Project title: "Recognition of professional qualifications for the purposes of transfer on the European labor market"
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The required professional competencies on typical job positions in professions of an electrician and a vehicle mechanic (Poland, Germany, Portugal)

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Chapter 1

The required professional competencies on typical job positions in professions of an electrician and a vehicle mechanic in Poland

Developed by:
Higher School of Economics in Ostrołęka
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1.1. Introduction

This report is a document summarizing the research results of the required professional competencies on typical job positions in professions of an electrician and a vehicle mechanic in Polish enterprises of the automotive and electrical industry. The tests were conducted in 60 enterprises, including 30 companies employing workers in the profession of an electrician and 30 companies employing workers in the profession of a vehicle mechanic. Enterprises are located in the cities of Radom, Zabrze, Cracow, Mikołów, Tarnobrzeg, Łódź, Warsaw, Łomża, Ostrołęka, places located in the poviat of Ostrołęka and places of Kobiór and Koźmin Wielkopolski.

1.2. Professional competencies on job positions in the profession of an electrician

1.2.1. Characteristics of examined companies

Among the examined enterprises employing electricians the largest share was held by enterprises conducting provision of service type of activity (56,7%). The remaining group of examined companies are enterprises conducting commercial activity (13,3%), production and services type of activity (13,3%), production activity (6,8%), services and commercial activity (3,3%), administrative and services activity (3,3%) and production, services and commercial activity (3,3%).

Table 1. The number of examined enterprises employing electricians according to the type of economic activity

No.	Type of activity	Number of enterprises
1.	Production	2
2.	Services	17
3.	Commercial	4
4.	Administrative	0
5.	Production and services	4
6.	Services and commercial	1
7.	Services and administrative	1
8.	Production, services and commercial	1
9.	Other* *Respondents also had the option to enter their own propositions and but none of them took the opportunity.*	0

Source: Own study

The vast majority of enterprises employing electricians are the enterprises employing up to 9 people (43%). The tests involved 1 enterprise employing from 251 to 500 and 1 employing more than 500 people.

Table 2. The number of examined enterprises employing electricians according to the employment figures

No.	Employment figures	Number of enterprises
1.	1-9 persons	13
2.	10-50 persons	8
3.	51-250 persons	7
4.	251-500 persons	1
5.	More than 500 people	1

Source: Own study

1.2.2. Characteristics of respondents - enterprises employing electricians

Respondents of the research were primarily males (97%). The largest group consisted of respondents aged 41 and more (63%). The second largest group were persons in the age of 26-40 (37%).

Table 3. The age of respondents taking part in the research

No.	The age of respondents	Number of people
1.	18-25	0
2.	26-40	11
3.	41 and more	19

Source: Own study

The largest group of respondents consists of persons with higher education (77%). The second largest group consists of persons with secondary vocational education (23%).

Table 4. Education of respondents participating in the research

No.	Education of respondents	Number of people
1.	Primary	0
2.	Basic vocational	0
3.	Secondary vocational	8
4.	Secondary, of general education	0
5.	Higher, bachelor's degree, engineering degree	10
6.	Higher, master's degree	11
7.	Higher, PhD, Eng.	1

Source: Own study

Table 5. Job positions of the respondents

No.	Position of the respondents	Number of people
1.	Director	3
2.	Head	10
3.	President of the Management Board	2
4.	Owner of the company	15

Source: Own study

Among the respondents 9 persons had the work experience of between 11-20 years and 1-5 years on a currently held position.

Table 6. Number of respondents participating in the research according to the length of service

No.	Length of service time span	Length of service in total	Length of service at the currently held position
1.	1-5 years	0	9
2.	6-10 years	0	7
3.	11-20 years	15	9
4.	21 years	15	4
5.	no answer	0	1

Source: Own study

1.2.3. Typical job position in the profession of an electrician

Employers most frequently employ workers at the position of an electrician (93% of answers), electrical equipment and devices maintenance worker (43% of answers), electrical installer of clearing devices (10% of answers) – table 7.
The remaining, indicated by representatives of employers, positions at which electricians are employed are electrical installer, electrical installer of LV, MV, HV grids, electrical installer of control cabinets (1 indication each).

Table 7. Typical job positions in the profession of an electrician
Note: respondents could choose more than one answer.

No.	Work position	Number of
1.	Electrician	28

2.	Electrical devices and equipment maintenance technician	13
3.	Electrical installer of clearing devices	3
4.	Other: *electrical installer*	1
5.	Other: *electrical installer of LV, MV, HV grids*	1
6.	Other: *electrical installer of control cabinets*	1

Source: Own study

1.2.4. Actions performed at typical job positions in the profession of an electrician

Table 8. The degree of importance of actions performed by electricians according to the opinion of employers

No.	List of professional tasks	Very important	Important	Significant	Minor	Redundant	Importance indicator
Z1	Mounting and commissioning electrical machinery and equipment based on the technical documentation	14	6	4	6	0	**3.9**
Z2	Performing and commissioning electrical systems based on the technical documentation	21	5	1	2	1	**4.4**
Z3	Assessing the technical condition of machinery, devices and electrical systems after the installation based on the measurements	17	9	3	1	0	**4.4**
Z4	Mounting control and protection systems of machinery and electrical equipment based on the technical documentation	11	13	6	0	0	**4.2**
Z5	Mounting and checking the operation of electric shock protection based on the technical documentation	14	12	2	2	0	**4.3**
Z6	Other (provide your suggestion): *Current maintenance*	1	0	0	0	0	**0.2**

Source: Own study

1.2.5. Professional competencies expected by employers (knowledge, skills, social skills) at typical job positions in the profession of an electrician

Table 9. Degree of professional competencies in the profession of an electrician according to the opinion of employers

No.	List of professional competencies	Very important	Important	Significant	Minor	Redundant	Importance indicator
K1	Installation and maintenance of electrical machinery and equipment	10	9	10	0	1	**3.9**
K2	Installation and maintenance of electrical systems	20	5	5	0	0	**4.5**
K3	Other (provide your suggestion): *Mounting and installation of low current devices*	0	1	0	0	0	**0.1**

Source: Own study

Employers pointed out that the most important professional competence is the installation and maintenance of electrical systems (importance indicator - 4,5). This stems from the fact that in the structure of examined companies the largest share was held by service providing companies dealing with execution of electric power systems and grids. Other competence was also highly evaluated: the installation and maintenance of electrical machinery and devices (3,9).

Table 10. Degree of importance of knowledge that an electrician should have in respect of the installation and maintenance of electrical machinery and devices according to the opinion of employers

No.	Knowledge	Very important	Important	Significant	Minor	Redundant	Importance indicator
1.	Rules and regulations for occupational health and safety, fire protection, environment protection and the ergonomics during the installation and maintenance of electrical machinery and devices.	18	11	0	1	0	**4.5**

No.	Knowledge	Very important	Important	Significant	Minor	Redundant	Importance indicator
2.	Electrical machinery and devices (types, characteristics, classification).	4	13	11	2	0	**3.6**
3.	The structure of electrical machinery (mechanical and electromagnetic).	0	8	16	6	0	**3.1**
4.	Technical documentation of the devices (block diagrams and guide drawings)	11	8	10	1	0	**4.0**
5.	The basics of electrical engineering and electronics.	1	14	11	4	0	**3.4**
6.	Standards and regulations for the installation of electrical machinery and equipment.	3	11	12	4	0	**3.4**
7.	Principles of installation and maintenance of electrical machinery/equipment	8	12	7	3	0	**3.8**
8.	Principles and methods of performance of electrical and mechanical connections	16	12	2	0	0	**4.5**
9.	Measurement instruments and methods	9	12	8	0	1	**3.9**
10.	Methods of locating and principles of removal of defects in the machinery and equipment	5	14	6	5	0	**3.6**
11.	Principles and methods of maintenance of machinery and equipment	1	15	7	7	0	**3.3**
12.	The basics of entrepreneurship	0	5	9	15	1	**2.6**
13.	Principles of starting and conducting an economic activity	0	6	4	17	3	**2.4**

Source: Own study

According to employers, the most important knowledge that an electrician should have (importance indicator equal to/greater than 3,5) is in respect of:

- rules and regulations for occupational health and safety, fire protection, environment protection and the ergonomics during the installation and maintenance of electrical machinery and devices. (4,5),
- principles and methods of performance of electrical and mechanical connections (4,5),
- technical documentation of the devices (block diagrams and guide drawings) (4,0),
- measurement instruments and methods (3,9),
- principles of installation and maintenance of electrical machinery/equipment (3,8),
- methods of locating and principles of removal of defects in the machinery and equipment (3,6),
- electrical machinery and devices (types, characteristics, classification). (3,6).

According to employers, the knowledge of the following is less significant:

- the basics of electrical engineering and electronics (3,4),
- standards and regulations for the installation of electrical machinery and equipment (3,4),
- principles and methods of maintenance of machinery and equipment (3,3),
- the structure of electrical machinery (mechanical and electromagnetic) (3,1).

The knowledge of the basics of entrepreneurship (2,6), principles of starting and conducting an economic activity, (2,4) received the lowest values of the importance indicator from the point of view of executed professional tasks.

Table 11. Degree of importance of skills that an electrician should have in respect of the installation and maintenance of electrical machinery and devices according to the opinion of employers

No.	Skills	Very important	Important	Significant	Minor	Redundant	Importance indicator
1.	Organize the workplace in line with the rules and regulations for occupational health and safety, fire protection, environment protection and the ergonomics during the installation and maintenance of electrical machinery and devices.	17	12	1	0	0	**4.5**
2.	Classify the electrical machinery and devices, specify their technical parameters.	2	14	11	3	0	**3.5**
3.	Differentiate between the parameters of elements and components of electrical equipment and determine their functions.	3	16	9	2	0	**3.7**
4.	Recognize the electrical machinery and devices and their elements, determine their purpose.	2	17	11	0	0	**3.7**
5.	Differentiate between structural elements used in electrical machinery and devices.	1	9	15	5	0	**3.2**
6.	Read and make drawings and diagrams of electrical machinery and devices	11	12	6	1	0	**4.1**
7.	Mount systems of power supply, control, adjustment and protection of electrical machinery and devices based on the documentation.	15	9	5	1	0	**4.3**
8.	Select tools for installation of electrical machinery and devices.	7	16	5	2	0	**3.9**
9.	Perform mechanical installation of electrical and electric components.	7	13	8	2	0	**3.8**
10.	Check the compliance of the performed work with the documentation.	10	12	5	3	0	**4.0**

No.	Skills	Very important	Important	Significant	Minor	Redundant	Importance indicator
11.	Take measurements of parameters of electrical machinery and equipment.	8	11	7	4	0	**3.8**
12.	Locate typical damage of electrical machinery and equipment.	5	13	9	3	0	**3.7**
13.	Plan the sequence of actions performed during the disassembly and installation of electrical machinery and devices.	10	13	5	2	0	**4.0**
14.	Perform the replacement of worn or damaged elements and components of electrical machinery and devices.	8	9	7	6	0	**3.6**
15.	Perform the replacement of damaged control and protection elements of electrical machinery and equipment.	7	14	5	4	0	**3.8**
16	Check the correctness of the performed installation based on the documentation.	12	11	4	3	0	**4.1**
17.	Perform inspections and maintenance of electrical machinery and equipment.	4	14	6	6	0	**3.5**
18.	Check the operation of electrical machinery and equipment after installation and maintenance.	8	11	6	5	0	**3.7**
19.	Establish and conduct an economic activity in the electrical industry.	0	1	5	20	4	**2.1**

Source: Own study

The majority of skills (17 out of 19) was considered very important, important or significant by employers (indicator equal to/greater than 3,5). Skills in distinguishing between structural materials used in the electrical machinery and equipment are of little importance (minor) (3,2), the same applies to establishing and conducting an economic activity in the electrical industry (2,1).

Table 12. Degree of importance of knowledge that an electrician should have in respect of the installation and maintenance of electrical systems according to the opinion of employers

No.	Knowledge	Very important	Important	Significant	Minor	Redundant	Importance indicator
1.	Rules and regulations for occupational health and safety, fire protection, environment protection and the ergonomics during the performance of electrical installations.	18	10	2	0	0	**4.5**
2.	Principles and methods of releasing persons that were electrocuted from voltage and rescuing them.	14	15	1	0	0	**4.4**
3.	Standards and regulations governing the execution of electrical systems	5	10	11	4	0	**3.5**
4.	Construction and types of electrical systems	4	19	6	1	0	**3.9**
5.	Symbols used in technical documentations for electrical systems	8	17	5	0	0	**4.1**
6.	Accessories, tools and methods used during the execution of electrical systems	12	15	2	1	0	**4.3**
7.	Principles and methods of construction and operation of electrical systems	12	13	5	0	0	**4.2**
8.	Principles and methods of performance of electrical and mechanical systems connections	15	12	3	0	0	**4.4**
9.	Methods of locating and removing defects in the electrical system	5	12	8	5	0	**3.6**
10.	Operation of devices, electric power systems and grids with voltage not exceeding 1kV	6	11	6	7	0	**3.5**
11.	Principles and methods of repairing power tools and electrical machinery in respect of the replacement of power cables with damaged insulation and the replacement of brushes in commutators	3	10	9	8	0	**3.3**

No.	Knowledge	Very important	Important	Significant	Minor	Redundant	Importance indicator
12.	Principles and methods of replacing bearings in power tools and induction motors, sharpening drills and cutters, other locksmith works	1	7	6	15	1	**2.7**

Source: Own study

Workers employed at typical job positions in the profession should most of all, according to employers (table 12), have knowledge (importance indicator equal to/greater than 3,5) of:

- rules and regulations for occupational health and safety, fire protection, environment protection and the ergonomics during the performance of electrical systems (4,5),
- principles and methods of releasing persons that were electrocuted from voltage and rescuing them (4,4),
- principles and methods of performance of electrical and mechanical systems connections (4,4),
- accessories, tools and methods used during the execution of electrical systems (4,3),
- principles and methods of construction and operation of electrical systems (4,2),
- symbols used in technical documentations for electrical systems (4,1),
- construction and types of electrical systems (3,9),
- methods of locating and principles of removal of defects in an electrical system (3,6),
- standards and regulations for the performance of an electrical system (3,5),
- operation of devices, electric power systems and grids with voltage not exceeding 1kV (3,5).

the knowledge in the following respect is of minor importance according to employers

- principles and methods of repairing power tools and electrical machinery in respect of the replacement of power cables with damaged insulation and the replacement of brushes in commutators (3,3),
- principles and methods of replacing bearings in power tools and induction motors, sharpening drills and cutters, other locksmith works (2,7).

