moderately confident
 4 Confident in most regards
 5 Completely confident

6. If you answered 1, 2 or 3 for question 5 please give a brief explanation of why you believe this to be so.

7. On a scale of 1 to 5 (1 being the least effective and 5 being the most effective) how would you rate the *effectiveness* of the *process* used to identify your training and professional development needs?

Check any that apply

- 1 Completely ineffective



- 2 Ineffective in most regards
- 3 Moderately effective
- 4 Effective in most regards
- 5 Completely effective

8. If you answered 1, 2 or 3 for question 7 please give a brief explanation of why you believe this to be so. If not go directly to question 9...

9. What are the three most important Training needs you would identify?

1.
2.
3.

10. Thinking back over the last 12 - 18 months, how well during that time on a scale of 1 to 4 (1 being not at all and 4 being completely) do you feel your identified training and professional development needs were actually met?

Check any that apply

- 1 Not met at all
- 2 Not met in most regards
- 3 Met in most regards
- 4 Met completely

11. If you answered 1, 2 or 3 for question 10 please give a brief explanation of why you believe this to be so. If not go directly to question 12...

12. If you have had a performance review, do you recall whether you discussed Training needs and/or Career development plans with your Manager?

Check any that apply

- Yes
- No



13. What method of training do you feel would be most effective for your job role?

Check any that apply

- Classroom
- Video
- Online
- Computer Based Training
- Workshop
- Web Conferencing
- Other (Please specify):

14. What method of training do you feel would be most convenient to attend?

Check any that apply

- Classroom
- Video
- Online
- Computer Based Training
- Workshop
- Web Conferencing
- Other (Please specify):

15. Do any of the following factors prevent you from meeting or achieving your training/professional development needs?

Check any that apply

- Cost
- Capacity of workforce
- Geography and location of venue
- Lack of managerial support
- Length of training
- Personal circumstances
- Training not available
- Other (Please specify):

16. Based on your experience, please appreciate the importance of the following competencies whereby "No answer" =Neutral



Very important Important Moderately important Low importance No answer

Legislation on Lifting Operation

- Workplace Safety and Health Act,
- WSH (Construction) Regulations,
- Regulations concerning Lifting Equipment, • Codes of Practice for Traffic Control at Work Zone)

Very important Important Moderately important Low importance No answer

Roles and Duties of Personnel in Lifting Operation

- Roles and Duties of lifting team (Rigger, signalman, Lifting Supervisor, Lorry crane operator)
- Use of Personal Protective Equipment (PPE)

Lorry crane operation

- Construction of wire ropes
- Types of slings (Direct attachment, Choker Hitch, Basket Hitch, Loose Load)
- Types of end fittings & connections
- Wire rope clips
- Inspection of wire rope slings
- Inspection of webbing slings
- Inspection of chain sling

Emergency response Procedures

- Emergency Response Procedures

Safe operating Procedures of Lorry crane

- Selection of lorry crane -- capacity and usage
- Basic ground assessment
- Setting up of lorry crane outriggers
- Stowing of lorry crane & its work equipment / accessories
- Interpretation of operation manual
- Hazards related to Lorry crane operation
- Operational and maintenance checks
- Safety precautions and safe work practices



Pre-lift inspection of lifting accessories

- Construction of wire ropes
- Types of slings (Direct attachment, Choker Hitch, Basket Hitch, Loose Load)
- Types of end fittings & connections
- Wire rope clips
- Inspection of wire rope slings
- Inspection of webbing slings
- Inspection of chain sling

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Very important **Important** **Moderately important** **Low importance** **No answer**

Selection and use of rigging equipment

- Slinging methods
- Effects of sling angles
- Selection of correct sling & slinging method to different loads
- Rigging guidelines
- Precautions during rigging

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Load Estimation and Centre of Gravity

- Lorry crane capacity chart interpretation
- Estimation of loads
 - o Safe working load
 - o Estimating loads
 - o Centre of Gravity for regular and irregular loads

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Lorry crane Operating Practice (Practical Experience)

- Checking of ground condition and proximity hazards
- Setting up of Lorry crane outriggers
- Positioning of safety notice and cordoning off area of work
- Identification and selection of lifting shackles
- Rigging of load (with estimation of loads)
- Hoisting & placement of loads
 - o Ground / below ground level
 - o onto a platform
- Stowing of Lorry crane and its work equipment

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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- Final check before travel to public road

17. Please list 3 ways, in your opinion, that the training needs process used within your organisation could be improved. (Please answer this question even if no planning process exists within your organisation)

- 1.
- 2.
- 3.

18. To help us understand your continuing training/education needs, what topics listed below would you like to see training on? Rank the following training/education needs from 1 (most important) to 5 (least important):

	1	2	3	4	5
People Management Skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supervisory Skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Innovation in working methods and/or optimisation of activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Health and Safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stress management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Compliance with current legislation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Job processes or machinery functioning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monitoring or managing proper implementation of safety rules	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Research & Development	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Computer Skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Workplace Ethics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Engineering Maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Communication	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leadership	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Wellness & Worklife Balance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Logistics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (Please specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

19. Based on your experience, please appreciate the importance of the following competencies whereby “No answer” =Neutral

	Very important	Important	Moderately important	Low importance	No answer
Leadership and people management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Communication skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Very important	Important	Moderately important	Low importance	No answer
Planning skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Time management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Problem-solving capacity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Industry knowledge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Language skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Innovation orientation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Technology skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. Please indicate the specific skills emerging that affect the quality of the work of people employed in construction sector, quality assurance and safety of crane operation
Check any that apply

- Implementation of new technologies, new software or machines and equipment, including those for sustainable, ecological and energy efficient production
- Changes in the market and customer requirements
- Changes in work organization and organizational culture within the company
- Implementation of new models and management systems



- Implementation of new regulation, legal norms and quality standards, etc.
- Other:

21. COMMENTS: Please add any other comment, recommendation or suggestion, that you consider interesting in relation with the improvement of the qualification of employees in crane operation and construction sector.

On behalf of project team, we would like to thank you for your willingness to participate in the survey!



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