Table 13. Degree of importance of skills that an electrician should have in respect of the installation and maintenance of electrical systems according to the opinion of employers

No.	Skills	Very important	Important	Significant	Minor	Redundant	Importance indicator
1.	Organize the workplace in line with the rules and regulations for occupational health and safety, fire protection, environment protection and the ergonomics during the performance of electrical installation.	20	9	1	0	0	**4.6**
2.	Release persons that were electrocuted from voltage and rescue them.	14	15	1	0	0	**4.4**
3.	Adhere to the applicable standards and regulations in the performance of electrical systems	7	14	8	1	0	**3.9**
4.	Identify the type o electrical systems and characterize their structure	8	17	4	1	0	**4.1**
5.	Use the technical documentation of electrical systems	11	18	1	0	0	**4.3**
6.	Choose cables, accessories, tools and methods relevant to the performance and repair of various types of electrical systems	14	15	1	0	0	**4.4**
7.	Perform temporary connections	11	8	5	6	0	**3.8**
8.	Perform temporary systems	11	7	8	4	0	**3.8**

No.	Skills	Very important	Important	Significant	Minor	Redundant	Importance indicator
9.	Perform and repair internal electrical systems	15	9	2	4	0	**4.2**
10.	Perform and repair external electrical systems: teletechnical, signaling, protection of property and lightning protection	10	11	3	6	0	**3.8**
11.	Perform cable connections or overhead connections of buildings	13	11	3	3	0	**4.1**
12.	Perform connections of electrical and mechanical systems (bolted, clamp and soldered)	11	11	5	3	0	**4.0**
13.	Check the correctness of operation of internal and external electrical systems	12	10	4	4	0	**4.0**
14.	Locate and remove defects in internal and external electrical systems	9	11	6	4	0	**3.8**
15.	Operate devices, electric power systems and grids with voltage not exceeding 1kV	6	11	11	2	0	**3.7**
16.	Use simple operation and maintenance documentation of electrical machinery and devices	7	17	6	0	0	**4.0**
17.	Repair power tools and electrical machinery, replace power supply cables with damages insulation, replace brushes in commutators.	6	7	4	13	0	**3.2**
18.	Replace bearings in power tools and induction motors, sharpen drills and cutters, other locksmith works	0	8	6	15	1	**2.7**

Source: Own study

According to employers (importance indicator equal to/greater than 3,5), the following skills of employees working at typical job positions are very important:

- organizing the workplace in line with the rules and regulations for occupational health and safety, fire protection, environment protection and the ergonomics during the performance of electrical systems (4,6),
- releasing persons that were electrocuted from voltage and rescuing them (4,4),
- choosing cables, accessories, tools and methods relevant to the performance and repair of various types of electrical systems (4,4),
- using the technical documentation of electrical systems (4,3),
- performing and repairing internal electrical systems (4,2),
- performing cable connections or overhead connections to buildings (4,1),
- identifying types of electrical systems and characterizing their structure (4,1),
- performing connections of electrical and mechanical systems (bolted, clamp and soldered) (4,0),
- checking the correctness of operation of internal and external electrical systems (4,0),
- using simple operation and maintenance documentation of electrical machinery and devices (4,0),
- adhering to the applicable standards and regulations in the performance of electrical systems (3,9),
- performing temporary connections (3,8),
- performing temporary systems (3,8),
- performing and repairing external electrical systems: teletechnical, signaling, protection of property and lightning protection (3,8),
- locating and removing defects in internal and external electrical systems (3,8),
- operating devices, electric power systems and grids with voltage not exceeding 1kV (3,7).

Minor skills are:

- repairing power tools and electrical machinery, replacing power cables with damaged insulation, replacing brushes in commutators (3,2),

- replacing bearings in power tools and induction motors, sharpening drills and cutters, other locksmith works (2,7).

Table 14. Degree of importance of knowledge and skills that an electrician should have in respect of the installation and maintenance of low-current systems according to the opinion of employers (*respondent's suggestion*)

No.	Knowledge	Very important	Important	Significant	Minor	Redundant	Importance indicator
1	Symbols used in the technical documentation	1	0	0	0	0	**0.2**
No.	**Skills**	**Very important**	**Important**	**Significant**	**Minor**	**Redundant**	**Importance indicator**
1	Reading technical documentation	1	0	0	0	0	**0.2**

Source: Own study

Table 15. Degree of importance of knowledge and skills that an electrician should have in respect of the installation and maintenance of electrical systems according to the opinion of employers (*respondent's suggestion*)

No.	Knowledge	Very important	Important	Significant	Minor	Redundant	Importance indicator
1	He/she knows the properties/parameters of materials/products	1	0	0	0	0	**0.2**
No.	**Skills**	**Very important**	**Important**	**Significant**	**Minor**	**Redundant**	**Importance indicator**
1	Selection or replacement of materials - equivalents	1	0	0	0	0	**0.2**

Source: Own study

It can be assumed that the substantive content of the survey exhausted the expected knowledge and skills of employees, therefore the suggestions (table 14 and 15) were submitted only by one respondent and are not relevant to the analysis.

Table 16. The degree of importance of personal and social competencies relevant to the position of an electrician, according to opinions of employers

No.	Competencies personal and social	Very important	Important	Significant	Minor	Redundant	Importance indicator
1.	He/she bears responsibility for the execution of tasks	15	14	1	0	0	**4.5**
2.	He/she is creative and consistent in the execution of tasks	2	11	13	4	0	**3.4**
3.	He/she respects the professional confidentiality	2	21	6	1	0	**3.8**
4.	He/she has the ability to assess his/her actions and actions of their team and take responsibility for their consequences	10	13	7	0	0	**4.1**
5.	He/she works partially on his/her own and takes on a cooperation in the organized conditions	12	13	4	1	0	**4.2**
6.	He/she recognizes his/her own educational needs, updates their knowledge and improves professional skills	3	13	14	0	0	**3.6**
7.	He/she can cope with stress	3	9	16	2	0	**3.4**
8.	He/she can negotiate the terms of arrangements	0	6	8	16	0	**2.7**

Source: Own study

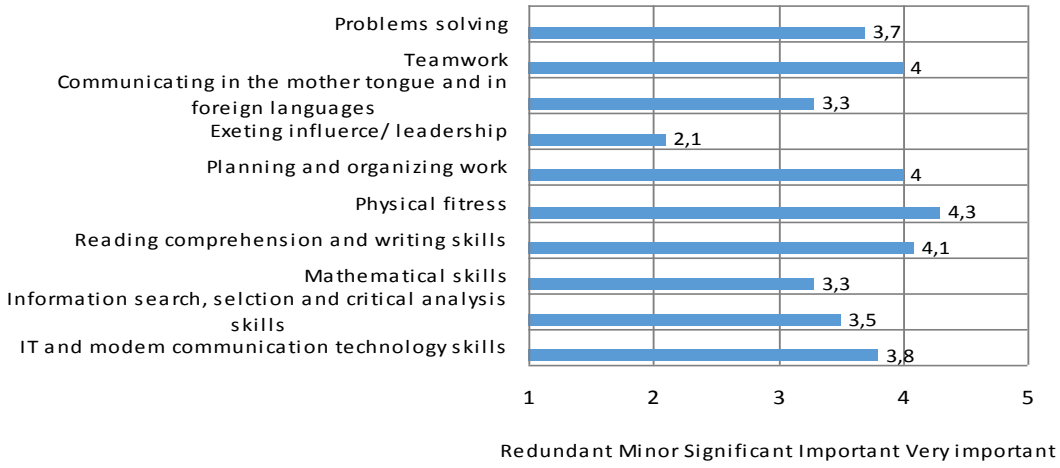
Personal and social competencies regarding creativity, consistency in the execution of tasks (importance indicator (3,4), coping with stress (3,4) and negotiating terms of arrangements (2,7), were considered minor or redundant by employers (table 16).

Table 17. The degree of importance of key competencies relevant to the position of an electrician, according to opinions of employers

No.	Key competences	Very important	Important	Significant	Minor	Redundant	Importance indicator
1.	Problems solving	8	9	10	3	0	**3.7**
2.	Teamwork	11	10	8	1	0	**4.0**
3.	Communicating in the mother tongue and in foreign languages	0	13	14	3	0	**3.3**
4.	Exerting influence/leadership	0	2	3	22	3	**2.1**
5.	Planning and organizing work	7	16	7	0	0	**4.0**
6.	Physical fitness	12	15	3	0	0	**4.3**
7.	Reading comprehension and writing skills	8	18	4	0	0	**4.1**
8.	Mathematical skills	1	10	17	2	0	**3.3**
9.	Information search, selection and critical analysis skills	0	16	12	2	0	**3.5**
10.	IT and modern communication technology skills	2	21	5	2	0	**3.8**

Source: Own study

Graph 1. Key competencies profile for the profession of an electrician



Source: Own study

1.2.6. Case studies

1. UNIMAR Marek Suchecki in Ostrołęka

The company has been providing services since 2003. The company operates in the telecommunications and power supply lines construction works industry. The company provides services in the field of construction of power supply and ICT installations. The company does not employ workers directly, but the broader scope of works is executed through constant cooperation with one-man companies. The interview was conducted with the owner of the company. The professional competencies expected from the collaborating one-man companies are analogous to those applying to employees and are the full professional competencies in the scope of the electrician job position. The owner also indicated that social

competencies are very important, especially in terms of team work, work organization planning, due to the sole responsibility for the entrusted parts of tasks.

In the owner's opinion, as long as a graduate sets up their own business, they are ready to co-operate in terms of the professional competencies held by that graduate.

2. Dariusz Wójcik Usługi Elektryczne i Teleinformatyczne in Ostrołęka

The company has been providing services since 2014. The company provides services in the field of construction of power supply and ICT installations, and the construction of cable lines. The company does not employ workers because it co-operates on a regular basis with analogous companies (one-man businesses), forming teams able to perform a broad scope of services.

In the company owner's opinion, the competencies gained in vocational schools are not sufficient to provide a full scope of electrical services. The above is associated with the broad scope of theoretical vocational education and insufficient scope of practical education, e.g. the use of measuring instruments, handling power tools or additional skills, e.g. handling mini excavators, backed up by relevant documents confirming the qualifications.

3. ZRI Zakład Robót Instalacyjnych Andrzej Sęk in Ostrołęka

The company has the form of a one-man business, operated since 1991. The core business is the execution of electrical installations and cable networks. The company belongs to the category of micro-enterprises, employing from 6 to 9 employees, depending on the acquired service contracts. The main area of operation is the Mazowieckie voivodship.

The interview was conducted with the owner of the company. The company hires employees for the electrician job position. When hiring, the company expects full professional competencies in the electrician profession from the candidates. It seems that the performed works concern electrical installations in structures of various purposes, including e.g.

specialized ones, like swimming pools. The owner has also indicated that professional experience associated with the variety of the performed professional tasks is of utmost importance. Team work and responsibility are expected social skills. It seems that the owner does not directly supervise the performed electric works on a continuous basis. Therefore, they do not employ graduates, since in their opinion they do not have the right social and professional skills.

1.2. Professional competence at job positions in the profession of a vehicle mechanic

1.2.1. Characteristics of examined companies

Among the surveyed enterprises employing vehicle mechanics, 46.7% were enterprises running a service business, 43.3% were running a service and commercial business, 6.7% were running a production and service business, and 3.3% were running a production, service and commercial business.

Table 18. The number of examined enterprises employing vehicle mechanics according to the type of business activity

No.	Type of activity	Number of enterprises
1.	Production	0
2.	Services	14
3.	Commercial	0
4.	Administrative	0
5.	Production and services	2
6.	Services and commercial	13
8.	Production, services and commercial	1
9.	Other* *Respondents also had the option to enter their own propositions but none of them took the opportunity.*	0

Source: Own study

The vast majority of enterprises employing vehicle mechanics are the enterprises employing up to 9 people. The tests involved 1 enterprise employing more than 251 people.

Table 19. The number of examined enterprises employing vehicle mechanics according to the employment figures

No.	Employment figures	Number of enterprises
1.	1-9 persons	16
2.	10-50 persons	5
3.	51-250 persons	8
4.	251-500 persons	1
5.	More than 500 people	0

Source: Own study

1.2.2. Characteristics of the respondents - enterprises employing vehicle mechanics

The respondents were 2 women and 28 men. The largest group consisted of respondents aged 41 and more (57%). The second largest group were persons in the age of 26-40.

Table 20. The age of respondents taking part in the research

No.	The age of respondents	Number of people
1.	18-25	2
2.	26-40	11
3.	41 and more	17

Source: Own study

The largest group of respondents consists of persons with higher education (50%). The second largest group consists of persons with secondary vocational education.

Table 21. Education of respondents participating in the research

No.	Education of respondents	Number of people
1.	Primary	0
2.	Basic vocational	3
3.	Secondary vocational	11
4.	Secondary, of general education	1
5.	Higher, bachelor's degree, engineering degree	9
6.	Higher, master's degree	5
7.	Higher, PhD, Eng.	1
8.	Other ** Respondents also had the option to enter their own propositions, however none of them took the opportunity*	0

Source: Own study

Table 22. Job positions of the respondents

No.	Position of the respondents	Number of people
1.	Owner	12
2.	Shift manager	5
3.	Head	10
4.	President of the Management Board	1
5.	President	1

No.	Position of the respondents	Number of people
6.	Station Managing Director	1

Source: Own study

Among the respondents 4 persons had the work experience of between 21-20 years and more on the currently held position. The most numerous group consisted of persons with a work experience of 1-5 years at the currently held position (37%).

Table 23. Number of respondents participating in the research according to the length of service

No.	Length of service time span	Length of service in total	Length of service at the currently held position
1.	1-5 years	2	11
2.	6-10 years	5	8
3.	11-20 years	13	7
4.	21 years and more	10	4

Source: Own study

1.2.3. Typical job positions in the profession of a vehicle mechanic

Employers running car services, car service stations (the most frequent type of surveyed entrepreneurs) most often hire workers for the vehicle mechanic and diagnostics mechanic positions (accordingly 90% and 50% of responses). Workers with professional experience are entrusted by the employers with managing positions - shift manager, superintendent.

Table 24. Typical job positions in the profession of a vehicle mechanic
Note: respondents could choose more than one answer

No.	Work position	Number of
1.	Motor vehicle mechanic	27
2.	Diagnostics mechanic	15
3.	Shift manager	1
4.	Other: *superintendent*	1
5.	Other: *vehicle electrician*	1

Source: Own study

1.2.4. Activities performed at typical job positions in the profession of a vehicle mechanic

Table 25. The degree of importance of actions performed by vehicle mechanics according to the opinion of employers

No.	List of professional tasks	Very important	Important	Significant	Minor	Redundant	Importance indicator
Z1	Acceptance and preparation of vehicles for diagnostics	12	9	6	1	2	**3.9**
Z2	Carrying out measurements and diagnostic tests on vehicles and locating defects	18	10	1	0	1	**4.5**
Z3	Interpretation of results and assessment of the vehicles' technical condition	13	15	2	0	0	**4.4**
Z4	Selection of the scope and methods of vehicle repair	12	12	5	0	1	**4.1**
Z5	Performance of disassembly, performance of verifications and selection of spare parts to be replaced in a vehicle	16	10	4	0	0	**4.4**

No.	List of professional tasks	Very important	Important	Significant	Minor	Redundant	Importance indicator
Z6	Replacement of damaged assemblies and components in a vehicle	19	8	3	0	0	**4.5**
Z7	Maintenance of assemblies and components in a vehicle	15	8	5	0	2	**4.1**
Z8	Assessment of the quality of performed repairs and their price estimation	14	9	4	1	2	**4.1**

Source: Own study

1.2.5. Professional competencies expected by employers (knowledge, skills, social skills) at typical job positions in the profession of a vehicle mechanic

Table 26. Degree of professional competencies of a vehicle mechanic according to the opinion of employers

No.	List of professional competencies	Very important	Important	Significant	Minor	Redundant	Importance indicator
K1	Fault diagnosis in a vehicle	22	6	1	0	1	**4.6**
K2	Repair of components and assemblies of motor vehicles	19	9	2	0	0	**4.6**

Source: Own study

Table 27. The degree of importance of knowledge that a motor vehicle mechanic should have in the diagnosis of failures of a motor vehicle according to the opinion of employers

No.	Knowledge	Very important	Important	Significant	Minor	Redundant	Importance indicator
1.	Rules and regulations for occupational health and safety, fire protection, the ergonomics, environment protection in the diagnosis of components and assemblies of motor vehicles.	15	11	3	1	0	**4.3**
2.	Diagnostic and repair documentation	9	19	1	0	1	**4.2**

No.	Knowledge	Very important	Important	Significant	Minor	Redundant	Importance indicator
3.	Classification and identification of motor vehicles	6	16	7	1	0	**3.9**
4.	Construction and principles of operation of components and assemblies of motor vehicles of various types	12	14	4	0	0	**4.3**
5.	Basics of technical drafting	3	11	14	0	2	**3.4**
6.	The basics of electrical engineering and electronics	6	13	9	0	2	**3.7**
7.	Tools and measuring instruments to perform motor vehicles diagnostics	11	14	4	0	1	**4.1**
8.	Methods of performing the diagnosis of motor vehicles	9	16	3	0	2	**4.0**
9.	Types of measurements and diagnostic testing of motor vehicles	9	15	4	0	2	**4.0**
10.	Principles of interpretation of the results of diagnostic tests	10	16	2	0	2	**4.1**
11.	Computer programs for the diagnosis of components and assemblies of motor vehicles	10	15	3	0	2	**4.0**
12.	Road traffic regulations and driving techniques	2	7	8	9	4	**2.8**
13.	The Basics of an economic activity in the automotive industry	5	4	7	8	6	**2.8**

Source: Own study

According to employers, the most important knowledge that a motor vehicle mechanic should have (importance indicator equal to/greater than 3,5) is in respect of:

– rules and regulations for occupational health and safety, fire protection, the ergonomics, environment protection, and within the scope of the diagnosis of components and assemblies of motor vehicles (4,3),

- construction and principles of operation of components and assemblies of motor vehicles of various types (4,3),
- diagnostic and repair documentation (4,2),
- tools and measuring instruments to perform motor vehicles diagnostics (4,1),
- principles of interpretation of the results of diagnostic tests (4,1),
- methods of performing the diagnosis of motor vehicles (4,0),
- types of measurements and diagnostic testing of motor vehicles (4,0),
- computer programs for the diagnosis of components and assemblies of motor vehicles (4,0),
- classification and identification of motor vehicles (3,9),
- the basics of electrical engineering and electronics (3,7),

According to employers, the knowledge in the following scope is of less importance (minor):

- the basics of technical drafting (3,4),
- road traffic regulations and driving techniques (2,8),
- the basics of an economic activity in the automotive industry (2.8).

Table 28. The degree of importance of skills that a vehicle mechanic should have in the diagnosis of failures of a motor vehicle according to the opinion of employers

No.	Skills	Very important	Important	Significant	Minor	Redundant	Importance indicator
1.	Compliance with rules and regulations for occupational health and safety, fire protection, the ergonomics, environment protection in the diagnosis of components and assemblies of motor vehicles	15	12	2	1	0	**4.4**
2.	Preparation of a service order of a motor vehicle to be diagnosed	4	14	7	2	3	**3.5**

No.	Skills	Very important	Important	Significant	Minor	Redundant	Importance indicator
3.	Classification of motor vehicles	3	13	13	1	0	**3.6**
4.	Characterizing the structure of motor vehicles and explaining the operation of components and assemblies of these vehicles	7	18	5	0	0	**4.1**
5.	Observation of the standards concerning a technical drawing, machine parts, construction materials and consumables	7	9	14	0	0	**3.8**
6.	Identification of elements and electrical and electronic systems	8	19	2	0	1	**4.1**
7.	Application of tools and measuring instruments to perform motor vehicles diagnostics	12	14	2	0	2	**4.1**
8.	Selection of methods and determination of the scope of the diagnosis of components and assemblies of vehicles	9	18	2	0	1	**4.1**
9.	Performance of the diagnosis of motor vehicles with the use of measuring instruments (motors, system of chassis, vehicle body, tires)	15	14	0	0	1	**4.4**
10.	Interpretation of the results of the diagnostic testing of motor vehicles	11	18	0	0	1	**4.3**
11.	Use of computer programs for the diagnosis of motor vehicles	12	13	3	0	2	**4.1**
12.	Use of road traffic regulations and vehicle drivers	2	8	8	8	4	**2.9**
13.	Establishing and conducting an economic activity	5	3	8	5	9	**2.7**

Source: Own study

Taking into account the results of the tests, the following skills are indicated most frequently by employers (importance indicator equal to/greater than 3,5):

- compliance with rules and regulations for occupational health and safety, fire protection, the ergonomics, environment protection in the diagnosis of components and assemblies of motor vehicles (4,4),
- performance of the diagnosis of motor vehicles with the use of measuring instruments (motors, system of chassis, vehicle body, tires) (4,4),
- interpretation of the results of the diagnostic testing of motor vehicles (4,3),
- characterizing the structure of motor vehicles and explaining the operation of components and assemblies of these vehicles (4,1),
- selection of methods and determination of the scope of the diagnosis of components and assemblies of vehicles (4,1),
- use of computer programs for the diagnosis of motor vehicles (4,1),
- use of tools and measuring instruments to perform motor vehicles diagnosis (4,1),
- identification of elements and electrical and electronic systems (4,1),
- observation of the standards concerning a technical drawing, machine parts, construction materials and consumables (3,8),
- classification of motor vehicles (3,6),
- preparation of service orders of vehicles to be diagnosed (3,5).

According to employers, the least important skills (importance indicator equal to/greater than 3,5) are:

- application of road traffic regulations and driving techniques (2,9),
- establishing and conducting an economic activity (2,7).

Table 29. The degree of importance of knowledge that a motor vehicle mechanic should have in the repair of components and assemblies of motor vehicles according to the opinion of employers

No.	Knowledge	Very important	Important	Significant	Minor	Redundant	Importance indicator
1.	Rules and regulations for occupational health and safety, fire protection, the ergonomics, environment protection in the repair of components and assemblies of motor vehicles.	11	13	5	0	1	**4.1**
2.	Catalogs and manuals for operation of motor vehicles	5	13	12	0	0	**3.8**
3.	Basics of technical drafting	4	10	15	0	1	**3.5**
4.	Construction and principle of operation of motor vehicles (drive system, brake system, steering system, bearing elements and wheel-axle assemblies of motor vehicles, wheels and tires, bodies of motor vehicles)	16	13	1	0	0	**4.5**
5.	Basic knowledge of engines	10	18	2	0	0	**4.3**
6.	The technology of repair of motor vehicles	13	14	3	0	0	**4.3**
7.	Principles and scope of performance of the maintenance of passenger vehicles	10	13	7	0	0	**4.1**
8.	Price list of repair of components and assemblies of motor vehicles.	3	6	11	5	5	**2.9**

Source: Own study

Workers employed at typical job positions in the profession should most of all, according to employers (table 29), have knowledge (importance indicator equal to/greater than 3,5) of:

- construction and principle of operation of motor vehicles (drive system, brake system, steering system, bearing elements and wheel-axle assemblies of motor vehicles; wheels and tires, bodies of motor vehicles) (4,5),
- basic knowledge of engines (4,3),
- the technology of repair of motor vehicles (4,3),
- rules and regulations for occupational health and safety, fire protection, the ergonomics, environment protection in the repair of components and assemblies of motor vehicles (4,1),
- principles and scope of performance of the maintenance of passenger vehicles (4,1),
- catalogs and manuals for operation of motor vehicles (3,8),
- the basics of technical drafting (3,5).

According to employers, minor is the knowledge of:

- the price list of repair of components and assemblies of motor vehicles (2,9).

Table 30. The degree of importance of skills that a motor vehicle mechanic should have in the repair of components and assemblies of motor vehicles according to the opinion of employers

No.	Skills	Very important	Important	Significant	Minor	Redundant	Importance indicator
1.	Observing rules and regulations for occupational health and safety, fire protection, the ergonomics, environment protection in the repair of components and assemblies of motor vehicles	11	13	5	1	0	**4.1**
2.	Using the technical documentation of machinery and devices	8	15	7	0	0	**4.0**
3.	Using the technical drawing during assembly and installation works	4	12	14	0	0	**3.7**
4.	Locating damaged components and assemblies of passenger vehicles	19	9	2	0	0	**4.6**

No.	Skills	Very important	Important	Significant	Minor	Redundant	Importance indicator
5.	Selecting the methods of repair for motor vehicles	15	12	3	0	0	**4.4**
6.	Disassembling components and assemblies of motor vehicles	11	14	5	0	0	**4.2**
7.	Choosing components or assemblies of motor vehicles or their substitutes for replacement	10	14	6	0	0	**4.1**
8.	Replacing damaged components and assemblies of motor vehicles using workshop tools and equipment	14	15	1	0	0	**4.4**
9.	Choosing consumable materials	8	17	4	0	1	**4.0**
10.	Controlling the quality of repair of motor vehicles	14	10	5	1	0	**4.2**
11.	Performing periodic technical maintenance of motor vehicles	9	16	5	0	0	**4.1**
12.	Assessing the quality of performed repair and determining its costs	7	10	8	3	2	**3.6**
13.	Preparing a cost estimate of repair	2	7	12	4	5	**2.9**

Source: Own study

According to employers (importance indicator equal to/greater than 3,5), the following skills of employees working at typical job positions are very important:

- locating damaged components and assemblies of passenger vehicles (4,6),
- selecting the methods of repair for motor vehicles (4,4),
- replacing damaged components and assemblies of motor vehicles using workshop tools and equipment (4,4),
- controlling the quality of repairs of motor vehicles (4,2),
- disassembling components and assemblies of motor vehicles (4,2),

- observing the rules and regulations for occupational health and safety, fire protection, the ergonomics, environment protection in the repair of components and assemblies of motor vehicles (4,1),
- choosing components or assemblies of motor vehicles or their substitutes for replacement (4,1),
- performing periodic technical maintenance of motor vehicles (4,1),
- choosing consumable materials (4,0),
- using the technical documentation of machinery and devices (4,0),
- using the technical drawing during assembly and installation works (3,7),
- assessing the quality of performance of works and determining their costs (3,6).

Preparation of a cost estimate of repairs is deemed minor (2,9).

Table 31. The degree of importance of personal and social competencies relevant to the position of a motor vehicle mechanic, according to opinions of employers

No.	Competencies personal and social	Very important	Important	Significant	Minor	Redundant	Importance indicator
1.	He/she is responsible for the execution of tasks related to the diagnosis and repair of motor vehicles	11	19	0	0	0	**4.4**
2.	He/she is creative and consistent in the execution of tasks	7	17	6	0	0	**4.0**
3.	He/she respects the professional confidentiality	6	13	10	1	0	**3.8**
4.	He/she can assess his/her actions and actions of their team and take responsibility for their consequences in the repair of motor vehicles	8	18	4	0	0	**4.1**
5.	He/she works partially on his/her own and takes on a cooperation in the organized conditions	8	20	2	0	0	**4.2**

6.	He/she recognizes his/her own educational needs, updates their knowledge and improves professional skills	3	21	5	1	0	**3.9**
7.	He/she can cope with stress	4	19	7	0	0	**3.9**

Source: Own study

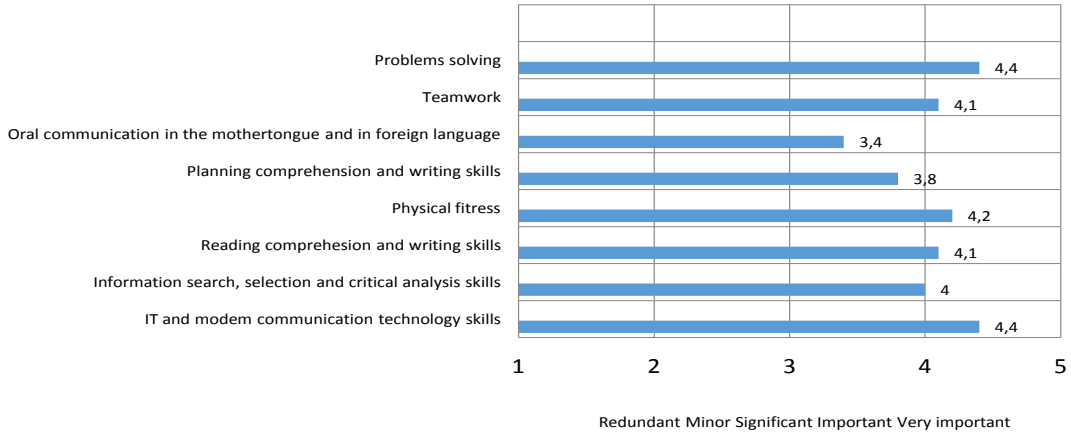
Employers indicated that all personal and social competencies are important when choosing an employee (importance indicator equal to/greater than 3,5).

Table 32. The degree of importance of key competencies relevant to the position of a motor vehicle mechanic, according to opinions of employers

No.	Key competences	Very important	Important	Significant	Minor	Redundant	Importance indicator
1.	Problems solving	13	16	1	0	0	**4.4**
2.	Teamwork	8	18	4	0	0	**4.1**
3.	Oral communication in the mother tongue and in foreign language	4	8	15	2	1	**3.4**
4.	Planning and organizing work	6	12	12	0	0	**3.8**
5.	Physical fitness	10	15	5	0	0	**4.2**
6.	Reading comprehension and writing skills	8	19	2	0	1	**4.1**
7.	Information search, selection and critical analysis skills	7	16	7	0	0	**4.0**
8.	IT and modern communication technology skills	13	15	2	0	0	**4.4**

Source: Own study

Graph 2. The profile of competencies that are key for the profession of a motor vehicle mechanic



Source: Own study

1.2.6. Case studies

1. Auto Serwis – Opony w Radomiu (*Auto service - tires in Radom*)

Auto Serwis – Opony w Radomiu (a small enterprise, the owner is a natural person) conducts a service and commercial activity in the repair and sales of parts and accessories for motor vehicles on a local scale.

Source: https://www.google.pl/maps/

Auto Serwis – Opony w Radomiu began its operation in 1999. It continues a family tradition of a first tire services company in the region of Radom (year of establishment - 1927) and the commercial - the sales of tires, inner tubes and car wheel rims. The company's offer was extended by the sales of batteries, sales and exchange of oil, brake pads and shock absorbers [1]

In 2005 the company was equipped with the diagnostic line for measuring and adjusting the geometry of the wheels of vehicles, the scope of activity was extended by auto repair and seasonal storage of tires and wheels.

The company provides computer diagnostics of engine. For this purpose it uses MEGA MACS 42 diagnostic computer, which, thanks to the appropriate technology and versatility proves to be effective with the operation of various brands of vehicles, in vehicles of all age groups. This tester is perfectly suitable for the purposes of a quick evaluation of used vehicles and reliable diagnosis of all major vehicle systems. Mechanics, thanks to this device, have the access to all necessary information, including those provided by vehicle manufacturers.

Services of the Service in respect of auto repair relate to, among others: measurement and adjustment of the geometry of wheels with state-of-the-art devices by Hunter company DSP

[1] Based on: Auto Serwis – Opony, online access http://opony-radom.pl/?o-firmie

600 (digital measurement is done using a wireless system DSP-600 reading the data from passive heads placed on the wheels of a vehicle, with the use of four passive video cameras), repair of car windows, air-conditioning service, sales and replacement of batteries, renovation of suspensions in vehicles.

The service is equipped with HUNTER WA340 elite Hawkeye system. The company, as the only one in Radom, has a device of this class. None of the prior devices on the market was able to set the geometry of the wheels/suspension with such a precision.

Since 2014, as the first company in Radom, it started using devices for releasing seized screws with a method of induction.

Auto Serwis - Opony offers tires for passenger, delivery and 4x4 vehicles. As an authorized representative of Michelin, Goodyear, Pirelli and Vredestein groups, it offers tires of such brands as: Michelin, Goodyear, Dunlop, Pirelli, Vredestein, Kleber, BF Goodrich, Fulda, Kormoran, Dębica.

The service carries out the sales of aluminum and steel wheel rims of such brands as: Auto Tip Top, Alcar and OZ-Racing.

Since March 2003 the company is part of a nationwide network of tire services and auto mechanics - Partner Opony Polska

Auto Serwis – Opony cares about the provision of services at the highest level using the first-class equipment. It employs workers who are valued for their technical skills and such personal competencies as responsibility, creativity, consistency in the execution of tasks, as well as key competencies: physical fitness, skills of using modern information and communication technologies.

The current knowledge and technical skills are acquired and improved by employees in trainings funded entirely by the employer.

The company does not recruit new employees. The number of employees is optimal. Graduates of vocational schools of motor engineering seeking work do not meet the

expectations of the employer, according to the charge-hand being interviewed, most of all due to the lack of technical knowledge and commitment to the work. The company does not cooperate with vocational schools of motor engineering in organizing and conducting internships and apprenticeships.

2. Carolina Car Company sp. j. Department in Ostrołęka

The company is an authorized Toyota dealer and it runs a Salon Pewnych Aut (Dependable Car Salon), where it sells used cars with a warranty. Furthermore, the company offers:

- mechanical repairs service,
- body and paint repairs,
- car parts sale.

The company also runs a vehicle inspection station. Management of the company is a task of a director, while individual departments are managed by charge-hands. The company employs mot vehicle mechanics at the positions of motor vehicle mechanic and diagnostics mechanic. The company participates in vocational education by hiring students from the vocational school based in Ostrołęka for internships and apprenticeships.

The interview was conducted with the director of the division. There is a natural rotation of workers in the company. In consideration of the above, the work positions are supplemented with new workers. However, these are not graduates from vocational schools, as every worker needs to assure continuity of services and sales with their work, so they need to have professional experience allowing to take up vocational activities immediately after being employed. When hiring, apart from experience, the company requires full professional competences associated with the work position. Social skills in the scope of responsibility for the entrusted tasks and team work skills are also expected.

Source: http://toyotaostroleka.pl/pl/used/show/Toyota-Auris-1.4-D-4D-Prestige-+-Executive,2404

The director, taking into account their hitherto experience associated with hiring students for internships and apprenticeships, gives a positive rating of the professional competences gained as a part of vocational education. However, they point out that not all students participate in internships and apprenticeships in facilities with high technological standards, thus there is a deficiency in their professional skills in terms of modern technologies, diagnosing and repairs of the newest models of cars. In the director's opinion, there is also a deficiency in social skills in terms of responsibility for the entrusted tasks, which is manifested e.g. by a lack of care for the entrusted tools and order in the work place. A graduate's willingness to learn and involvement in works associated with getting acquainted with specific solutions in the company is of great importance when hiring them.

3. CAR-SERVICE E.D.ZAŁUSKA S.C. in Ostrołęka

The company is a family business that has been present on the market for 6 years. The company provides services in the scope of:

- mechanical repairs service,
- tire service,
- sales of car parts and tires.

The company also runs a car wash. The company is managed by a director - the son of the owners. The workers are directly subordinate to the director. The company employs motor vehicle mechanics at the positions of motor vehicle mechanics performing all the professional tasks associated with the company's offer. The company participates in vocational education by hiring students from the vocational school based in Ostrołęka for internships and apprenticeships.

The interview was conducted with the director of the company. The company employs 5 mechanics and there is no rotation of workers. With hitherto employment, apart from experience, the company required full professional competences and willingness to perform other tasks associated with the company's offer, entrusted by the director. The workers perform not only tasks associated with their vocation. Social skills in the scope of responsibility for the entrusted tasks and team work skills are also expected.

The director, taking into account their hitherto experience associated with hiring students for internships and apprenticeships, gives a positive rating of the professional competences gained as part of vocational education. However, they point out that not all students have sufficient professional skills associated with the universality of the services provided by the company, and the scope of practical vocational education (apprenticeship) is not sufficient to form them properly. In the director's opinion, there is also a deficiency in social skills in terms of involvement in work pursuant to the company's needs and a lack of care for the entrusted tools and order in the work place. A graduate's willingness to learn and involvement in works

associated with getting acquainted with specific solutions in the company is of great importance when hiring them.

1.3. Summary

The surveys were conducted among 60 entrepreneurs running a production, service, trade, production and service, service and trade, service and administrative and production and service and trade business, located in the voivodships: Mazowieckie, Podlaskie, Wielkopolskie, Małopolskie, Łódzkie, Śląskie, Podkarpackie with diverse employment size. Such a surveying area allowed for obtaining representative information.

The respondents of the surveys were, first and foremost, men aged above 41, holding a higher bachelor's, engineer's or master's degree and secondary vocational education. They are company owners or hold managerial positions with a varied degree of tenure in the work position held.

A typical work position for which the surveyed companies employ workers is the position of electrician.

The profile of services in the companies hiring more than 50 people, as well as a precise specialization of the enterprises results in the workers being employed at the positions of electricians, but also e.g. electrical installer of LV, MV, HV grids or electrical installer of control cabinets.

Diagnostic tests of the expected professional competences in the profession of electrician show that installation and maintenance of machines, devices, electrical installations are very important professional competences for the above profession (an importance indicator of 3.9 and 4.5 accordingly). The staff of the surveyed enterprises gave a very high rating to the importance of individual stages of work (professional tasks) for the profession (importance indicator between 3.9 and 4.4).

The employers gave a high rating to the relevance of the professional competences of the future employees, expected from the graduates of vocational schools, educating in the vocation of electrician (importance indicator above 3.9). In the case of the ability to set up and

run a business, a relevance factor of 2.1 was noted, also the knowledge associated with this ability is insignificant, in the opinion of the surveyed enterprises (basics of entrepreneurship - an indicator of 2.6, the principles of setting up and running a business - an indicator of 2.4). Similar opinions were noted in terms of skills concerning the replacement of bearings in power tools and induction drives replacing bearings in power tools and induction motors, sharpening drills and cutters, other locksmith works - an indicator of 2.7).

According to the respondents, very important personal and social skills in the profession of an electrician are worker's responsibility for the execution of tasks (an indicator of 4.5), self-assessment of professional tasks of the worker and the team of co-workers and assuming responsibility for their results (4.1), self-reliance in the performance of work and team work (4.2), maintenance of professional secrecy (3.8), observance of own educational needs and updating of knowledge and honing professional skills (3.6).

Typical work positions, at which the surveyed automotive industry companies employ workers, are the vehicle mechanic (27 responses) and the diagnostics mechanic (15 responses). Diagnostic tests of the expected professional competences in the profession of vehicle mechanic indicate that the professional competences of fault diagnosis in a vehicle and repair of components and assemblies of motor vehicles are very important professional competences in the above profession (an importance indicator of 4.6 each). The respondents from the surveyed enterprises gave a very high rating to the importance of all professional tasks (importance indicator between 3.9 and 4.5). In the area of expected knowledge, the respondents indicated most areas as important (an indicator of 3.9-4.3). Knowledge in the field of traffic provisions and vehicle steering, and business basics in the car industry is the least important from the point of view of the employers (an indicator of 2.8 each). Most areas of the expected skills (an indicator of between 3.6 and 4.6) are important from the point of view of the employers. Drawing up a cost estimate of the repairs is considered to be a minor skill (an indicator of 2.9) by the employers.

According to the respondents, very important personal and social skills in the profession of vehicle mechanic are worker's responsibility for the execution of tasks (an indicator of 4.4), work partially on one's own and taking on cooperation in organized conditions (an indicator of 4.2), self-assessment of professional tasks of the worker and the team of co-workers and assuming responsibility for their results (an indicator of 4.1), observance of own educational needs and updating of knowledge and honing professional skills, as well as coping with stress (indicators of 3.9 each), self-reliance in the performance of work and team work (an indicator of 4.2), maintenance of professional secrecy (an indicator of 3.8).

1.4. Conclusions

Most work positions in the professions of electrician and motor vehicle mechanic are generated by companies from the small and medium enterprises sector. The in-depth interviews show that the specificity of these enterprises is that workers perform a broad scope of professional tasks resulting from the clients' needs. In the employers' opinion, in the surveyed professions of electrician and motor vehicle mechanic, vocational schools provide good theoretical knowledge to the graduates. However, the graduates do not have properly formed practical professional skills. It is the result of lack of practical education in actual working conditions. Great emphasis in terms of social skills is put by the employers on team work skills and responsibility, which is common for both professions. This shows that in small companies, the workers must perform various tasks on their own, because there is no supervision (e.g. foreman, shift manager), and the owner is unable to constantly monitor the course of work.

1.5. Source materials

1. Filled in survey forms for the profession of electrician - 30 pcs.
2. Filled in survey forms for the profession of motor vehicle mechanic - 30 pcs.
3. Interview with an employer developed on the basis of an interview scenario for the profession of electrician - 3 pcs.
4. Interview with an employer developed on the basis of an interview scenario for the profession of motor vehicle mechanic - 3 pcs.
5. http://toyotaostroleka.pl/pl/used/show/Toyota-Auris-1.4-D-4D-Prestige-+-Executive,2404
6. http://opony-radom.pl/?o-firmie
7. https://www.google.pl/maps/

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Chapter 2

The required professional competencies on typical job positions in professions of an electrician and a vehicle mechanic in Portugal

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Portugal, Barcelos

2.1. Typical job positions and activities, accepted competences and skills in the profession of electrician

2.1.1. Typical job position in the profession of electrician in Portugal

2.1.1.1. List and characteristics of the tested companies

In the profession of electrician 31 enterprises were tested in Barcelos, Esposende, Apulia, Braga and Famalicao with different types of business activity.

-*Manufacturing*: **8**

-*Services*: **14**

-*Commercial*: **9**

As far as the distribution of employees concerned it was also shown that there is a significant difference between the enterprises.

-*1-9 people*: **8**

-*10-50 people*: **19**

-*51-250 people*: **4**

2.1.1.2. 1.1.2 Characteristics of interviewees

Of the *97* employees who completed the questionnaire, ***26*** were female and ***71*** male. Distribution of age:

- *18-25*: **21** people
- *26-40*: **47** people
- *41 and more*: **29** people

According to the measurement **38** people participated in secondary vocational, **31** in secondary general education. **23** people have higher degree of Engineer or Bachelor and **5** employees possess Master's degree.

The results show that **18** people are working in the maintenance, **25** employees are working as seller, **4** people are working as manager and there are **31** technicians and **19** engineers.

Total seniority:

- *1-5 years*: **22** people
- *6-10 years*: **32** people
- *11-20 years*: **26** people
- *21 years and more*: **17** people

2.1.2. Quantitative results of survey research

The current research is focused on the measure of the acceptance level of professional tasks, professional competence, knowledge and skills, personal and social competences and the key competences in the professions of electrician and car mechanic. An indicator was used to the analyses, to the assessment scale of "Very important-Important-Relevant-Unimportant-Unnecessary" number values were assigned "5- 4- 3- 2- 1".

$$W = \frac{\sum_{i=1}^{5} L_i \cdot i}{\sum_{i=1}^{5} L_i}$$

W – *task importance indicator*

L_i – *number of interviewees who gave particular grade*

i – *value of scale grade (i=1,2,3,4 5)*

2.1.2.1. Acceptance level of professional tasks

Table 1. The degree of importance of actions performed by electricians according to the opinion of employers

No.	List of professional tasks	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
Z1	Assembling and running of the machinery and electrical equipment on the basis of technical documentation	15	22	34	19	**7**	**3.19**
Z2	Implementation and running of electrical installations on the basis of technical documentation	19	25	36	14	**3**	**3.4**
Z3	Assessing the technical condition of machinery, equipment and electrical systems after installation on the basis of measurements;	25	24	36	13	**0**	**3.65**
Z4	Mounting of control systems, regulation and protection of machinery and electrical equipment on the basis of technical documentation	5	20	52	17	**3**	**3.07**
Z5	Monitoring and verification of the fire protection measurements on the basis of technical documentation	9	22	65	1	**0**	**3.4**

Source: Own study

As can be seen from the table the most significant task is the *assessing the technical condition of machinery, equipment and electrical systems after installation on the basis of*

measurements as *the mounting of control systems, regulation and protection of machinery and electrical equipment on the basis of technical documentation* is of less importance.

2.1.2.2. Acceptance level of professional competence

Table 2. Degree of professional competencies in the profession of an electrician according to the opinion of employers

No.	List of professional competences	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
K1	Installation and maintenance of machinery and electrical equipment	35	34	28	0	**0**	**4.07**
K2	Installation and maintenance of electrical installations	22	51	24	0	**0**	**3.97**
etc.							

Source: Own study

Installation and maintenance of machinery and electrical equipment and of electrical installations are evaluated by the employees on the same level which suggest that both tasks are of almost equal importance.

2.1.2.3. Acceptance level of knowledge and skills

2.1.2.3.1. Installation and maintenance of machinery and electrical equipment

Table 3. Degree of importance of knowledge that an electrician should have in respect of the installation and maintenance of electrical machinery and devices according to the opinion of employers

No.	Knowledge	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	Safety regulations, fire regulations, electric shock regulations, environmental protection and ergonomics during installation and maintenance of machinery and electrical equipment.	25	32	37	3	0	**3.81**
2	Electrical machinery and equipment (types, characteristics, classification).	36	41	20	0	0	**4.16**
3	The structure of electrical machines (mechanical and electromagnetic).	13	51	32	1	0	**3.78**
4	Technical documentation of equipment (circuit diagrams and assembly).	14	27	46	10	0	**3.46**
5	Basics of electrical engineering and electronics.	18	28	49	11	1	**3.83**
6	Standards and regulations for the installation of machinery and electrical equipment.	15	37	43	12	0	**3.87**
7	Rules of installation and maintenance of machinery / electrical equipment	10	44	36	6	1	**3.57**
8	Rules and methods of making electrical and mechanical connections	10	18	46	20	3	**3.12**

No.	Knowledge	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
9	Measurement instruments and methods	55	14	20	8	0	**4.19**
10	Methods of finding the faults and rules of fixing the faulty mechanisms in machines and equipment.	10	53	34	0	0	**3.75**
11	Rules and methods of maintenance of machines and equipment	6	33	47	11	0	**3.35**
12	Basics of entrepreneurship	0	4	30	41	22	**2.16**
13	Rules of establishing and running a business	0	3	19	30	45	**1.79**

Source: Own study

Table 4. Degree of importance of skills that an electrician should have in respect of the installation and maintenance of electrical machinery and devices according to the opinion of employers

No.	Skills	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	Organizing workplace in accordance with safety regulations, fire regulations, electric shock regulations, environmental protection and ergonomics during installation and maintenance of machinery and electrical equipment.	28	29	35	5	0	**3.82**
2	Classify machines and electrical equipment, determine their technical parameters.	5	11	40	26	15	**2.63**

No.	Skills	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
3	Distinguish the parameters of elements and components of machinery and electrical equipment and determine their functions.	8	24	63	2	0	**3.9**
4	Recognize machinery and electrical equipment and their components to determine their purpose.	10	34	44	9	0	**3.77**
5	Distinguish structural materials used in machinery and electrical equipment.	20	29	40	11	0	**3.61**
6	Read and produce drawings and diagrams of machinery and electrical equipment.	5	16	59	14	3	**3.55**
7	Assemble of power, control, regulation supplies and conservation of machinery and electrical equipment on the basis of the documentation.	1	21	24	33	18	**3.12**
8	Choose tools for installation of machinery and electrical equipment.	5	22	65	3	2	**3.45**
9	Perform mechanical assembly of electrical and electronic components.	10	33	39	10	5	**3.59**
10	Check the compliance of the work with documentation.	4	15	44	19	15	**2.93**
11	Take measurements of parameters of machinery and electrical equipment.	16	28	53	7	0	**3.9**
12	Locate the typical damage of machinery and electrical equipment.	9	61	27	0	0	**4.15**

No.	Skills	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
13	Plan the sequence of steps during removal and installation of machinery and electrical equipment.	2	12	27	35	21	**2.66**
14	Perform replacement of worn or damaged parts and components of machinery and electrical equipment.	11	54	29	3	0	**4.06**
15	Perform replacement of defective control systems and protection devices of machinery and electrical equipment.	10	31	53	2	0	**3.63**
16	Check the correctness of the assembly on the basis of documentation.	3	15	40	23	16	**3.38**
17	Carry out inspection and maintenance of machinery and electrical equipment.	6	29	22	27	13	**2.97**
18	Check the performance of machine and electrical equipment after the assembly and maintenance.	20	22	55	0	0	**3.51**
19	Establish and run a business in the electrical industry	6	19	22	33	17	**2.87**

Source: Own study

As can be seen the most significant knowledge on the field of installation and maintenance of machinery and electrical equipment is the *measurement instruments and methods and the knowledge of electrical machinery and equipment*, the least important factor is about the *rules of establishing and running business*.

As far as the skills concerned *the location the typical damage of machinery and electrical equipment* is of the most relevance, *classify machines and electrical equipment, determination of their technical parameters* is the least important skill.

2.1.2.3.2. Installation and maintenance of electrical installations

Table 5. Degree of importance of knowledge that an electrician should have in respect of the installation and maintenance of electrical systems according to the opinion of employers

No.	Knowledge	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	Safety regulations, fire regulations, electric shock regulations, environmental protection and ergonomics while doing an electrical installation	22	19	56	0	0	**3.69**
2	Rules and methods of releasing people from voltage and rescuing electrocuted ones.	14	48	33	2	0	**3.93**
3	Standards and regulations concerning the fitting of electrical installations	34	23	37	3	0	**3.86**
4	Structure and types of electrical installations	33	27	34	2	1	**3.89**
5	Symbols used in technical documentation for electrical installations	13	18	65	1	0	**3.28**
6	Equipment, tools and methods used when doing electrical installations	16	62	19	0	0	**4.03**
7	Rules and methods of building and exploitation of electrical installations	13	36	43	3	2	**3.57**
8	Rules and methods of making electrical and mechanical connections	25	25	47	0	0	**3.82**

No.	Knowledge	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
9	Methods of locating and removing defects in the electrical system	18	20	56	3	0	**3.35**
10.	Exploitation of equipment, installations and networks with a voltage not exceeding 1 kV	9	42	38	8	0	**3.59**
11	Rules and methods of repairing power tools and electric machines used when exchanging power cables with damaged insulation and while replacing brushes in commutator motors.	15	24	36	19	3	**3.44**
12	Rules and methods of exchanging bearings in power tools and induction motors, sharpening drills and cutters and other metalwork.	5	15	30	32	15	**2.76**

Source: Own study

Table 6. Degree of importance of skills that an electrician should have in respect of the installation and maintenance of electrical systems according to the opinion of employers

No.	SKILLS	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	Organize the workplace in accordance with the safety, fire, shock regulations, environmental protection and ergonomics when doing electrical installations	9	23	35	13	15	**3.11**
2	Release people from voltage and rescue electrocuted ones.	7	12	49	19	10	**2.88**

No.	SKILLS	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
3	Obey standards and regulations concerning the fitting of electrical installations	15	19	57	4	2	**3.34**
4	Identify the types of electrical installations and characterize their structure.	22	32	35	7	1	**3.61**
5	Use the technical documentation of electrical installations.	10	24	36	22	5	**3.57**
6	Choose cables, fittings, tools and methods relevant to the fitting and repairing of various types of electrical installations	2	18	62	13	2	**3.09**
7	Perform temporary connections	10	5	33	24	25	**2.58**
8	Perform temporary installations	3	16	42	16	20	**2.93**
9	Perform and renovate indoor electrical installations	26	25	37	2	2	**3.67**
10	Perform and renovate outdoor electrical installations of the following types: telecommunication, signaling, protection of property and lightning	30	23	40	1	3	**3.86**
11	Install building cable or aerial connections	15	19	35	13	15	**3.14**
12	Perform connections of electrical and mechanical systems (bolted, clamping and soldered)	12	28	27	19	11	**3.21**

No.	SKILLS	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
13	Check the correctness of functioning of internal and external electrical installations	12	21	63	1	0	**3.34**
14	Locate and remove faults in internal and external electrical installations	33	43	21	0	0	**4.02**
15	Exploit the equipment, installations and power grids with a voltage not exceeding 1 kV	9	42	38	8	0	**3.62**
16	Use simple technical documentation of machinery and electrical equipment	27	15	37	15	3	**3.38**
17	Repair power tools and electric machines, exchange power cables with damaged insulation, replace brushes in commutator motors..	19	23	35	8	12	**3.47**
18	Exchange bearings in power tools and induction motors, sharpen drills and cutters and other metalwork.	7	19	24	25	22	**2.78**

Source: Own study

In this chapter the relevance of different professional competences are compared with each other on the area of **installation and maintenance of electrical installations.**

According to the interview with employees in the last few years there has been a growing importance of the knowledge about equipment and tools, the methods as well, in order to live up to the growing expectations of the labour market. Due to that fact compared with other areas it is the most important factor. Whereas *knowing rules and methods of exchanging*

bearings in power tools and induction motors, sharpening drills and cutters and other metalwork are playing not a vital role in the profession of electricians.

Investigating the skills of this field the conclusion can be drawn from the indicators that all of them are almost the same level, in the views of companies the skill *location and removing faults in internal and external electrical installations* is the most relevant.

2.1.2.4. Acceptance level of personal and social competences

Table 7. The degree of importance of personal and social competencies relevant to the position of an electrician, according to opinions of employers

No	Personal and social competences	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	He/she feels responsible for the preformed tasks	9	43	32	12	1	**3.64**
2	He/she is creative and consistent in the implementation of tasks	17	12	30	21	17	**3.1**
3	He/she respects professional confidentiality	9	13	46	14	15	**2.94**
4	He/she can evaluate his/her actions and the actions of his/her team and takes responsibility for the consequences	19	34	22	13	9	**3.83**
5	He/she works well both on his/her own and within a group	18	38	27	12	2	**3.36**
6	He/she recognizes his/her own learning needs, updates his/her knowledge and improves his/her professional skills	47	26	16	5	3	**4.23**
7	He/she deals well with stress.	15	17	25	17	23	**2.83**

No	Personal and social competences	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
8	He/she has good negotiating skills	1	6	29	27	34	**1.79**

Source: Own study

There are distinct differences between the lowest and highest indicators. According to them the most relevant competence is recognizing the learning needs, possessing update knowledge and improvement professional skills. Contrary to that possessing good negotiating skills is of the least relevance.

2.1.2.5. Acceptance level of key competences

Table 8. The degree of importance of key competencies relevant to the position of an electrician, according to opinions of employers

No	Key competences	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	Problem solving	30	37	25	3	2	**3.92**
2	Teamwork	6	29	35	17	10	**3.18**
3	Communication in the mother tongue and in foreign languages	7	21	38	9	22	**2.73**
4	Leadership skills	0	31	29	18	19	**2.74**
5	Planning and organizing work	7	27	52	6	5	**3.11**
6	Motor efficiency	29	25	29	11	3	**3.45**
7	The ability of comprehensive reading and writing	0	29	67	1	0	**3.3**

No	Key competences	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
8	Mathematic skills	10	19	47	18	3	**4.01**
9	The ability to search, filter and critical analysis of information	0	31	29	18	19	**2.73**
10	The ability to use modern information and communication technologies	1	6	29	27	34	**2.1**

Source: Own study

The results show that whereas mathematic skills are considered the most relevant key competences, the ability to use modern information and communication technologies is relevant only on a low level.

2.2. Typical job positions and activities, accepted competences and skills in the profession of car mechanic

2.2.1. Typical job position in the profession of car mechanic in Portugal

2.2.1.1. List and characteristics of the tested employers

In the profession of electrician 30 enterprises were tested in Barcelos, Esposende, Apulia, Braga.1 and Famalicao with different types of business activity.

-*Manufacturing*: **7**

-*Services*: **13**

-*Commercial*: **6**

-*Administrative:* **4**

As far as the distribution of employees concerned it was also shown that there is a significant difference between the enterprises.

-*1-9 people*: **13**

-*10-50 people*: **15**

-*51-250 people*: **2**

2.2.1.2. Characteristics of interviewees in tests

Of the *63* employees who completed the questionnaire, ***17*** were female and ***46*** male. Distribution of age:

- *18-25*: **17** people
- *26-40*: **28** people

- *41 and more*: **18** people

According to the measurement **20** people participated in secondary vocational, **26** in secondary general education. **13** people have higher degree of Engineer or Bachelor and **4** employees possess Master's degree.

The results show that **14** people are working in the maintenance, **8** employees are working as seller, **4** people are working as manager and there are **24** mechanic technicians and **13** engineers.

Total seniority:

- *1-5 years*: **10** people
- *6-10 years*: **19** people
- *11-20 years*: **22** people
- *21 years and more*: **12** people

2.2.2. Quantitative results of survey research

The current research is focused on the measure of the acceptance level of professional tasks, professional competence, knowledge and skills, personal and social competences and the key competences in the professions of electrician and car mechanic. An indicator was used to the analyses, to the assessment scale of "Very important-Important-Relevant-Unimportant-Unnecessary" number values were assigned "5- 4- 3- 2- 1".

$$W = \frac{\sum_{i=1}^{5} L_i \cdot i}{\sum_{i=1}^{5} L_i}$$

W – *task importance indicator*

L_i – *number of interviewees who gave particular grade*

i – *value of scale grade (i=1,2,3,4 5)*

2.2.2.1. Acceptance level of professional tasks

Table 9. The degree of importance of actions performed by vehicle mechanics according to the opinion of employers

No.	List of professional tasks	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
Z1	Accepting and preparing motor vehicle for diagnostics	**6**	**15**	**27**	**13**	**2**	**3.2**
Z2	Taking measurements and diagnostic tests of motor vehicle and locating defects	**11**	**25**	**26**	**1**	**0**	**3.7**
Z3	Interpreting the results and evaluation of the technical condition of motor vehicle	10	22	31	0	0	3.7
Z4	Adjusting the scope and methods of the repair of motor vehicle	13	36	12	2	0	3.95
Z5	Dismantling, verification and matching spare parts for replacement of the motor vehicle	8	19	32	3	1	3.47
Z6	Replacing the damaged assemblies and components of motor vehicle	7	27	29	0	0	3.65
Z7	Maintenance of assemblies and components of motor vehicle	22	15	20	5	1	3.82
Z8	Assessing the quality of repair, and its valuation/estimated cost	7	12	36	6	2	3.25

Source: Own study

As can be seen from the table the most significant task is the *adjusting the scope and methods of the repair of motor vehicle* as *the accepting and preparing motor vehicle for diagnostics* is

of less importance. As in the attached table can be seen there no significant differences between the indicators.

2.2.2.2. Acceptance level of professional competence

Table 10. Degree of professional competencies of a vehicle mechanic according to the opinion of employers

No.	List of professional competences	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
KZ1	Fault diagnosis of the vehicle	**25**	**15**	**23**	**0**	**0**	4.03
KZ2	Repairing parts and assemblies of motor vehicle	19	27	17	0	0	4.03

Source: Own study

Fault diagnosis of the vehicle and *repairing parts and assemblies of motor vehicle* are evaluated by the employees on the same level which suggest that both tasks are of almost equal importance.

2.2.2.3. Acceptance level of knowledge and skills

2.2.2.3.1. Fault diagnosis of the motor vehicle

Table 11. The degree of importance of knowledge that a motor vehicle mechanic should have in the diagnosis of failures of a motor vehicle according to the opinion of employers

No.	Knowledge	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	Safety regulations, fire regulations, environmental protection and ergonomics within diagnosis of components of motor vehicle	15	15	24	4	5	**3.49**

No.	Knowledge	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
2	Diagnostic and repair documentation	25	21	17	1	0	**4.09**
3	Classification and identification of motor vehicles	10	7	22	14	10	**2.88**
4	Structure and operation of components and assemblies of motor vehicles of various types	11	29	17	4	2	**3.68**
5	Basics of technical drawing	0	1	31	13	18	**2.23**
6	Basics of electrical engineering and electronics	3	21	18	9	12	**2.9**
7	Tools and measuring instruments necessary to perform motor vehicle diagnostics	6	35	22	4	0	**3.64**
8	Methods of diagnosis of motor vehicles	31	19	13	0	0	**4.3**
9	Types of measurement and diagnostic testing of vehicles	16	17	28	2	0	**3.7**
10	Principles of interpretation of the results of diagnostic tests	8	27	22	4	2	**3.6**
11	Computer programs for the diagnosis of components and assemblies of motor vehicles	9	13	28	8	5	**3.2**
12	Traffic rules and driving technique	0	9	13	17	24	**2.1**
13	Basics of entrepreneurship in the automotive industry	6	8	19	8	22	**2.5**

Source: Own study

Table 12. The degree of importance of skills that a vehicle mechanic should have in the diagnosis of failures of a motor vehicle according to the opinion of employers

No.	Skills	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	Obey the safety regulations, fire regulations, environmental protection and ergonomics within diagnosis of components of motor vehicles	0	15	20	11	17	**2.5**
2	Prepare orders of service concerning diagnosis of a motor vehicle	13	8	27	13	2	**3.3**
3	Classify motor vehicles	12	29	18	2	2	**3.7**
4	Characterize the construction of motor vehicles and explain the principles of components and assemblies of such vehicles	12	18	25	3	5	**3.5**
5	Observe the standards for technical drawing, machine parts, construction materials and supplies	1	11	26	18	7	**2.7**
6	Recognizes the parts and electrical and electronic systems	2	19	35	4	3	**3.2**
7	Use tools and measuring instruments to perform motor vehicle diagnostics	11	28	19	5	0	**3.7**
8	Choose the method and define the scope of diagnostic components and combinations of motor vehicles	10	26	22	2	3	**3.6**
9	Perform diagnostics of motor vehicles using measuring devices (engines, chassis, bodywork, tires)	9	18	31	5	0	**3.5**

No.	Skills	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
10	Interpret the results of diagnostic tests of motor vehicles	9	25	18	6	5	**3.4**
11	Use computer programs used for the diagnosis of motor vehicles.	3	29	13	7	11	**3.1**
12	Follow traffic rules	3	13	9	17	21	**2.4**
13	Establishing and running his/her own business	1	17	13	15	17	**2.5**

Source: Own study

As can be seen the most significant knowledge on the field of fault diagnosis of the motor vehicle is the *knowledge about methods of diagnosis of motor vehicles*, the least important factor is about the *traffic rules and driving technique.* As far as the skills concerned *classifying motor vehicles* is of the most relevance, it is very important to remark that *use tools and measuring instruments to perform motor vehicle diagnostics* is signed on the same level. *Following traffic rules* is the least important skill.

2.2.2.3.2. Repairing parts and assemblies of motor vehicles

Table 13. The degree of importance of knowledge that a motor vehicle mechanic should have in the repair of components and assemblies of motor vehicles according to the opinion of employers

No.	Knowledge	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	Safety regulations, fire regulations, environmental protection and ergonomics within the repair of parts and assemblies of motor vehicles	24	17	22	0	0	**4**

No.	Knowledge	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
2	Catalogs and manuals of motor vehicles	16	26	17	3	1	**3.8**
3	Basics of technical drawing	2	35	19	5	2	**3.5**
4	Construction and operation of motor vehicles (drive system, brake system, steering system, bearing and the driving elements of motor vehicles, wheels and tires, body of motor vehicles)	2	16	20	17	8	**2.8**
5	Basic knowledge on engines	26	25	12	0	0	**4.2**
6	Technology of repair of motor vehicles	18	19	22	3	1	**3.8**
7	Rules and scope of car service.	5	13	29	11	5	**3**
8	Price list of the services connected with the repair of parts and assemblies of motor vehicles	4	13	19	18	9	**2.8**

Source: Own study

Table 14. The degree of importance of skills that a motor vehicle mechanic should have in the repair of components and assemblies of motor vehicles according to the opinion of employers

No.	Skills	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	Obey the safety regulations, fire regulations, environmental protection and ergonomics within the repair of parts and assemblies of motor vehicles	8	17	34	3	1	**3.4**

No.	Skills	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
2	Use the technical documentation of machines and equipment	3	8	21	15	16	**2.5**
3	Use the technical drawing of the mounting and installation work	11	8	28	9	7	**3.1**
4	Locate damaged assemblies and subassemblies of cars	10	26	21	4	2	**3.6**
5	Choose the methods of repair of motor vehicles	15	23	19	5	1	**3.7**
6	Disassemble the assemblies and components of motor vehicles	8	17	20	16	2	**3.2**
7	Select assemblies, subassemblies or their substitutes which are necessary to be replaced	16	27	13	7	0	**3.8**
8	Replace damaged assemblies and components of vehicles using the equipment and workshop tools	14	11	35	1	2	**3.5**
9	Choose supplies	3	3	25	17	15	**2.4**
10	Control the quality of vehicle repair	21	22	16	2	2	**3.9**
11	Perform periodic maintenance of vehicles	12	23	21	5	2	**3.6**
12	Assess the quality of repair and determine its cost	4	17	25	13	4	**3.1**
13	Prepare estimated cost of repair	17	24	16	3	3	**3.8**

Source: Own study

Investigating the relevance of different professional competences and compared that with each other on the area of repairing parts and assemblies of motor vehicles, considerable attention has been paid to the *basic knowledge on engines.*

It was also shown that the importance indicators of the knowledge about *construction and operation of motor vehicles (drive system, brake system, steering system, bearing and the driving elements of motor vehicles, wheels and tires, body of motor vehicles)* and about *price list of the services connected with the repair of parts and assemblies of motor vehicles* are significant on the same level. As far as the skills concerned the most relevant skills are with the same indicators *select assemblies, subassemblies or their substitutes which are necessary to be replaced* and *preparation estimated cost of repair,* whereas *choice of supplies* is not of relevance.

2.2.2.4. Acceptance level of personal and social competences

Table 15. The degree of importance of personal and social competencies relevant to the position of a motor vehicle mechanic, according to opinions of employers

No	Personal and social competences	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	He/she feels responsible for the preformed tasks connected with car diagnosis and repair	12	15	23	11	2	**3.4**
2	He/she is creative and consistent in the implementation of tasks	17	5	29	7	5	**3.3**
3	He/she respects professional confidentiality	19	21	19	3	1	**3.9**
4	He/she can evaluate his/her actions and the actions of his/her team and takes responsibility for the consequences (within the car diagnosis and repair)	20	22	17	2	2	**3.9**

5	He/she works well both on his/her own and within a group	6	25	31	1	0	**3.6**
6	He/she recognizes his/her own learning needs, updates his/her knowledge and improves his/her professional skills	14	24	19	5	1	**3.7**
7	He/she deals well with stress.	3	7	32	9	12	**2.7**

Source: Own study

According to the research there are numbers of similarities between the indicators, the most relevant competences are *respecting of professional confidentiality* and *responsible evaluation his/her actions and the actions of his/her team and takes responsibility for the consequences (within the car diagnosis and repair).* Contrary to them *dealing well with stress* is of the least relevance.

2.2.2.5. Acceptance level of key competences

Table 16. The degree of importance of key competencies relevant to the position of a motor vehicle mechanic, according to opinions of employers

No	Key competences	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	Problem solving	11	25	19	5	3	**3.6**
2	Teamwork	22	15	17	7	2	**3.8**
3	Communication in the mother tongue and in foreign languages	11	19	24	4	5	**3.4**
4	Leadership skills	10	12	21	13	7	**3.1**

No	Key competences	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
5	Planning and organizing work	9	22	27	3	2	**3.5**
6	Motor efficiency	11	26	19	4	3	**3.6**
7	The ability of comprehensive reading and writing	4	11	27	13	8	**2.8**
8	Mathematic skills	5	9	16	15	18	**2.5**
9	The ability to search, filter and critical analysis of information	8	12	23	14	6	**3**
10	The ability to use modern information and communication technologies	9	18	19	12	5	**3.2**

Source: Own study

The results show that whereas in the profession of electrician mathematic skills are considered the most relevant key competences, in the profession of car mechanic this one is of lowest importance. Teamwork is considered the most relevant key competence.

2.3. Case study

1. Electrocelos

Electrocelos is a company which was brought to life 30 years ago.

From a small workshop it gradually evolved and chenged into na enterprise which employs almost 50 people (both on permament and temporary contracts). Electrocelos emerged based on a long experience in the marketing, design and manufacture of components for automation of doors, windows and shutters, as well on the research of the current needs of the European market, where reliability and competitiveness necessarily have to be combined.They differ from other companies being competitive and offering aftermarket quick response. They want to grow and for that reason they are constantly open to new markets and looking for new agents.

The area of automation was the last of Grupo André to be created, but quickly became the biggest of them all.

Electrocelos S.A. commercializes and installs automated systems. They were able to create a network of resellers and installers throughout Europe.

That way, was created a team dedicated to the installation of all products, continuing an ambitious and innovative project, in which we ally quality, price and speed. So we continue to bet on specialized technical personnel, and thus can install and perform all necessary tests on our products, to ensure flawless performance.

They have designed automation solutions in view of easy installation, long life and low maintenance, both for private and industry sectors for various applications, featuring automatic products designed to meet all needs.

Electrocelos automatic products are available for a wide range of applications, with the assurance of high quality manufacturing, assembly by experienced personnel and qualified technical assistance.

As the company is growing fast they have their own departamento devoted to lectrical parts. They are constantly looking for new solutions in the field. Their workshops are well designed and they undergo a constant chnge as the answer to the need of the market.

They employ electricians and electrotechnicians from all around Portugal. They give them the chance and opprtunity to grow and develop by allowing them to travel and visit branches and offices in other European countries.

As far the electrical departamento is concerned they offer servisse on the spot They work on the best possible equippement.

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2. Ferreirolux, Barcelos

Ferreirolux, is a company which appeared on the market in Barcelos around 20 years ago. they specialise in the production of lamps of diferente kinds. The company managed to develop in the recente years and now it opened another branch in Lijo. They have different departaments from the production line through the electrical service to the sales departamento. Ferreirolux consider itself as a small sized company which employs 23 people.

The company is run by a woman which for portuguese standarsd is something new. Their electrician and the staff of other depratements are people with pasion and devotion. As they are deeply set on the market in Barcelos, they cooperate with schools, institutions and associations which place the stagers there.

Ferreirolux is a company which offers to its customers full service. They introduced a 24h emergency cal for electrician. The clients can count on the company 7 days a week.

During the interview the manager and owner of the company underlined the fact that students wgo have stages in the company lack practical knowledge. Mrs Susana Amadeu stated that the students need more practice at school or outsider it so that is why she is so open to place

the stagers in her own company. She sees nad understands the needs and desires of students to develop.

Imperio Centro Auto, is a company placed in Braga. The company employs 25 people. They specialise with three diferente services:

1) Repair of all types of vehicles
2) Tyres (exchange and repair)
3) Sales departamento of used cars

The company has strong and deep roots on the market in Braga. Bearing in mind the fact that they hire a lot of employees and also collaborate with local schools within the field of vocational training and stages, the performed interview brought a lot of answers to our questions.

Similarily to other companies, the owner told us that the biggest problem he is facing nowadays with his employees is the lack of motivation. According to him, majority of well-qualified employees are leaving Portugal to work in fereign countries within their fields of study. He also told us that through international contact he is trying to invest in the employees by allowing them to participate in workshops, show initiative by coming up and realising their own ideas.

As for the stagers he is working with, he admitted to unofficial converstaions with teachers during which he tried to suggest some ideas connected to the students' curriculum. Unfortunately the teachers in Portugal do not have the freedom to take this kind of decisions on their own.

The general opinion of the owner was quite positive buta t the same time he pointed out flaws of the system.

3. H.M Motor

H.M.Motor is a company dedicated to the commercialization of AUTOMOTIVE QUALITY USED AS NEW. It started its activity in 2000 carrying far extensive experience in the automotive sector by its management and employees, and successively extended its universe of customers and friends. From the beginning the H.M.Motors, as well as all Group companies are guided by the strength, honesty, integrity and quality factors without which would not have been possible for successful implementation in the market, which we are proud and we strive to maintain. We sell the best brands with all necessary guarantees, thus providing a quality service and satisfaction to our customers at the time of sale, delivery and after sales service. H.M Motor is a place where you will not only buy a car but also or most of all you will manage to repair it. They employ around 20 people. Among those 20 people, you will find 6 car mechanics who specialise in the repair of all types of vehicles.

2.3.1. Summary of the case study:

- Does the enterprise employ students from vocational schools? If no, why not?
As far as the competences and skills are concerned, are the employees able to meet the requirements of employers?

The enterprises we interviewed coopeate with graduates of vocational courses performed by local schools. The owners and managers told us that first, by offering the stages to the schools and the students he has the chance to create and bring up his future employees. Barcelos is a region which is mostly concentrated on tourism and handcrafts, that is why, the local businesses like car mechanic workshops do not have any problems to employ the students who underwent a training course in the profession of a car mechanic. Secondly, the interviewees pointed out the problema of the fact that students and graduates have too much theoretical knowledge and not enough practical skills. The schools are lacking spaces to prepare the students from the practical side for the future profession and when the graduates enter the company, although, they are very compassionate, they have problems with adjusting to the system of work, they lack the knowledge on proper tools and they need to be properly trained in order to perform the job properly.

- Which professional competences are the students from the vocational schools missing?

All the interviewed company owners and managesr underlined the fact that the competecies that the students are missing belong to the practical part of the training. Although the students posses the theoretical knowledge they lack the experience and practical part. The majority of schools are not equipped enough to prepare the students

of vocational training for the future work. As mentioned by one owner they get an excellent, well-educated material who does not know how to use the tools properly.

- Do the employees have possibilities to professional development? (Courses, education, national and international internships) Is the training leave ensured and paid?

Nowadays the trend in Portugal has changed. The owners and managers told us that they are investing in the employee. They give them the opportunity to expand, gain new knowledge and working experience. They send the employees to additional courses, give them a chance to take part in exhibitions, presentations, international meetings which help to broaden the working competencies.
On the other hand this opprtunity is mostly given to the most ambitious and hard working employees. The owners state that they do not create problems when the employee wants to take part in an additioanl training but the company is only covering the cost of the training itself. The costs of travel or stay have to be paid by the employees. What is more, as for the training leave, usually the company managers and owners allow their employees to take part in the training but it cannot be longer than one week.
As for international internships, so far not many employees of the companies we interwieved were interested in taking part in a training abroad.

-Does the enterprise cooperate with vocational schools concering the organisation of tasks and implementation of courses, internships or in any other way?

According to the performed interwiev, the companies do not influence the schools as far as the curriculum is concerned. As the general trend in Portugal is to gain more

theoretical than practical knowledge, the employers take into consideration the fact that they will have to educate their own employee if they want the company to achieve any success. Although there is a cooperation between the school and the representative of the local labour market, the system needs to undergo some more changes in order for both involved parties to become more coherent.

- Does the company take part in the creation of the curriculum for the vocational and training courses?

As mentioned before the companies do not have any influance on the curriculum for students of vocational courses. This departamento belongs entirely to the Ministry of education and board of professional teachers who meet during general meetings and decide on the curriculum for the current year.

2.4. Conclusions

The case study presented consists of the experiences collected at the companies with the professional area of electricians and car mechanics.

Both of them are of relevant importance in Portugal and their importance has increased in the last years.

Thus, it appears to be appropriate to analyse the impact and relevance of the two professions on the practice involving the companies.

One of the more significant findings to emerge from this study is that professional identity is the starting point for establishing common standards and professional development, which is also strategically important at the institutional level.

In order to get an inside view of the professional identity we conducted a discussion session with a group of Portuguese professionals of electricians and car mechanic aimed at finding the most relevant competences, skills and knowledge in a broad sense, identifying competences and skills required to perform such roles and discussing perspectives for career development in the current Portuguese environment.

This paper is a result of a major study that have the object of making an overview of the accepted competences and skills in the professions electrician and car mechanic.

Summing up the results it can be concluded that the investigated competences, tasks and skills are of practical relevance on the workplaces; their permanent development can contribute to improving quality of work which meets all of the criteria needed on the European labour market.

According to the opinion of the employees on different professional area it is quite necessary to be faced with the factors which were investigated during this study.

On the basis of the promising findings presented in this paper, work on the remaining issues is continuing and will be presented in the future papers.

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Chapter 3

The required professional competencies on typical job positions in professions of an electrician and a vehicle mechanic in Germany

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3.1. Typical workplaces of electricians (energy and building services) and car mechanics (passenger cars)

Within this study 30 trainers from motor vehicle companies and 33 from electric businesses had been interviewed in Germany. Interviewees were asked for typical work locations or workplaces as well as typical working activities (see chapter 2). In addition trainers were interviewed concerning requirements regarding technical, social and personal competencies of professionals and key skills (see chapter 3). Finally personal data was collected.
These quantitative questionings were carried out in face-to-face situations in order to provide chances for queries, three qualitative interviews per profession were done. All results can be found in the following description and analysis.

3.1.1. Typical workplaces of car mechanics

3.1.1.1. Typical work locations

Small to middle size garages and production sites are common locations when working as a car mechanic (passenger cars). Businesses hiring professionals in this field are usually garages, car showrooms, spare parts stores or wholesale distributors. Working for roadside assistances, in garages owned by hauliers or inspection bodies is also possible. In addition car mechanics can work for automobile manufacturers and supply industries as well as for local public transport companies or logistics enterprises with large fleets.

3.1.1.2. Analysis of the interviewed enterprises

Most of the enterprises focus on service although it is important to realise that commercial and administrative topics are important parts of business. But regarding the manufacturing part, one can state that it is mostly insignificant for the majority of enterprises.

a) manufacturing - **2**
b) services - **20**
c) commercial - **13**
d) administrative - **15**
e) others - **6**

Most of the interviewed enterprises (15 out of 23) occupy ten to fifty employees. These are mostly small or middle size garages. Six companies classify as micro-businesses as they employ up to nine people. Besides that two large enterprises with more than 500 employees took part in the study.

a) 1-9 people - **6**
b) 10-50 people - **15**
c) 51-250 people - **3**
d) 251-500 people - **0**
e) more than 500 people - **2**

3.1.1.3. Analysis of interviewees

For the most part interviewees are **male** (**27 people**), only **3** are **female**. Amongst the interviewed persons there were only three women who work as trainers.

Regarding age structure it can be stated that the majority is older than 26. There is only one person younger than 26 years of age.

a) 18-25 - **1** people
b) 26-40 - **17** people
c) 41 and more - **12** people

As the study also deals with educational levels of the interviewees it can be said that most of them hold a secondary vocational level (German *Realschule*) or secondary general (German *Abitur*). There is only one person holding a higher degree.

a) primary - **0** people
b) basic vocational - **0** people
c) secondary vocational - **17** people
d) secondary general - **5** people
e) higher degree of Engineer, Bachelor - **1** people
f) Master's degree - **0** people

Current job descriptions of the interviewees rank from managing director to **head of service/fleet/branch/store or garage.**

– **Master Training** ..... - **5** people
– **KFZ Master**..... .... - **6** people
– **Managing Director**..... ..... - **7** people

Most of the interviewees have been employed by the current company for more than eleven years but have been holding their current position for less than eleven year. Some of the persons

interviewed have been employed for more than 21 years by their current employer but none of them has been holding his or her current position all the time.

TOTAL SENIORITY:

a) 1-5 years - **3** people
b) 6-10 years - **3** people
c) 11-20 years - **9** people
d) 21 years and more - **10** people

SENIORITY ON THE CURRENT POSITION:

a) 1-5 years - **7** people
b) 6-10 years - **6** people
c) 11-20 years - **8** people
d) 21 years and more - **0** people

3.1.1.4. Typical workplaces

The respondents were originally offered the chance to choose one out of three typical professions in order to answer only questions in this specific field. The three options mentioned were car mechanic, mechanic diagnosian and foreman. But the pre-test already showed that this classification required some adaption for Germany which was also recommended by experts of Handwerkskammer Erfurt who argued that the classification demanded changes in order to meet the reality of German automotive vocations. In cooperation with the project manager car mechanics, mechanic diagnosians, car electricians and body constructors were considered to be typical professions in the field of automotive in Germany and were hence included.

The project manager's decision concerning the changes in consideration of characteristics in the German automotive branch was totally right which can be seen when looking at the results.

Almost all of the respondents state that car mechanics hold positions in the fields of car mechanic, vehicle diagnosis and car electricity. Half of the interviewees also say that body construction is a typical position as well regarding their daily businesses. There were no further possible professions mentioned.

3.1.2. Typical workplaces of electricians

3.1.2.1. Typical work locations

As for electricians it is common to work in factory buildings, garages, offices or outdoors. Most companies hiring professionals with appropriate qualifications are part of the electric handicraft and sometimes part of the property sector (e.g. facility management, janitorial services). Others are repair shops, car showrooms, spare parts stores and distribution services.

3.1.2.2. Analysis of the interviewed companies

The interviewed enterprises focus on manufacturing and services although commercial and administration are important as well.

f) manufacturing - **14**
g) services - **11**
h) commercial - **6**
i) administrative - **7**
j) others - **9**

Compared to the size of enterprises in the automotive industry as mentioned earlier, enterprises of the interviewed persons in the branch of electronics are of similar size. Most of them classify as

small to middle size companies as they occupy 10-250 people (18 occupy 10 to 50 people, 5 occupy 51 to 250 people). Another seven can be regarded as micro-businesses employing up to nine persons. There were three big businesses as well with more than 500 employees.

f) 1-9 people - **7**
g) 10-50 people - **18**
h) 51-250 people - **5**
i) 251-500 people - **0**
j) more than 500 people - **3**

3.1.2.3. Analysis of interviewees

Almost all interviewed persons were **male** (**32 persons**). There was only **one woman** in the profession of trainers who had been interviewed. Taking age structure into consideration it can be stated that the majority is older than 26. Only one interviewee was younger than 26.

a) 18-25 - **1** people
b) 26-40 - **18** people
c) 41 and more - **14** people

When looking at education levels one can state that most interviewees hold a secondary vocational (German *Realschule*) or a secondary general (German *Abitur*). In terms of trainership being a master craftsman is obligatory. That is why all interviewees are master craftsmen. None of the interviewed holds a master´s degree from university.

a) primary - **0** people
b) basic vocational - **0** people
c) secondary vocational - **20** people
d) secondary general - **7** people

e) higher degree of Engineer, Bachelor - **1** people
f) Master's degree - **0** people

The current job titles of the interviewees are **managing director**, **senior fitter**, **branch manager**, **division manager**, **maintenance manager**, **head of customer service** or **foreman**.

- **Instructur** ..... - **2** people
- **Employee**..... ..... - **2** people
- **Managing Director**..... - **7** people

Most of the interviewees have been employed by their companies for more than 21 years already. Almost half of them have been holding their current position throughout all these years. But at the same time many of them hold their current position for no longer than five years. In comparison to car mechanics there is a big difference as none of those interviewees have been holding their positions for more than 21 years.

1. TOTAL SENIORITY:
   e) 1-5 years - **0** people
   f) 6-10 years - **6** people
   g) 11-20 years - **9** people
   h) 21 years and more - **17** people

2. SENIORITY ON THE CURRENT POSITION:
   e) 1-5 years - **12** people
   f) 6-10 years - **7** people
   g) 11-20 years - **3** people
   h) 21 years and more - **9** people

3.1.2.4. Typical Workplaces

Originally, project members had agreed on the examination of the following professions: *restorer of electrical equipment* and *electrical appliances and electrician of measuring devices (electrical meters).* As these professions do not exist as such in Germany, adaptions had to be made. In fact the German electrician (*Elektroniker*) is included into two disciplines which means that workplaces are highly influenced by these disciplines. Therefore German experts decided to focus on energy and building technologies as well as information and telecommunications technology. The suggestion of including these professions in the survey had been confirmed by the project manager.

Expectations were met when interviewees confirmed that both of the chosen professions can be regarded as typical ones. In terms of energy and building technologies it has to be mentioned that due to high numbers of participants in this branch it is natural that mostly enterprises that offer vocational training or plan to do so in the future were interviewed. Besides these typical workplaces, one person mentioned another one which was *automation and control technology*.

3.2. Typical professional tasks in the professions of electricians (energy and building technology) and car mechanics (passenger cars) being carried out at workplaces.

3.2.1. Typical professional tasks in the profession of car mechanics (passenger cars)

Interviewees were asked to rank eight typical tasks according to their relevance. In addition individual standard tasks could be mentioned and weighted. But none of the car mechanics used this option which means that the enlisted eight typical tasks mirror German daily routines quite well. This is also emphasized by the fact that most tasks are ranked between 3.0 and 4.4 which means *import* and and *very important*.

For the majority of enterprises technical tasks (*dismantling, verification and matching spare parts for replacement of the motor vehicle*, Z5) were ranked as *very important* (average: 4.4).

Secondly, *maintenance of assemblies and components of motor vehicle* (Z7) (average: 3.3) was mentioned.

Again, quite close to the above mentioned the two technical tasks *taking measurements and diagnostic tests of motor vehicle and locating defects* (Z2) and *replacing the damaged assemblies and components of motor vehicle (*Z6) were ranked.

Interpreting the results and evaluation of the technical condition of motor vehicle (Z3) were regarded as *very important* as 3.9 is close to 4.0 (*very important*).

Summing up the results of Z1, Z4 and Z8 one can say that these were ranked somewhere in between *important* and very *important*. In contrast to car mechanics electricians ranked all of the activities as *very important* (close to 4.0).

The index of 3.1 represents *adjusting the scope and methods of the repair of motor vehicles* (Z4) and *assessing the quality of repair and its valuation/estimated cost* (Z8). It is important to know that one interviewee regards theses competencies as *unnecessary*.

Another three interviewees regard *collecting and preparing vehicles for repairs/diagnosis* (Z1) as *unnecessary*. But again another three interviewees are of the opposite opinion so that in the end this item is ranked as 3.0 throughout all surveys.

Table 1. The degree of importance of actions performed by vehicle mechanics according to the opinion of employers

No.	List of professional tasks	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
Z1	Accepting and preparing motor vehicles or diagnostics	3	8	9	7	3	**3**
Z2	Taking measurements and diagnostic tests of motor vehicle and locating defects	6	23	1	0	0	**4,2**
Z3	Interpreting the results and evaluation of the technical condition of motor vehicle	5	19	4	2	0	**3,9**
Z4	Adjusting the scope and methods of the repair of motor vehicle	2	7	13	7	1	**3,1**
Z5	Dismantling, verification and matching spare parts for replacement of the motor vehicle	17	9	3	1	0	**4,4**
Z6	Replacing the damaged assemblies and components of motor vehicle	13	10	6	1	0	**4,2**
Z7	Maintenance of assemblies and components of motor vehicle	14	11	4	1	0	**4,3**
Z8	Assessing the quality of repair, and its valuation/estimated cost	2	9	10	9	0	**-3,1**

Source: Own study

3.2.2. Typical professional tasks in the profession of electrician (energy and building technology)

Interviewees of this profession were given the opportunity to rank five typical professional tasks by importance. Additionally they were offered the chance to name further ones which was done by one of them.

Again it can be stated that the chosen items correspond very well to the actual tasks that can be observed in daily business in German enterprises in this sector.

The two items *assembling and running of the machinery and electrical equipment on the basis of technical documentation* (Z1) and *implementation and running of electrical installations on the basis of technical documentation* (Z2) are both ranked as a 4.4.

Another very important item *is mounting of control systems, regulation and protection of machinery and electrical equipment on the basis of technical documentation* (Z4) according to the interviewees.

Both *assessing the technical condition of machinery, equipment and electrical systems after installation on the basis of measurements* (Z3) and *monitoring and verification of the fire protection measurements on the basis of technical documentation* (Z5) were given a 3.9 and therefore rank closely below *very important*.

The additional item that one of the interviewees established is ***maintaining electrical machinery according to German DIN*** **(Zn)**. It is estimated as very important.

Table 2. The degree of importance of actions performed by electricians according to the opinion of employers

No.	List of professional tasks	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
Z1	Assembling and running of the machinery and electrical equipment on the basis of technical documentation	16	15	2	0	0	**4,4**

No.	List of professional tasks	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
Z2	Implementation and running of electrical installations on the basis of technical documentation	15	16	2	0	0	**4,4**
Z3	Assessing the technical condition of machinery, equipment and electrical systems after installation on the basis of measurements;	10	14	6	3	0	**3,9**
Z4	Mounting of control systems, regulation and protection of machinery and electrical equipment on the basis of technical documentation	9	18	4	2	0	**4**
Z5	Monitoring and verification of the fire protection measurements on the basis of technical documentation	8	16	7	2	0	**3,9**

Source: Own study

3.3. Professional competencies as expected by employers (knowledge, skills and social competence)

Questions about professional competencies as expected by employers represent a considerable element of the survey. Interviewees were supposed to explain which competencies they expect from qualified applicants and how important those are when it comes to employment.
Competencies were further subdivided into *professional*, *social* and *personal skills* and *key competencies*. At first *professional skills* were examined and therefore interviewees were asked to grade crucial *professional competencies*. After that the very contents relating to these crucial competencies were graded.
The general questionnaire made another distinction of *knowledge* and *ability/skills*. Counsellors of *Handwerkskammer Erfurt* regarded the whole of ***knowledge*** relating to the *competencies* as essential for the vocational training of car mechanics and electricians in Germany. Therefore they graded all items as ***crucial*** and excluded this part of the grading from the survey because it was beyond dispute. The project manager agreed upon this procedure.

3.3.1. Expected professional competencies of car mechanics (passenger cars)

In the following, expectations of enterprises concerning professional competencies of car mechanics will be presented.
Expectations were subdivided into professional, social and individual skills as well as key competencies. Companies were given the opportunity to rank them with the help of a five-point scale reaching from *unnecessary* (=1) to *crucial* (=5).

3.3.1.1. Required professional competencies

Both of the professional competencies *fault diagnosis of the motor vehicle* (KZ1) and *repairing parts and assemblies of motor vehicles* (Kz2) were rated with a 4.3 which means *very important*. None of the enterprises classified these as *unnecessary* (=1) or *not important* (=2).

Table 3. Degree of professional competencies of a vehicle mechanic according to the opinion of employers

No.	List of professional competences	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
KZ1	Fault diagnosis of the vehicle	13	13	4	0	0	**4,3**
KZ2	Repairing parts and assemblies of motor vehicle	14	10	6	0	0	**4,3**

Source: Own study

Many interviewees took their chances and named further *professional skills*. Due to the fact that those could be named first, interviewees mentioned a wide range of them and also mixed them up with *social* and *personal skills* as well as *key competencies* because they did not know that there would still be an opportunity to add these as well. This results in partial double-grading of single *skills* and *competencies* (e.g. problem solving, linguistic skills). In order to keep this analysis understandable and friendly to readers' eyes only items that come along with *professional skills* will be presented in the following. The rest of them will be mentioned when *social* and *personal skills* and *key competencies* are mentioned.

Additionally mentioned *professional skills* are**: *handling diagnosing systems, specialised fault location, well-versed handling of various diagnosing systems*** and ***an educational background in the field of welding*.**

3.3.1.2. Abilities/skills (competencies KZ1) – Fault diagnosis of the vehicle

As has been mentioned at the beginning of chapter 3 items connected to ***knowledge*** are graded as ***crucial*** for Germany. This is why there will not be any further analysis of these. **Surveys in Germany focused on ability and skills instead.**

Regarding professional skills connected to *fault diagnosis of the vehicle* (KZ1) it can be stated that tools and measuring instruments necessary to perform motor vehicle diagnostics (Kz1.7), *types of measurement and diagnostic testing of vehicles* (Kz1.9) as well as *computer programs for the diagnosis of components and assemblies of motor vehicles* (Kz1.11) are regarded as key skills. All of these skills are graded 4.5 which means *very important* to *crucial*. They are closely followed by safety regulations, fire regulations, environmental protection and ergonomics within diagnosis of components of motor vehicles (Kz1.1) and principles of interpretation of the results of diagnostic tests (Kz1.10) with a 4.4.

A bundle of four other skills are given a 4.3. These are: *classification and identification of motor vehicles* (Kz1.3*), basics of electrical engineering and electronics (Kz1.6), traffic rules and driving technique* (Kz1.12) and *basics of entrepreneurship in the automotive industry* (Kz1.13).

Diagnostic and repair documentation (Kz1.2) and *basics of technical drawing* (Kz1.5) are regarded as very important but not crucial and therefore receive a 4.2 in average.

The last two skills *structure and operation of components and assemblies of motor vehicles of various types* (Kz1.4) and *methods of diagnosis of motor vehicles* (Kz1.8) are ranked as least important (4.1). Nevertheless 4.1 still represents *very important*. That is why one can conclude that all of the introduced items are of great importance for German enterprises.

Please note that there were no further professional skills mentioned by the interviewees.

Table 4. The degree of importance of skills that a vehicle mechanic should have in the diagnosis of failures of a motor vehicle according to the opinion of employers

No.	Skills	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	Obey the safety regulations, fire regulations, environmental protection and ergonomics within diagnosis of components of motor vehicles	14	25	1	0	0	**4,4**
2	Prepare orders of service concerning diagnosis of a motor vehicle	9	15	2	1	1	**4,2**
3	Classify motor vehicles	14	11	3	1	0	**4,3**
4	Characterize the construction of motor vehicles and explain the principles of components and assemblies of such vehicles	9	15	5	1	0	**4,1**
5	Observe the standards for technical drawing, machine parts, construction materials and supplies	10	15	2	1	0	**4,2**
6	Recognizes the parts and electrical and electronic systems	12	13	4	0	0	**4,3**
7	Use tools and measuring instruments to perform motor vehicle diagnostics	15	12	1	0	0	**4,5**
8	Choose the method and define the scope of diagnostic components and combinations of motor vehicles	8	14	5	0	0	**4,1**
9	Perform diagnostics of motor vehicles using measuring devices (engines, chassis, bodywork, tires)	15	13	1	0	0	**4,5**
10	Interpret the results of diagnostic tests of motor vehicles	12	13	2	0	0	**4,4**
11	Use computer programs used for the diagnosis of motor vehicles.	16	12	1	0	0	**4,5**

No.	Skills	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
12	Follow traffic rules	9	13	2	1	3	**4,3**
13	Establishing and running his/her own business	1	5	1	4	11	**4,3**

Source: Own study

3.3.1.3. Abilities/skills (competencies Kz2) – Repairing parts and assemblies of motor vehicles

Regarding professional competencies connected to the category of *repairing parts and assemblies of motor vehicles* (Kz2) one can see that there are larger spreads which means that the importance of the items is regarded as highly different by the majority of interviewees (between 3.5 and 4.5). *Locate damaged assemblies and subassemblies of cars* (Kz2.4) and *select assemblies, subassemblies or their substitutes which are necessary to be replaced* (Kz2.7) are ranked highest with a 4.5.

Items *obey the safety regulations, fire regulations, environmental protection and ergonomics within the repair of parts and assemblies of motor vehicles* (Kz2.1), *choose the methods of repair of motor vehicles* (Kz2.5) and *disassemble the assemblies and components of motor vehicles* (K72.6) are following closely with a 4.4. This means that skills that classify as Kz1.1 and Kz2.1 are the two that were ranked highest by most of the interviewees and therefore are the most important professional core competencies.

Another four skills were given a 4.3 namely *use the technical documentation of machines and equipment* (Kz2.2), *use the technical drawing of the mounting and installation work* (Kz2.3), *replace damaged assemblies and components of vehicles using the equipment and workshop tools* (Kz2.8) and *perform periodic maintenance of vehicles* (Kz2.11).

There are no items ranked as 4.2 or 4.1 wo that the next one is control the quality of vehicle repair (Kz2.10).

Receiving a 3.8 *assess the quality of repair and determine its cost* (Kz2.12) is regarded as still very important. This is the first time that an item is located below 4.0.

Choose supplies (Kz2.9) and *prepare estimated cost of repair* (Kz2.13) are least important to the average interviewee and therefore receive a 3.5. That is why they are not regarded as *very important* but only as *important*.

Please note that there were no suggestions made in terms of adding further skills and abilities that qualify as requirements.

Table 5. The degree of importance of skills that a motor vehicle mechanic should have in the repair of components and assemblies of motor vehicles according to the opinion of employers

No.	Skills	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	Obey the safety regulations, fire regulations, environmental protection and ergonomics within the repair of parts and assemblies of motor vehicles	15	12	2	0	0	**4,4**
2	Use the technical documentation of machines and equipment	11	15	3	0	0	**4,3**
3	Use the technical drawing of the mounting and installation work	11	14	3	0	0	**4,3**
4	Locate damaged assemblies and subassemblies of cars	17	10	2	0	0	**4,5**
5	Choose the methods of repair of motor vehicles	13	14	2	0	0	**4,4**
6	Disassemble the assemblies and components of motor vehicles	15	12	2	0	0	**4,4**

No.	Skills	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
7	Select assemblies, subassemblies or their substitutes which are necessary to be replaced	15	11	0	1	0	**4,5**
8	Replace damaged assemblies and components of vehicles using the equipment and workshop tools	13	11	2	2	0	**4,3**
9	Choose supplies	3	11	8	4	1	**3,5**
10	Control the quality of vehicle repair	5	17	3	2	1	**4**
11	Perform periodic maintenance of vehicles	14	13	2	1	0	**4,3**
12	Assess the quality of repair and determine its cost	6	11	4	4	2	**3,8**
13	Prepare estimated cost of repair	3	8	4	7	3	**3,5**

Source: Own study

3.3.1.4. Social and personal competencies

Regarding social and personal competencies there were seven items to be assessed by the interviewees with the help of a five-point-scale which reaches from crucial (=5) to unnecessary (=1). Other than that they were offered the chance to add further competencies that they regarded as important to mention and wanted to be ranked according to the scale.

In this case all given items are in average estimated as very important (=4).

Both *he/she respects professional confidentiality* (PSC3) and *he/she recognizes his/her own learning needs, updates his/her knowledge and improves his/her professional skills* (PSC6) gain highest ranking with 4.2. The special importance of the latter is further underlined by the fact that

a positive attitude towards lifelong learning was added as a further item and ranked as *crucial* by one of the interviewees.

He/she works well both on his/her own and within a group (PSC5) is regarded as *very important* (=4.1) *and he/she deals well with stress* (PSC7) follows closely with a 4.0.

Again very close to that can be found all competencies that were given a 3.9. These are he/she feels responsible for the performed tasks connected with car diagnosis and repair (PSC1), he/she is creative and consistent in the implementation of tasks (PSC2) and he/she can evaluate his/her actions and the actions of his/her team and takes responsibility for the consequences (within the car diagnosis and repair) (PSC4).

Some of the interviewed individuals **added further social and personal competencies** that appeared necessary to their eyes. Two interviewees mention ***he/she is able to understand and imagine connections and processes*** and rank it very important (=4). In addition to **that *he/she keeps track of existing and necessary processes*** and ***he/she has the ability of logical thinking*** **estimated as crucial** (=5.0) by one interviewee each.

Table 6. The degree of importance of personal and social competencies relevant to the position of a motor vehicle mechanic, according to opinions of employers

No	Personal and social competences	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	He/she feels responsible for the preformed tasks connected with car diagnosis and repair	5	18	7	0	0	**3,9**
2	He/she is creative and consistent in the implementation of tasks	4	21	4	1	0	**3,9**
3	He/she respects professional confidentiality	15	8	6	1	0	**4,2**

No	Personal and social competences	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
4	He/she can evaluate his/her actions and the actions of his/her team and takes responsibility for the consequences (within the car diagnosis and repair)	7	11	10	0	**1**	**3,9**
5	He/she works well both on his/her own and within a group	6	20	4	0	**0**	**4,1**
6	He/she recognizes his/her own learning needs, updates his/her knowledge and improves his/her professional skills	10	15	4	0	**0**	**4,2**
7	He/she deals well with stress.	8	14	8	0	**0**	**4**

Source: Own study

3.3.1.5. Key competencies

Along with previous categories the exactly same approach is used in order to assess *key competencies*. Again a five-point-scale was used in order to rank ten *key competencies*. And again there was an opportunity of mentioning and ranking further competencies that had not been included in the list of suggestions yet.

Teamwork (KC2) and *the ability to use modern information and communication technologies* (KC10) were both ranked highest with 4.1 which equals *very important*.

Next come *problem solving* (KC1), *planning and organizing work* (KC5) and *motor efficiency* (KC6) that receive 3.9 in average.

Following closely with 3.8 the *item the ability to search, filter and critical analysis of information* (KC9) is mentioned. Others that receive a 3.7 are *communication in the mother tongue and in foreign languages* (KC3) and *mathematic skills* (KC8). T*he ability of comprehensive reading and*

writing (KC7) is right in the middle of *important* and *very important* (3.5). The only competence that is assessed as less than *important* for professionals is *leadership skills* (KC4) which receives a 2.9.

Interviewees were invited to **add key competencies** to the presented ones. Two of interviewees mentioned **the *general education*** of professionals as a *very important* or even *crucial* competence. ***Good manners*** in terms of customer service were graded as *very important* or *crucial* by four interviewees. Other than that one interviewee does not only rate KC 10 which is *the ability to use modern information and communication technologies* very important but also emphasizes the importance of ***general communication skills*** which means *very important* as well. Another two interviewees mentioned ***quality awareness*** as a key competence and graded it as *very important* and *crucial*.

Table 7. The degree of importance of key competencies relevant to the position of a motor vehicle mechanic, according to opinions of employers

No	Key competences	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	Problem solving	6	16	8	0	0	**3,9**
2	Teamwork	9	16	5	0	0	**4,1**
3	Communication in the mother tongue and in foreign languages	4	13	10	2	1	**3,7**
4	Leadership skills	0	6	9	12	3	**2,9**
5	Planning and organizing work	4	18	8	0	0	**3,9**
6	Motor efficiency	7	14	9	0	0	**3,9**
7	The ability of comprehensive reading and writing	5	7	15	3	0	**3,5**

8	Mathematic skills	7	9	13	1	0	**3,7**
9	The ability to search, filter and critical analysis of information	5	16	8	1	0	**3,8**
10	The ability to use modern information and communication technologies	10	15	4	1	0	**4,1**

Source: Own study

3.3.2. Professional competencies in the profession of electricians (energy and building technology)

In the following the expectations of German enterprises concerning requirements for professional competencies for electricians in the field of energy and building technology will be presented.
Along with the previous portrayal for car mechanics, competencies are subdivided into professional, social and personal skills and key competencies. And again, interviewees were asked to rate a number of items per category with the help of a five-point-scale that reaches out from unnecessary (=1) to crucial (=5).

3.3.2.1. Expected professional competencies

The original survey intended to cover *installation and maintenance of machinery and electrical equipment* (KZ1) *and installation and maintenance of electrical installations* (KZ2). Due to changes of the profession in Germany and also due to the fact that only energy and building technology was considered, the survey was customized to meet German circumstances best. The project manager consented to these changes. As **KZ1** is totally **neglected by the German** system of vocational education, the decision was made to neglect it within this survey as well.

Hence the survey for Germany **focuses** *on installation and maintenance of electrical installations* **(KZ2)**. Again, interviewees were kindly invited to add further items to the list if they seemed appropriate and necessary but none of them followed the invitation.

When assessing the relevance of the above mentioned competence it becomes clear that it really is a key competence because it is rated a 4.5 which means a hybrid of *very important* and *crucial*. None of the interviewees rated one of the items unnecessary or not important. This underlines once more the profound knowledge which the survey is basing on.

Table 8. Degree of professional competencies in the profession of an electrician according to the opinion of employers

No.	List of professional competences	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
KZ2	Installation and maintenance of electrical installations	18	13	2	0	0	**4,5**

Source: Own study

3.3.2.2. Abilities/skills (competencies Kz2) – Installation and maintenance of electrical installations

As mentioned in the introduction of chapter three, items connected to ***knowledge*** are estimated as **highly meaningful** in Germany. Following the above arguments there will not be presented any additional analysis in this place. This is why the **German survey** for electricians **focuses** on grading ***professional competence*** with reference to *ability* and *skills*.

With regard to *professional competence* in the field of *installation and maintenance of electrical installations* (Kz2) the readership should know that interviewees were presented a set of 18 items which they were supposed to grade.

In the end there were five of them with equal relevance. Those are *organize the workplace in accordance with the safety, fire, shock regulations, environmental protection and ergonomics*

when doing electrical installations (Kz2.1), *release people from voltage and rescue electrocuted ones* (K72.2), *obey standards and regulations concerning the fitting of electrical installations* (Kz2.3), *perform temporary connections* (Kz2.7) *and perform temporary installations* (Kz2.8). All of them received a 4.4.

Next come *use the technical documentation of electrical installations* (Kz2.5) and *use simple technical documentation of machinery and electrical equipment* (Kz2.16) with 4.3. Followed by *perform and renovate indoor electrical installations* (Kz2.9) *and locate and renovate faults in internal and external electrical installations* (Kz2.14) which are rated with 4.2. *Choose cables, fittings, tools and methods relevant to the fitting and repairing of various types of electrical installations* (Kz2.6) and *check the correctness of functioning of internal and external electrical installations* (Kz2.13) receive a 4.1.

A 4.0 which represents *very important* is given to *perform connections of electrical and mechanical systems (bolted, clamping and soldered)* (Kz2.12).

This item is followed by three others that are graded as 3.9: *identify the types of electrical installations and characterize their structure* (Kz2.4), *install building cable or aerial connections* (Kz2.11) and *exploit the equipment, installations and power grids with a voltage not exceeding 1 kV* (Kz2.15).

Repair power tools and electric machines, exchange power cables with damaged insulation motors, sharpen drills and cutters and other metalwork (Kz2.17)is given a 3.8.

Perform and renovate outdoor electrical installations of the following types: telecommunication, signalling, protection of property and lightning (Kz2.10) and *exchange bearings in power tools and induction motors, sharpen drills and cutters and other metalwork* (Kz2.18) are ranked lowest with a 3.5 which still means *important* or *very important*.

None of the interviewees had further items to be added to the list.

Table 9. Degree of importance of skills that an electrician should have in respect of the installation and maintenance of electrical systems according to the opinion of employers

No.	Skills	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	Organize the workplace in accordance with the safety, fire, shock regulations, environmental protection and ergonomics when doing electrical installations	17	10	4	0	0	**4,4**
2	Release people from voltage and rescue electrocuted ones.	14	16	1	0	0	**4,4**
3	Obey standards and regulations concerning the fitting of electrical installations	14	16	1	0	0	**4,4**
4	Identify the types of electrical installations and characterize their structure.	5	18	7	0	0	**3,9**
5	Use the technical documentation of electrical installations.	12	17	2	0	0	**4,3**
6	Choose cables, fittings, tools and methods relevant to the fitting and repairing of various types of electrical installations	7	19	4	0	0	**4,1**
7	Perform temporary connections	13	17	1	0	0	**4,4**
8	Perform temporary installations	14	15	2	0	0	**4,4**
9	Perform and renovate indoor electrical installations	10	16	4	0	0	**4,2**
10	Perform and renovate outdoor electrical installations of the following types: telecommunication, signaling, protection of property and lightning	1	15	8	3	0	**3,5**
11	Install building cable or aerial connections	5	17	5	1	0	**3,9**

No.	Skills	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
12	Perform connections of electrical and mechanical systems (bolted, clamping and soldered)	6	18	6	0	0	**4**
13	Check the correctness of functioning of internal and external electrical installations	10	16	5	1	0	**4,1**
14	Locate and remove faults in internal and external electrical installations	12	16	3	1	0	**4,2**
15	Exploit the equipment, installations and power grids with a voltage not exceeding 1 kV	6	14	7	1	0	**3,9**
16	Use simple technical documentation of machinery and electrical equipment	10	14	2	0	0	**4,3**
17	Repair power tools and electric machines, exchange power cables with damaged insulation, replace brushes in commutator motors	5	10	8	2	1	**3,8**
18	Exchange bearings in power tools and induction motors, sharpen drills and cutters and other metalwork.	3	5	7	4	3	**3,5**

Source: Own study

3.3.2.3. Social and personal competencies

The two items *he/she respects professional confidentiality* (PSC3) and *he/she works well both on his/her own and within a group* (PSC5) are estimated as most important and therefore receive a 3.9 which means *very important*. It is highly interesting that confidentiality and teamwork as well as individual work are of equal relevance.

All three items *he/she is creative and consistent in the implementation of tasks* (PSC2), *he/she recognizes his/her own learning needs, updates his/her knowledge and improves his/her professional skills* (PSC 6) and *he/she deals well with stress* (PSC 7) are given a 3.8.

Least important but still very important *are he/she feels responsible for the performed tasks* (PSC1) and *he/she can evaluate his/her actions and the actions of his/her team and takes responsibility for the consequences* (PSC4).

Some of the interviewees took their chances and named additional personal and social competencies. Two of them believe ***he/she can determine characteristic values without the use of technical resources*** to be *crucial* for electricians. Two others added ***he/she has a good general comprehension*** as another *crucial* competence. And another two of them regard ***he/she understands circuit diagrams*** **as** ***very important*** (=4.0) and *crucial* (=5.0). The competence ***he/she can recognize structures of buildings*** **is** ***crucial*** **for one single interviewee.**

Table 10. The degree of importance of personal and social competencies relevant to the position of an electrician, according to opinions of employers

No	Personal and social competences	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	He/she feels responsible for the preformed tasks	4	16	10	3	0	**3,6**
2	He/she is creative and consistent in the implementation of tasks	5	14	12	0	0	**3,8**
3	He/she respects professional confidentiality	7	18	3	4	0	**3,9**
4	He/she can evaluate his/her actions and the actions of his/her team and takes responsibility for the consequences	3	17	9	4	0	**3,6**
5	He/she works well both on his/her own and within a group	6	19	8	0	0	**3,9**

6	He/she recognizes his/her own learning needs, updates his/her knowledge and improves his/her professional skills	2	22	9	0	0	**3,8**
7	He/she deals well with stress.	5	16	10	0	0	**3,8**

Source: Own study

3.3.2.4. Key competencies

Corresponding to the previous parts of the survey, *key competencies* were presented in exactly the same way in order to be graded by the interviewees with the help of a five-point-scale. Ten items were offered and of course the opportunity of adding and grading further individual items was given.

All in all the whole of items were ranked between 2.8 which is right in the middle of *important* and *not important* and 4.0 which represents very important. Nevertheless most items are ranked between 3.0 and 4.0.

The most *crucial* key competence is *problem solving* (KC1) which is rated 4.0.

Teamwork (KC2) and *motor efficiency* (KC6) are also *very important* (=3.8). These two are followed by *planning and organizing work* (KC5) and *mathematic skills* (KC8) which receive a 3.7.

The ability to search, filter and critical analysis of information (KC9) ranks 3.6, *communication in the mother tongue and in foreign languages* (KC3) equals 3.5 and both *the ability of comprehensive reading and writing* (KC7) and *the ability to use modern information and communication technologies* (KC10) rank 3.4.

Just as for car mechanics it is again *leadership skills* (KC4) which is the least important *key competence* for Germany.

Interviewees did not hesitate to name and rate additional items. All of them were identified as *crucial*. These are**: *professional customer dialogue and consulting services, cleanliness* and *driving licence*.**

Table 11. The degree of importance of key competencies relevant to the position of an electrician, according to opinions of employers

No	Key competences	Very important	Important	Relevant	Unimportant	Unnecessary	Importance indicator
1	Problem solving	8	19	5	1	0	**4,0**
2	Teamwork	3	22	8	0	0	**3,8**
3	Communication in the mother tongue and in foreign languages	5	10	14	4	0	**3,5**
4	Leadership skills	0	5	17	10	0	**2,8**
5	Planning and organizing work	4	15	13	1	0	**3,7**
6	Motor efficiency	4	19	10	0	0	**3,8**
7	The ability of comprehensive reading and writing	2	10	19	2	0	**3,4**
8	Mathematic skills	6	13	13	1	0	**3,7**
9	The ability to search, filter and critical analysis of information	4	14	14	1	0	**3,6**
10	The ability to use modern information and communication technologies	4	6	18	3	0	**3,4**

Source: Own study

3.4. Conclusion

As a result it can be said that the adaptions which – thanks to the project manager – could be made, contributed a lot to the success of this study and hence to the conclusions that could be drawn. Adaptions were necessary in order to receive reliable data.

Of course professional competencies of the two differing professions cannot be compared. But instead, comparing results with the other participating countries will surely bring to light a number of interesting facts.

When looking at *key competencies* it is rather interesting that *leadership skills* are ranked lowest both for car mechanics and electricians. This could result from the fact that general requirements stipulate further training for managers such as business administrator (German *Fachwirt*), master craftsman (German *Meister*) or management expert (German *Betriebswirt*). German professionals are not supposed to be involved in leadership without gaining any further qualifications.

Another interesting aspect is the highly different perception of *modern information and communication technologie*s of interviewees from the two different professions. Referring to car mechanics *modern information and communication technologies* are regarded as highly relevant whereas electricians are apparently not supposed to fulfil these to such an extent.

One more remarkable feature refers to the general estimation of items regardless of categories. Only very few interviewees rated single items as *not important* (=2) or unnecessary (=1). This means that fortunately the survey meets German conditions quite well which of course has to be ascribed to the adaptions.